FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMEENT: COMPUTER ENGINEERING

CEF 440: INTERNET PROGRAMMING AND MOBlLE PROGRAMMING

TASK 2

REQUIREMENT ANALYSIS

GROUP MEMBERS

Names	Matriculation
ALAIN NKEH MBUNKUH	FE21A133
ANANFACK ZANGO ANGELA CARINE	FE21A137
CHO WESLEY MUNGO	FE21A160
NKWETI MANGEM ANCELIA	FE21A280
NTUI RAOUL NTUI NJOCK	FE21A288

COURSE INSTRUCTOR : Dr NKEMENI VALERY

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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 Requirements analysis

Requirements analysis (requirements engineering) is the process of determining user expectations for a new or modified product. It is usually a team effort and demands a variety of human soft skills, such as critical thinking, communication and judgment.

Requirements analysis is a common and essential concept in software development and software 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*, 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 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 creep.

Types of software requirements

Business requirements	User requirements	Software requirements
Outline measurable goals for the business.	Reflect specific user needs or expectations.	Identify features, functions, non-functional requirements and use cases.
Define the why behind a software project.	Describe the who of a software project.	Delve into the how of a software project.
Match project goals to stakeholder goals.	Highlight how users interact with it.	Describe software as functional modules and non-functional attributes.
Maintain a BRD with requirements, updates or changes.	Create a URS, or make them part of the BRD.	Compose an SRS, and, optionally, an FRS.

Requirements analysis is an important concept in software development.
The importance of communication during requirements analysis

During requirements analysis, project team members come together to understand the project goals, clarify expectations and document the product's required specifi-

cations and features. All of this requires clear and unambiguous communication between team members.

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 and Departments Heads):** 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.

2.3. Importance of Involving them in the Requirement Gathering Process

- **Understanding Needs:** Stakeholders have diverse perspectives and needs. Involving them ensures a comprehensive understanding of requirements,

leading to a solution that meets everyone's needs.

➢ **Building Support:** Engaging stakeholders early builds buy-in and support for the project. When stakeholders feel heard and involved, they are more likely to champion the project and its success.

➢ **Identify Risks:** Stakeholders can identify potential risks or challenges that might not be apparent to the project team. Their input helps in mitigating risks and planning for contingencies.

➢ **Validating Assumptions:** Often, assumptions are made during the requirement gathering process. Involving stakeholders allows these assumptions to be validated or corrected, ensuring that the project is based on accurate information.

➢ **Improving Communication:** By involving stakeholders, communication channels are established early on. This fosters transparency and ensures that stakeholders are kept informed throughout the project lifecycle.

➢ **Enhancing Quality:** Stakeholder involvement leads to better-defined requirements, reducing the likelihood of misunderstandings or misinterpretations. This ultimately contributes to the quality of the final product or solution.

➢ **Minimizing Resistance to Change:** When stakeholders are involved from the beginning, they are more likely to embrace changes resulting from the project. This reduces resistance and increases the likelihood of successful implementation.

3. REQUIREMENT GATHERING TECHNIQUES

Requirement gathering techniques encompass various methods used to collect, analyze, and documents for a project. These techniques include:
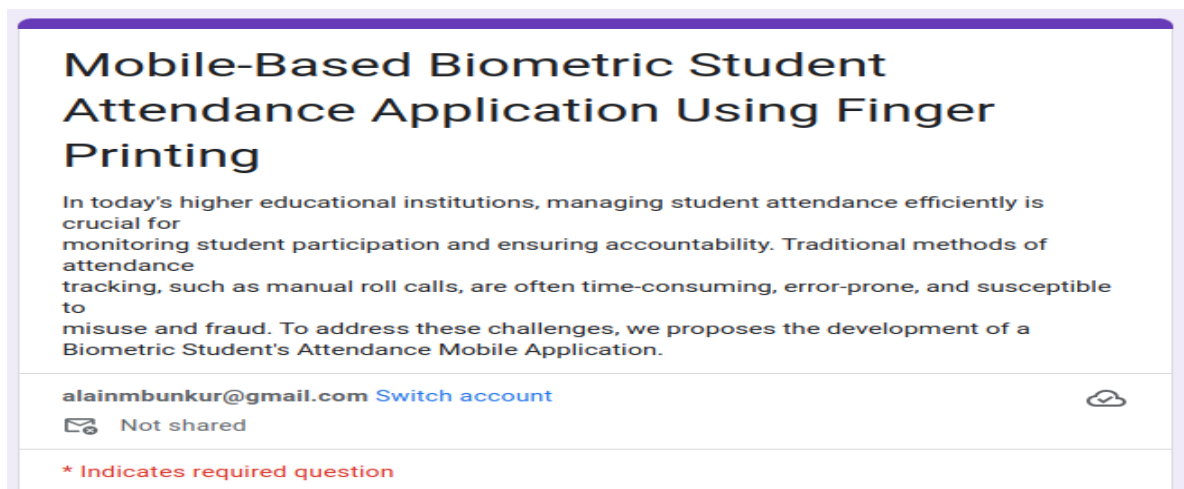
3.1. Interviews:

