

**THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY**

**IVR USAGE PATTERNS AND IMPROVING
USABILITY**

Master of Science Thesis

NEFİSE KULA

İSTANBUL, 2016

**THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY**

**THE GRADUATE SCHOOL OF NATURAL AND APPLIED
SCIENCE COMPUTER ENGINEERING**

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Supervisor: ASSIST. PROF. DR. YÜCEL BATU SALMAN

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DEDICATION

This thesis is dedicated to my husband Fatih, who has so many personal graces; Wisdom, talent, and generosity of spirit. Thank you for bringing so much joy to my life and my work.

It is also dedicated to my lovely sons, Ahmet and Mert: they were with me every step of the study waiting for me to come back home.

Lastly, it is dedicated to other family members and co-workers who supported me with their knowledge, experience and friendships throughout this work.

İstanbul, 2016

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Nefise Kula



ABSTRACT

IVR USAGE PATTERNS AND IMPROVING USABILITY

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Interactive Voice Response (IVR) system is a telephony technology that interacts with callers through the use of voice and/or DTMF tone input via keypad. IVR gives callers the ability to access a database of information via phone. In order to gain that information, they respond by pressing digits on the telephone or speaking short phrases. IVRs offer callers the advantage of getting self-service 24 hours a day.

An IVR system usually has several menus of pre-recorded voice prompt to present information and options to callers. Most of the choices are as simple as choosing a number, some options may require detailed information such as account number or credit card number. IVR is a technical interface to humans, just like a web site is and just like many web sites, it is usually configured and developed by some engineers without much guidance from Marketing or Customer Service. Therefore, while an IVR can technically be very good and functionally rich, these systems can be quite confusing and unfriendly from a customer's perspective. Because of these facts, callers dislike IVRs and try to find a quick way to reach an agent. It costs organizations much more when a customer talks to a live agent compared to an IVR session. For that reason, truly effective IVRs can bring significant cost savings to the organization and can boost customer satisfaction.

At the core of this work, we tried to understand usage habits of the customers, reasons of the calls, system's peak times, highlights of the day, demographic and product profile of the customers etc. and effects on the calls in IVRs. Therefore, we could find new

ways to deliver highly effective IVR solutions and improve IVR usability. Customer Profile IVR and Buffer Zone are our important suggestions among others that guide calls to related IVR algorithm according to customer profile or encourages customers to use IVR more efficient according to peak times, highlights of the day or any other defined major subject. In addition, this research showed that improving IVR usability can reduce call center costs substantially.

Keywords: IVR, Call Centers, Usability, Human–Computer Interactions, Self-Service



ÖZET

IVR KULLANIM EĞİLİMLERİ VE KULLANILIRLIĞI ARTTIRMA

Nefise Kula

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Tez Danışmanı: Yrd. Doç. Dr. Yücel Batu Salman

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Sesli Yanıt Sistemi (IVR) DTMF tonlaması veya ses aracılığıyla kullanıcıdan girdi olarak etkileşimde bulunan bir telefon teknoloji sistemidir. IVR'ın yardımıyla, arayan kullanıcı telefon aracılığıyla veri tabanındaki bilgilere ulaşım imkânı elde eder. İstenen bilgiyi elde etmek için kısa ifadelerle ya da telefondaki tuşlara basarak yanıt verirler. SYS arayanalar günün 24 saati istenilen servise ulaşma avantajı sağlar.

Tipik bir IVR, arayanlara daha önceden kaydedilerek hazırlanmış anonslarla menü yoluyla bilgi veya seçenek sunar. Çoğu seçenek, tek tuşla seçim yapılacak kadar basitken, bazen detaylı bilgi girilmesi gerekebilir, üye numarası veya kredi kartı numarası gibi. IVR tıpkı web siteleri gibi kullanıcılara sunulmuş teknik bir ara yüzdür. Birçok web site gibi genellikle bir mühendis tarafından, Satış veya Müşteri İlişkileri uzmanından destek alınmadan tasarlanmış, geliştirilmiştir. IVR sistemleri teknik açıdan becerikli, işlem yönünden zengin olabilirken, müşteri açısından son derece karmaşık ve soğuk bulunabilir. Bu sebeplerden ötürü, arayanlar IVR sisteminden hoşlanmaz ve müşteri temsilcisine ulaşacak hızlı bir yol bulmaya çalışırlar. Bu yüzden, gerçekten etkili bir IVR sistemi, şirkete önemli ölçüde mali tasarruf sağlayabilir ve müşteri memnuniyetini arttırabilir.

Bu çalışma ile arayanların kullanım alışkanlıklarını, arama sebeplerini, sistemin en yoğun olduğu zamanları, günün önemli olaylarını, arayanların demografik yapılarını ve ürün profili gibi konuların IVR sistemi üzerindeki etkisini anlamaya çalıştık. Bu yüzden, IVR kullanılabilirliğini ve müşteri memnuniyetini arttırıcı yeni çözümler

bulabileceğimizi düşünüyorum. Bu amaçla, geçmişe dönük müşteri verilerini inceledik, IVR yapısını güncelledik, öneri sistemi, hızlı müşteri tanıma ve menü önceliklendirme gibi yöntemleri denedik.

Bu doğrultuda, Digiturk Çağrı Merkezi'nin IVR sistemine ait günlük binlerce veri içeren müşteri logları incelendi. Bazı sonuçların önemini vurgulamak için çeşitli raporlar hazırlandı. Pozitif ve negatif sonuçlara göre Digiturk IVR yapısı yeniden tasarlandı ve kullanılabilirlik, self-servis kullanım adedi ve IVR'ın etkinliği artırıldı.

Anahtar Kelimeler: IVR, Çağrı Merkezi, Kullanılabilirlik, İnsan-Bilgisayar İletişimi, Self-servis



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ABBREVIATIONS

ACD : Automatic Call Distribution
ACW : After Call Work
ANI : Automatic Number Identification
CC : Call Center
CTI : Computer Telephony Integration
DNIS : Dialed Number Identification Service
DTMF : Dual Tone Multi Frequency
IVR : Interactive Voice Response
IVRs : IVR system
KPIs : Key Performance Indicators
PVR : Personal Video Record
QM : Quality Management
STB : Set-top Box
WFM : Workforce Management

1. INTRODUCTION

Today lots of companies use automated phone-based user interfacing systems known as interactive voice response system (IVRs). It is simple and effective and will significantly reduce costs and increase efficiency within any company. IVRs allow the customers to solve their own problems and access the information they are searching for without speaking with an agent. However, very different kind of IVRs are widely used by customers, it does not mean that willingly made.

User's negative attitude through IVRs and tendency to reach an agent quickly is base problem of call center managers trying to solve. Unfortunately, while they trying to solve this problem, they neglect customer satisfaction in the process and result is often a low value of IVR usability. Maybe because of the difficulties of reading IVR customer log data properly; analyze caller's frequent inputs, which route they use and how fast they reach a service and eventually whether they can reach their mean goal are hard to measure and comprehend..

In the shadow of these issues, there were numerous academic studies. One of the studies was (Commarford at. al. 2008) based on IVR menu structure which authors tried to understand and conclude the effects on user navigations and memory to use IVR options properly. IVRs require some inputs from callers to response acquired result or guide to related step. Therefore, it's important to user's inputs should be correct. Particularly some of the self-services need some long inputs like credit-card number which is hard to press right digit and in time or like an account number that it's rare for user to input digits by memorize. Another study was (Delude 2002) mentioned the difficulties of IVR usability and aging factor and this study's concern of the long inputs, vague prompts and too-rapid information.

Actually, there are common knowledge usability problems of IVRs such as (Kim at. al. 2011) prepared a study and described them inherent usability problem in IVRs. Though, this knowledge is not sufficient to eliminate them. Marketing teams trying to prepare a meaningful IVR structure, yet they can be insufficient to building understandable and

IVR system should be user friendly, efficient and at the same time helps to companies to achieve their low cost, high self-service usage expectations. Some researcher (Asthana at. al. 2015) experienced a data driven algorithm that rearrange IVR structure based on callers' log data.

In this study, we tried to emphasize the importance of identification of the caller. According to customer profile, IVR structure can be various without making notice to the customers. IVR menus or sub menus count and their content are different according to need and importance of customers. We observed call paths and customer's tendency in our IVR system. We used agent feedbacks and data of internal transfers to reengineered IVR structure. We detected our peak time monthly, important events of increased call counts. We considered what can be done to help callers to reach desired solution easily and quickly. That way we could reduce call duration and improve customer satisfaction.

Also, we noticed sometimes an advertisement, informative or warning announcement required and without development delay on the way. Therefore, we developed an IVR structure that is called Buffer Zone, to prepare and ready to use by Customer Relationship Management (CRM) or any IVR developers. One of the most desired improvements is about self-service usage. We analyzed and came some conclusions by using customer's log data. Some of them are, making recommendations based on customer profile, fault tolerance such as customer feedback of error reason and giving retry chance. Another method is allowing transition between processes by suggesting related one after a completed transaction.

After we made our changings, we verified our actions with call reports. Although, we improved our self-services' usage and call completion in IVR, we know that there are lots of work needs to be done to improve IVR usability.

