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TASK 3: REQUIREMENT GATHERING

BY GROUP 17

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Table of Contents

GROUP MEMBERS: 2

Introduction 4

1. Stakeholder Identification 5

1.1) Primary stakeholders (Direct users): 5

1.2) Secondary users (Indirect impact): 6

2. **Requirement Gathering Techniques** 7

2.1) Survey Forms: 7

2.2) User Interviews: 8

2.3) Reverse Engineering 8

2.4) Observations: 9

3. Data Gathering 10

3.1) Types of Data we collected: 10

4. Data Cleaning 11

4.1) Importance of Data Cleaning 11

4.2) Common Issues in Data that Require Cleaning 11

4.3) Steps in the Data Cleaning Process 13

4.4) Tools for Data Cleaning 15

5. User Reluctance Assessment 15

5.1) Assessment methods 16

5.2) Common causes of user reluctance 16

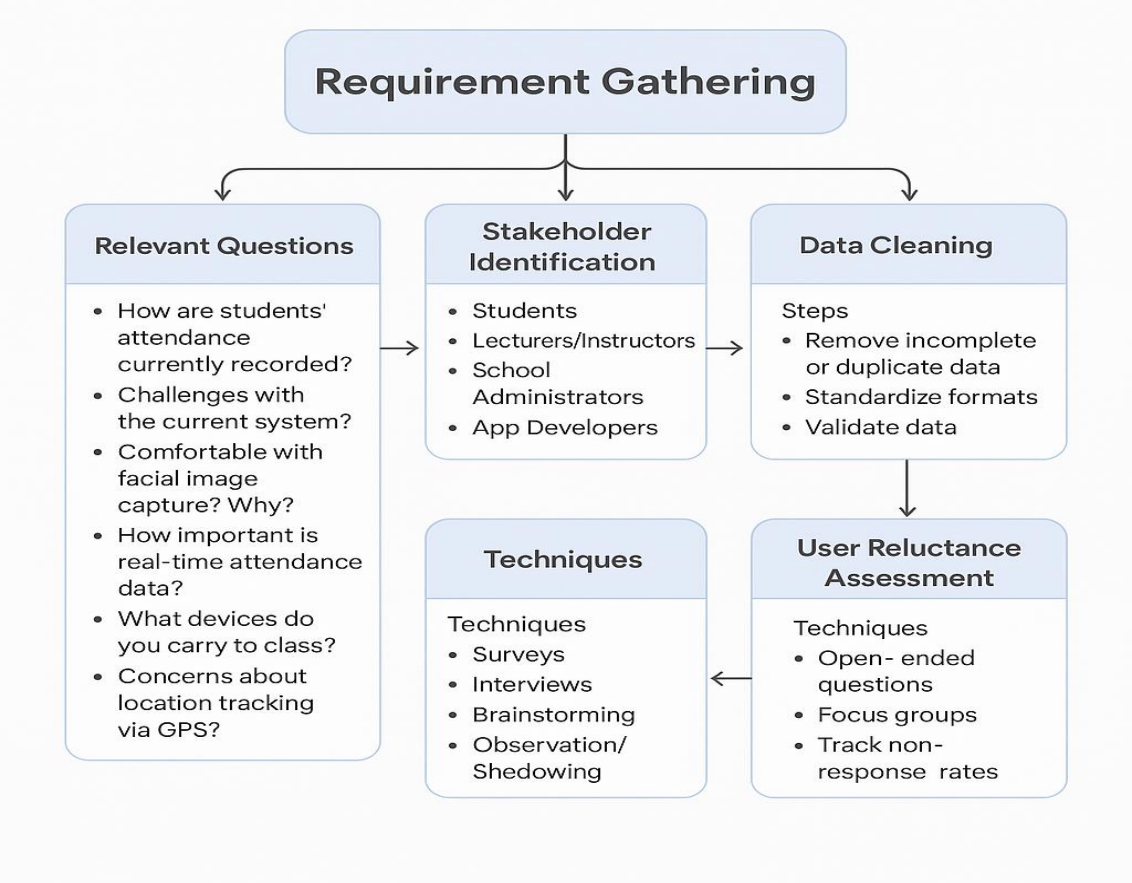
5.3) How to address 16

Conclusion 17

Introduction

In designing a mobile-based attendance system, understanding user needs and environmental factors is essential for delivering a reliable, user-centered, and secure application. A well-structured requirement gathering phase sets the foundation for all subsequent stages of system development — from architecture to interface design.

