Interactive Voice Response Service to Improve High School Students Covid-19 Literacy in Burkina Faso: A Usability Study

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Abstract. Mobile technology is widely used in healthcare. However, designers and developers in many cases have focused on developing solutions that are often tailored to highly literate people. While the advent of the pandemic has called for people to seek and use Covid-19 related information to adapt their behaviors, it is relatively difficult for low literate to get easily access to health information through digital technologies. In this study, we present a Mobile based Interactive Voice Response service designed particularly for low-literate people which provides validated Covid-19 related health information in local African languages. We conducted a field study, among high school students, through a usability study to assess users' perception. The service received an excellent numerical usability score of 78.75

Keywords. Health literacy, Interactive Voice Response, mobile technology

1. Introduction

Given the rapid increase of smartphone owners, which has almost doubled between 2016 (336 million) and 2020 (660 million) in Sub-Saharan Africa (SSA) [1], mobile-based Interactive Voice Response (IVR) interventions have the potential to be widely deployed. IVR-like systems can enable users to have access to relevant health information through simple keys pressed on a telephone keypad. This can be effective in targeting behavior change [2]. Moreover, IVRs systems do not commonly require to be highly literate, nor a need of any medical examination or access to costly technology. In low resources settings, various voice-based systems, have already proven to be efficient in engaging low-literate users during the Ebola epidemic [3]. Other IRV-related initiatives have been experimented. The Wegen AIDS Talk-line in Ethiopia empowers Ethiopians regarding their HIV status [4]. Similarly, the Fitun Warmline AIDS Hotline is devoted to answering questions about HIV/AIDS from health care providers [5]. In Senegal, the m-Learning system Capacity-Plus project, which uses a combination of IVR and SMS text messaging is used to deliver refresher training to family planning providers [6]. With a low health

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literacy, and beside the challenges raised by the current Covid-19 pandemic, we observe that many countries in low resources settings are facing infodemic issues together with poor access to relevant health information. Therefore, there is a need to provide them with tailored solutions to overcome these issues.

We have developed in the context of the PATIENT-Covid-19 project, among other services, a mobile based IVR service aimed at providing Covid-19 related validated health information in some African languages [7]. The service has been tested among high school students in Bobo Dioulasso (Burkina Faso). We describe in this paper the usability test that has been conducted to evaluate the IVR service.

2. Background

Although Africa seems to be less impacted by the Covid-19 pandemic, the weakness of it healthcare systems, the high illiteracy rate of the population combined with the widespread use of foreign languages in health services limit the access to health information among vulnerable populations, particularly the rural communities. However, the continent has many potentialities. Mobile Internet connectivity is strong, yet sporadic. PATIENT-Covid19 aimed at the design and implementation of low resources compliant digital solutions to contribute to fighting the Covid-19 pandemic in Africa. The objective was to provide a set of digital services which allow (i) performing an online pre-diagnosis test, (ii) mobile based contact tracing, and (iii) an IVR service which helps users to improve Covid-19 literacy by providing accurate information related to the epidemic. The delivered solutions rely on Artificial Intelligence based technology such: Natural Language Processing, ChatBot conversational agent, knowledge graphs and Text-To-Speech. These services are accessible in common languages in West Africa: French, Peul, Moré, Dioula, etc.

IVR systems are technologies that allow humans to interact with a computer-operated phone system through the use of voice and Dual Tone Multi-Frequency (DTMF) tones input via a keypad. The user interacts with the service host system via a telephone keypad or through Speech-To-Text (STT) technology. The IVR service can then respond with pre-recorded or dynamically generated audio to further direct users on how to proceed. This technology offers several advantages, including convenience, simplicity and confidentiality. IVR systems have been used in many African countries such as Guinee [3], Senegal [6], and Ethiopia [4] to disseminate healthcare information.

The IVR service relies on the Asterisk PBX technology, a W3C Voice Extensible Markup Language (VoiceXML 2.1) and a VoiceXML interpreter (Voximal ˙https://www.voximal.com). The service is made available 24/24 and 7/7. The interactions with the user are made through DTMF tones input via a keypad. A relational database via ODBC technology is used to record call details. Furthermore, Zoiper free soft-phone was used to make VoIP calls through to the PBX. A toll-free number, 3000, was assigned for calls. Menus items have been limited to a maximum of 3 options and the system has been configured to allow sufficient time for the caller to enter the different choices, repeating the instructions if the entry is missing or invalid. A set of instruction messages for menu navigation are provided to facilitate user interactions. For example, the first interactions are: "*Welcome to the Covid-19 patient project, to choose the Dioula language press 1, to choose the Moore one press 2, to choose the Fulfulde press 3, to keep French press 4, and to exit press *"*. There are 5 languages: French which is the official language of several African countries, Dioula and its variants which is the most

common local language in many West African countries, Mooré, Fulfulde, and Wolof. In the deployed service, STT technology was not used.

