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PROJECT: DESIGN AND IMPLEMENTATION OF A BIOMETRIC STUDENT'S  
ATTENDANCE MOBILE APPLICATION

TASK TWO : REQUIREMENT GATHERING

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## ABSTRACT

The Biometric Class Attendance Register app revolutionizes the traditional method of tracking student attendance in educational institutions through the seamless integration of advanced biometric technology. This innovative application aims to modernize attendance management, offering educators and administrators a powerful tool to streamline processes, enhance accuracy, and ensure data security. At its core, the app automates attendance tracking by employing sophisticated biometric modalities such as fingerprint or facial recognition. Students' unique biometric data serve as their digital identity, eliminating the need for cumbersome manual attendance sheets or barcode scanning. With a simple touch of their fingertip or a glance at the camera, students can swiftly register their attendance, ensuring a frictionless experience that maximizes class time. Designed with accessibility in mind, the app is compatible across various devices, including smartphones and tablets. Whether in a traditional classroom setting or a remote learning environment, educators can effortlessly track attendance, ensuring accountability regardless of the teaching modality. The user-friendly interface of the app further enhances its appeal. Intuitive navigation and clear prompts guide both educators and students through the attendance registration process, minimizing learning curves and maximizing efficiency. Accessibility features are also integrated to accommodate users with disabilities, promoting inclusivity and equal access to the attendance system.

## 1. INTRODUCTION

In the modern educational landscape, the need for efficient and accurate attendance tracking systems has become increasingly evident. Traditional methods of attendance taking, such as manual paper-based systems or basic digital solutions, often suffer from inaccuracies, delays, and inefficiencies. To address these challenges, there is a growing interest in implementing biometric class attendance registers, leveraging biometric technologies such as fingerprint or facial recognition for automated and real-time attendance tracking.

This report presents a comprehensive overview of the requirement gathering process for developing a biometric class attendance register. Through an in-depth analysis of stakeholder needs, current processes, pain points, and areas for improvement, this report aims to provide valuable insights for designing an effective and user-friendly biometric attendance solution.

### 1.1 Overview

The Biometric Class Attendance Register project aims to modernize and streamline the process of tracking student attendance in educational institutions using biometric technology. By implementing a biometric attendance system, the project seeks to improve accuracy, efficiency, and security while reducing administrative burden and potential errors associated with manual attendance tracking methods.

## 1.2 Objectives

- **Automate Attendance Tracking:** Implement a biometric attendance system that automates the process of capturing and recording student attendance using biometric modalities such as fingerprint or facial recognition.
- **Enhance Accuracy and Reliability:** Improve the accuracy and reliability of attendance records by eliminating errors associated with manual data entry and verification.
- **Improve Efficiency:** Streamline the attendance tracking process for teachers and students, reducing the time and effort required for attendance management tasks.
- **Ensure Data Security and Privacy:** Implement robust security measures to protect biometric data and ensure compliance with privacy regulations, such as obtaining informed consent from users and encrypting sensitive data.
- **Facilitate Integration:** Develop APIs or integration protocols to enable seamless data exchange with existing school systems, including student information systems (SIS) and learning management systems (LMS), ensuring interoperability and data consistency.

## 2. IDENTIFICATION OF STAKEHOLDERS AND ROLES

### 2.1 Stakeholder Analysis

Stakeholder analysis is a crucial step in understanding the needs, requirements, and expectations of those who will be affected by or involved in the development and implementation of a biometric class attendance register. Let's explore each stakeholder group in detail:

#### INTERVIEW

##### 2.1.1 Administrator

- Infeasibility of integration may limit the system's potential functionality and interoperability with other systems.
- Lack of emphasis on data security may pose risks to sensitive information and user privacy.
- Simplification of the database structure may sacrifice scalability or performance.
- Implementation of offline functionality may present technical challenges or limitations.