This report outlines the critical steps and techniques involved in gathering requirements for such a system. It focuses on identifying the stakeholders, collecting and cleaning relevant data, selecting appropriate requirement gathering methods, and evaluating user reluctance. These insights guide the development team in building a robust attendance platform.



1. Stakeholder Identification

Stakeholders are individuals or groups who either influence or are impacted by the mobile attendance system. Identifying them is crucial to ensure that the system meets real-world needs. Anyone with an interest in or concern for the organization's overall success.

We have the following types of stakeholders:

1.1) Primary stakeholders (Direct users):

They are typically affected by the outcome of decisions and actions taken by the organization.

In the context of our mobile application for school attendance management, primary stakeholders would be:

Students: They are the primary users of the application (whose attendance data will be used.), as it allows them to check in and out of school, track their attendance records, and receive notifications about attendance-related matters.

Teachers and Staff: They use the application to take attendance, monitor student participation, and generate reports on attendance patterns. Their involvement is crucial for ensuring the app meets educational needs.

School Administration: Administrators and school management teams use the application for record-keeping, compliance with education regulations, and making data-driven decisions based on attendance trends.

Developers and IT Support: They are responsible for the design, development, and maintenance of the application. Their insights are essential for ensuring the app functions smoothly and effectively meets stakeholder needs.

Local Education Authorities: They may have regulatory oversight regarding attendance tracking and reporting, making it important for the application to comply with existing regulations.

Engaging these primary stakeholders throughout the development and implementation of the school attendance management app is vital for ensuring it effectively meets their needs and enhances the overall educational experience.

1.2) Secondary users (Indirect impact):

Secondary stakeholders are individuals or groups that do not have a direct stake in an organization, project, or initiative but can still be affected by its actions or have an indirect interest in its outcomes.

In the context of our mobile application for school attendance management, secondary stakeholders might include:

Alumni: Former students may be interested in the app's development and its impact on current student engagement and success.

Community Members: Local residents and community members may be indirectly affected by student attendance patterns and school performance.

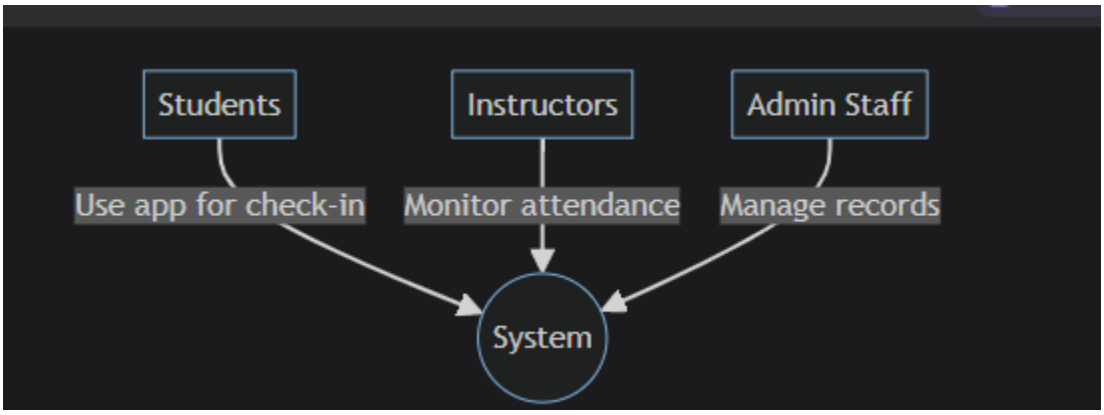
Educational NGOs and Nonprofits: Organizations that focus on educational improvement or student welfare may have an interest in the attendance data and trends reported by the application.

Researchers and Academics: They may study the implications of attendance data and trends for educational outcomes and performance, using the app's data for research purposes.

