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Optimization of Interactive Voice Response Systems using SAS®

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ABSTRACT

Many communication channels exist for customers to engage with businesses, yet Interactive Voice Response (IVR) systems remain most popular of them. IVR acts as the front end to consumer interaction and is the most effective method for customers to resolve their issues before talking to an agent. If IVR interface is not designed properly customers would be stuck in an endless loop of pressing buttons that can lead to consumer frustration. The bottom line is this: IVR systems should be setup to quickly resolve as many routine inbound inquires as possible, and allow customers to speak to an agent when necessary.

The purpose of this paper is to demonstrate how SAS® tools helped optimize the IVR system for a book publishing company. The dataset used in this study was obtained from a telecom services company and contained IVR logs of more than 300,000 calls with 1.4 million observations. To gain insight into customer behaviors, path analysis was performed on this data using SAS® Enterprise Miner and obstacles faced by customers was identified. This helped in determining prompt performance and analysis using SAS PROCs was conducted on such prompts. Prompts improvement was recommended and new self-service areas were identified which avoid transfers and would save client's thousands of dollars invested in call centers.

INTRODUCTION

Currently, most of the large companies with a vast customer base use IVR system as this ubiquitous telephony menu system enables identification of callers and automates most of the routine tasks. Furthermore, IVR routes the callers to the most appropriate agent skill groups. Customers prefer to provide their information to this *automated attendant,* which allows to them to self-service instead of being put on hold to talk to a live agent. The benefits of IVR systems are countless. From simple information lookup to complex stock account balance transfers, IVR proves to be the quick and reliable method for completing a transaction. However, despite its ease of use, IVR also risks eroding customer satisfaction by playing lengthy menu options that can induce frustration. So, it is important to optimize the IVR interface and keep the options simple and short.

Typically, IVR systems are a combination of the following elements: greeting message, identification and verification, predicting why the customer is calling – predictive call intent, main menu, and specific functional areas. Figure 1 shows the IVR system of a book publishing company that has four functional areas - 1 through 4. As soon as the customer calls in, the caller is greeted with a welcome message and their information is pulled from a client database. With the help of this information the caller is then authenticated and the call proceeds. Once the identification and verification is complete, caller's past interactions are retrieved from a database and then routed to the appropriate functional area, thereby avoiding unnecessary questions for the customer. If no previous interactions of the caller are retrieved, then the call proceeds to the main menu where the customer is asked what they are calling about. The customer is presented with various options where self-service is possible, and in the case of a difficulty, the caller can opt out and speak to an agent at any step.

About 20% of the customers of this book publishing company end up successfully completing routine tasks within IVR or obtaining some key information about their account. In order to increase the meaningful containment from 20%, and to improve customer satisfaction, the obstacles faced by the customers are diagnosed and the performance of the IVR applications are optimized.