- Addressing errors in real-time may require additional resources and development effort.
- Ensuring transparency may involve designing clear user interfaces and providing accessible documentation.
- Complexity or lack of transparency in the system may hinder user adoption and trust.
- Difficulty or inconvenience in activating attendance could disrupt class flow.
- Complicated registration processes may deter users from using the system effectively. Slow or cumbersome attendance recording methods may cause frustration for users.
- Manual generation of attendance lists can be time-consuming and prone to errors.
- Limited or difficult access to attendance data may hinder administrative tasks.
- Concerns about bias in attendance tracking could undermine system credibility and fairness.
- User-friendly interface and clear processes to ensure ease of use and understanding.
- Efficient activation mechanisms for lecturers to streamline attendance management.
- Simplified registration procedures to encourage user engagement and participation.
- Quick and intuitive attendance recording features to save time and effort.

### **2.1.2 Teacher**

- Enable lecturers to activate attendance easily.
- Ensure reliability and accuracy of the attendance system.
- Require registration for both students and lecturers.
- Consider handling unknown cases effectively.
- Provide real-time updates on attendance.
- Generate attendance lists after each session.
- Allow for offline functionality if possible.
- Facilitate lecturer registration of students in special cases.
- Enable students to create their accounts.
- Respond to errors promptly.
- Ensure transparency in the attendance process.
- Simple database for ease of use.
- Real-time updates for accurate attendance tracking.
- Ability to handle unknown cases effectively.
- Offline functionality for flexibility.
- Prompt error response for smooth user experience.
- Transparency in attendance processes for accountability.
- Ensure the reliability of the attendance system.
- Determine compatibility with various devices.
- Address the handling of carryover students (students from previous semesters or sessions).

- Manage situations where students are present in class but fail to register within the activation time limit.
- Establish procedures for handling late arrivals in the attendance system.
- Clear information on system reliability to instill confidence in users.
- Compatibility with a wide range of devices to accommodate diverse user preferences.<sup>3</sup>
- Efficient handling of carryover students to ensure accurate attendance records.
- Effective mechanisms for addressing registration issues within the activation time limit to maintain attendance accuracy.
- Reliable procedures for recording and managing late arrivals to maintain attendance integrity and fairness.
- Ensure ease of use and transparency in the attendance system.
- Enable lecturers to easily activate attendance.
- Facilitate registration for both students and lecturers.
- Provide a fast and straightforward process for recording attendance.
- Generate attendance lists automatically after each session.
- Allow users to access attendance data efficiently.
- Ensure impartiality and transparency in the system to avoid bias
- User-friendly interface and clear processes to ensure ease of use and understanding.
- Efficient activation mechanisms for lecturers to streamline attendance management.
- Simplified registration procedures to encourage user engagement and participation.
- Quick and intuitive attendance recording features to save time and effort.
- Automated generation of attendance lists to reduce manual workload and errors.
- Accessible and well-organized attendance data for effective monitoring and analysis.
- Transparent algorithms and processes to maintain fairness and integrity in attendance tracking.

## **ONLINE SURVEY AND QUESTIONNAIRE**

### **2.1.3 Students**

- Implement a more efficient attendance recording method to replace the current manual or verbal processes.
- Address challenges associated with the current attendance tracking system, such as time-consuming processes, inaccuracies, and inability to track late arrivals or early departures.<sup>3</sup>
- Explore the potential of implementing a biometric attendance system as an alternative solution.

- Address concerns regarding the privacy and security of fingerprint data in the proposed biometric system.
- Assess the potential impact of a biometric attendance system on reducing attendance fraud or proxy attendance.
- Evaluate the convenience of a biometric attendance system compared to existing methods.
- Familiarize students with fingerprint recognition technology for attendance tracking and gauge their level of understanding.
- Determine desired features and functionalities for a fingerprint recognition student attendance system based on student preferences and needs.
- Gather additional comments or suggestions regarding the implementation of a fingerprint recognition student attendance system from students.
- Time-consuming processes associated with current attendance recording methods.
- Inaccuracies in attendance tracking leading to potential discrepancies in records.
- Inability to track late arrivals or early departures using manual or verbal attendance methods.
- Concerns about the privacy and security of fingerprint data in a biometric attendance system.
- Uncertainty or skepticism about the effectiveness and usability of a biometric attendance system.
- Potential inconvenience or challenges associated with transitioning to a biometric attendance system.
- Lack of familiarity with fingerprint recognition technology among students.
- Desire for specific features or functionalities in a biometric attendance system that are not currently available.
- Some students may have reservations or specific requirements regarding the implementation of a biometric attendance system.
- Streamlined and efficient attendance recording processes to save time and improve accuracy.
- Improved methods for tracking late arrivals or early departures to enhance attendance monitoring.
- Implementation of a biometric attendance system that addresses privacy and security concerns related to fingerprint data.
- Assurance of the effectiveness of a biometric attendance system in reducing fraud and improving overall attendance accuracy.
- Convenience and ease of use in transitioning to and using a biometric attendance system.
- Education and awareness initiatives to familiarize students with fingerprint recognition technology and its application in attendance tracking.

