East African Journal of Social and Applied Sciences (EAJ-SAS)
Vol.2, No.1 Publication Date: April. 20, 2020
ISSN: (Online) 2714-2051, (Print) 0856-9681
The current issue and full text archive of this journal is available at: http//www.mocu.ac.tz

Cite this article as: Matto, G., Ramadhani, A. & Mjema, L. (2020). Optimizing navigation strength of IVR systems through the use of a Non-Chronological Pre-Programmed Prompt Approach, *East African Journal of Social and Applied Sciences,* 2(1), 31-37.

OPTIMIZING NAVIGATION STRENGTH OF IVR SYSTEMS THROUGH THE USE OF A NON-CHRONOLOGICAL PRE-PROGRAMMED PROMPT APPROACH

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ABSTRACT

This study was carried out to investigate the weaknesses of existing Interactive Voice Response (IVR) systems and suggest solution. The study involved a survey of various literature where content analysis was employed to analyse the surveyed literature. The study revealed that most of IVR systems have common navigation weaknesses that prevent the users from using them effectively. The most serious one is that they require users to follow a fixed pattern (i.e. "Press 1 for… Press 2 for… Press 3 for…"). When user Presses 1, for example, the same series of chronological pre-programmed prompts appears ("Press 1 for…, Press 2 for…, and so forth") until the user gets what s/he wants. This pattern of chronological pre-programmed prompts is slow, tedious, and impersonal to users. In addition, in most of IVR systems there is no option for users to undo mistakes when they recognize that they have made a mistake. Moreover, the study observed that in some of systems there is absence of the "help" option that could provide help to users who are stuck in the cause of using the system. Basing on the observed weaknesses the study proposes an improved IVR system design based on a non-chronological pre-programmed prompts (NCPP) approach. Through the NCPP approach users will be able to select the intended contents just after interacting with the IVR system instead of following chronological patterns of the existing systems. For an effective IVR system design, the following three steps has to be observed; user identification, topic selection, and receiving intended contents. The study calls for implementation of the proposed approach through design and development of IVR mobile application based on the suggested approach, among other recommendations.

Keywords: *Communication, IVR System, navigation, Non-Chronological Pre-programmed Prompts (NCPP)*
Paper type: *Research paper*
Type of Review: *Peer Review*

1. INTRODUCTION

Communication as one of the integral parts of science has always been a focus point for exchanging information among physically separated parties or locations (Matto, 2013). Historically, the first means of communication was the human voice. The next big step in communication was the invention of alphabets, which introduced written communication means. Written communication means were further improved after the discovery of printing. The

invention of electronic means of communication such as telephones, radio, TV and later introduction of the internet marked a significant improvement in communications (Matto, 2015; Lambert, 2014). With such improvements various related technologies and services are being introduced from time to time.

The 1980s brought about the Interactive Voice Response (IVR) systems (Marchant, 2016; Paper, 2014). An IVR is a phone technology that allows a computer to detect voice and touch tones (Dual-Tone Multi-Frequency (DTMF) Signalling) using a normal phone call to automate interaction with telephone callers (VanguardNetwork, 2013). These applications allow users to retrieve information from any telephone hence provide efficient and effective way of communicating through voice (Kreuter *et al.,* 2008). IVR systems play an important role in collecting and disseminating information. Because of this, as pointed out by TELUS International (2018), IVR systems have been implemented in a variety of industries over the years, mainly to facilitate customer self-service, deflect support tickets from agents and route calls more efficiently.

Historically IVR systems were used by companies as an optional channel of service (TELUS International, 2018; Paper, 2014). But according to Kassavou and Sutton (2016), Diedhiou *et al.,* (2015) and Vashistha and Thies (2012), these voice-based services have spanned diverse domains, including citizen news journalism, agricultural discussion forums, community dialogue, user-generated maps, access to health information and group messaging platform. They are focused not only on information dissemination, but also on information creation, thus enabling communities to create, share, and consume audio content using low-end mobile phones. Researchers have used IVR technology to build voice forums in which callers leave messages that can be heard over the internet and over the phone (Vashistha and Thies, 2012).

