Nous Vote Group 15

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Project name: Nous Vote
Github link : https://github.com/gracexuanzhou/NousVote_Group15
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0. Name

Our project is called Nous Vote.(Nous is French for "we".)

Logo (Figure 1):

Figure 1. Nous vote logo

1. Summary of key idea

Mali's radio station hopes to receive opinions from listeners about the discussing issue. Due to communication constraints in the rural area (e.g. lack of Internet access), the interaction will be carried out by GSM mobile phones. Listeners send "BIPs" to the particular number that represents their vote. Bip means to hang up the phone before the receiver picks up to avoid the cost of the call. When the vote is going on, the application is designed to automatically count and show the results. And the results of each poll are saved for the radio host to review.

2. Actors and goals

Who are the actors in the scenario and what are their roles/responsibilities and goals? See this table.

Stakeholder	Operational goal
Organizers(Mali's radio station)	Start or close the voting
Participants/listeners	Make a call to voting number
Voting system	Receive the vote call and count the number.
Carriers	Provide the phone call network.

Table 1. stakeholders and their operational goals
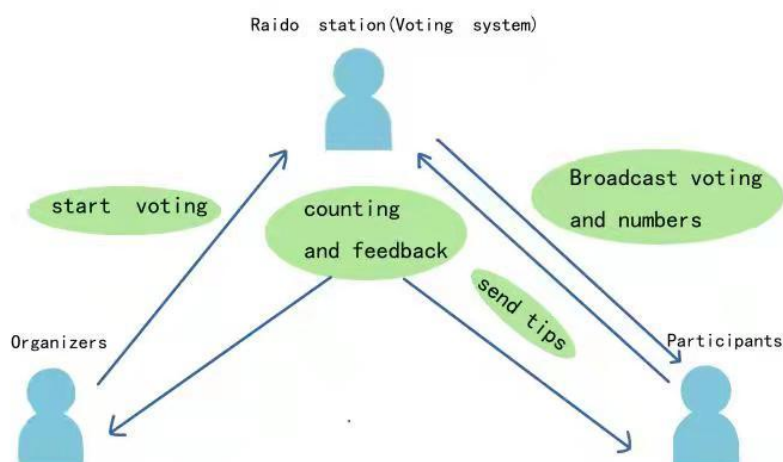
3. Context and scope

Figure 2. The interactions between stakeholders.

a. The first stakeholder is the radio host,which saves him a lot of time to do manual counting and at the same time avoids the occurrence of human error. For listeners, they save on the cost of the call, and the non-manual count adds credibility.

b. The voting system only provides two numbers for "yes" or "no", (binary choice), which makes it difficult for some listeners to express themselves when they have other views. And cannot deal with multi-calling cases.

c. The expected system should be able to withstand multiple simultaneous calls and records, and automatically calculate accurate statistical results.

d. (i)The original broadcast system and mobile phone communication must be reliable. This will avoid incorrect statistical results due to receiving or sending questions by listeners during the voting period.