Potential Investors or Sponsors: Individuals or organizations that may be looking to invest in educational technology or sponsor school initiatives to support student success might be interested in the app's effectiveness.

While secondary stakeholders do not have a direct influence on the decision-making processes of the mobile application, their opinions, interests, and potential external impacts can still play a significant role in shaping its development and implementation.

To achieve this project, we will focus our attention on the primary stakeholders of this system, specifically students, teachers and staff and administration.



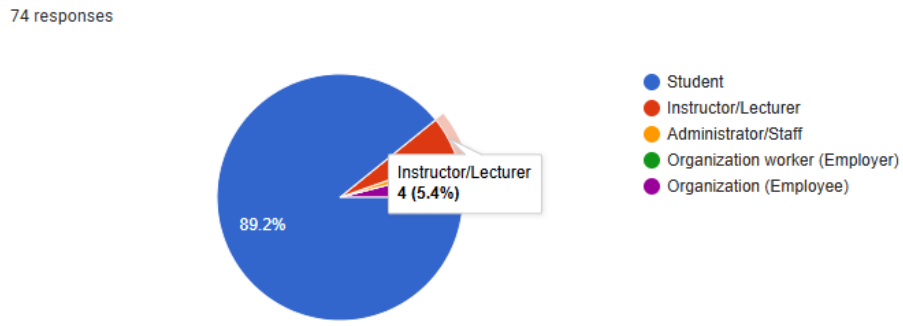
2. **Requirement Gathering Techniques**

After identifying stakeholders, the next thing was to get the requirements from them. Requirement gathering techniques are methods used to gather qualitative and quantitative requirements from the stakeholders. It is a crucial phase in the software development lifecycle, where the needs and expectations of stakeholders are identified and documented. Its purpose is to define what the system should do

There are several techniques used to gather requirements but we adopted the following:

2.1) Survey Forms:

Survey forms were created and shared via Google Forms to students and lecturers with 70+ responses received as from the time this report was written. With 89% responses from students and 5.4% responses from lecturers according to Google Form's reporting tool.



- **Benefits**: Can reach a large number of stakeholders quickly, allows for quantitative analysis, and offers anonymity.

- **Challenges**: May yield superficial responses, limited interaction for clarification, and relies on stakeholders' willingness to participate.

2.2) User Interviews:

Conducting one-on-one or group conversations with stakeholders to elicit detailed requirements. A set of questions developed based on what we needed to understand. Open-ended questions are better to promote discussion and responses were documented

- **Benefits**: Provides in-depth insights, allows for clarification and follow-up questions, and builds rapport with stakeholders.
- **Challenges**: Can be time-consuming, requires skilled interviewers to extract valuable information, and may suffer from bias if questions are leading.

This was conducted on mainly students where 20 of them were interviewed. Just a single lecturer who is also an administrator was interviewed.

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2.3) Reverse Engineering

Reverse engineering is the process of deconstructing an existing application or system to uncover its functionalities, workflows, and design elements. This can encompass examining software code, user interfaces, and system documentation.

The process involves Identifying existing system or application that served similar tasks and analyze it. Gathering relevant artifacts like source code, user manuals, design documents, and system architecture diagrams. If the source code is not available, the user interface and functionality can be analyzed. Carefully dissect the application to understand how it works, including user interactions with the system, business logic and data flow (examine how data is processed, stored, and retrieved within the system.

- **Benefits:**

  - Provides insights into current functionalities, helping to identify both strengths and weaknesses of the existing system.

- Filling Knowledge gaps
- Informed Decision Making**.**

- **Challenges**

- Complexity**:** Some systems may be sophisticated, making reverse engineering challenging without deep technical knowledge or the correct tools.
- Legal and Ethical Concerns**:** Reverse engineering proprietary software can lead to legal issues if not conducted with permission or in compliance with licenses.
- Incomplete Understanding**:** The analysis may miss undocumented functionalities or features that are critical to users, leading to gaps in requirements.

Link to system we studied

2.4) Observations:

This involves monitoring how traditional attendance is taken in lecture halls. As students ourselves, we were able to draw conclusions from how our attendance was taken.

