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REPORT FOR THE REQUIREMENT GATHERING PROCESS

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1.0 INTRODUCTION

In the evolving digital landscape, mobile technology keeps growing and people expect better and more reliable network services. In Cameroon, mobile network subscribers often face problems such as slow internet, poor connection quality, or poor voice quality. These issues affect how they feel about the services provided by mobile network operators.

To help solve this project, our project aims to design and implement a mobile application that will collect user experience data about the network status and user feedbacks. The mobile app will also collect technical data from users' devices such as signal strength, network type, and internet speed. This information may be of help to the network operators or providers to better understand the real experience of users and find ways to improve their services.

Before the design or implementation phase of the project, it is important to clearly understand what users and stakeholders need (users' expectations). This process is called **requirement gathering**. It helps to collect useful information that will guide us in designing the mobile app that solves the users' problems.

This report explains the different steps we followed in the requirement gathering process for the mobile app. It includes how we identified the stakeholders, the requirement gathering techniques, the requirement collection and cleaning, and finally how we evaluated users' reluctance during the process.

2.0 STAKEHOLDERS IDENTIFICATION

The identification of stakeholders in a software system is a very crucial phase because it helps to obtain better insights about the requirements of the system. Identifying the stakeholders of the system early is important because their needs, expectations and feedback help shape the final software product.

Who are stakeholders?

Stakeholder are the people or groups who are directly or indirectly affected by the system being built.

For our mobile app, which aims to collect users' experience data from mobile network subscribers, the following stakeholders were identified:

- Mobile network subscribers (Users)
- Mobile network operators (Example: MTN, Orange, CAMTEL)

- Project Team (Us)
- Lecturer (Dr. NKEMENI Valery)

The table below will summarize the identified stakeholders together with their roles and interest/expectations.

Table 1: Summary about the stakeholders, their roles and Interest/Expectation

Stakeholders	Roles	Interest/Expectations
Mobile network subscriber	Primary user of the mobile application	Want an easy-to-use app that helps them share their experience with network operators in order to get better services.
Mobile network operator	Network service provide	Want to understand users' experience to improve service quality and customer satisfaction
Project Team	Designers and developers of the app	Want to build an efficient, reliable, and user-friendly mobile app based on other stakeholders' requirements
Lecturer	Project evaluator	Expect a well-designed system that meets both technical & academic requirements and also awaits the creativity of the project team

3.0 REQUIREMENT GATHERING TECHNIQUES

In this section, we will elaborate about the various techniques that were used in the requirement gathering process.

To properly and effectively design and implement a mobile application that meets the needs and expectations of users and stakeholders, it is essential to use the right techniques for gathering requirements. It should be noted that different stakeholders have different needs and the collection of accurate, clear, and complete requirements is the foundation for building a useful mobile app.

Below are the techniques use in the requirement gathering process:

3.1 Surveys

Surveys were designed and distributed to mobile network subscribers/users to collect both **quantitative** and **qualitative** data. The survey questions focused on user satisfaction about the network operator they use, common issues faced when using mobile networks (example: poor internet speed), and their willingness to provide feedback through a mobile app.

- **Advantages**

- Easy to reach many people and data is easy to analyze.
- Reach a large number of users easily.
- Time-saving (surveys are faster to conduct) and cost-effective.

- **Tools used**

- **Google Forms:** User-centered questions were edited and a link was generated then shared to network subscribers so that they could respond to the survey.
- **Hardcopy Forms:** The same questions that were in the google form were then printed in hardcopy format in order to reach without digital means.

3.2 Interviews

An interview is a structured or semi-structured conversation between a stakeholder(s) and the interviewer aimed at gathering detailed insights, opinions, or requirements about the system to be built.

One-on-one interviews were conducted with some network operator agents (MTN and Orange). These interviews helped gather in-depth insights on how users experience network quality in different areas, and how network engineers currently collect and use the collected data to enhance their services.

For instance, we found out that MTN makes use of a geo-localization technology to locate areas with weak signals strengths and allocate Base Transceiver Stations (BTSs) to those areas in order to meet users' requirements in those areas.