   (ii)Voting systems must eliminate the possibility of recording repeated calls, which can lead to a lack of credibility.
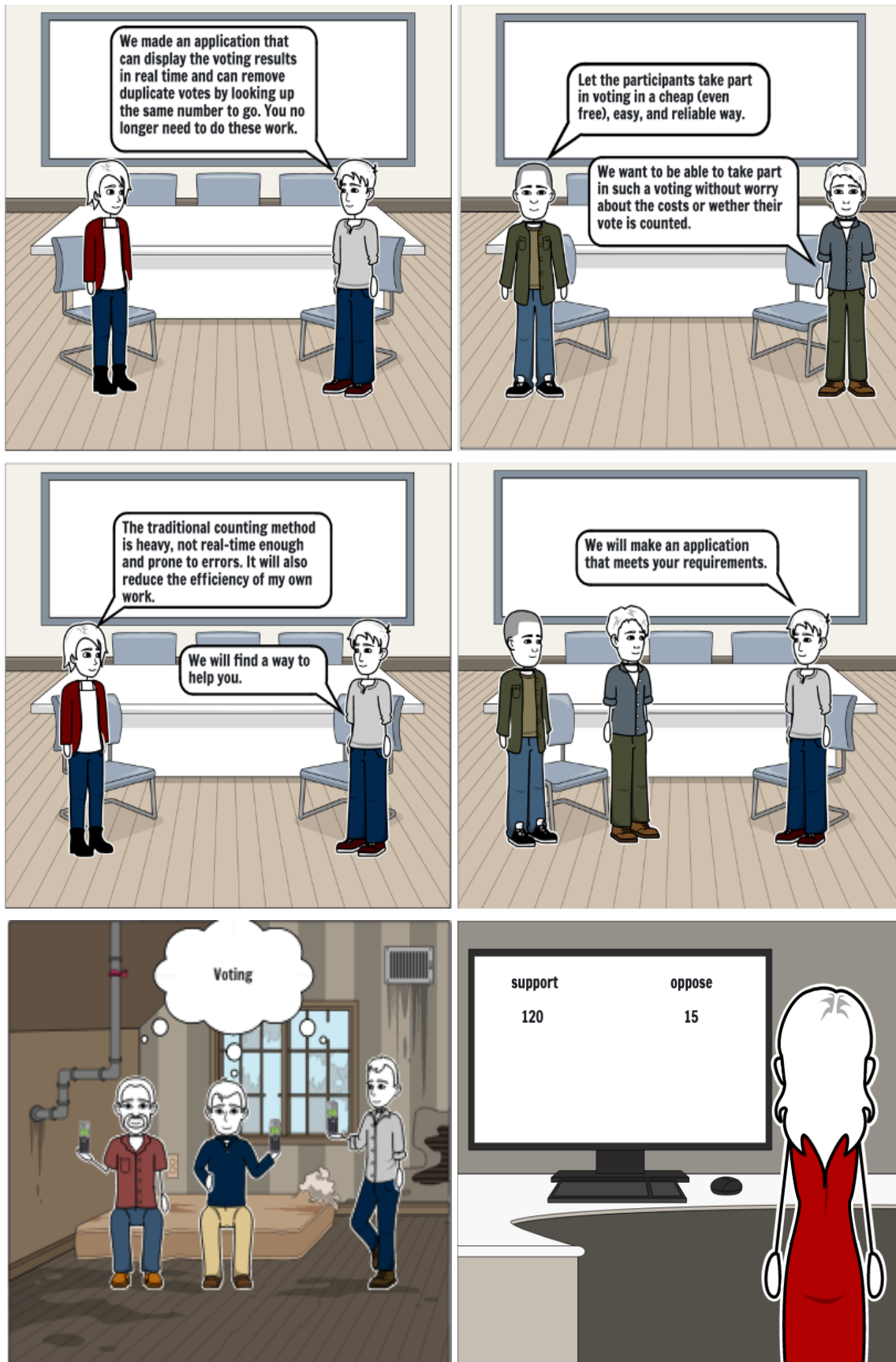
4. Use case scenario script
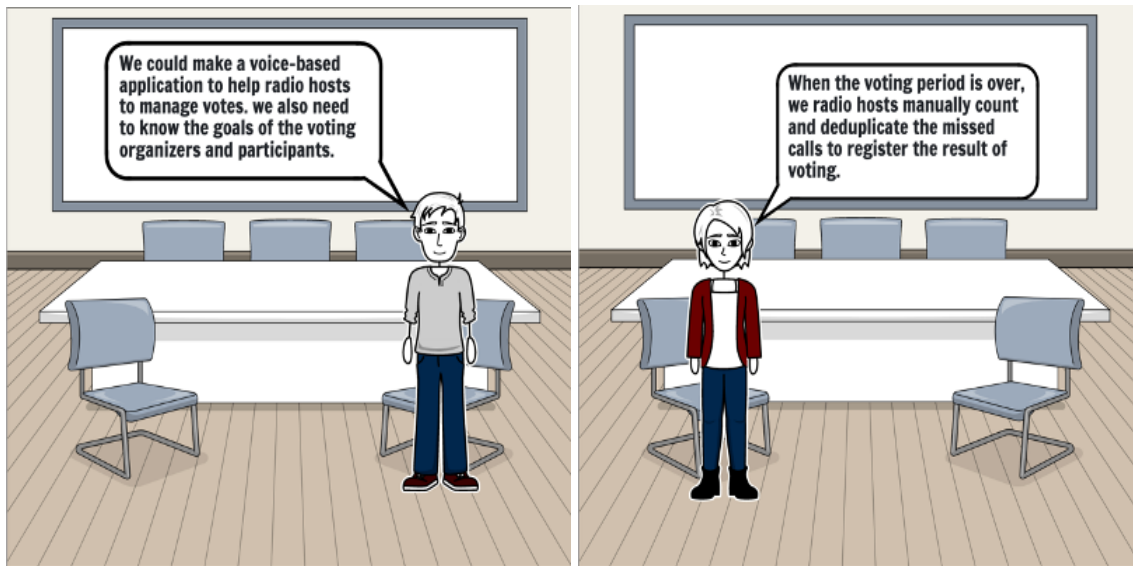
Figure 3. The storyboard of user case scenario

