Exploring the usability of Interactive Voice Response System's design

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ABSTRACT

In this work, we propose a 3-Dimensional information space to study the usability of different designs of Interactive Voice Response system (IVR). We study three different system design of IVR through real world experiment and control lab studies. Relative position of each system design is investigated in the proposed information space.

Categories and Subject Descriptors

H.5.2 [**User Interfaces**]: Voice I/O

General Terms

Theory, Design, Human Factors

Keywords

Voice System, IVR, Information Space, Usable Design

INTRODUCTION

Interactive Voice Response (IVR) technology is emerging for accessing information (e.g. customer care) via phones. It is also used as a medium for information dissemination [4]. However, usability of IVR systems is low as they provide
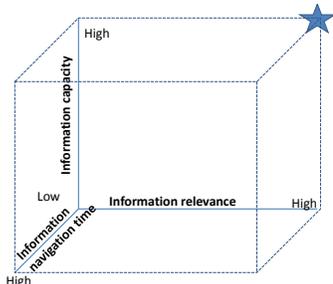
Figure 1: Information space to measure the usability of information dissemination system.

only limited information and are time consuming [1]. It is

important to have design parameters which helps in analyzing the usability of IVR system. Perugini et al. have studied different aspects (e.g. interaction style, input modality) of IVR system's design through a 3-Dimensional conceptual design space [5]. However, dimensions of design space are focused on exploring the alternatives for different design aspects of IVR rather than analyzing the usability of it.

As an information system, usability of IVR depends upon ease of access, relevance and breadth of information content provided by it. Based on this, we are proposing an information space with three dimensions as shown in Figure 1. The three dimensions of information space are as follows:

- **Information navigation time:** It refers to time spent on navigation to access information in IVR systems. Lesser the navigation time the quicker a user can access information.

- **Information relevance:** It refers to relevance of information provided by the system as measured through standard metrics like precision and recall. Traditional IVR systems, provide relevant information as information content is prepared manually. However, automated technique as practiced by upcoming system may result in providing irrelevant information.

- **Information capacity:** It refers to breadth of information content provided by the system for variety of user queries. Traditional IVR systems provide limited information as browsing and navigating through large content is difficult on audio interfaces.

Ideally, a usable system should provide relevant information from large content and should have low navigation-time as shown by "⋆" in Figure 1. Prior work has shown to improve the usability of IVR in one or more dimensions of information space [3]. IVR system with dynamic rearrangement of menu and use of information retrieval (IR) technique have been proposed to reduce navigation time and to increase the information capacity in voice based system [6, 2].

METHODOLOGY

We studied two system designs for IVR based on dynamic rearrangement and automatic IR technique and compared it with the traditional IVR system:

- **Traditional IVR**: An IVR system with static menu deployed in practice to provide information to applicants for admission to different courses in the institute.

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[1]Calls were received from different parts of India. Although, we did not collected data about caller's age, but it was assumed that callers represent different age group.

	Traditional	Dynamic	IR-IVR
User Queries	174	220	64
Unique callers	127	133	16
User type	All age group, across the India [1]	All age group, across the India [1]	Students in age group of 18-24 with different background
Remarks	1 month deployment for admission process	1 month deployment for admission process	Conducted a control experiment with 16 users

Table 1: Data collection of each IVR system

- **Dynamic Rearrangement IVR:** An IVR system deployed in parallel with traditional IVR but menu options get rearranges based on relative popularity of menu options among the callers. Dynamic rearrangement reduces navigation time by decreasing the waiting time for desired option to appear early in menu.

- **IR-IVR:** An IVR system using IR technique to automatically generate responses to user query related to institute. The system was design to achieve high information capacity in IVR system. This IVR was tested under controlled experiment as impact of using IR technique on information relevance was not known. An inaccurate or irrelevant information may have adverse effects in real world deployments.

Table 1 summarizes the collected data for each system usage.

RESULTS

We analyzed the data and the results are summarized below:

- **Dynamic rearrangement Vs Traditional IVR:** We showed that Dynamic rearrangement of IVR system has better navigation time (especially for callers not having tendency to barge-in) but slightly low relevance as compared to Traditional IVR. We found that Dynamic system[2] reduces the navigation time by 19.08%. Further analysis reveals that sometime repeat callers who have tendency to barge-in[3] dynamic rearrangement gave them information different from expected.

- **IR-IVR Vs Traditional IVR:** Use of IR in IVR system has shown increase in information capacity and decrease in information relevance. In our experiment, IR-IVR system responded to 64 different questions asked by users and had information content to respond to many more questions where traditional IVR system had only 10 options. We also found that relevance score for IR-IVR was 3.46 (on a scale of 1 to 5, where 1 signifies bad and 5 signifies good) which was evaluated from relevance score for each response collected from users. In the survey, user reported that many time responses were incomplete or irrelevant information was mixed with relevant which was never observed with traditional IVR system.

Figure 2, shows three systems in information space. This suggest that techniques used for reducing navigation time or increasing the information capacity may result in low information relevance.

[2] Dynamic system may perform worse where system expects one caller to call multiple times. In our system most callers were single time caller.

[3] In an IVR system, experienced users are accustomed to interrupting the system ahead of menu announcement to quickly navigate to the next prompt.
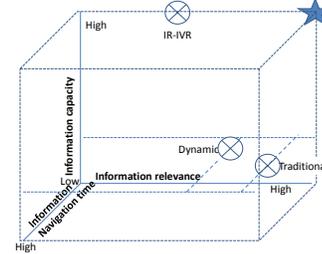

Figure 2: Position of Traditional, Dynamic Rearrangement and IR-IVR system in information space.

CONCLUSION

We proposed an information space for studying the usability of IVR systems. However, framework may not be applicable for IVR system which are used for collecting information like IVR based survey. We also evaluated 3 system designs through real world experiment and controlled lab studies. The system design were analyzed on different dimension of information space. Our information space may help in designing IVR system based on desired usability on different dimensions.

Acknowledgments

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