On the other hand, an Orange agent (in the Buea branch) makes use of field agents to collect users' data daily, in order to enhance their services in areas that experiences network issues.

- **Advantages**

- Deep understanding of needs and problems
- Clarification of requirements between stakeholder and interviewer
- **Builds Trust and Engagement:** Interviews make participants feel valued hence increasing their willingness to share honest feedback

- **Challenges**

- Time-consuming and requires good communication skills

3.3 Brainstorming

Group brainstorming sessions were held with the project team to come up with possible features, challenges, and user scenarios for the mobile app. This made us think creatively and explore different solutions to meet user needs. The brainstorming also made use of a technique known as observations which is a technique that consists of informally observing how people use their mobile devices in real-world settings. For example, how they react to network delays or disconnections. This gave us ideas on how to design the app to fit naturally into their behavior.

- **Advantages:** Encourages team collaboration and idea generation
- **Outcome:** A list of potential features and problems to be solved by the app. Some of these potential features include:
 - Background data collection (passive monitoring)
 - Periodic user feedback prompts (active monitoring)
 - Real time data logging (storage)

3.4 Reverse engineering

We also reviewed similar existing apps and systems that collect user data. The reverse engineering process was also done on system that encompasses features that we wish to realize in the mobile app development process. We studied factors such as their design and app's features to identify what could be improved or adopted in our own system.

Example of systems that were studied during the reverse engineering process are;

- Orange Maxit app
 - MyMTN app
 - Opensignal
 - Speedtest
 - nPerf
-
- **Advantages**
 - Helps avoid mistakes
 - Helps reinventing the wheel
 - Helps in the adoption of important features in the system to be built
 - **Outcome:** Clear view of industry standards and user expectations

4.0 DATA GATHERING

The data gathering phase served as the foundation for understanding the needs and expectations of both end-users and stakeholders. It involved the collection of data from diverse sources, using various requirement-gathering techniques.

This phase was essential for identifying the key features to be included in the mobile application, challenges faced by mobile network users, and the kind of data that would be relevant for Quality of Experience (QoE) analysis.

4.1 Types of Data Collected

We collected two main categories of data:

a. Subjective Data (User Feedback)

- Opinions, complaints, and suggestions from users.
- Collected through surveys, interviews, and informal conversations.
- Examples include user complaints about poor call quality, network dropouts, and low internet speeds.

b. Objective Data (Technical Indicators)

- Data about device performance and network quality.
- Includes signal strength, call drop rate, latency, and network type (e.g., 3G/4G/5G).
- Will be captured automatically by the app in real-time and stored securely.

4.2 Data Sources

- **Google form surveys:** Reached mobile users to gather structured feedback.
- **Hardcopy (paper-based) surveys:** Distributed to network users to get data.
- **Stakeholder interviews:** Conducted with telecom agents to gain deep insights.

4.3 Data Recording and Organization

- **Digital data** was collected directly into Google Sheets via google forms.
- **Manual responses** from printed surveys were entered manually into a google form for better analysis.

- **Interview summaries** were recorded by manual means.

5.0 DATA CLEANING

After the data was collected by the various techniques, a crucial step was undertaken to ensure the integrity, consistency, and reliability of the gathered information. This process is known as **data cleaning**. This process involved identifying and correcting errors, handling missing values, and standardizing responses to make the dataset suitable for further analysis and system design.

5.1 Objectives of data cleaning

- Remove incomplete or duplicate responses
- Handle missing data
- Ensure uniformity between paper-based and online survey data

5.2 Cleaning methods applied

The cleaning methods applied in this section was about reviewing the hardcopy survey and ensuring that the entry is clear for clarity and correctness purposes, handling missing values for the online google forms, clarifying unclear responses for interviews.

Some points that were actually conducted during this phase were:

- Responses from hardcopy survey forms were manually entered into another google form for analysis.
- Each entry was reviewed for clarity and correctness before the response was submitted.
- For the interviews conducted with the network operator agents, unclear or unstructured responses were clarified when possible.