Conducted one-on-one interviews with key stakeholders, such as students, instructors and administrative staff. Asked open-ended questions to understand their requirements, expectations, and concerns regarding attendance recording. For example:

➢ What are the current challenges with the existing attendance recording system?
➢ What specific features would you like to see in the new biometric attendance system?
➢ How should the system integrate with other university systems?

3.2. Observations:

Observed the current attendance recording process in the various environment. Spent time in classrooms or lecture halls to understand how attendance is currently recorded, the devices or systems used, and any challenges faced by faculty and students. Made note of any pain points or inefficiencies that could be addressed by the new biometric system.

3.3. Online Surveys:

Mobile-Based Biometric Student Attendance Application Using Finger Printing

In today's higher educational institutions, managing student attendance efficiently is crucial for
monitoring student participation and ensuring accountability. Traditional methods of attendance
tracking, such as manual roll calls, are often time-consuming, error-prone, and susceptible to
misuse and fraud. To address these challenges, we proposes the development of a Biometric Student's Attendance Mobile Application.

alainmbunkur@gmail.com Switch account

Not shared

* Indicates required question

Created online surveys (e.g., via filing google forms) to a large sample of students. We collected quantitative data regarding their preferences, concerns, and expectations related to attendance recording. The survey questions could cover topics such as:

- ➢ Satisfaction with the current attendance recording process
- ➢ Willingness to adopt a biometric system
- ➢ Desired features, such as real-time reporting, notifications, or mobile access

3.4. Document analysis

Document analysis is a research method used to examine and interpret written or recorded information to gain insights and understanding about a particular topic or subject of interest. It involves systematically reviewing and analyzing various types of documents, such as written texts, reports, letters, memos, photographs, videos, or audio recordings.

3.5. Brainstorming

This is a creative problem-solving technique used to generate a large number of ideas, solutions between team members. It is a group activity that encourages participants to freely share their thoughts, suggestions, and insights without judgment or criticism. During these sessions, we engage in a structured discussion to explore various possibilities and generate innovative solutions for our project requirements.

- ➢ The student approaches the biometric system and places their finger on the fingerprint scanner.
- ➢ The system captures the fingerprint and verifies the student's identity.
- ➢ If the student's identity is successfully verified, the system records the attendance for that student.
- ➢ The system provides feedback to the student indicating successful attendance recording.

4. REQUIREMENT GATHERING RESULTS

4.1 Raw Data Assessment

After the online survey was done using Google forms, the following results were gotten from the responses of the students.
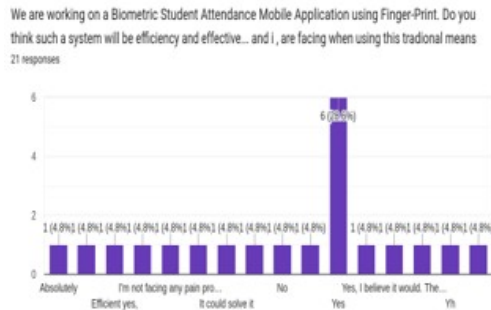