5. Interaction and communication

In this section, we show four diagrams. Two activity diagrams and two participant diagrams. The figure 4 shows the design of the system and shows how the user interacts with this system. The first activity diagram (Figure 5: left) shows the activities of the organizers, who can log in to the webpage for creating a vote campaign. This includes setting the duration of the poll (m hours / days). After the user gets in the main menu, press 1 is used for participants to call and vote yes for this topic, and press 2 is used for participants to vote no. The voting campaign should automatically end after m hours/days.

The second activity diagram (Figure 5: right) shows the activities of the voting system. When a participant's call comes in, it first determines if there is a voting campaign in progress at that moment. If not, the call is automatically terminated with a voice message indicating that there is no polling activity currently in progress. If there is an active poll, then the system determines which number the participant has pressed and counts it. The participant is notified of a successful vote by voice after five seconds of calling the voting number and is automatically hung up. The figure 7 shows the Context model of the service candidates including stakeholders.
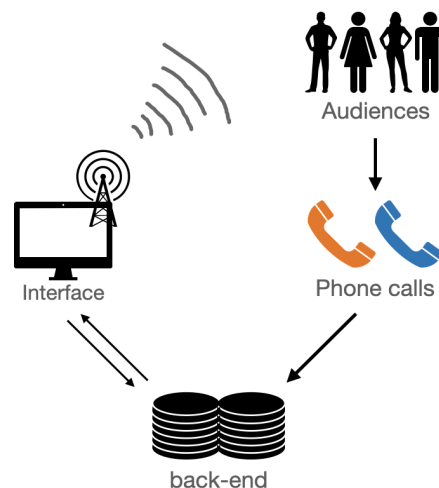
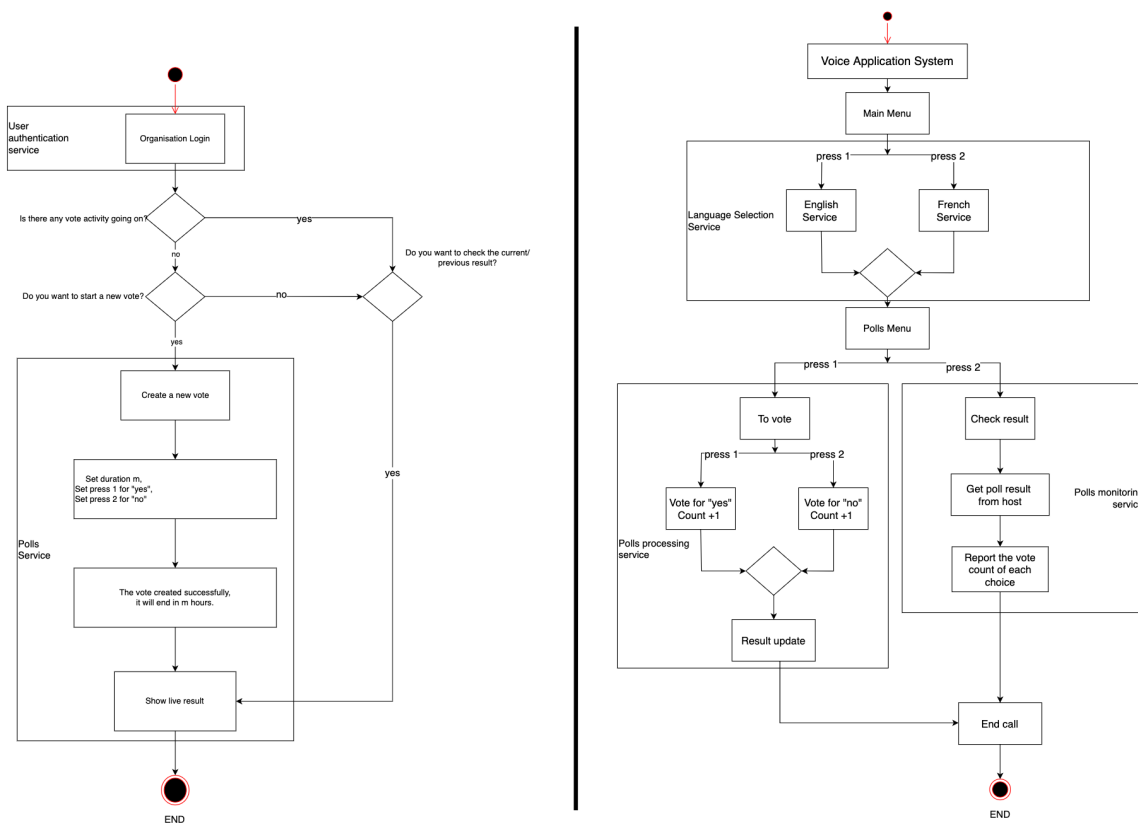