Summary of Techniques used and others that exist

Technique	How It's Used	Why It's Useful
Interviews	One-on-one conversations with students, lecturers, or IT staff.	Provides in-depth insight into their expectations and frustrations.
Surveys	Forms distributed to a wide group, e.g., Google Forms for students and staff.	Helps quantify user preferences, concerns, and access patterns.
Focus Groups	Gather 5–10 users for discussion on expectations and ideas.	Allows collective ideation and reveals common opinions or pain points.

Technique	How It's Used	Why It's Useful
Observation	Watching how attendance is currently taken (e.g., sign sheets or card swipes).	Identifies inefficiencies and unspoken issues.
Brainstorming	With developers or users to generate solution ideas.	Encourages creativity and participation from all involved.
Reverse Engineering	Studying current systems or mobile attendance apps to extract useful features.	Helps identify what works well or poorly in existing systems.
Questionnaires	Structured form with specific closed and open-ended questions.	Balances standardization and detailed responses.

3. Data Gathering

This refers to the **collection of actual data points** needed for design, development, and validation. That is **collection of raw information** (numbers, responses, GPS coordinates, check-in time, student ID, etc.) needed to support design, development, and analysis.

Examples: Collecting survey results, system usage logs, class rosters, GPS data samples, or biometric image samples.

Its purpose is to collect factual or statistical data to use for prototyping, training facial recognition models, or analyzing user behavior.

3.1) Types of Data we collected:

- **Student Attendance Records**: For comparative analysis. Collected from a delegate.
- **Device Access Data**: To know what platforms to support (Android, iOS).
- **Network Availability**: Signal strength in typical classroom zones.
- **Survey/Interview Responses**: For qualitative patterns.

4. Data Cleaning

Raw data usually contains errors or inconsistencies, so it must be cleaned before it can be used effectively.

Data cleaning, also known as data cleansing or data scrubbing, is the process of identifying and correcting or removing inaccurate, incomplete, irrelevant, or improperly formatted data from a dataset. This process is essential for ensuring data quality and integrity, making it a crucial step in data preprocessing for analysis, reporting, and decision-making.

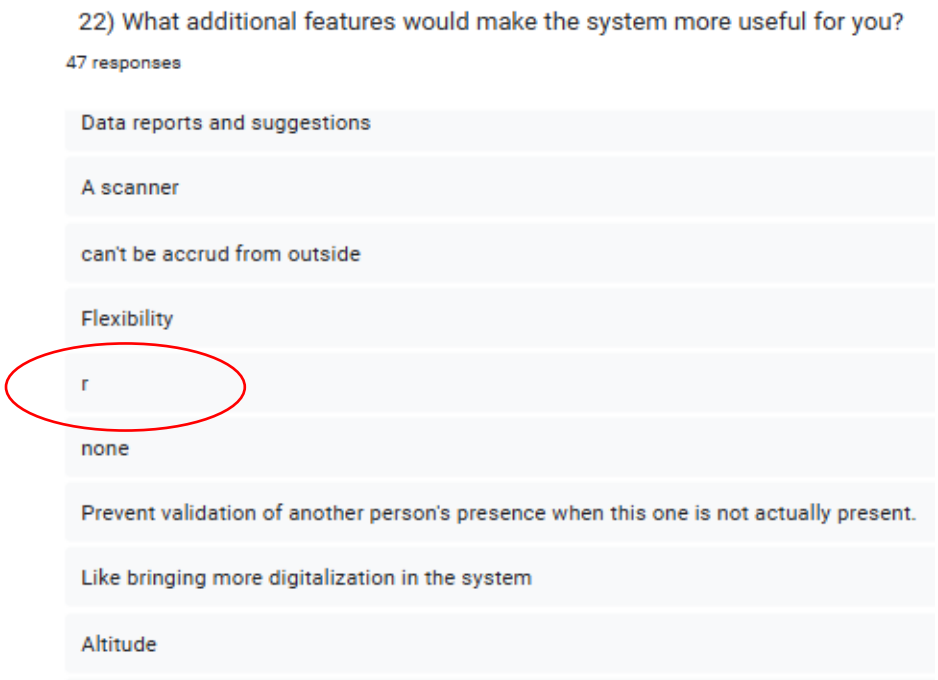
4.1) Importance of Data Cleaning

1. **Improved Data Quality**: Clean data enhances the accuracy and reliability of analysis, leading to more informed decisions.
2. **Increased Efficiency**: Effective data cleaning reduces the time spent on data analysis, as analysts do not have to deal with problematic data.
3. **Enhanced User Trust**: Stakeholders are more likely to trust insights drawn from clean and well-organized data.
4. **Regulatory Compliance**: In many industries, maintaining accurate data is not only a best practice but also a legal requirement.