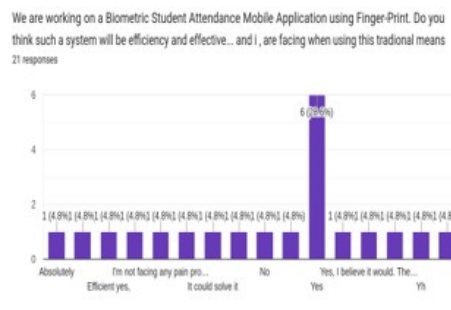
Figure 1: google form statistics 1
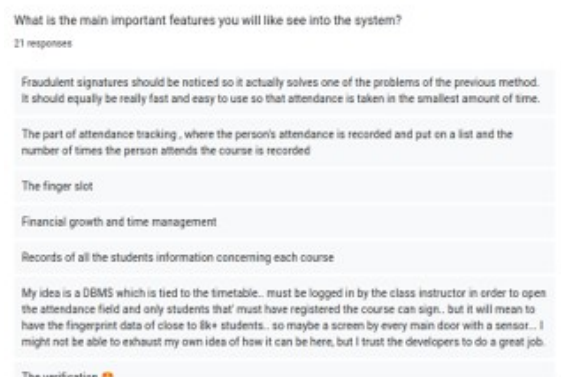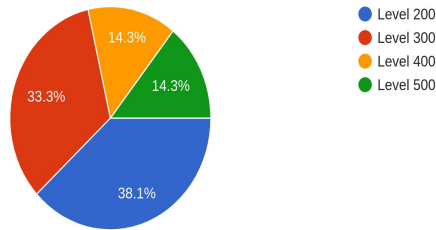

Figure 2: google form statistics 2

Figure 3: google form statistics 3

Figure 4: google form statistics 4

Level
21 responses

- Level 200
- Level 300
- Level 400
- Level 500

14.3%
14.3%
33.3%
38.1%

From the statistical results and replies above, we can see the students' preferences and recommendations for the system.

4.2. Data visualization in Excel:

The data obtained from google forms were exported to an excel sheet for better visualization of students' responses for the extractions of relevant requirements.

Below is a view of the exported excel sheet;

Timestamp	What do you think o‣	We are working on a‣	What is the main im‣	We think this syster‣	How important is it f‣	Do you know that th‣	Lastly, how do you v‣	Pl
4/26/2024 8:44:37	Yes they are time co‣	I support. But what ‣	I don't really have a ‣	That's right very imp‣	Important		Yes it will since the ‣	Don't really understa‣	Co
4/26/2024 8:50:29	Time consuming	Yes	Attendances recorde‣	Great, if will reduce ‣	Safes the time of m‣	Yes it will		More user-friendly	Co
4/26/2024 12:42:42	Yes	Yh	A personal attendan‣	Great	Very important	Yes it will			Ci
4/26/2024 15:51:03	Yes	In one way yes. but ‣	Fast authentication ‣	Good idea	If the attendance ca‣	For some will be inc‣	it should be elegant,‣	El
4/26/2024 22:05:20	Error prone and very‣	Yes, I believe it wou‣	Mobility and portabil‣	Of Course it will, sa‣	It permits me to esti‣	It will but not recogn‣	The attendance of a‣	Co
4/27/2024 14:50:07	Yes	Yes	Nice	Great	It's going to be wond‣	It's great		Digital	Ci
4/27/2024 18:19:12	yes	somehow	no idea	is a good idea	is very important	yes		simple	Ci
4/27/2024 18:29:25	It is time consuming‣	Absolutely	The efficiency of the‣	I think it is a great id‣	It is very important. ‣	In my opinion, yes.		It should be academ‣	Co
4/28/2024 10:36:38	Time consuming ye‣	Efficient yes,	I think just the ability‣	Yes, it can and is a ‣	Important	Yes		It will be more of a ‣	Co
4/28/2024 13:51:58	Yes	Yes	Easy to use	True	Not really important	Yes		Nice	Co
4/28/2024 15:00:54	Yes it is	Yes, I think. If right ‣	A database could be‣	Do you mean studen‣	Pretty cool.	Yes.		A good UI and UX. J‣	Co
4/28/2024 15:32:15	Yes	Yes	Have my presence r‣	Great idea	Very important	Increase student en‣	Like a fingerprint re ‣	Co
4/28/2024 16:02:10	Yes	Yes	Finger print recognit‣	No . Because it will ‣	What happens if a s‣	I think it will		It should have a stri‣	Co
4/28/2024 16:03:16	Yes it is	Definitely	The fingerprint may ‣	Smart move	Very important	It will and it'll set the		difference between ‣	Co
4/28/2024 16:40:57	Yes	It could solve it	Fraudulent signature‣	Absolutely	It's very important	I think it will but at ‣	Simple and easy to ‣	Co
4/28/2024 19:21:45	Yes it is	It will, but what abo ‣	The part of attendan‣	Yes good	So that I can know v‣	Yes it will		Simple and user frie‣	Co
4/28/2024 20:14:31	Error prone	Yes it will efficient a‣	The finger slot	Yes it sure will	Really intriguing and‣	Yes it sure will		Best of its kind	Co
4/28/2024 21:16:43	Yes and not relevan‣	No		Financial growth and‣	Workers and busine‣	How will a mobile ap‣	If people are willing ‣	If the Advantages ar‣	El
4/28/2024 23:50:58	Yes	Yes	Records of all the st‣	Very good idea	It think it is crucial ‣	Yes, greatly		User friendly	Ci
4/29/2024 6:56:47	Right..	I'm not facing any p‣	My idea is a DBMS ‣	Yes it's great. More ‣	A follow up will be g‣	Definitely. A system‣	Two separate interfa‣	Ci
4/29/2024 8:05:13	Exactly	Very very efficient I ‣	The verification 😊	That's true	It'll be very useful to‣	It definitely will th ‣	I don't really know, b‣	Co