- Development of a biometric attendance system with desired features and functionalities as indicated by student feedback.
- Consideration of student input and suggestions in the implementation of a biometric attendance system to ensure acceptance and usability.

## **BRAINSTORMING**

- Improve attendance tracking efficiency and accuracy.
- Enhance user experience for both lecturers and students.
- Increase transparency and accountability in attendance management processes.
- Ensure reliability and integrity of attendance data.
- Enable real-time access to attendance information.
- Address concerns regarding data security and privacy.
- Accommodate varying needs and preferences of users.
- Current attendance tracking methods are time-consuming and prone to errors.
- Lack of transparency in manual attendance processes.
- Concerns about data security and privacy in a digital attendance system.
- Resistance to change from traditional attendance recording methods.
- Challenges in integrating the attendance system with existing infrastructure.
- Uncertainty about the reliability and accuracy of a new attendance system.
- Complexity in registration procedures for users
- A user-friendly interface for easy navigation and operation.
- Seamless integration with existing systems or platforms.
- Clear guidelines and instructions for registration and attendance recording.
- Real-time access to attendance data for both lecturers and students.
- Customization options to accommodate different user requirements.
- Error handling mechanisms to address any issues promptly.
- Regular updates and improvements based on user feedback.
- Transparency in attendance tracking processes to build trust and confidence.

## **3. RESEARCH AND BACKGROUND INVESTIGATION**

### **3.1 Assessing Biometric Technology**

Assessing biometric technology involves evaluating different biometric modalities based on their accuracy, reliability, scalability, and user acceptance, as well as considering practicality and suitability within the classroom environment. By carefully weighing these factors and



conducting thorough evaluations, educational institutions can select the most appropriate biometric solution to meet their attendance tracking needs while ensuring user satisfaction and data security.

### **3.1.1 Evaluation of Biometric Modalities**

**Objective:** Assess biometric modalities based on accuracy, reliability, scalability, and user acceptance.

**Explanation:**

- Biometric modalities are the methods used to capture and verify individuals' unique physiological or behavioral characteristics for identification or authentication purposes.
- Common biometric modalities include fingerprint recognition, facial recognition, iris scanning, voice recognition, and palm vein recognition.
- Evaluation criteria for biometric modalities:
  - Accuracy: Measure of how reliably the biometric system can distinguish between different individuals and correctly identify or authenticate users. Accuracy is typically expressed as a false acceptance rate (FAR) and false rejection rate (FRR).
  - Reliability: Consistency and stability of biometric measurements over time and across different conditions (e.g., variations in lighting, environmental factors).
  - Scalability: Ability of the biometric system to accommodate varying numbers of users and handle increased workloads without significant degradation in performance or accuracy.
  - User Acceptance: Perception of users towards the biometric modality, including ease of use, comfort, and willingness to adopt the technology.
- Biometric modalities should be evaluated under real-world conditions to assess their performance in the intended deployment environment, including factors such as lighting conditions, user demographics, and usage scenarios.
- Pilot testing and usability studies can provide valuable insights into user acceptance and practical considerations, allowing stakeholders to make informed decisions about which biometric modality is most suitable for the classroom environment.

### **3.1.2 Consideration of Practicality and Suitability**

**Objective:** Consider practicality and suitability within the classroom environment, including device compatibility and ease of use.