4.2) Common Issues in Data that Require Cleaning

1. **Missing Values**: Some records may have incomplete data fields where information is absent.

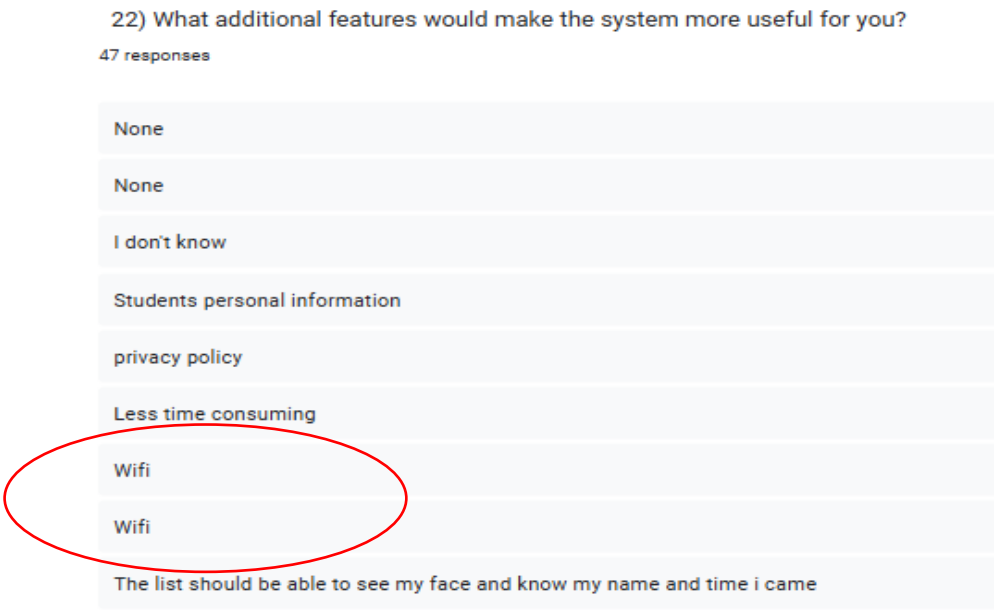
   Example with ours: you can see an entry here with just the letter ‘r’ It is an incomplete answer which doesn’t give any insights. This has to be removed.



2. **Standardize formats:** E.g., convert “No”/”Nope”/”None”/I don’t” into a single format

3. **Duplicate Records**: The same record may be present multiple times, which can skew analysis results.

   Example with ours:



4. **Invalid Data**: Entries that do not conform to expected values or formats (e.g., negative values for age) should be corrected or removed.

   Example with ours:

   We added a scenario to extend the attendance system to other organizations out of school. For example, in a hospital setting, attendance can be taken to see what time nurses and doctors clocked in. But responders who misunderstood the question entered school names as organization names. So their response had to be deleted from the statistics that other organizations responses were stored.

5. **Outliers**: Extreme values that do not fit within the expected range can indicate data entry errors or unique cases that need separate analysis.
6. **Inconsistent Formatting**: Differences in data formats (e.g., date formats, text capitalization) can lead to discrepancies in data interpretation.

4.3) Steps in the Data Cleaning Process

1. **Data Profiling**:

Begin by examining the dataset to understand its structure, relationships, and issues. This involves generating summaries, checking for missing values, and assessing data types.

2. **Identifying Errors**:

Utilize statistical tools and algorithms to detect discrepancies, such as comparing against established standards, checking for outliers, and validating data ranges.

3. **Handling Missing Values**:

Address missing data through various methods, including:

Deletion: Removing records with missing values entirely (if it doesn't significantly impact results).