2. LITERATURE SEARCH

In literature, there is a lot of research effort going on IVR Usability or Human-Computer Interactions. Some of them focused the role of human demography effects at the interaction computers or using habits of IVRs, some of them focused designed and human memory, ability to use IVRs or interact computers with properly. Most of them agree about IVRs or HCI models' efficiency and less costly for the provider companies. However, both technologies are still trying to be simpler, tend to human habits and user-friendly.

One of the earliest studies (Shum et.al. 2001) draws attention to the customers' tendency to connect an agent and high agent costs. The authors described a comprehensive methodology for usability re-engineering of telephone voice user interfaces based on detailed call center assessment and call flow design. They emphasized of the difficulties for call centers is providing user-friendly, though cost-efficient, customer service. They defined that they quantified cost-effectiveness in terms of agent time saved by automation in the IVR.

Another research (Louise Dulude 2002) made a research about IVRs and aging factor on using ability on automated telephone answering systems. The author had 22 senior women and 22 female university students to made same six real IVR tasks. While, most of the old age participants had bad performance on all systems than young ones but one for which they obtained same results, seniors went into division as poor and good performers. The author explained that old participants were expected to assign lower usability ratings than young to all IVRs but this hypothesis was not confirmed. Old participants gave lower usability ratings to only two of the six systems while both age groups gave similar ratings to the rest. The author expressed that with one exception, results of the IVR task were consistent with the prediction that human subjects would be successful at the tasks that required the fewest choices/decisions and would be less successful at the tasks requiring the greatest number of choices to accomplish. She said that she thought their results obvious since simpler tasks usually produce the best results. Therefore, one of the task's results was surprising for her because United

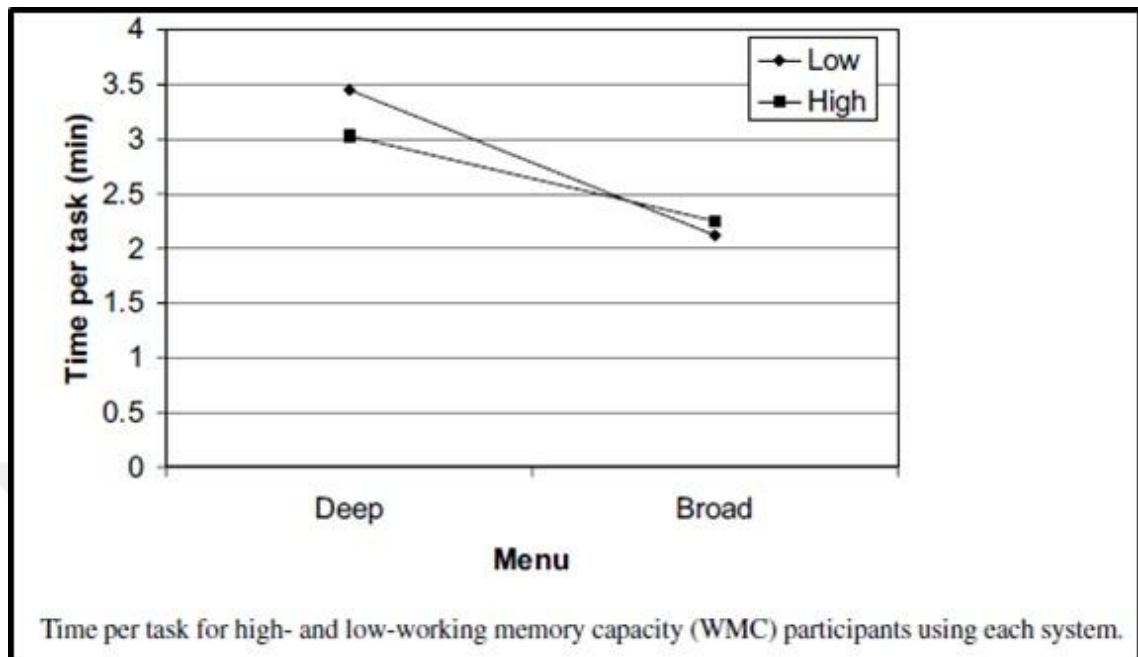
Airlines (UA) system and Canadian Airlines (CA) system were almost identical and both of the systems second-to-largest number of choices of the six IVR tasks. However, UA has a voice-activated system and young users produced the highest number of success. On the other hand CA has a touchtone system and it requires two-and-a-half times as many choices as the voice-activated system to reach the same goal with poorer results for both age groups. Young and old participants gave high ratings to the system with the fewest choices, though young people loved the UA system and gave it extremely high ratings, but most old users disliked it and gave it comparatively low ratings. This may mean that old people take longer to get used to new tasks.

In the end, the author concluded that most of the volunteers had problems because of the design flaws in the IVRs such as confusing choices or instructions, too-rapid automated voices, too-long introductions/menus/ menu items, difficulties with verbal data entry, lack of means of recovering from error, problems with keystroke entries, and problem with jargon. Because of that facts, badly designed IVR systems that cause callers to press '0' button to speak an operator can cost IVR owners a great deal of money.

And Ms. Dulude suggested that universal design will make IVRs and other technological products more usable for everyone.

Three IBM researchers and two academicians (Commaford et al. 2008) examined on the utilization of working memory while interacting with a speech-enabled IVR system. They mostly discussed that if an IVR menu structure should have limited to five or fewer items as suggested based on Miller's (1956) paper or according to modern theories of working memory least to the opposite conclusion. So that reducing menu length by creating a deeper IVR structure is actually more demanding of users' working memories. And at the end, it leads to poorer performance and satisfaction. The authors indicated that their experiment provided evidence that, contrary to common belief, it can be advantageous to design an IVR system to use a broader structure with fewer long menus as opposed to a deeper structure with greater number of shorter menus. These findings are consistent with predictions based on examination of modern theories of working memory and detailed analyses of phone-based tasks. Figure 2.1 presents of relations between broad and deep auditory menu structure and high- and low- working memory capacity (WMC) on the participants using each system.

Figure 2.1 Broad and deep menu structure and working memory capacity



Source : Patrick M. J., James R. L., Janan A. S. and Marc D. G., 2004. A Comparison of Broad Versus Deep Auditory Menu Structures.

Human Factors The Journal of the Human Factors and Ergonomics Society (Impact Factor: 1.69). 03/2008; 50(1):77-89.

In another survey about IVR usability (Kim et al. 2011), the authors inferred that based on the literature review and their experimental data, IVR systems have four inherent problems. One and the most known of them is *transience*. They said that IVR systems require memorizing menu prompts and which option is needed to complete a task. However, human brains will not store this information for long, and in time, it will be forgotten. Therefore, transience can be considered an important inherent problem.

Linearity is another problem for their conclusion. In an IVR system, user should listen present information verbally and is considered a linear method because in order to making desired choose, callers should listen all of it until hear expectant menu options. This wastes time, unlike GUI mode and participants shared that they didn't pleasant to listen other menu options or any advertisement to reach the goal.

Ambiguity is another problem and it is important to understand what is expecting from a caller to response properly.

The last of the inherent problem is *feedback*. The lack of visual feedback in IVR systems can make users feel less in control.

Overall, these are the problems of IVR they concluded at the end of their work and they suggested that IVR developers can use these findings to make more user-friendly IVR systems.

Another paper (Peevers et al., 2011) compared the usability of SMS mobile banking and automated IVR telephone banking. Authors worked with 116 participants to use SMS banking and IVR banking to find their account balance in a repeated-measures experiment. IVR banking scored higher for usability metrics: effectiveness, attitude, and quality. Participants gave positive comments regarding speed and efficiency with SMS banking, but had serious doubts over the security of the SMS channel, impacting consumer trust in SMS banking. The authors argued that usability problems and security concerns are a major factor in the low adoption of SMS mobile banking.

Another research (Kim, 2012) developed an IVR system simulator to enable efficient, flexible, and rich usability tests for IVR and used it for experimental study. He expressed that ambiguity was the most serious usability problem. Phonetic deficiency concerning pronunciation, volume, and voice speed was also found to be a major problem. The author expected to results is a basis for user-centric IVR system design. Another paper (Asthana et al., 2013) proposed an information space with three dimensions to study the usability of IVR design as an Information System. In this work, the authors extended their initial work and studied information space for identifying usability of IVR systems Also; they evaluated three system designs through real world experiment and controlled lab studies. They concluded that information system depends on three factors:

Information capacity of the system,

Time taken in expressing the information need of the user to the system,

The quality of information delivered to the user,

Based on this, they proposed an information space to measure the usability of an IVR system as an information system. Information space has three aspects that are Information navigation time, Information relevance, Information capacity.

They showed that improving a design for a usability aspect may affect other usability aspect of information system.

Another paper (Asthana et.al. 2013) proposed an adaptive IVR which way they aimed to create a new user interface to enable faster access to information in an IVR system. They experienced three different structures on the IVR system and measured all three system performance based on IVR utilization and Average Handle Time.

They took noticed that callers' how much time input a key-pressed for menu options to access the desired information and which system was near to idealistic Average Handle Time(AHT) which prefers has low value.

They concluded that the called *Direct* one is the best one. Direct presented the top 4 most accessed menu options among the leaf nodes of Default (currently used one). Figure 2.2 presents of IVR utilization per unit time according to IVR structure. Higher values indicate that callers were able to enter the requested input quickly

Figure 2.2 : IVR utilization per unit time.