3. Evaluation of the IRV service

A quantitative method using the System Usability Scale (SUS) questionnaire [8] was used to assess the usability of the service. Demographics were assessed at baseline. A System usability scale tool was used to collect data. A total of 18 high school students in Bobo Dioulasso (Burkina Faso) were recruited through school directors. We typically sought parental consent for all youth under the age of 18. Inclusion criteria were as follows: fluent in Dioula, ownership of a smartphone (Android or IOS), and being a high school student in the city of Bobo Dioulasso. We collected the data in January 2022. All the participants were briefed through an orientation session by the principal investigator and research assistants. During the session, the participants were given an overview of the usability study protocols and the IVR service. They completed an initial IVR call with the research team, and asked questions if any. Following the orientation session, all participants downloaded the Zoiper soft-phone, a free soft-phone to make VoIP calls through our PBX app). After downloading the app, participants were asked to create an account (an id and password). Upon successful login, the 3000 toll-free number was provided to participants for a call through the Zoiper keyboard. After finishing the call, participants were asked to complete the SUS questionnaire with 10 questions on a google form. All 10 questions aimed at assessing how the participants felt about the IRV service after interacting with it for 3 hours. Then, we used the quantitative method to analyze the collected data.

4. Results and analysis

From the total sample of participants in the study (n=18), 12 were women (66.7%) and 6 were men (33.3%). They were aged between 12 and 20 years old.
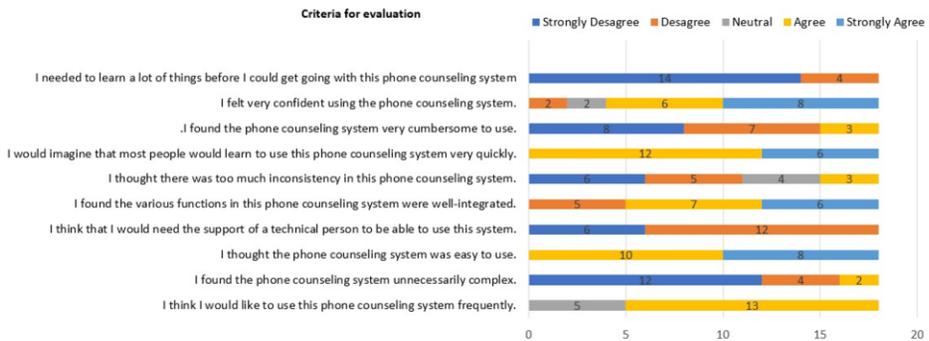

Figure 1. Diverging stacks bar chart highlighting the Likert scale questionnaire responses.

The usability assessment was conducted and yielded positive results (figure 1). All participants (18/18, 100%) agreed that the IVR service was easy to use without the need for technical assistance or extensive training. The participants were confident in using

IVR (14/18, 77.77%), and 72.22% (13/18) would like to use IVR frequently. Very few participants found the IVR service cumbersome (3/18, 16.66%) and only 11.11% (2/18) of the participants found it to be unnecessarily complex. In terms of functionality, 72.22% (13/18) of the participants agreed that the various functions of the service were well-integrated. The numeric interpretation of the usability of the service was performed using the SUS scoring procedure [8]. This resulted in an average score of 78.75/100. Previous research indicates that a SUS score >68 can be considered above-average usability, 78.75 translates to an e*xcellent* rating [8][9].

5. Discussion and conclusion

This study demonstrates that the developed IVR service is usable and has the potential to improve health literacy related to Covid-19. Findings suggested that it is easy for the low literate participants to use it without any need for technical assistance and 72.22% of participants would like to use it frequently. In addition, the participants found the system very accessible and inclusive because of its local language facility. The IVR service received a numerical usability score of 78.75, corresponding to an e*xcellent* usability score. These promising results are consistent with those observed by N.Wolfe and colleagues in Guinea [3]. We couldn't use voice recognition because African languages are being left behind when it comes to voice recognition innovation. This is an avenue for further research. Automotive interaction through voice would help those with very limited numeracy skills. When it comes to speech recognition, Initiatives such as the Common Voice project from Mozilla (https://commonvoice.mozilla.org/fr), which aim at providing an open voice database representative by all people, is an excellent step to democratize and diversify Voice Technology for all.

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