Figure 4. System design Diagram

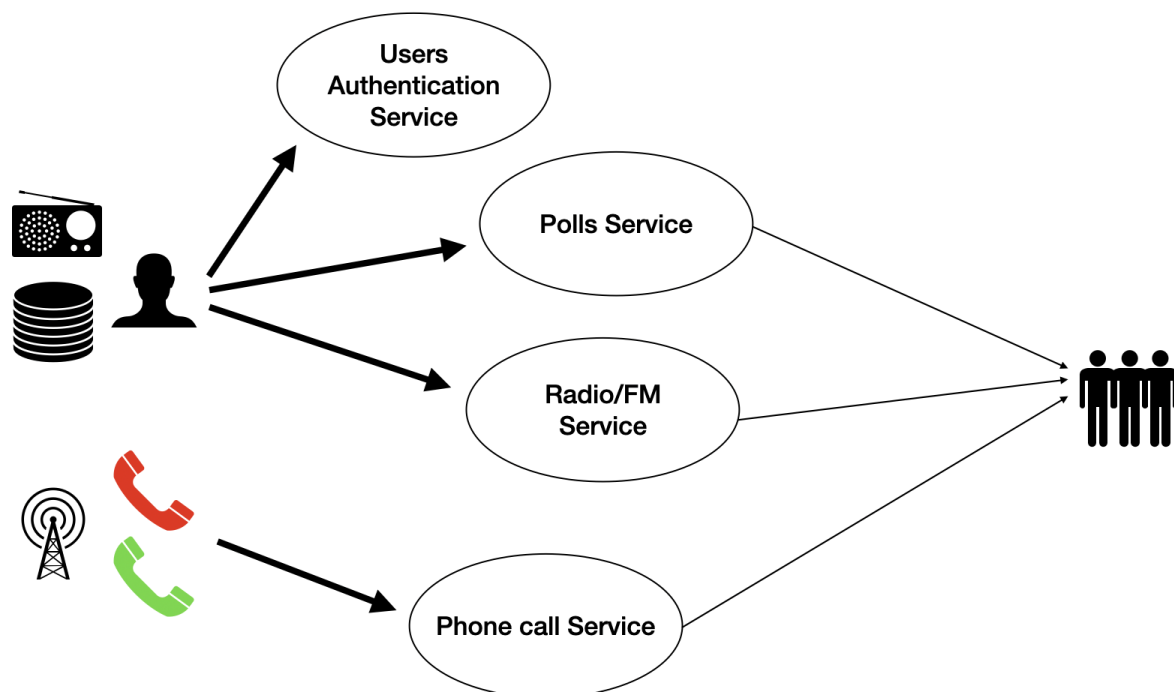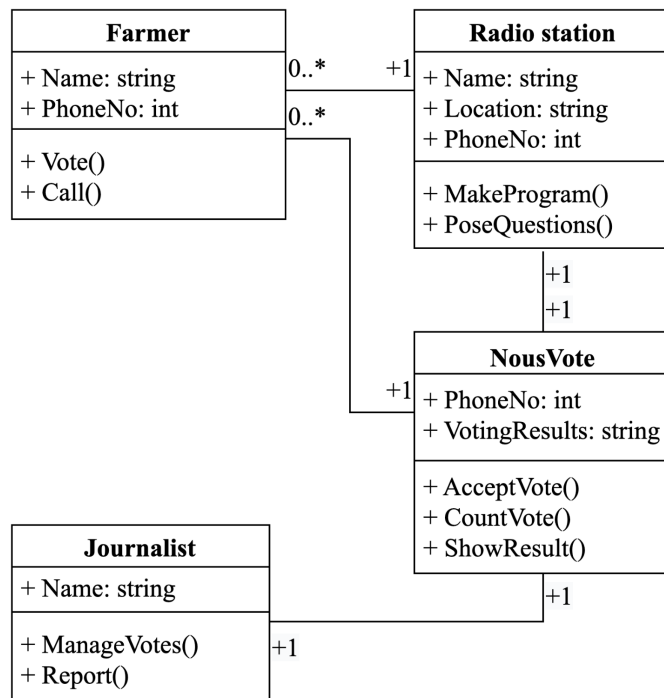*Figure 5. Organization and Voting service Behavior diagram.*