Despite of the IVR potentials, studies have reported technical and navigational weaknesses that thwart users from using the IVR systems effectively. It is in this line that Patel *et al.,* (2010) presented an interesting research question: how can these voice-based systems be made easier to navigate and search? The current research was therefore carried out to analysing the weaknesses of IVR systems and, accordingly, propose a solution to the identified weaknesses. The study proposes the improvement of IVR systems design through the use of Non-Chronological Pre-programmed Prompts (NCPP) approach as further elaborated in subsequent sections. The remainder of this paper is organized as follows: Section 2 presents a survey of related literature. Section 3 describes the methodological underpinnings of the study. Section 4 presents the study findings which among others, describes in detail the proposed NCPP approach. And, study conclusion and recommendations are presented in Section 5.

2. RELATED LITERATURE

IVR, as defined by Marchant (2016) and Datamonitor (2009), is the technology that analyses a sequence of spoken and/or DTMF commands and reproduces voice prompts to the caller. The call is then routed via the switch or serviced wholly within the IVR, which is linked to a database. According to the Diedhiou *et al.* (2015) IVR is a technology that uses any type of phone to deliver information by voice via audio recordings and allows users to provide feedback by pressing a number key that corresponds to their selected choice. Users can also leave a recorded response for more extensive feedback. IVR Lab (IVRLab, 2013) defines IVR as a technology that allows callers to interact with a company's communications system over the telephone. It enables the caller to get information from a database, enter information into a database, or both. Although these definitions differ slightly in some ways, they are all pointing at IVR as a phone technology that enables interaction between a caller and the system based on either phone keypads strikes or by voice.

Effective design and implementation of IVR systems offers several advantages to the users in both individual and organization levels (Suhm, 2008). In connection with this Chakraborty (2013) explains how IVR can be used to facilitate low cost but efficient phone-based data collection. IVRs, in many cases, are also used by small and large businesses to reduce labour costs by using automated systems to answer routine queries from customers. They similarly extend hours of operation by making business service options available 24/7 (IVR Lab, 2013). IVRLab (2013), TalkDesk (2013) and Genesys (2014) pointed out that the use of IVR in businesses saves time (handles high call volumes), enhances customer satisfaction, provides 24/7 customer support, increase professionalism and

increases organization's efficiency. Moreover, the use of IVRs expands business' ability to get feedback from customers with surveys that populate its database from IVR solutions.

A recent trend has shown a move towards designing specific purpose IVR based systems. Studies by Marchant (2016), Vashistha and Thies (2013), Mudliar & Donner (2015) Mudliar *et al.* (2012) and Patel *et al.,* (2010) for example, mentioned various specific purpose IVR based systems. Some of them are; Avaaj Atoro designed specifically for agriculture information sharing, IVR Junction for voice forums, VoiKiosk for community dialogue and CGNet Swara for providing a voice forum for citizen news journalism. IVR technology has been used for many years in a variety of health care applications in the developed world. For example, IVR systems have been used to assist in the management of chronic illnesses, screen for nicotine dependence and dementia (Diedhiou, et al., 2015). In connection with these systems, there are also several platforms available for building IVR systems including Freedom Fone (Clark & Burrell, 2009), ODK Voice (Hartung et al., 2010), Tangaza (Odero *et al.,* 2010) and Gram Vaani (Gram Vaani, n.d.). This has accelerated an inclination to the use of the systems.

IVR Lab (2013) points out that users interact with IVR based systems through a series of pre-programmed prompts. These prompts are pre-recorded and can also further direct the caller to a live customer service representative. In some cases, it may be forwarded to a voicemail box or even a message from the customer recorded and emailed to the customer service team. IVR systems can also be designed to recognize human voice and respond accordingly. Intelligence (2010) added that IVR systems create voice forms for DTMF Touch-tone, speech recognition, or spoken/recorded responses; also store or bundle responses into e-mails for delivery. However, most IVR systems are effective navigation tools for callers and phone keypads — "Press 1 for… Press 2 for…" and so forth.