5.3 Outcome of the cleaning process

After the data cleaning process, the following were achieved:

- Final cleaned data contained forty-two (42) valid user responses from the online google form and forty-one (41) valid user responses from the hardcopy survey forms. These forms were from mobile network subscribers
- Final cleaned data contained two (2) responses from the mobile network operator agents.
- Ready for requirement extraction, statistical analysis, and design modeling.

Some graphics that could be extracted from the google form can be shown below:

Which network operator(s) do you use ? (Select all that apply)
42 réponses

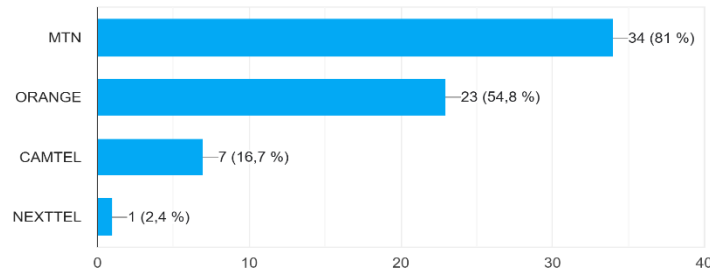


Fig 1: Network operator preferences of network users

What are the challenges you frequently face with the internet services provided by this operator ?
(Select all that apply)
42 réponses

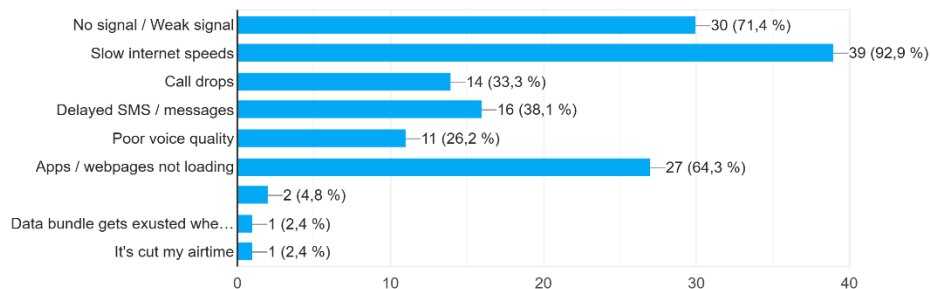


Fig 2: Network issues faced by network users

Do you think the quality of service is equivalent to the price of the bundle you subscribe to ?
41 réponses

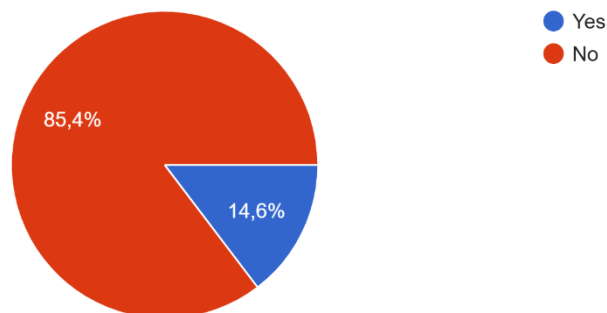


Fig 3: Percentages of evaluation of price to QoS for users

6.0 USER RELUCTANCE ASSESSMENT

Despite the value and innovation behind the structure of the mobile app, it's crucial to acknowledge that not all users may be eager to adopt it. Through the survey we conducted, we experienced a certain level of reluctance from some users which was characterized by:

- **Some complains like time availability:** Some users showed some reluctance by turning us down when we pleaded for some of their time to carry out the survey.
- **Limited awareness:** Some users just directly expose their disinterest when the purpose of the survey was explained to them.
- **Lack of trust in the purpose of the app:** Some users didn't fully understand the purpose of QoE data collection.

We tried to assess the user reluctance by including open-ended questions in the surveys asking users if: "Would you be interested in using a mobile app that helps reports your network experience and permits you to give feedback to the network operators" in order to better explained the purpose of the app hence overcoming the issues of lack of trust in the purpose of the app.