Figure 6. Context model

6. Information concepts

We use the class UML to illustrate models for the systems. We show the relationship among all the roles related to voting. (Data model)

7. Technology infrastructure

We use the Django microservices in Python to support the voting functionality. On the backend, we use an SQLite database to store vote questions, polls results and user account information.

For further connection with voiceXML, we are working on: Voxeo development system, which implements handling incoming calls and registering Nous (implementation platform). Moveover, we remotely built an amazon EC2 instance (document server). and deployed the microservices on it. We realized the communication between the Django backend and voxeo virtual call and voiceXML service through php and python scripts.
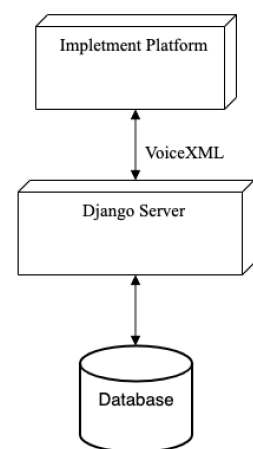
8. Cost considerations

We presume that infrastructure expenditures, such as the telecommunications network, are not included. In Mali, the great majority of listeners have already owned a basic cell phone. What matters most is that the bips are free. However, there is a possibility that telecoms providers will ban these phone numbers if the dials get too numerous and expensive.

With regard to potential commercial revenue, one possible option is to insert advertisements in polling calls, which aim at the listeners of the Mali radio programme.

Category	Type	Cost estimation (€)
Two phones and two numbers	operational	200
A server or a local computer to implement the system	operational	2000

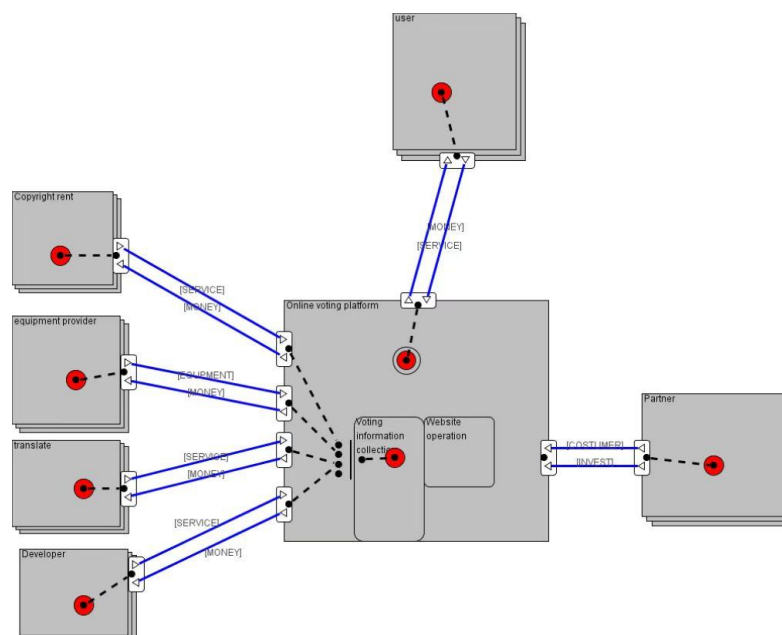|		
Development expenses of service	development	3000
IT technician for common IT problem solving	outsource	3000
Room for workplace and machine	Rents	1000
Enterprise investment & Ads	income	6000
Institute sponsored	income	3000