3. METHODOLOGY

This study was largely qualitative in nature. It involved a survey of various literature in relation to the present research focus so as to establish weaknesses of the existing IVR systems. The literature involved in this research was obtained from three main sources; journal articles, books and internet sources such as websites. The surveyed literatures were analyzed by using content analysis to establish common weaknesses of the existing IVR systems. The study conceptualized the established weaknesses through the presented system's architectural diagram. Further, as part of presenting findings on the suggested approach for improving IVR systems the study adopted the use of architectural diagram and system's flowchart.

4. RESULTS

4.1 Challenges of the existing IVR systems

As it has already been explained, IVR systems have many advantages to the users. However, it was found out in this study that these systems have got technical and navigational drawbacks. Apart from requiring considerable technical setup, which is beyond the reach of many organizations, they require users to follow a fixed pattern, which can be slow, tedious, and impersonal relative to a live conversation. These weaknesses, especially navigational weaknesses, have made IVR systems frustrating and difficult to use. The systems are blamed to consume users' time in navigation while providing them with unnecessary frustrations with a lot of prompts (Mead, 2019; Aditya Vashistha, 2013; Mudliar, *et al.*, 2012; Patel, *et al.*, 2010) and (Dipanjan Chakraborty, 2013). For example, in a study by Chakraborty, *et al.* (2013) to evaluate IVR versus a live operator for phone surveys in India, the authors observed that users often displayed signs of being stuck (remaining silent) while a prompt repeats in advance of dropping the call or failing to answer an individual question. According to the authors, that was caused by an absence of an automated assistance or a dedicated "help" button to help the user to successfully complete the survey. In connection with this, studies observed that in some of the IVR systems there are no options for the users to undo mistakes when recognized that they had made a mistake.

4.2 Architecture of the Existing Systems

The main navigation weakness of the existing IVR systems as indicated by Mead (2019), Vashistha and Thies (2013), Mudliar *et al.* (2012), Patel *et al.* (2010) and Chakraborty *et al.* (2013) is that the systems require users to listen to all topics (the chronological pre-programed prompts) before choosing what they are interested on. In its simplest form, Figure 1 shows how this navigational process takes place.

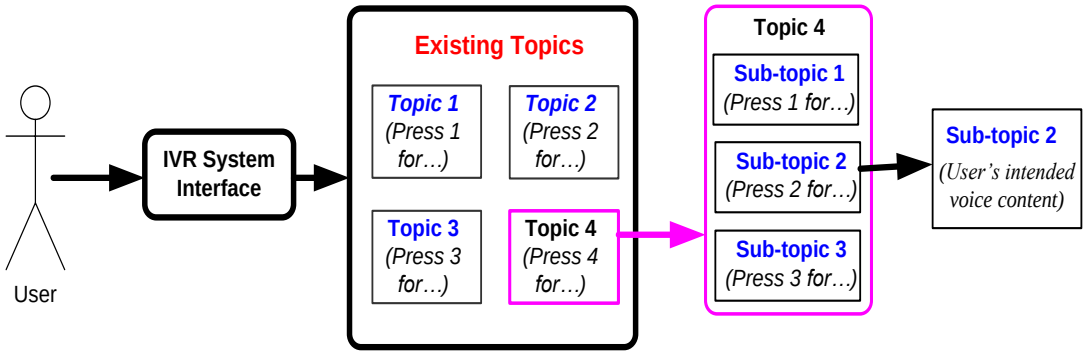

Figure 1: Conceptualized architecture of the existing systems
(*Source:* Authors' Construct, 2019)

The user in this illustration should listen to four different existing topics (Topic 1, Topic 2, Topic 3 and Topic 4) before choosing his topic of interest, which is Topic 4. In most cases these topics appears to user in prompts form; Press 1 for…., 2 for…., 3 for…., 4 for…. After choosing Topic 4, user will again be required to listen to the subsequent sub-topics; Sub-topic 1, Sub-topic 2 and Sub-topic 3 before choosing what s/he wants to hear, Sub-topic 3 in this illustration. It is possible that Sub-topic 3 could also have sub topics and other sub topics that would require user to follow before getting what s/he is seeking. This scenario, as already pointed out, consumes users' time in navigation and may provide them with unnecessary frustrations with a lot of topic and sub-topic menus.