### Explanation:

- Practicality and suitability factors determine the feasibility and effectiveness of deploying biometric technology in educational settings, particularly classrooms.
- Considerations for practicality and suitability:
  - Device Compatibility: Biometric devices should be compatible with existing hardware infrastructure, such as computers, tablets, or smartphones, commonly used in classrooms. Compatibility ensures seamless integration and ease of deployment.
  - Ease of Use: Biometric devices should be intuitive and easy to use for both teachers and students. User-friendly interfaces and clear instructions can help minimize user errors and facilitate adoption.
  - Cost-Effectiveness: Consideration of cost implications, including initial investment, maintenance, and operational expenses, is critical. The chosen biometric solution should offer a balance between performance and affordability.
  - Privacy and Security: Biometric technology should incorporate privacy-enhancing features, such as data encryption, secure storage, and access controls, to protect individuals' privacy and prevent unauthorized access or misuse of biometric data.
  - Pilot deployments and user feedback sessions can help validate the practicality and suitability of biometric solutions in real-world classroom environments. Feedback from teachers, students, and administrators can inform adjustments and refinements to optimize usability and effectiveness.

## 4. USER REQUIREMENTS GATHERING

User experience requirements for the biometric class attendance system encompass intuitive interface design, mobile compatibility, and accessibility features. By prioritizing user satisfaction, accessibility, and inclusivity, educational institutions can ensure that the attendance system is user-friendly, accessible, and accommodating to the diverse needs of teachers and students.

- The system should be easy and transparent to use for both lecturers and students.
- Lecturers should be able to activate attendance quickly and efficiently.
- Registration for both students and lecturers should be straightforward and user-friendly.
- Attendance recording should be fast and easy for all users.
- Users should have access to attendance lists after each session.
- Users should be able to gain easy access to attendance data for monitoring and analysis.

- The system should ensure transparency and impartiality in attendance tracking processes.

## 5. SYSTEM REQUIREMENTS GATHERING

### 5.1 Hardware Requirements

- Reliable and scalable database infrastructure to support attendance data storage and management.
- Biometric authentication hardware for students to register attendance accurately and securely.
- Compatibility with various devices, including computers, tablets, and smartphones, to ensure accessibility for users.
- Robust security measures, such as encryption protocols and secure storage solutions, to protect sensitive biometric data.
- Efficient error-handling mechanisms, which may require sufficient computing resources for real-time processing and response.

### 5.2 Software Requirements

- The application will be Compatible with Android and iOS operating systems.
- Support for a specific DBMS for storing user data, attendance records, and system configurations.
- Offline functionality options to ensure system usability even in environments with limited or no internet connectivity.

## 6. FUNCTIONAL REQUIREMENTS GATHERING

- Lecturers should have the ability to activate attendance.
- The system should ensure reliability and accuracy in attendance tracking.
- Registration functionality should be provided for both students and lecturers.
- The system should be able to handle unknown cases or exceptions.
- Attendance lists should be generated automatically after each session.
- Offline functionality should be implemented if possible.
- Lecturers should be able to register students in special cases.
- Students should be able to create accounts.
- The system should respond to errors promptly.
- The system should ensure transparency in all processes.

## 7. NON-FUNCTIONAL REQUIREMENTS GATHERING

- The system should be easy and simple to use for all users.
- The system should generate attendance lists efficiently after each session.
- Access to attendance data should be provided for monitoring and analysis purposes.
- The system should generate timestamps for attendance records.
- The system should be capable of handling large amounts of data efficiently.
- The system should ensure impartiality and transparency to avoid bias.
- The system should be able to handle various conditions like weather (e.g., raining).
- The system should be customizable to handle carryover students and other special cases.
- Attendance recording should be fast and effective.
- Data integrity should be maintained, and data should be easily convertible between different formats.

## CONCLUSION

The requirement gathering process for a biometric class attendance register involves a comprehensive analysis of stakeholder needs, current processes, and technological considerations. By addressing these aspects systematically, educational institutions can develop an effective and user-friendly attendance solution that enhances accuracy, efficiency, and data security. The insights provided in this report serve as a foundation for the design and implementation of a robust biometric attendance system tailored to the unique requirements of educational environments.

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