9. Feasibility and sustainability

At the technical level this is feasible because in Mali there has already been cellular mobile communications and radio infrastructure. Even in most underdeveloped areas, basic telecommunications and cellular networks are still with good coverage. The only challenging thing that needs to be yielded is the "BIP-Vote" system that we're working on. For the locals, there is nothing to change or take effort to understand. Thus, our project has the potential to be replicated in a wider context.

As for the economic support, we expect the main source of economic support to be local enterprises. Businesses can pay radio stations to conduct polls as market research. They are interdependent in this respect. One possible conflict is that a phone carrier may block a phone number when it receives too many invalid calls.

However, it is necessary to guarantee that all stakeholders trust the process and have control of programme content. If the method is utilized for votes that are relatively important and influential such as elections, fraud or incitement may become a concern, resulting in civil unrest, since the results can be manipulated because of the lack of strong oversight. The pre-proposal we can do on the technical side is to detect and remove the repeated calls.

e3value model:

10. Key requirements

Must have	Should have	Could have	Won't have
Two numbers that can be dialed	Ability to record the incoming phone numbers	Functionality to remove duplicated phone calls in a short time	A web page that can also accessed by listener
Functionality to record the number of times the phone is dialed		Functionality to automatically hang up the call 5 second after receiving dialing for	To bound phone numbers with user personal information
Radio station with broadcasts	Functionality to record historical voting data for future reference		
A user interface to show the recorded number of votes for each choice.	Functionality to set the start time and end time of voting, and to present the voting data in real time in the form of web pages		
	A stable tele-network		

11. Prototype description

Our voice application provides a voting service which can be accessed by phone calls. It supports two languages which are English and French. When our users dial in, it firstly will show a DTMF menu for choosing service language. After selecting the language source, users could choose to vote or to check the poll result of the current topic. Press of 1 indicates that the user is in favor of the polling activity or a vote for YES, and pressing 2 is indicating that the user is not in favor or a vote for NO.

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Implementation details

Since we can't get the real call signal (this data is usually only controlled by the operator) on the voxeo platform, the final presentation is not exactly the same as the one described at the beginning of the project. We can only vote by dialing in the phone, not just dialing to complete this voting service.

As mentioned in section 7, our xml and voiceXML files are deployed on the voxeo development platform, where IVR voice applications can be created and hosted. Our backend is deployed on an Amazon EC2 cloud server, which allows us to build a web service accessible from the public network, that is, our voting system.

The service for administrators (radio reporters) is entirely visualized, which is a front-end dashboard web page. Here, users can manage users & groups, customize topics and initiate polls, and view the current poll results. The user-oriented voting service also has a corresponding front-end web page, but it is not necessarily open to the user (the listener of the radio program). The service interacts with the voice application on the voxeo platform through php and python scripts, so that the user can press the key to vote during the call, and the backend can receive the vote and present the results in real time.

12. Pointer to the Application code

Github link : https://github.com/gracexuanzhou/NousVote_Group15

13. Pointer to how to access the application

Installation methods and requirements are listed in the *README.md* in the github repository.

Dashboard Link (Login as Manager) : http://13.38.249.239:8000/admin
 User name: user1
 Password: QWERqwer1234
Back-End Server Link (Vote page) : http://13.38.249.239:8000/polls/

14. Short Usage scenario
Scenario1: A successful vote attempt by calling.
1) Dial the correct phone number based on your phone carrier's country
2) Enter the pin number according to the voice prompt.
3) Choose the language version according to the voice prompt.
4) Start voting or check current vote counts with voice prompts.
5) Voice prompt to hang up after successful voting.