Imputation: Filling in missing values using statistical methods, such as mean, median, or mode, or more complex techniques like regression analysis.

4. **Correcting Inaccuracies**:

Identify incorrect entries and correct them, which may involve consulting original data sources or experts.

5. **Removing Duplicates**:

Implement algorithms to detect and eliminate duplicate records based on key identifiers.

6. **Standardizing Formats**:

Ensure consistency in data formats by converting data into a uniform structure (e.g., standardizing date formats, currency formats, or text casing).

7. **Validating Data**:

Check for the validity of data entries based on defined business rules. This may include checking for logical relationships (age cannot be negative, etc.) and ensuring proper constraints.

8. **Outlier Treatment**:

Evaluate outliers to determine if they are legitimate or errors. Options include correcting, adjusting, or removing these values.

9. **Documentation**:

Maintain detailed records of changes made during the cleaning process for future reference and accountability.

10. **Automation**:

Where possible, automate parts of the data cleaning process through the use of software tools or scripts (e.g., Python, R) to ensure repeatability for future datasets.

4.4) Tools for Data Cleaning

Several tools and programming languages offer features for data cleaning, including:

- **Microsoft Excel**: Provides functions for identifying duplicates, filling missing values, and extensive data manipulation.
- **OpenRefine**: A powerful tool for cleaning messy data, handling large datasets, and transforming data formats.
- **Python Libraries**: Such as Pandas and NumPy, which provide various methods for data manipulation and cleaning.
- **R Packages**: Like dplyr and tidyverse, which offer functions specifically tailored for data wrangling.

5. User Reluctance Assessment

User reluctance refers to the hesitation or resistance of individuals to adopt or engage with new systems, applications, or changes in established processes. This reluctance can significantly impact the successful implementation of technology solutions and can arise from a variety of factors. Understanding user reluctance is crucial for organizations seeking to implement new technologies or changes effectively.

Even the best system will fail if users are reluctant to adopt it. Assessing this early helps shape a **user-centered and trustworthy** app.

5.1) Assessment methods

- **Include Reluctance Questions in Surveys**:
    - *Do you have concerns about using facial recognition for attendance?*
    - *Would you prefer a manual override option?*

Many responses showed that users had security concerns with respect to GPS tracking, and their facial data being stored.

To ease their concerns, we suggested anonymous location tracking and reassurance of them being able to delete personal data. Also, a solution was, their locations can be turned off after attendance has been recorded.

Image recognition/biometric data is becoming increasingly unpopular and sensitive (GPDR in EU, Congress Act S.681 - 118th in the US), so measures have to be taken to limit data exposure

- **Hold Feedback Sessions**:
    - Focus groups or short interviews after showing a prototype.
- **Analyze Behavior**:
    - Track response rates to facial image submissions or location tracking opt-ins.

5.2) Common causes of user reluctance

- Privacy concerns.
- Fear of surveillance.
- Fear of change as many users are comfortable with existing systems and processes. New things can provoke anxiety.
- Technological unfamiliarity: If the change is perceived as too complex, it can lead to reluctance to adopt.
- Previous negative experiences: Past experiences with poorly implemented systems or unsuccessful software may lead users to be skeptical about new technologies.
- App crashes or poor UX.

5.3) How to address

- Add **privacy notices and user agreements**.
- Allow users to see and manage their data.
- Provide **education/orientation videos**.
- Include **manual fallback options**.
- Effective communication highlighting the benefits of the new system
- Positive Reinforcement**:** Reward and recognize users who actively engage with the new system. Positive reinforcement can motivate others to adopt the change.

Understanding user reluctance is critical for the successful implementation of new technologies and processes. By addressing the concerns that lead to resistance and employing strategies to mitigate those concerns, organizations can foster a more receptive environment for change. A well-planned approach that prioritizes user engagement, communication, and support can significantly enhance the likelihood of successful adoption and integration of new systems.

Conclusion

The five components of **Task 2: Requirement Gathering** are essential to designing an efficient, secure, and user-friendly mobile-based attendance system. Each step — from identifying stakeholders to assessing user reluctance — contributes to a system that aligns with real-world expectations and respects user needs and privacy.