4.3 Proposed Solution to improve IVR Systems

4.3.1 Architecture of the Proposed System

In contrast to the existing systems, Figure 2 shows the architecture of the proposed system. In this case, unlike following the chronological pre-programmed prompts, this study is proposing an NCPP approach. With this approach, user should be able to select what s/he wants to listen just after interacting with the system. That is, the user should be able to listen to Sub-topic 2 by only one keystroke or a single voice command. In this illustration, two stages of topic menus are skipped. If this scenario is followed it will save user's time and unnecessary frustrations when interacting with IVR systems.

It is further important that after the user has received what s/he is looking for or if s/he was unable to get it the system should give option to start again selections before deciding to exit. To achieve this, IVR systems in connection with NCPP approach should embrace a button/option to redo selections before deciding to exit from the system.

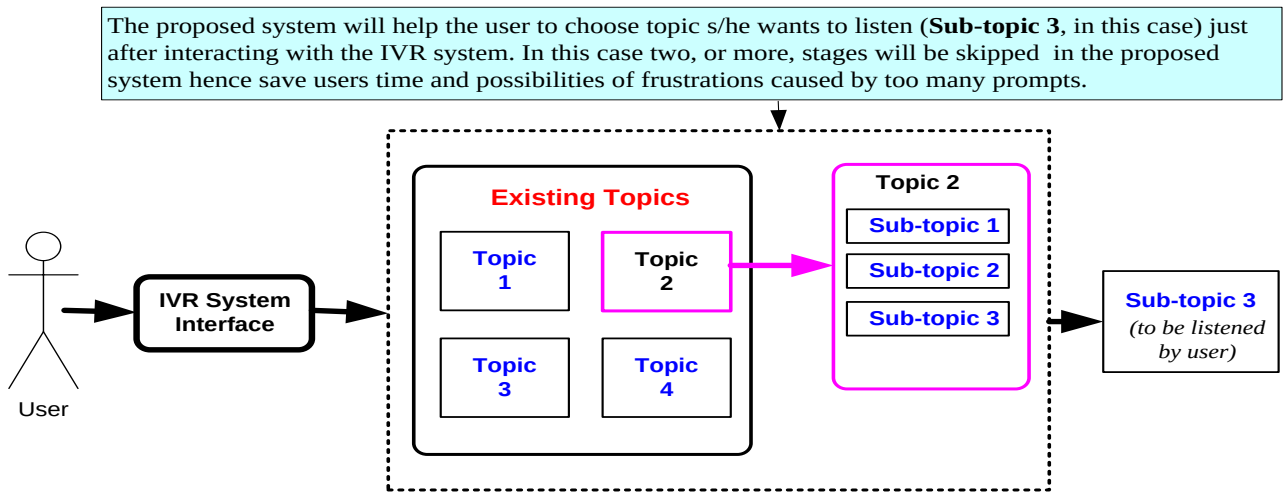

Figure 2: Architecture of the proposed system
(*Source:* Authors' Construct, 2019)

4.3.2 Algorithm of the Proposed System

Figure 3 shows a flowchart of the proposed IVR system design using the NCPP approach. In this design, a series of steps when user interacts with the system (i.e. from user identification, just after user interacts with the system, to when s/he gets the intended contents from the IVR system) are shown.