Statistic	Default	Hierarchical	Direct
Average	0.024	0.078	0.062
Median	0.062	0.069	0.047
Variance	0.00	0.002	0.001

Source: Siddhartha A., Pushpendra S., Amarjeet S., 2013. *A Usability Study of Adaptive Interfaces for Interactive Voice Response system.* ACM New York, NY, USA 2013.

Also Figure 2.3 presents of AHT for each IVR system and result indicated that Direct IVR structure had the best value.

Figure 2.3: Average handle time for each IVR system

System	AHT (in seconds)
Default	45.14
Hierarchical	42.29
Direct	34.68

Source: Siddhartha A., Pushpendra S., Amarjeet S., 2013. *A Usability Study of Adaptive Interfaces for Interactive Voice Response system.* ACM New York, NY, USA 2013.

They explained that findings are consistent with literature that show that broad IVR design perform tasks faster with greater satisfaction.

Another remarkable paper (Radolph B. et al 2014) discussed human interaction with computing and communication system involves a mix of parallel and serial processing by the human-computer system. The authors worked on 100 years of the human performance literature and shows that the disparity between the non-growth in human performance and the geometrical improvements in computational capacity. They told engineered products improve daily, and the amount of information for us to potentially process is growing at an ever quickening pace, the fundamental building blocks of human-information processing (e.g., reaction time, short-term memory capacity) have the same speed and capacity as they did for our grandparents. They added that their intention is to motivate strides both in our understanding of the human limits that should drive all computer design and in our communicating this fact to the greater HCI-design community.

There is paper is (Asthana and Singh, 2015) based on IVR menu system and wasted call duration on selecting the correct menu option. The authors explained that despite being in use for a long time, IVR systems are still time consuming. Since the menu options are presented sequentially, more time is required to access desired options later in the sequence. Therefore, to reduce this, they concluded that relevant menu options must appear early in the sequence. In their paper, they presented their data driven prediction algorithms for adaptive rearrangement of menu option according to history of calls information of the users. So the callers can hear desired option early. They examined three important attributes of data driven algorithm: the size of data, frequency of information usage, and novelty of information usage. The authors explained that they believed that adaptive algorithms have great potential and a right combination will help improve the usability.

Researches about Human-computer interactions help to understand human behaviour about technology usage with an interface is not human. There is research (Posard and Rinderknecht, 2015) about human behaviour and trust issue about computer partner. Their research resulted that people did not treat a called name Samantha West any different because she was a computer. Even they claimed that telling end-users their partners were computers instead of hiding the fact could improve how these users

perceive their interactions with artificial intelligence technology, especially if the interaction contains a threat of distrustful behaviour. In the future, intelligent IVR system that includes an avatar to communicate customers will be used in most of the call centres. This way, IVRs will be more friendly and fluid to process.



3. DATA AND METHODOLOGY

3.1 OVERVIEW OF IVR AND CALL CENTER ENVIRONMENT

3.1.1 Defining IVR, and IVR Components

IVR systems are a part of computer-telephone integration (CTI). The most common method for a phone to communicate with a computer is through the tones generated by touch-tone keypad. These are known as dual-tone multi-frequency (DTMF) signals. IVR System helps the caller to interact through the phone system which is connected to the computer system to make a transaction or to reach information from the company. This is an efficient method to exchange of information that does not require a customer service representative (CSR) in another name agent or any other staff member to assist.

IVR is one of the important parts of a call but not is the only one. Attain an effective functioning call center system require a well establish management team and system. CTI, Workforce Management, Forecasting, Queue Management, Quality Management etc. are another important factors for CC Management. While working on these subjects, CC Management may need help of IVR System for reduce agent's workload, increase sell service or reduce agent-related costs.

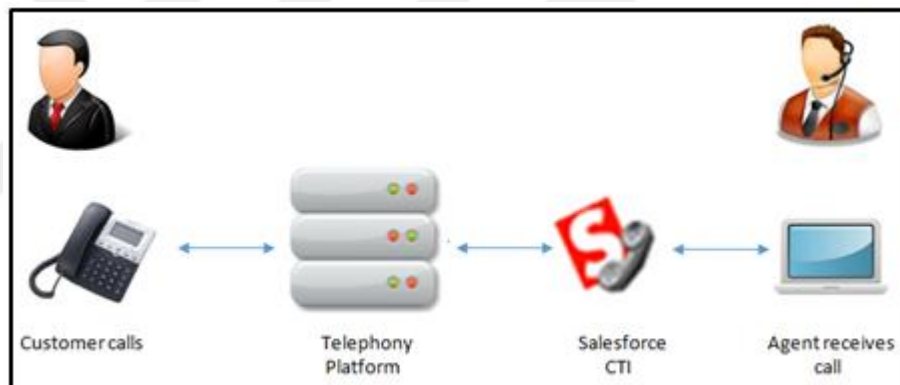
3.1.2 CTI Overview

An IVR system exists of telephony equipment, a database, software applications, and a supporting infrastructure. CTI is an expression that can be used to define any technology that enables computers to interact with telephones. This technology is firstly used in call centers and is often used to describe desktop interactions that boost human agents' productivity. Its main job is being to speed up the process for both incoming and outgoing calls. IVR applications can hand-off a call to a stuff who can view data related to the caller at a display with the help of CTI. Figure 3.1 shows IVR, CTI, Agent integration.

CTI applications provide the following abilities:

1. Authenticate callers
2. Match the number of a caller with a customer record and display it to reference when talking to the caller
3. Call Routing - Using telephone network information and data entered at the IVR to route the call to the appropriate agent or skill group
4. Transfer back to call to the IVR
5. Manage voice or video conferences
6. Receive fax messages and route them to appropriate fax machines
7. Outbound calling
8. Collect and display pending live calls or messages that have been left by callers

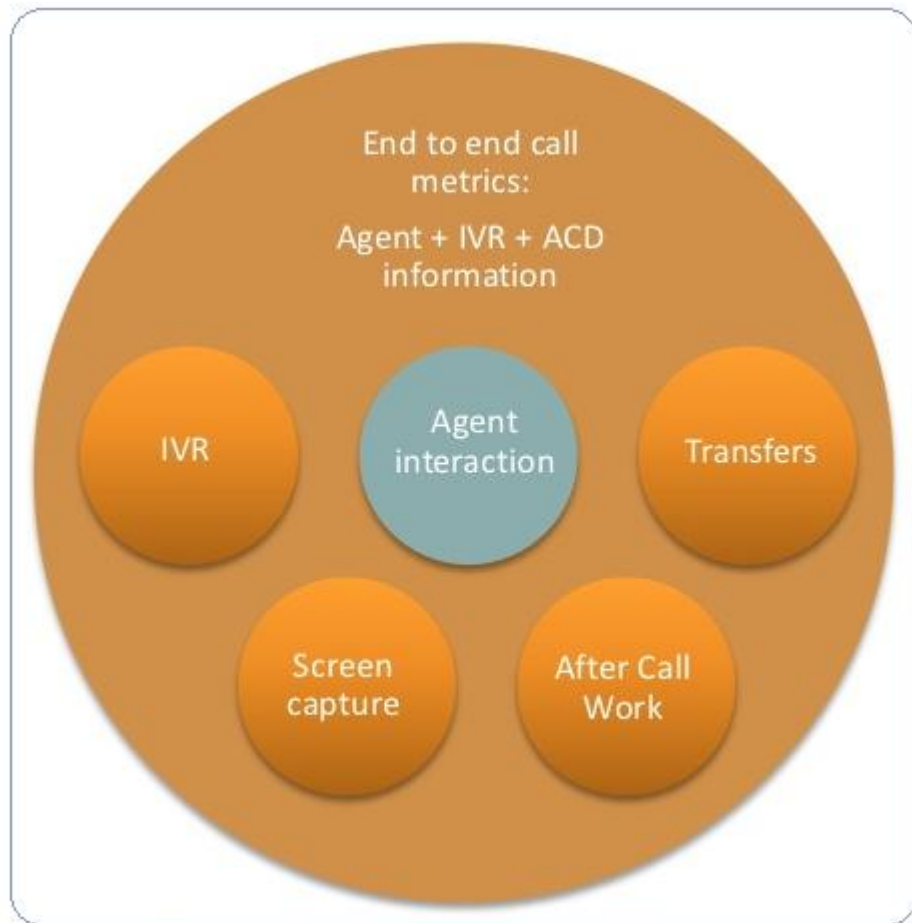
Figure 3.1: Examples of IVR, CTI, and agent integration



Source: <http://www.mstsolutions.com/blog/content/forcecom-connect-cti>

Therefore, to gain efficient customer happiness, it's important to track a call end-to-end and IVR-CTI integration ensures that. Identifying a customer at the beginning of the call in IVR makes it easier to service customer properly. If a call transfers to agent, system should provide to progress of the call. At the end of the call, managers can gather some information to use improve system ability and productivity. End-to-End Call metrics include, Agent, IVR, ACD (Automatic Call Distribution) information. Figure 3.2 shows these components relationship.

Figure 3.2: Examples of end-to-end call metrics



Source: <http://www.slideshare.net/spokencomm/boring-is-good-using-analytics-to-enhance-the-customer-experience>

ACD is in telephony, an automatic call distributor (ACD) or automated call distribution system, is a device or system that distributes incoming calls to a specific group of terminals or agents based on the customers selection, customers telephone number, selected incoming line to the system, or time of day the call was processed. It is often part of a computer telephony integration (CTI) system.