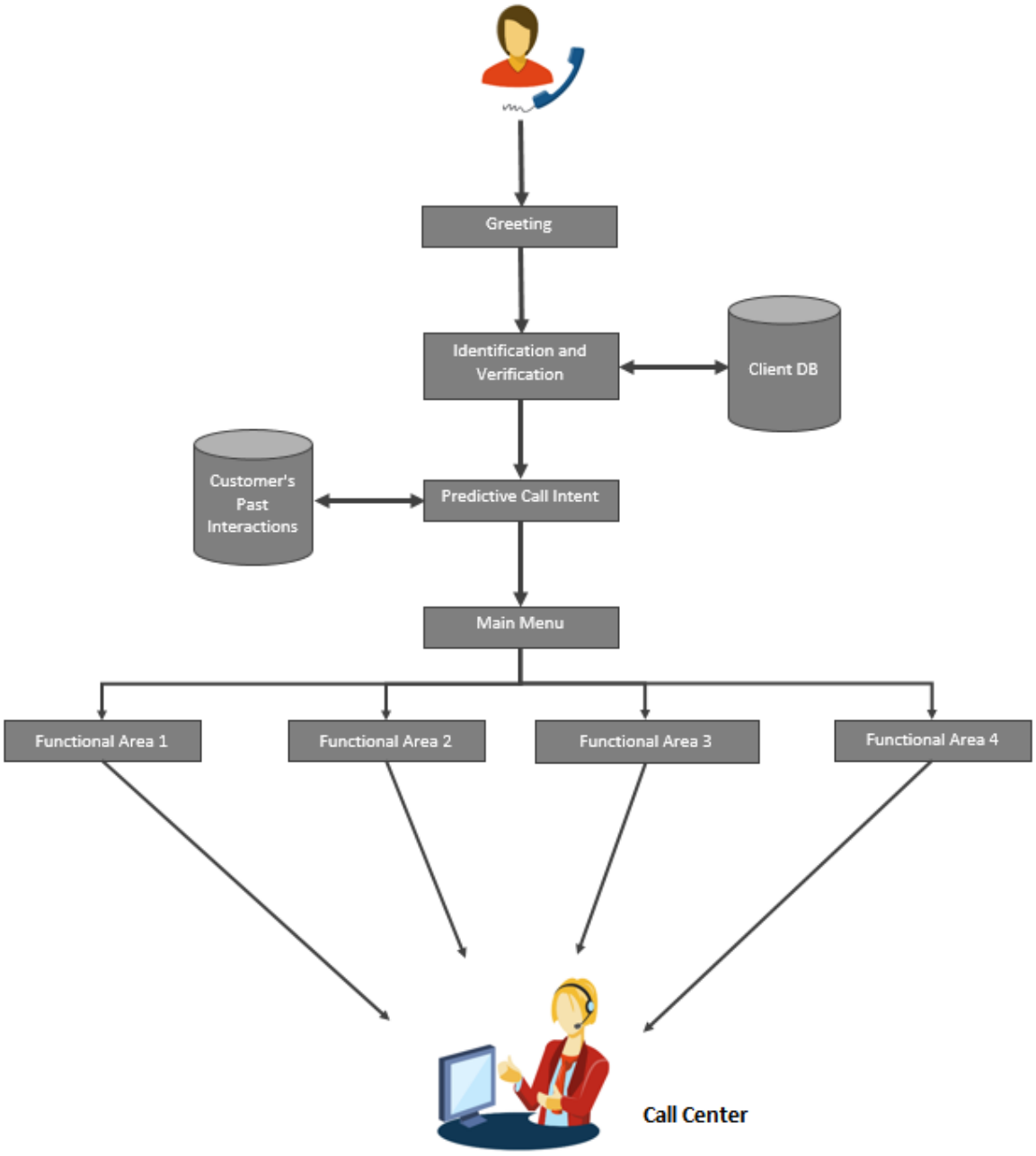

Figure 1. IVR Call Flow of a Book Publishing Company

DATA OVERVIEW

The data used in this study is IVR data that contains call logs of about 300,000 callers who had called the book publishing company's IVR system between the months of May 2016 to August 2016. The call logs are a collection of events that had occurred during interaction between caller and the system, and are in the form of sequential transactional data. The customer details captured through fields such as ANI and API return information from customer databases. Other fields in the data helps us understand what happened during the interaction – how much time did the customer spend at each prompt, what options did they chose, whether those options were valid entries, and if they were transferred to an agent etc.

METHODOLOGY

The analysis performed on the IVR data is based on the framework shown in Figure 2. The call logs which are a collection of a history of events that happened inside IVR is first prepared by joining it with a prompts collection list. The prompts collection list is a grid that categorizes each prompt that is played inside the IVR of the book publishing company, and then categorized into three types: Self Service, Information or Navigation.

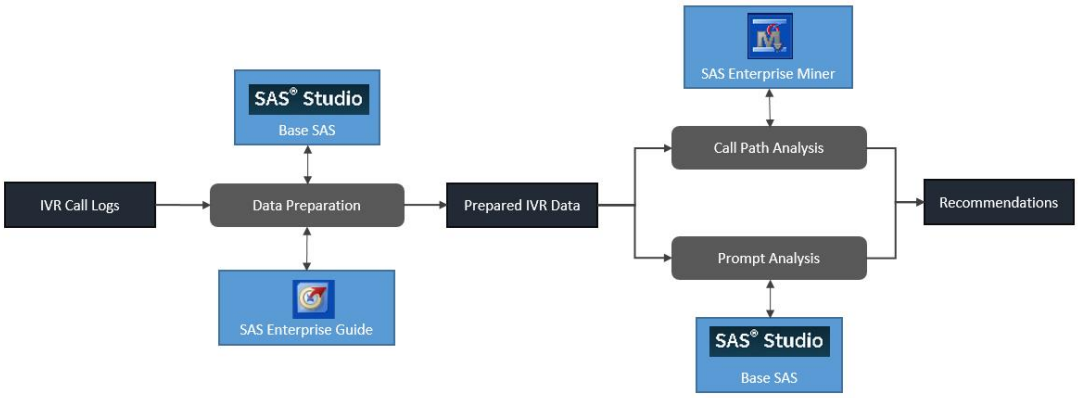

Figure 2. Framework for analysis of IVR data

DATA PREPARATION

Once the join is made using PROC SQL, additional fields such as Module_Category and Module_Category_Sequence are created that would help determine the type of call and obtain the sequence of steps taken by the customer inside IVR respectively. This prepared data is used for prompt analysis. For performing path analysis using SAS® Enterprise Miner, variable roles are set as shown in Figure 3.