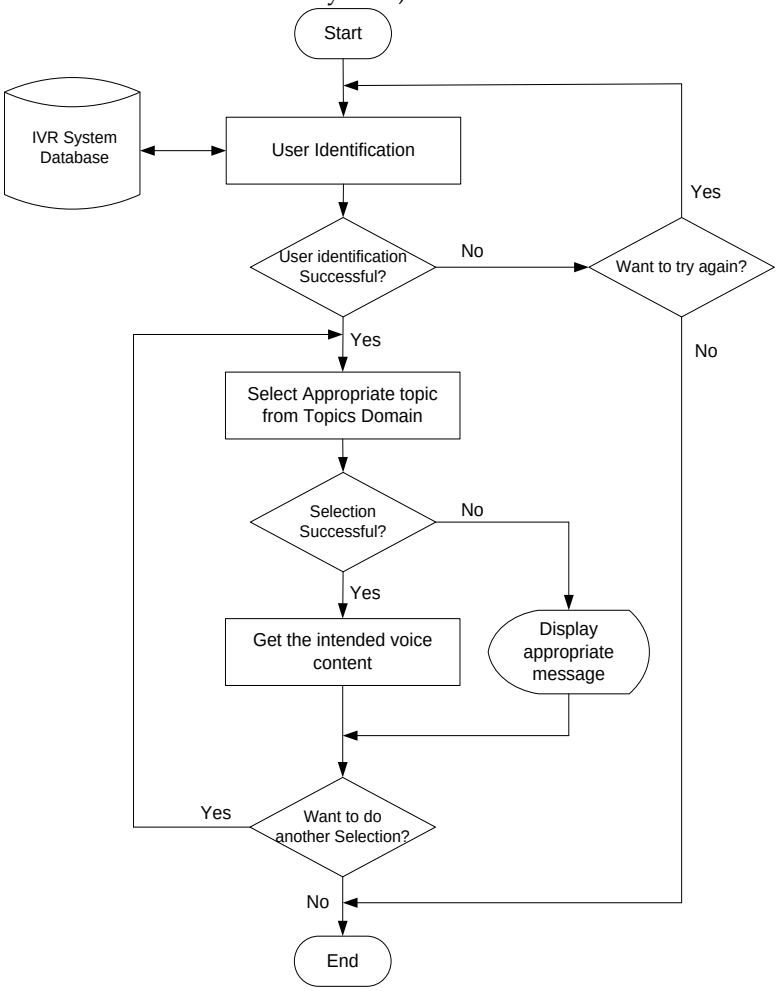

Figure 3: Flowchart of the proposed system

(*Source:* Authors' construct, 2019)

As shown in figure 3, three important steps that are involved in this system are as follows:

Step 1: User Identification: For IVR systems that are to be used by authorized users only the first step should be to check user's identity. User providing his credentials to the system achieves this step. The system then checks if the supplied credentials match with the existing ones in the IVR system database. If they match the system continues to step 2, but if they do not match it gives user an agreed number of attempts to re-enter credentials before denying access.

Step 2: Topic Selection: After being successful in step 1 above, user will be able to select the intended content (topic) by only one keystroke or voice command. This step is actually the central part of the proposed system design. With successful implementation of this step, user will be able to skip a series of other steps s/he had to follow (as it is in the existing IVR systems) to get the intended content.

Step 3: Getting Intended Content: In this step, user will be able to get the results of his selection. If a right choice of option was made, s/he will be able to get the intended content, but if the choice was wrongly made the system will give user an appropriate message while availing an option to try again. In fact, whether user has got the intended content or not, s/he will actually be given an option to continue with another selection or exit. In their study, Chakraborty, *et al.* (2013) posed a question: why not provide a dedicated

"undo" button on IVR systems? The option to make another selection in this step essentially gives an answer to that question.

5. CONCLUSION AND RECOMMENDATIONS

This research has analysed the weaknesses of the existing IVR systems, and presented a design solution for the identified weaknesses. Among other weaknesses, IVR systems are blamed for having common navigation weakness. The weakness is basically a result of requiring users to follow a fixed pattern of chronological pre-programmed prompts (i.e. Press 1 for…Press 2 for… Press 3 for…) which can be slow, tedious, and impersonal to many users. To overcome the identified weaknesses this study proposed an improved IVR systems design by employing the use of Non-Chronological Pre-programmed Prompts (NCPP). The NCPP approach provides user with an ability to select what s/he wants to listen just after interacting with the IVR system (with only one keystroke or voice command) instead of following chronological topics as it is in the existing systems. To achieve this, three steps are to be followed. First is the user identification, second, topic selection, and third, receiving the intended content. The use of the NCPP approach will save user's time and unnecessary frustrations when interacting with the IVR systems.

The study recommends to the developers of IVR systems to adopt and implement the proposed NCPP approach in designing their systems. In connection, Mobile Network Operators and other service providers who interact with their customers via IVR systems should consider acquiring IVR systems that have been designed following the NCPP approach. While recommending the use of the presented NCPP approach, the study equally calls upon other researchers and scholars to further test, implement and enhance the proposed approach. And, due to the increasingly development and use of mobile technology the study puts forward to the developer of IVR systems to consider employing the proposed approach in coming up with IVR mobile applications.

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