After Call Work (ACW) is the task lists that a call center agent completes after the call has ended. During this process, agent is not available to accept new call, so ACW time is the lower, the better to reduce costs.

3.1.3 Quality Management

Quality management is becoming more common in CC and can be a strategic force in an organization. When a CC management focus the concentration on the right customer interactions and service metrics, Quality Management (QM) helps to monitor call center performance, run measurable improvements, save money and provide executives with valuable business insight.

QM focuses some areas such as customer service, communication or sales skills, product knowledge, or a variety of other metrics. The most effective way to measure call CC quality is call monitoring. CC Management can learn their agents performing by listening some sample of customer telephone interactions and scoring them against various criteria.

3.1.4 Workforce Management

Workforce Management (WFM) is the process of getting the just right number of staff in place every hour to maximize service and minimize cost. WFM is very important planning and management functions in the call center.

Optimizing a call center workforce starts with accurate forecasting and cost effective scheduling among all communication channels. IVR has an important role in Workforce Management. Figure 3.3 shows Workforce Management

3.1.5 Integrating QM and WFM Systems

On the surface, integrating efficiency and service quality may appear to present a puzzle. While efficiency requires speed, service quality demands more time to understand and meet the customer's needs.

The best way involves integration of workforce management (WFM) and QM systems used by contact centers to drive both efficiency and service quality. Figure 3.3 shows

the synergy achieved by an integrated WFM and QM systems. There are some key scopes open to integration WFM and QM systems.

Figure 3.3: Synergy achieved by an integrated WFM and QM System



Source: <http://www.contactcenterworld.com/view/contact-center-article/integrating-quality-management-and-workforce-management-in-contact-centers.aspx>

3.1.5.1 Planning, Forecasting and Scheduling

The most basic functions of a workforce management system are planning, forecasting, scheduling. Forecasting is trying to guess the accurate number of agents needed to cover a shift and determine the skills of an agent supposed to have. An accurate schedule starts with an accurate forecast.

Scheduling is assigning an appropriate number of workers to the determined forecasting. The most sensitive spot is these agents should have expected skills to achieve the planning goal.

Planning is a discussion where a company explores alternative futures and strategies to prepare themselves for taking action to complete their aim.

3.1.5.2 Quality Measurement

Blend agent schedules with the QM system helps supervisors select the best calls for evaluation.

3.1.5.3 Monitoring

Monitoring allows managers to identify problems, ensure quality standards, improve the customer experience and make better agent, call center and departmental performance. Real-time monitoring allows supervisors to see exactly what is happening with their call centers. Everything from which agents are logged-on, how many callers are in the queue, what the average wait time for current on-hold callers is, and even how many calls have been abandoned?

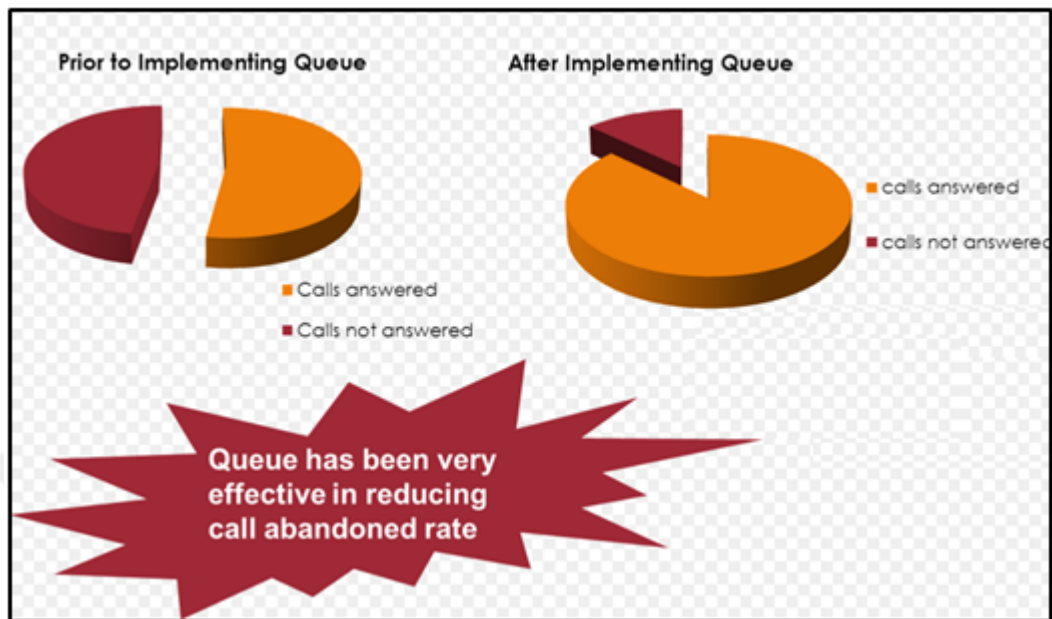
3.1.6 Service Level

Service level measures the accessibility of a company to their customers and the company's ability to plan for forecasting and scheduling. Service level is defined as the percentage of calls answered within a predefined quantity of time. Service level has been accepted as one of the most important performance measurement which is called Key Performance Indicators (KPIs) as it is intimately tied to customer service quality and overall performance of the call center.

3.1.7 Queue Management

Queue Management is the heart of a call center. When queue management works properly, that means that CC is well organized and it helps to service level positively. When queue management fails, a CC has bad values to affect service level negatively such as increasing hold time. Furthermore, this will result with customer dissatisfaction and even churn, low service level and high abandonment, decreased CC efficiency, increased telecom expense, employee dissatisfaction and turnover. Figure 3.4 shows importance of queue management in a CC.

Figure 3.4: Importance of Queue Management System

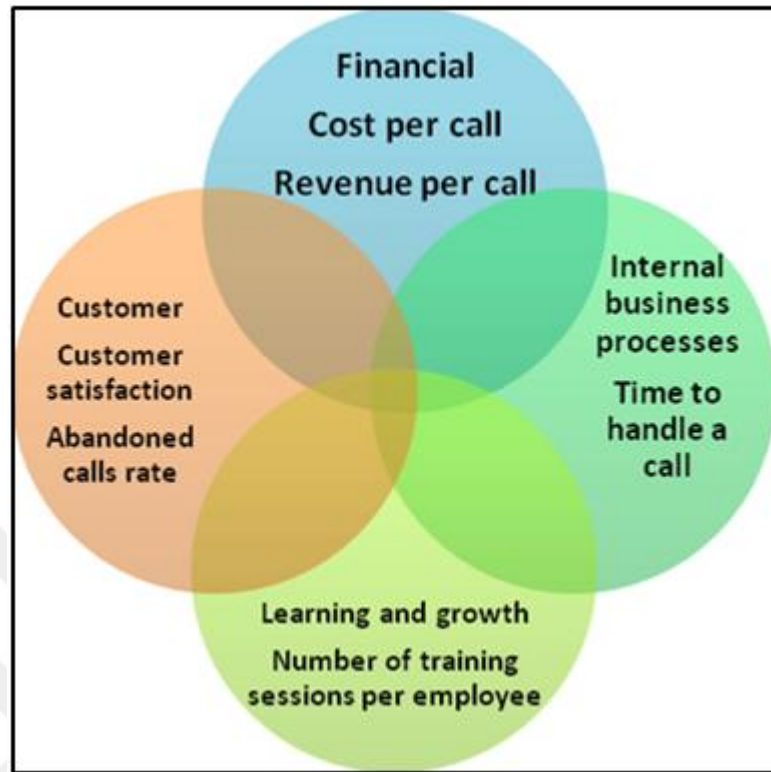


Source: <http://blog.cloudagent.in/2013/04/cloud-contact-center-acdqueue.html>

3.1.8 Key Performance Indicators (KPIs)

CC KPIs are quantitative metrics that are used to evaluate builds that are critical to the success of the call center. They usually assess the performance of the team, agent, department and/or the call center as a whole. They can be used to make data-driven decisions that will improve efficiency, optimize customer satisfaction, increase income and reduce costs. Overall, call center KPIs are metrics that provide information about how a CC is performing and can be used as base information to make strategic decisions that will help to create new desired results. Figure 3.5 shows a general CC KPIs metrics.

Figure 3.5: Call center major KPIs



Source: <http://www.call-center-metrics.com/page/7>

3.2 OBSERVE A PAY TV COMPANY'S CALL CENTER AND IVR USABILITY

The company has been observed and analyzed is a satellite television provider. It has different kind of technical products. These products provide to customer watch any product within the legal time duration on any technical devices, such as set-top box (STB), tablet pc or mobile phone. TV is the most common technological devices that almost every house has it. TV and new kind of broadcasting technology intrigues and attract both customers and potential customers very much. Although, the company's products are just about entertaining industry, they receive quite much customer attention. It has 3 million active accounts and every day its call center has average 80 thousands call overall inbound IVRs. In this paper, main inbound IVR (MII) has been watched and analyzed.

3.2.1 Overview Company's Call Center Internal Structure

Inherently, technical products need good supporting teams. These kinds of companies should have an efficient and skillful call center. Like other counterparts, Digiturk has a big and strong formation in Call Center.

Call Center has 1.400 ACD in other word; agent number that can login to take call in real time. IVR has 800 ports, email and chat system has 100 sit, and predictive dialing system (PDS) has 150 port capacities in real time. Also, voice recording system has same capacity as ACD system.

Call center has 69 basic teams, overall team count is 223 and has five locations, and each of them is distinct city.