Variable	Role
Module/Function/Prompt Name	Target
Call Key	ID
Sequence Number	Sequence

Figure 3. Variable Roles for Path Analysis

IVR CALL PATH ANALYSIS

An IVR system can be divided based on the purpose it is designed for. These purposes are termed as Modules. Each module can have one or more functions and each function can have few or more prompts. In order to identify where customers face challenges inside IVR, it is sensible to start the call path analysis at the module level and focus on the module that needs improvement.

Figure 4. Path Analysis performed for this study using SAS Enterprise Miner

The functions of such modules are further analyzed using path analysis and low call volume functions are screened. Finally, path analysis is performed at prompt level and low performing prompts are diagnosed. Figure 4 shows the path analysis performed at different levels.

Items Report

Target Item	Transaction Count	Transaction Support (%)
Module 1	49,359	16.3236
Module 2	131,628	43.5308
Module 3	253,193	83.7337
Module 4	22,980	7.5997
Module 5	21,824	7.2174
Module 6	58,876	19.4709
Module 7	35,305	11.6757

Figure 5. Items Report at module level

Figure 5 shows the items report of path analysis performed on module level IVR data. The transaction count gives the frequency of calls at each module and the Support tells the percentage of calls at each module relative to the total number of calls the entire IVR had received. It is noted that at the module level, module 3 has the highest transaction Support – about 84%. This is expected as module 3 is the very first module the customer interacts with inside IVR. In contrast, module 1 and module 6, which has the self-service functionalities has transaction support of just 16% and 19% respectively. So, the focus will be on these two modules.

Similar path analysis is performed on both function level and prompt level and low performing areas are identified. Figure 6 shows the link graph at function level. Each node in the graph represents a function. Larger circles mean those functions have received a higher call volume compared to others. Each link represents a connection between two functions and a thicker line indicates higher confidence. From the link graph, it is to note that the strongest connections are between *Function 1 -> Function 3 -> Function 4*. The weakest connection is between *Function 1* and *Function 2,* indicating that there is low probability that a user moves to *Function 2* from *Function 1*.

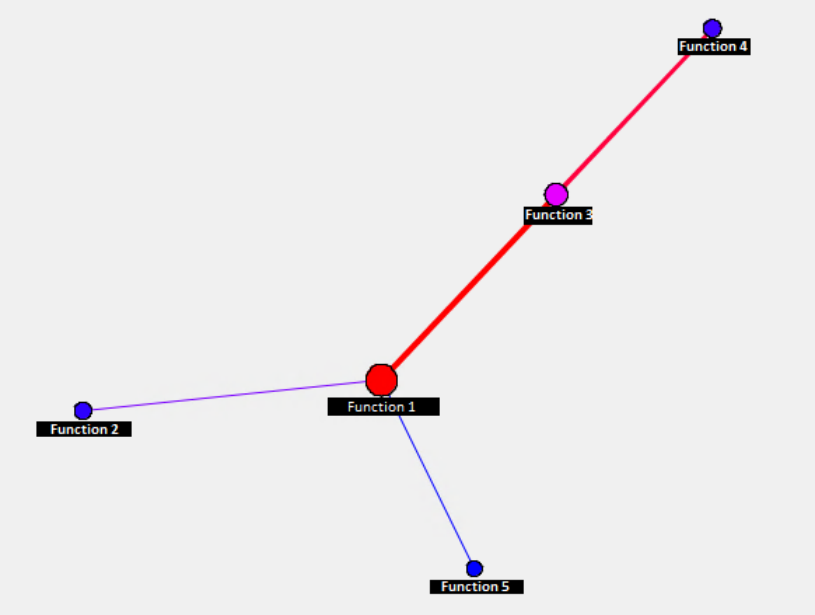

Figure 6. Link Graph at function level

PROMPT ANALYSIS

With the help of initial path analysis using SAS® Enterprise Miner the low performing functions and prompts are identified. The next step is to compare these low performing prompts based on their recognition rate and success rate and target the prompts in common. Figure 7 shows top ten low performing prompts based on recognition rate. Recognition rate is confidence with which the recognizer's response matches the response with a value in the associated grammar, above the confidence threshold.