7.0 CONCLUSION

This report shows the steps we followed to prepare for the design of a mobile app that collects user experience data from mobile network users in Cameroon. We identified key people involved, gathered useful data through surveys and interviews, and cleaned the data to make it accurate and usable.

We also looked at the reasons why some users may be afraid or not interested in using the app, like privacy concerns. Based on this, we planned ways to make the app more secure, and easier to trust.

The work done here gives us a strong base to move forward with the actual design and development of the app. The final goal is to help mobile users have a better network experience, and to give telecom companies useful feedback for improving their services.

APPENDIX

APPENDICE 1: Survey form for the mobile network subscribers

MOBILE NETWORK USER EXPERIENCE SURVEY FOR CAMEROON

This survey is conducted for a school project so as to collect user data related to **Quality of Experience (QoE)** of the services provided by network operators (like ORANGE, MTN, CAMTEL) in Cameroon. Please note that, your responses will be analyzed anonymously so as to provide it to these operators in order to improve on their quality of service.

1. Which network operator do you use? (Select all that apply)

☐ ORANGE ☐ MTN ☐ CAMTEL ☐ NEXTTEL ☐ Other

2. Why do you use this operator?

.....
.....
.....

3. What are the challenges you frequently face with the internet services provided by this operator? (Select all that apply)

☐ No signal/Weak signal ☐ Slow internet speeds
☐ Call drops ☐ Delayed SMS/messages
☐ Poor voice quality ☐ Apps/webpages not loading
☐ Other:

4. When do you encounter these challenges? (Select all that apply)

☐ Morning ☐ Afternoon ☐ Evening ☐ Night
☐ Random/Unpredictable

5. Where are these challenges frequently encountered? (Select all that apply)

☐ Inside your house ☐ School campus ☐ Market ☐ Office
☐ Others:

6. What data bundle do you subscribe to and how often?

.....
.....
.....
.....

7. What are the main activities you do with the internet services? (Select all that apply)

☐ Social Media (Snapchat, Instagram, Facebook, ...)
☐ Video streaming (YouTube, Netflix, ...)
☐ Messaging / Voice calls (WhatsApp, Telegram, ...)
☐ Gaming
☐ Others:

8. Do you think the quality of service is equivalent to the price of the bundle you subscribe to?

☐ Yes ☐ No

9. What frustrate you the most about your mobile network?

.....
.....
.....

10. In a statement, state your expectation for mobile network connectivity.

.....
.....
.....

11. Would you be interested in using a mobile app that helps reports your network experience and permits you to give feedback to the network operators.

.....
.....
.....

FOR NETWORK SUBSCRIBERS

APPENDICE 2: Survey form for the network operators

MOBILE NETWORK USER EXPERIENCE SURVEY FOR CAMEROON

This survey is conducted for a school project. This survey is intended to gather important insights directly from service providers regarding the delivery, monitoring, and improvement of mobile network services. Your responses will help us better understand how user experience feedback is received, processed, and acted upon, and how technical and operational challenges are managed from your end.

1. What are the current challenges you face when collecting user feedback?

.....
.....
.....

2. What strategies do you use to collect network status data and user feedback and how do you use it to increase on the quality of your services provided?

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.....
.....

3. How frequent do you collect users' network status data?

.....

4. Do you make use of a monitoring tool to monitor the service(network) performance. Which metrics are used to evaluate these (network performance)?

.....
.....
.....
.....

5. If no, what kind of data would be most helpful from a user-driven mobile monitoring app? (e.g., signal strength, call drop reports, app usage quality, location-based logs)

.....
.....

6. How frequently would you want to receive this data?

☐ Real time ☐ Daily summary ☐ Weekly reports

7. Are you willing to use and pay for an app which provides you with real-time network status data and users feedback data all displayed on already analyzed and intuitive UI charts ready for interpretation and decision making?

.....
.....

8. If yes, how much?

FOR NETWORK OPERATORS