Operation groups are about sales, churn, backline such as email, chat and fax, and welcome call group. Inbound groups are categorized about customer profile. While platinum skill team has the most profitable customers, radar has the most complainant customers; churn has the customers that have tendency to churn.

Call center's average making production is 380.000 minutes per day and its service level for KPIs is 80/20 and it can succeed it so far.

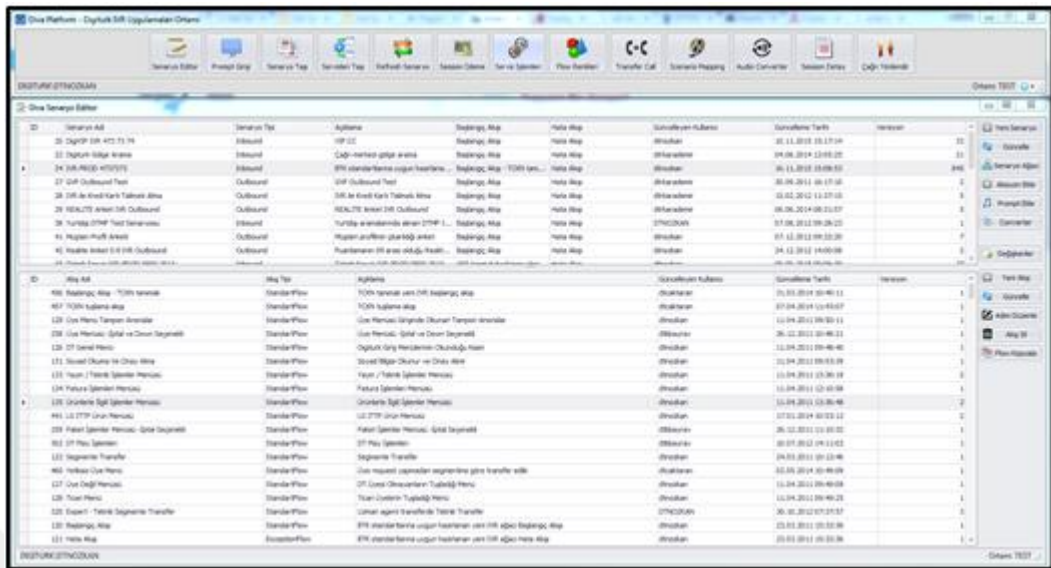
Call center also, support for its distributors too. Distributors have their own IVR and operating system with the support of agents.

3.2.2 Overview Company's IVR System

IVR system has 800 ports and its average call count is 75 thousand per day, in a month its value is 2 million so far in this year. Therefore the company needs a strong and manageable IVR and IVR interface.

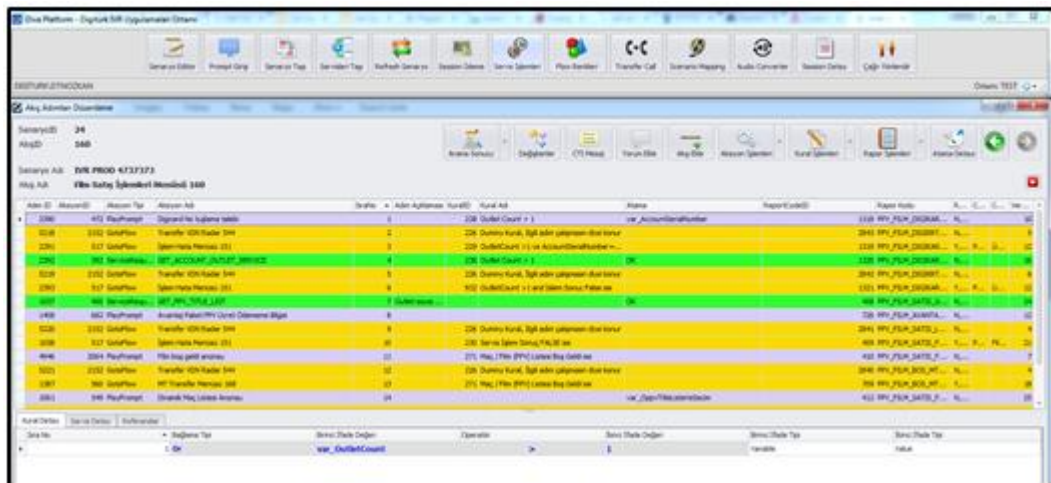
Digiturk uses Avaya for central operation, Genesys for CTI and other outbound operations. Using different products for a telephony technology, it required new products like behave an adapter. Instead of supply a new product from any company, Digiturk developed their own IVR development kit that as called Digiturk Interactive Voice Adapter (Diva). Figure 3.6 shows main screen of Diva.

Figure 3.6: View of Diva main screen



With a simple interface, a developer can define either a pre-recorded audio or text to speech (TTS) or phrase file to use in any scenario, create new flow in the existence scenarios, define rules, connect database (DB) to progress a sell service or execute a query. Figure 3.7 shows a simple flow of sale pay-per-view (PPV) menu in IVR structure.

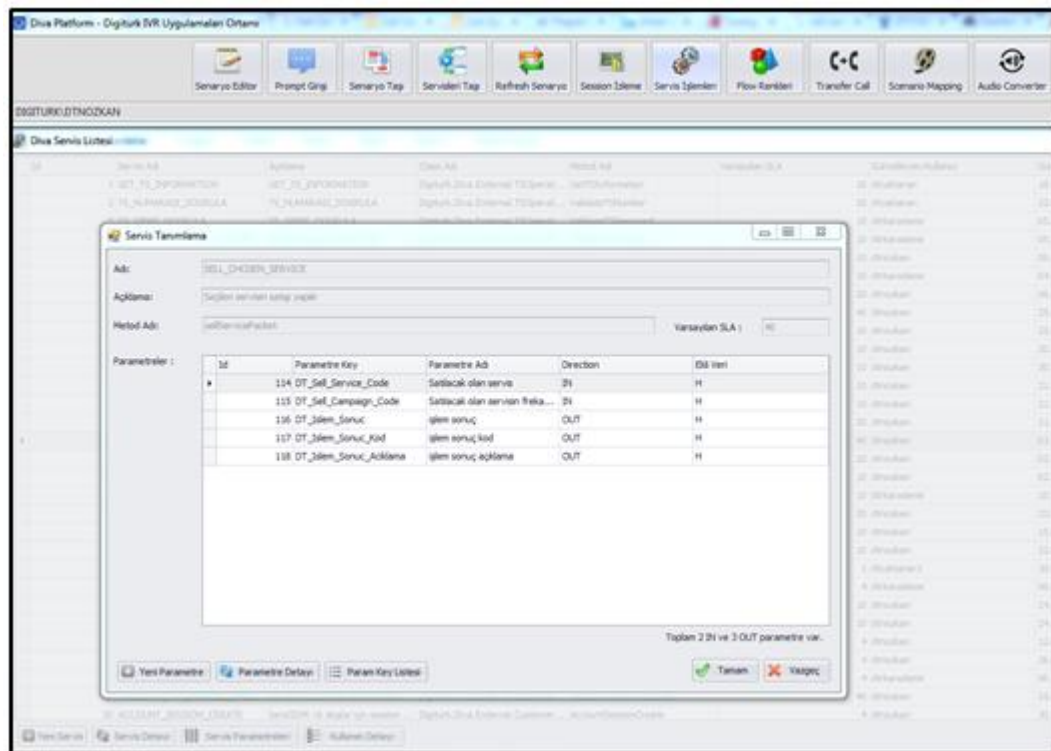
Figure 3.7: View of sale PPV menu in IVR structure



Each operation has a different color in the flow steps, that way it's easy to read a flow such a play prompt is purple, call a service to connect database (DB) is green, go to new flow is yellow etc.

DB operations need a Dynamic Link Library (DLL) to help connection and possessing between Diva and DB. Define to DLL's methods and procedures for the using in the scenarios; Diva has an interface to provide to definition of these objects with their parameters. Figure 3.8 shows service operation screen which is used to define DLL objects to connect and process DB operations.