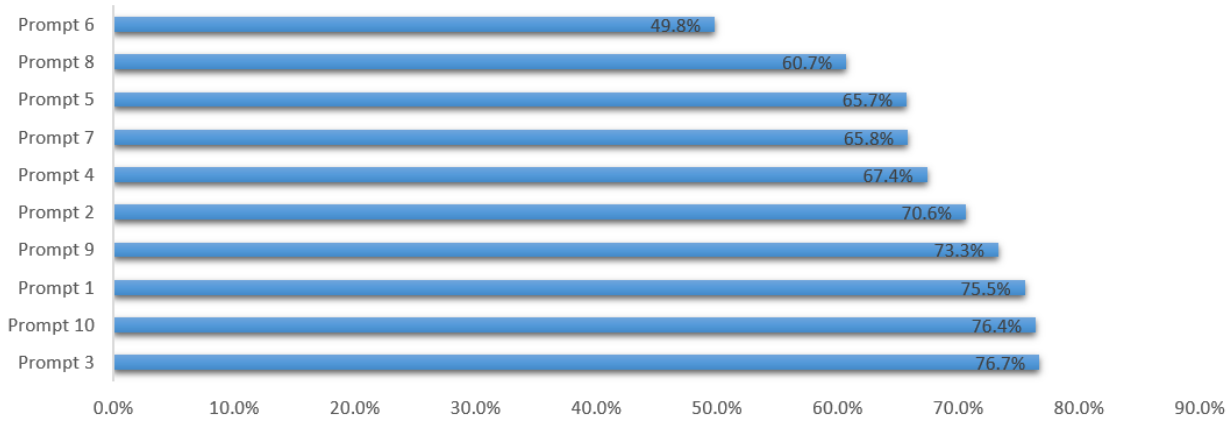

Figure 7. Prompt Recognition Rate

Success rate is the rate a customer moves through one prompt to another each time a prompt is played. Figure 8 shows the top ten low performing prompts based on success rate.

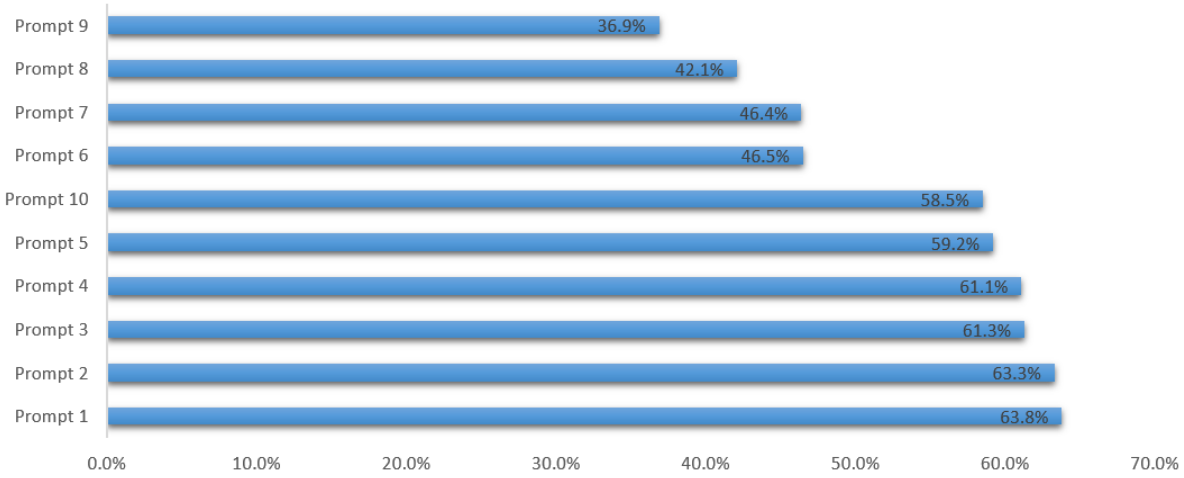

Figure 8. Prompt Success Rate

RECOMMENDATIONS

Based on the calculation of recognition rate and success rate, the following seven prompts are common and part of both low recognition and success rate.

- Prompt 4,
- Prompt 6,
- Prompt 7,
- Prompt 8,
- Prompt 9,
- Prompt 3 and

- Prompt 2

These are the prompts that need to be checked for verbiage and responses and should be the top priorities for improvement. It is also recommended that an AB test is performed pre-post change and improvements are measured.

CONCLUSION AND NEXT STEPS

The IVR system plays a critical role in any business. If implemented correctly, it can save client's thousands of dollars invested in call centers. IVR systems also drive customer satisfaction, which will help in revenue generation. So, understanding what customers do inside IVR, what are the paths they take most and paths they avoid, and what is their effort, are some questions that are answered in this study. This paper presents a few of the prompts that were identified to be low performing and improving them will optimize the IVR of the book publishing company and generate revenue for the client by adding new self-service areas. The next steps are to measure the impact of changes based on the mentioned recommendations through an AB test and assess the cost savings.

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