Scenario2: View voting result at site administration
1) Enter the URL(http://13.38.249.239:8000/admin/) in your browser.
2) Click on the "questions" button.
3) Choose the question text which you want to view.
4) You can view the content and the voting result.

15. Feedback questions
Question: The voting system only provides two numbers for "yes" or "no", (binary choice), which makes it difficult for some listeners to express themselves when they have other views. And cannot deal with multi-calling cases.

Feedback: After our discussion, the audience did not need to express their opinions when voting, so no attempt was made to solve this problem.

16. Discussion of Scope and Fidelity
Implemented:
(i). Support for multiple voice functions (English, French)
(ii). Count the number of calls
(iii). Query voting history and realize data visualization

Not-implemented:
(i). Unable to receive voice messages
(ii). Fully automated operation of voting service and voiceXML application.

(Have to manually edit the config file after posting a new poll)

17. Conlusions

Due to limited communication in rural areas (e.g. lack of Internet access), we designed the Nous Vote system to help Malian radio hosts Vote on their stations. This low-cost, easy-to-use system allows listeners to vote for free by sending BIPs to a specified phone number. The Nous Vote system automatically processes the text messages and reports the results back to the radio host. Nous Vote is built to run on VOXEO and Django.

Radio hosts can access Nous Vote through a web interface. The web interface showcases all the features of Nous Vote, including information visualization of voting history and results, and supports multiple languages (English, French).

Nous Vote still has a number of shortcomings such as the lack of a wide range of supported languages, the inability to display the number of times a number has been dialed in real time, and the inability to provide voice recording to receive suggestions. But overall Nous Vote, as a simple prototype, meets the basic needs of Malian radio.

Appendix.
Change log table

Date	Descriptioin	Details	Progress
2022.4.5	Group formed		
2022.4.6	Meeting	Brainstormed and discussed the use case document. Discussed with each other about course goals and the low resource scenarios. To do: Browse the list of projects separately, and prepare some feasible choices of use cases for next meeting to determine.	
2022.4.8	Meeting	A total of 5 preferred topics were listed, and the implementation of ICT methods under these use cases were discussed. Finally, the G topic, bip vote, was determined. Work assignments for each member. Finished: Summary of key idea	version 0.1
2022.4.12	Progress Meeting	Integrated works of use case description document. Finished: Name, Actors and goals, Context and scope, Use case scenario script	version 0.2
2022.4.13	In class discussion	Talked about the selected use case and its low resource context in-depth with Anna in class. Also discussed the ways VoiceXML to collect bip signal, as well as the implementation method of voice-based system.	
2022.4.17	Progress Meeting	Integrated works towards the voice-based service. Service prototype created.	version 0.3
2022.4.18	Interaction prototype	Finished Assignment 1.	version 1.0
2022.4.20	Meeting	Discussed about Assignment 2 and divided work part for members.	
2022.4.23	Progress Meeting	The project details were discussed, including feasibility, necessary conditions, social condition, technical solutions, etc.., and expanded relavant parts in project report. Finished a web interface for voting constructed by Django.	version 1.1
2022.4.29	Progress Meeting	Revised some expression of descriptive words. Added technology infrastructure, cost consideration, feasibility, substainability, e3value model and MoSCoW requirements parts. Updated voice application with French audio in evolution voxeo under the root directory as .wav format.	version 1.2
2022.4.29	Functional Prototype	Finished Milestone 2.	version 2.0
2022.5.12	Progress Meeting	Discussed about Assignment 2A and divided personal work part for each member.	
2022.5.19	Progress Meeting	Outline the functional parts that need to be improved according to the proposed goal and feedback of peer review. Revised several descriptions in the report based on comments.	version 2.9
2022.5.17--2022.5.21	Progress Meeting	Deployed the entire voting service from local to public network; Tested and created more detailed voice interface; Editted and provided detailed voice prompt supporting.	version 2.99
2022.5.22	Progress Meeting	Deleted hard-coded, and managed variables in a unified manner by setting configuration files to make the project more in line with development specifications Modified and wrote remaining report.	version 2.999
2022.5.22	Functional Prototype	Finished Assignment 2A	version 3.0