Figure 3.8: View of service operations screen in IVR structure

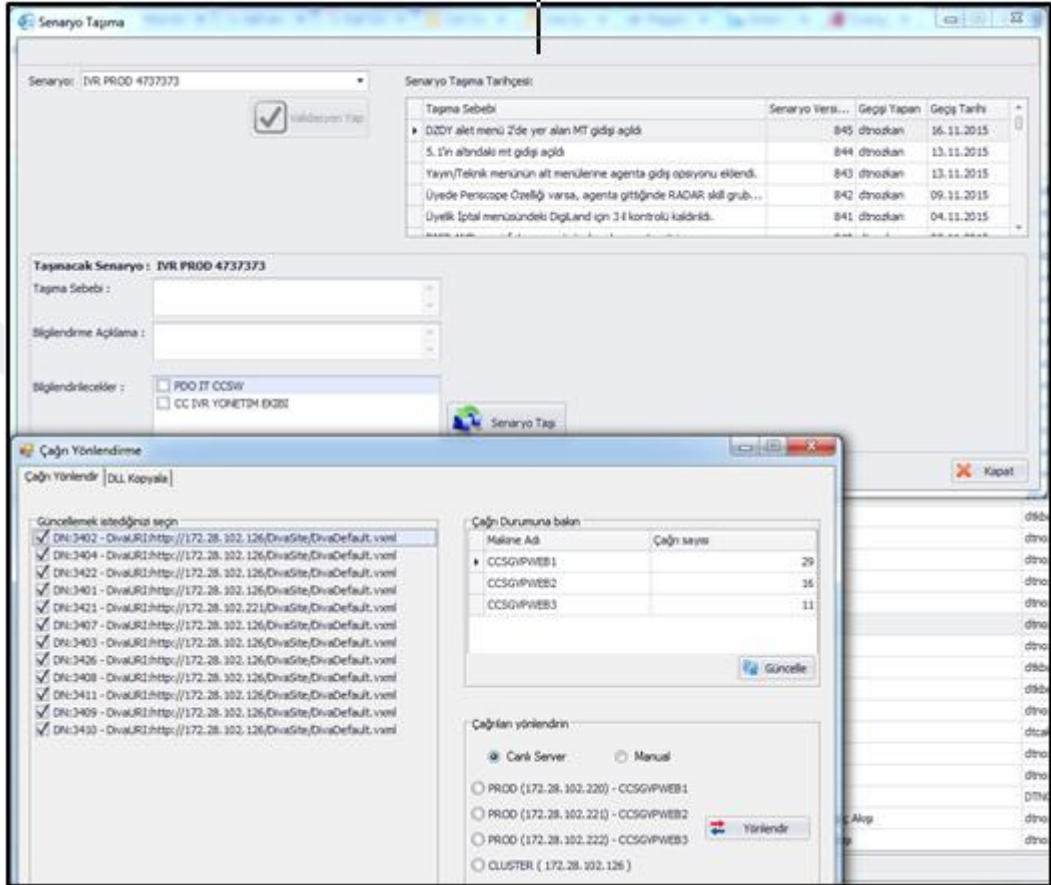


Diva also helps to production deployment. IVR scenario's deployment requires attention. When a developer forgets any simple definition such as agent transfer number, or copy any pre-recorded audio file, or a DLL file, then that IVR scenario is not progress properly, even cannot take any call.

Diva has a simple interface to complete all these tasks easily. Make validation before copy scenario and progress other steps. While a scenario requires copying of DLL, it

helps to canalize all call to just one machine to take calls. So developer can copy DLL without interrupting any calls. Figure 3.9 shows both scenario deployment and canalize to all scenarios' calls on a single IVR web server.

Figure 3.9: Diva scenario deployment and canalize call to single IVR web server

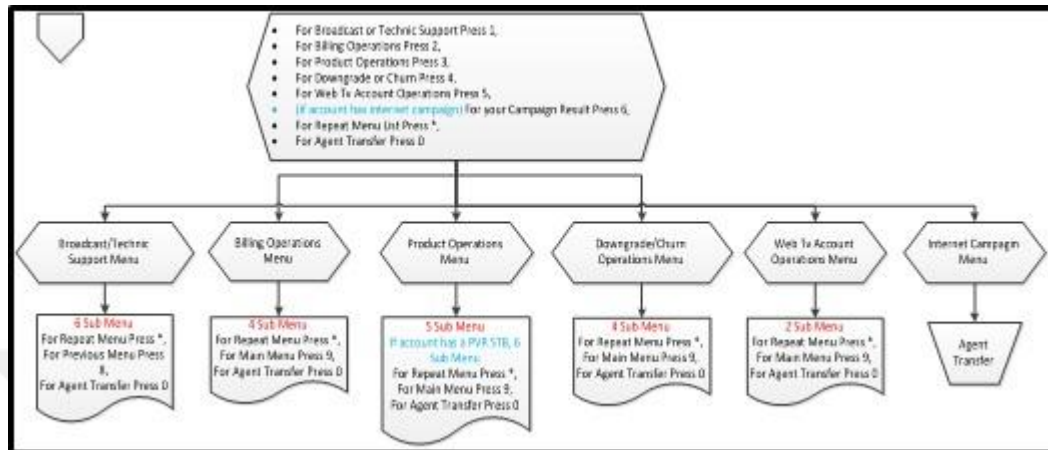


When a call comes to inbound IVR, it tried to identify customer by the caller phone number which is called Automatic Number Identification (ANI) in call center world. If customer identifying is not succeed by ANI, then IVR request either recorded phone number, customer number or ID number. After identifying succeed, IVR request confirmation from customer with an input. Identifying complete with customer confirmation and system admit caller to use customer IVR for any operation within.

The company has a quite big IVR structure. After customer identifying, caller encounter an IVR that it has six menus and each menu has minimum two sub menu options. Big

IVR menu structures are against to human memory and negative affect on usability (Commarford et.al. 2008). Figure 3.10 shows an outlined chart of IVR structure.

Figure 3.10: Outline chart of IVR main structure



Digiturk IVR structure offer their customer five main operation to attain. Broadcasting / Technical Question and Problems menu is the first and one of the most commonly used one. Usually, in daily calls, %44 of the calls pours in this menu.

There is some main broadcasting / technical problem can customers solve with the right information. This menu has presents these solutions with sub menus. Even, help customers to learn their technical support team’s phone information to make an appointment, or create a memo to declare needing support to their technical team automatically. Their technical team calls back them to make an appointment later that day.

Billing Operations is one of the most useful menu IVR structure and presents most commonly used sell services such as bill payment. Also, it is the second menu that most of calls pour in.

Operations about products are the third menu option in the IVRs. It has some sell services that customers can buy any product such as PPV or broadcasting services which includes some TV channels without help any agent. Also, there is some products that simply offer one channel to special interest, like world leagues and basketball

match. However, this menu presents the most crowded sell service; it still needs some shove to encourage customers to use it.

Fourth option in the main account menu is Downgrade and Churn Operations. This menu is like an invitation to transfer an agent. Therefore, it is the third most commonly used menu options.

DT Play is a new technology of Digiturk. Customers have an account that can use company's products just on internet. Internet is very popular all around the world, products based on internet can preferred easily. Manage these kind of brand is difficult, because they can have vary of problems and it may not be about your product, just about connection.

3.2.2.1 Subject Matters of the IVR Usability

There are many factors to decide alternative design solutions to create an affective IVR system. Before to finalize which design to use, it's important to consider feasibility and ratio of expected asset versus the cost to implement the desired solution.

The caller path diagram is the most useful when analyzing call reasons and results to average IVR usability. Sometimes, an IVR sub-menu's usage rating can be very low and without call results, it can be overlooked. According to callers' tendency, menu structure can rearrange and help to improving of usage all part of the IVR system.

Transferred calls are another clue of the usability IVR and customers' attitude. It shows while callers actually can complete their job on IVR; they prefer to connect an agent. Popularity of the transfer subjects and menu, IVR structure can review and reengineering according to new point.

Analyzing agent transfer distribution based on menu structure and transaction is help to understand user patterns and why these paths are preferred by callers. Menu structure is to decide if callers accept it a getaway to access agents instead of using the menu

appropriately. Transactions are to define either it is a broken process or why it results with error, is there a way to make it work properly.

Menu structure review important to understand how users react to menu changings and how much time they waste based new arrangements. There are a lot of researches based on menu structure.

Identifying caller is one of the most important processes an IVR system. According to caller's customer profile, IVR can manage many things at once such as rearrange menu structure with respect to preferences of customer's previous log trace. Purpose of the warning or instruction, system can play prompt to customer specific. One more, caller can redirect a menu or a skillful customer care group according customer segment profile. Even, caller can prioritize of the queue to access that agent group with

3.2.2.2 IVR Menu Order and Agent Transfer

Almost all researchers agree about customer's tendency to transfer agent, rather than using IVRs. Therefore, while designing IVR, it's important to decide which menu include agent transfer option or which sell service allow callers transfer to the agent after completed process. Callers usually try to hear agent transfer option at the playing audio menu and when they hear it, they usually do not try to solve their problem on the IVR. When they do not hear it in the first play, they understand that they should choose one option so they request to listen menu option again.

In 2015 June and July month, Digiturk IVR account main menu structure was changed. First, in June, pre-recorded main menu audio file didn't announce to customers that they can choose agent transfer option. They wanted to hear agent option so they didn't listen other options properly and didn't remember what they could choose. Therefore repeat menu option input star (*) was pressed 23 fold over. Also, in July, %33 of the calls in the customer main menu, transferred to the agent. Figure 3.11 show menu options for

June and July months. Table 3.1 shows call distributions among the main menu options for June and July months.