5. 5. Categorizing Requirements

5.1 Functional Requirements:

- **Attendance Exception Handling:** The instructors should be able to mark attendance exceptions such as excused absences and include relevant note or explanation.

- **Attendance Backup System** : The system should have a backup option if in case the student fingerprint data is no longer recognized into the system database provided in case the student has enrolled his biometric data into the system before. In that case the lecturer is going to manually mark the attendance of the student's name

- **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.

- 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 lecturers should be able to closed up the attendance session taking

- **Time Frame:**
  The system should be able to show the exact time at which the students have mark their attendance

- **Registration and Login Process**
  The system should enable students or instructors to be able to register or login into the system

- **Generate Attendance Records**
  The system should provide lecturers with the ability to generate students' attendance records of the course he or she teaches.

- **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

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percentage of students that have attended that particular course.

- **Monitoring**

  The system can also be used to monitor lecturers if they are frequently coming to class. To observe the trend, pattern.

- Integrating with School Management Database (seamless data transfer)

- **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 issues 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. (*From Dr Nguti)*

- **Fingerprint Enrollment:**

  The student should be able to enroll their fingerprint data through the client application and be securely stored in the server database. (*From Dr Nguti)*

- Real-time Attendance Tracking

- **Account Registration:**

   Student should be able to registered themselves into the platform using their name, matriculation number, intuitional email, department, level and password.

- Recording Attendance Data (storing attendance information)

  5.2 Non-Functional Requirements:

- **Interface Customization**

  The student should be able to choose between light mode or dark mode.

- **Usability:**

  The system or platform should be easy and simple to use and navigate.

- **Portability:**

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This has to do with the compatibility or cross platform usability of the application with multiple devices and platforms. Students who own devices of different operating systems should be able to use the app.

- **Efficiency:**
Students' attendance should be taken correctly as in the fingerprint of a student shouldn't mark the presence of another student.

- **Performance:**
The application should be able to take attendance for students fast enough.

Security:

 The attendance should be taken and stored safely since it deals with the biometric data of students which is really sensitive data.

Offline mode:

- **Weekly Reviews:**
Students should be able to view their attendance reports at the end of the week.

The platform or the system should be a cross platform that is compatible with both Android and iOS devices.

- **Scalability:**
The system should be scalable and customizing in mind, allowing education institution to adapt the application to their specific requirements and scale it to accommodate varying class sizes.

- **Biometric Authentication:**
The system should enable students to verify their identities using fingerprint recognition technology

6. REQUIREMENT CONSTRAINT AND LIMITATIONS

6.1. 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.

➢ Regulatory Compliance: The system must comply with relevant laws and regulations regarding biometric data and privacy, such as obtaining consent from students and ensuring data protection.
➢ **Unavailability of some Key stakeholders:** Some key administrative staffs like HOD were not available when we were gathering this requirement gathering. This make it really difficult to be able to meet with them and get their feedback about such system being implemented at the various department level and get their requirements.

6.2. Limitations:

➢ **Accessibility:** The biometric system may have limitations in accommodating students with disabilities or physical impairments that affect fingerprint recognition. Alternative attendance recording methods should be provided for such cases.
➢ **Environmental Factors:** External factors like extreme weather conditions or environmental factors (such as wet or dirty fingers) might affect the accuracy of fingerprint recognition. Mitigation strategies should be considered to address these limitations.

7. CONCLUSION

Overall, requirement gathering 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.