Figure 3.11: Customer Main Menu structure for June and July months

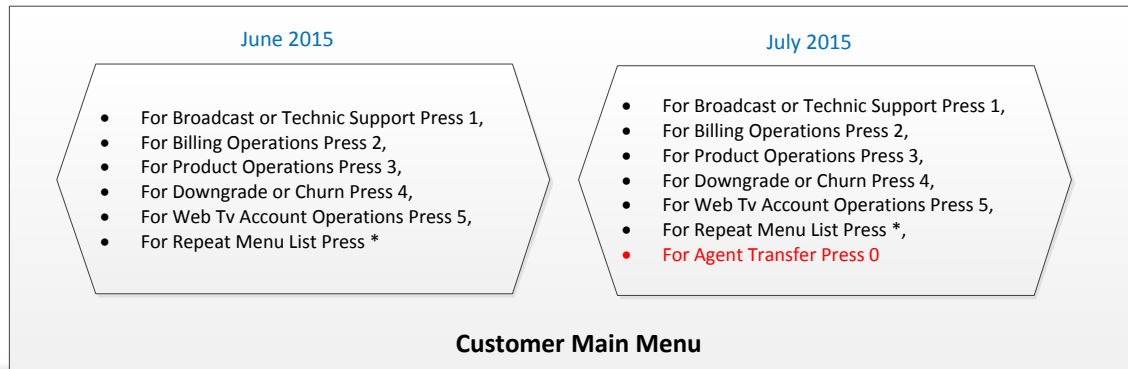
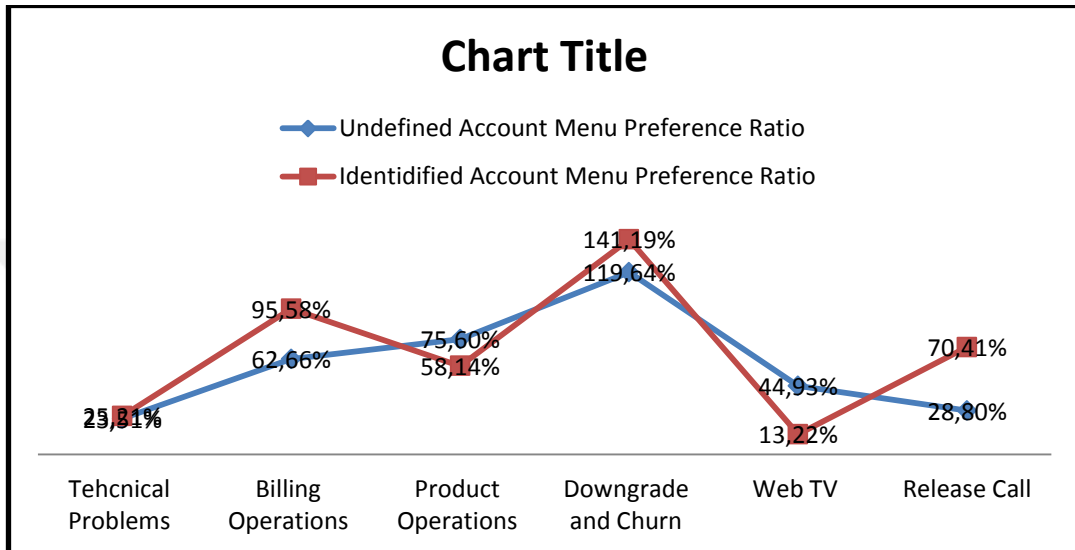


Table 3.1: Customer Main Menu percentage of distribution for June and July months

		June (without agent option)	July (with agent option)
	Repeat Menu Press Count	62044	2604
	Repeat Menu Option Ratio		
Menu Percentage of Distributions	Broadcasting & Technical Menu Chosen Ratio	27%	21%
	Billing Operations Menu Chosen Ratio	24%	22%
	Product Operations Menu Chosen Ratio	13%	7%
	Downgrade & Churn Menu Chosen Ratio	38%	19%
	Web TV Account Operation Menu Chosen Ratio	4%	2%
	Agent Transfer Menu Chosen Ratio	0%	33%

Most of the customers don't listen and make choice to achieve their goals on IVR. Even menu options do not include agent transfer option, customer log data showed that they listen and try to find an option that would transfer customers to agent. Following figure shows a monthly usage pattern on main menu.

Figure 3.12: Menu choose ratio for Identified and Undefined Accounts.



3.2.2.3 Critical Situation, Technical Issues and Usage of IVR

Generally, CC management team is ready to accept calls and have knowledge what kind of calls would be come. Agent number and team groups are prepared to workflow of the day by management team. Sometimes unforeseen circumstances can be happened and day plan can changed immediately.

Digiturk has technical products so most of the unforeseen circumstances are about broadcasting problems. While having these kinds of problems, calls count increase more than expected. Customers try to talk an agent or try to solve their problem on IVR. In these days, IVR helps to customers to reach technical competence team. Using the right menu and chose right menu option is important. Therefore, broadcasting & technical problem menu was made the first menu to hear for customers. When they call with unhappy feelings, they can have the opportunity solve it quickly.

Also, IVR structure changed to adapt to emergency and was created an additional portion to use conveniently in the structure. That portion is called Buffer Zone. In

emergency, buffer zone is used for announcement or executed a sell service such as refresh signal for broadcasting problem.

There was a problem Saturday, 21st November; a product that called DZDY had a broadcasting problem. Account main menu has a sub menu (1.5) for this product problem. The day of the problem, this sub menu received 2327 number of call. 7th November, the same menu received 522 number of call. While at 21st November Broadcasting & Technical Problem Menu received 32.713 number of call, at 7th November, it received 18.649 number of call. Figure 3.12 shows call traffic of Broadcasting & Technical Problem Menu for both days. Table 3.2 shows call distributions for these two days.

Figure 3.13: Call traffic of Broadcasting & Technical problem menu

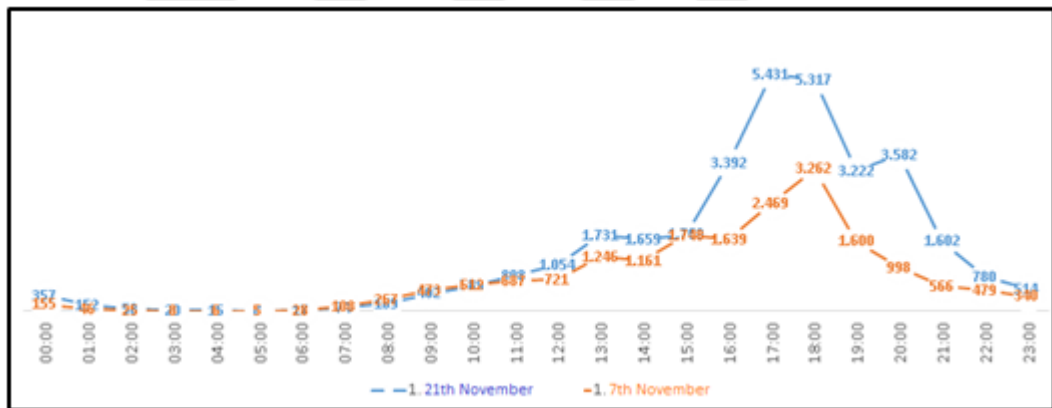


Table 3.2: Call distribution of technic menu and its sub menu for two different days

	7 th November	21 st November
Call Number of Broadcasting & Technical Problem Menu	18.649	32.713
Call Number of DZDY Sub Menu	522	2.327

The same day, to help to solve broadcasting problem, in Buffer Zone, equipment refresh sell service was executed per call. Therefore, if caller has a problem while call was progressing, equipment problem solved that moment. That day, equipment refresh self service was executed 39.330 times by Buffer Zone.

Sometimes, customers have problem about their equipment and listening problem solve techniques from IVR and doing the right things might not be enough. In these kinds of situations, technical officer should need to examine the case. In the past, customers should have called call center, talked an agent, and reported their problem. Agent opened a case for technical authorized service and customers waited for that technical service call them to assign an appointment.

In April 2016, a new sell service was added to Broadcasting & Technical Problem Menu in the IVR. In sub menu, Technical Service Operations (1.6), callers could open their own case to their Authorized Technical Service. That way, workload of agents was reduced and customer can take a step to solve their problem more quickly. Table 3.3 shows three months of 2015, before IVR sell service was prepared and three months of after it was prepared.

Table 3.3: Opened case numbers for authorized technical service by agent

Technical Problem Types	2015/01	2015/02	2015/03	2015/04	2015/05	2015/06	The Average Reduction
Set-top Box (STB) & Hardware Problem	25428	21962	22161	16218	14817	13394	63,88%
Broadcasting & Signal Problem	58579	53747	39416	32170	29460	24701	56,89%

3.2.2.4 Navigation between Menus

When customers visit a menu, if there is another menu associated, suggest to pass that associated menu increased the both menu usability and self-service transaction count.

In Digiturk IVR, Billing Operations Menu has three sub menus. First one is about learn billing balance and if account has unpaid bills, IVR recommend to customer pass through paying bill sub menu with a key press.

There is another example for Payment Instructions Menu. Afterward customer paid the bill, IVR recommend to caller give payment instructions. In a one day, Payment Instructions sub menu requested just 194 times, while after paid the bill, passed through this sub menu count is 327. Table 3.4 shows one day of IVR menu choose option count and pass through menu count.

Table 3. 4: Menu options choose count and navigation count for menu

Customer Count in Listen Unpaid Billing Menu	1987
Customer Count that was Passed-Through Pay Bill Menu	1185
Customer Count Chose Payment Instructions Menu	194
Customer Count that was Passed-Through Payment Instructions Menu	327

3.2.2.5 Increase Self Service Usability by Retry Chance and Menu Ranking

A company wants to increase usability of sell service, to achieve this, read and interpret of customer’s IVR patterns, habits and errors are important. Mostly, billing menu is commonly used all over the IVRs and to successfully complete payments make both customers and company satisfy. On the telephone keypad, input long credit card number is hard. Therefore, system should help to customers fix their mistakes with reentering expected input values or with feedback of the error reasons, allow retry sell service again.

One of the busiest days is 19th of every month. Table 3.5 shows payment transaction error count, customers request to try again count and its results in that day.

Table 3.5: Payment transaction and retry counts

The Number of Error for Payment Transaction	3416
The Number of Second Chance Request	1269
The Number of Successful Payment Attempted Again	977
Percentage of Second Chance Request	37,15%
Percentage of Successful Payment for Second Try	76,99%

Customers can buy content with remote control and to prevent buying mistakenly, company request a code which is call Pin Code. Sometimes, customers can forget their code and need to reset it. They can do that at IVR, where the process was located Broadcasting & Technical Problem Meu. While callers use IVRs, they want to complete their task immediately. If an IVR structure is prepared according to customer's need, they use menu and sell service more frequently. Most of researches show that long and big menu structure reduces IVR usability. In January 2015, Reset Pin Code was located third level of menu (1.3) and customers could hear it without waiting very long playing menu list and used it average 11.000 times per month. The menu order was changes in late of February 2015 and Reset Pin Code sell service sub menu was located sixth level. When results were checked about using of the menu, it showed that utilization decreased immensely such as percentage decrease of menu usability is %42, 77. Table 3.6 shows reset Pin Code Menu usage information and percentage of differences for both months.

Table 3.6: Reset Pin Code usage info for January and March months

Reset Pin Code Sell Service Using Values	
January 2015	11.970
March 2015	5.120
Percentage Decrease of Menu Usability	42,77%

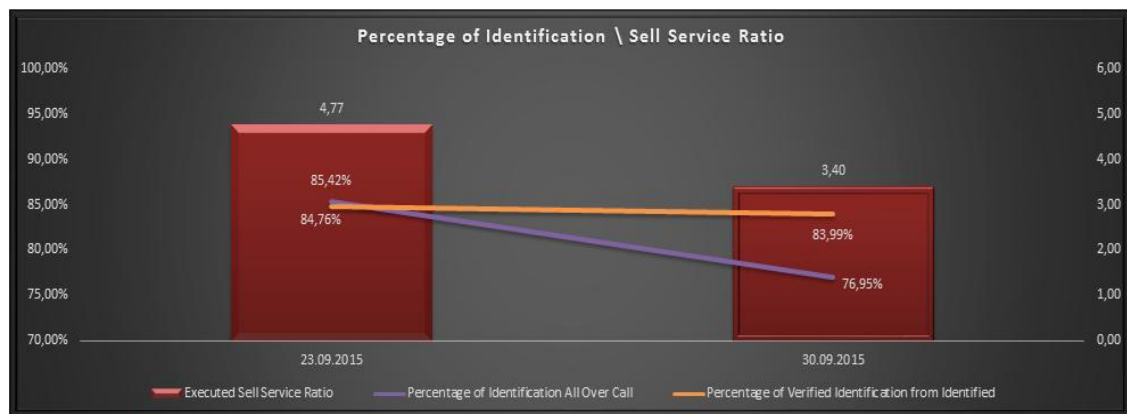
3.2.2.6 Caller Identifying and Customer Profile for Usability

There is a direct proportion to identifying an account and IVR usability. When a call ended before 10 seconds, it is accepted a false call.

While an IVR identifies its customer, it can reengineer structure according to customer profile. It can suggest a campaign, or play warning announcement, or if there is general technical problem, it can execute a wrecking service.

Figure 3.13 shows identification counts and its effect on sell service usage on an IVR. While, in 23rd September, IVR verified identification percentage is %72, 40 over all inbound call, in 30th September this value is %64, 63. Sell service usage values are for 23rd September is 160.672, 30th September is 152.672. These results ratio over identification is 4, 773 for 23rd September and 3, 402 for 30th September. Little differences like %10 identification effect %1 more sell service using values.

Figure 3.13: Identification effect on self-service usage



Sometimes call center might be very busy with an important daily event. Digiturk has legal broadcasting Turkey Football League.

When an important match is playing, there is huge call traffic and most of callers try to buy a PPV to watch match or a sport packet that has sport channels so they can watch this important football match. It's very important to take call as much as possible and of course they should result with the expectant sell count and customer satisfaction.

While performing these tasks, call center management should careful to not increase call center costs. Achieving desired all these goals, IVR is a big opportunity. Identification gives a remedy to decide if customer might be calling to buy PPV or Sport Packet. Buffer Zone is the convenience of adapt to busy and emergency call status by offering callers a shortcut to buy a PPV or Sport Service with a minimum keypad input and doing this, it offers that only the callers who don't have a sport packet or has not bought PPV yet.

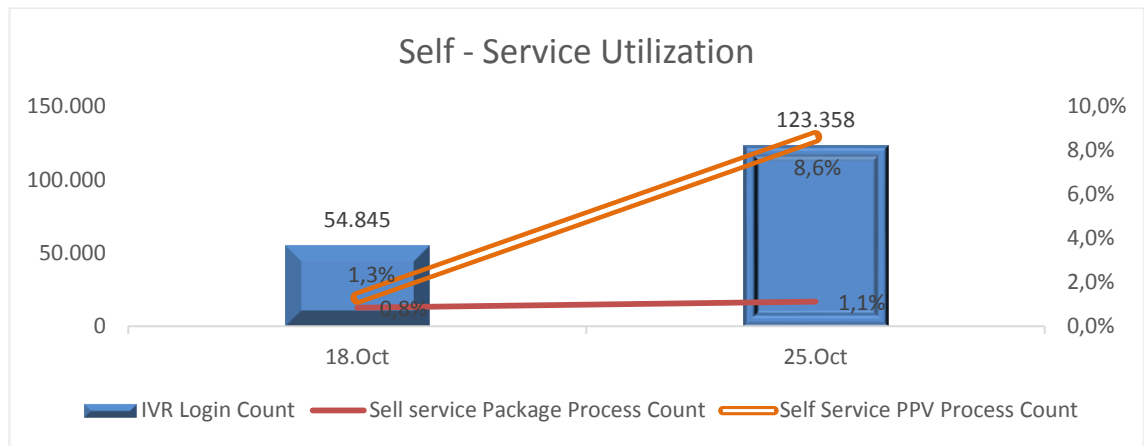
In 25th October, there was a very important derby that always IVR has very huge call. One of the most efficient ways is to answer most of the calls and release them without going agent and being prepared to sell these two services on IVR without exhausting customers. That day, IVR had 170.817 call and 123.358 callers were login IVR appropriately. %95, 20 of the callers had a potential to buy a PPV or Sport Packet so they were offered to buying these products with a shortcut menu input. Table 3.7 shows IVR main process about login, hear shortcut announcement and sell service results.

Table 3.7: Main process of IVR in a derby day

IVR Main Process Counts	
IVR Login Count	123.358
Sell Service Shortcut Announcement	117.440
Shortcut Acceptance Count	33.723
Sell Service Process Count	12.008
Percentage of Announcement to Login Callers	%95,20
Percentage of Shortcut Usage to Announcement	%28,72
Percentage of Sell Service Count to Shortcut Acceptance	%32,51

Another an ordinary Sunday, IVR sell service about football match is not this high values. While in 18th October, IVR had 461 amounts of Sport Packet sales, in a derby day that number was 1375 and 706 amounts of PPV sales in 18th October, in derby day it was 10.633. Figure 3.14 shows the result sell services count for each day.

Figure 3.14: Sell PPV and packet ratio



Another convenience of identification is modifying menu structure according to customer product ownership. Customer might have a special campaign and hearing an announcement about it making that customer pleased, other customers who do not have the same campaign might be getting bored, even angry. Customers might have different type of products and it may need an extra menu option to process and announcing these kinds of options to all customers both extends the call durations and lower customer satisfaction.

Digiturk has two kinds of main menu and one of them include extra one menu option that help to customers learn their campaign progressing. Chart 3.1 shows a classic main menu and it has 5 options to choose. Chapter 3.2 shows the alternative main menu that has 6 options and last option for the customers that has internet campaign.

Chart 3.1 Standard Main Menus

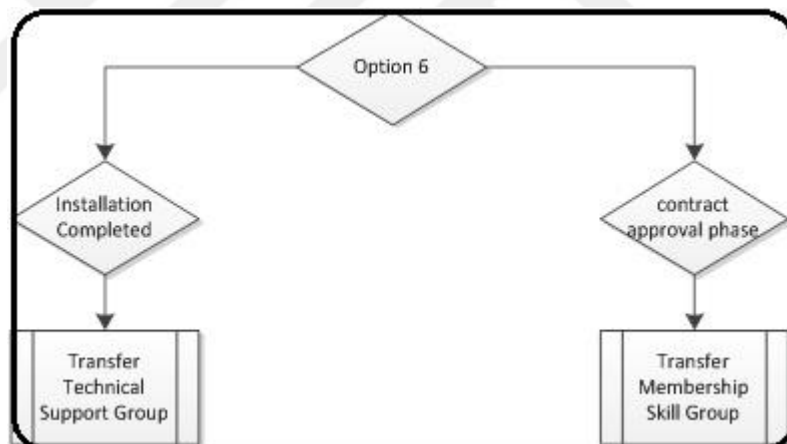
- For Broadcast or Technic Support Press 1,
- For Billing Operations Press 2,
- For Product Operations Press 3,
- For Downgrade or Churn Press 4,
- For Web Tv Account Operations Press 5,
- For Repeat Menu List Press *,
- For Agent Transfer Press 0

Chart 3.2 Main Menus for customer with an internet campaign

- For Broadcast or Technic Support Press 1,
- For Billing Operations Press 2,
- For Product Operations Press 3,
- For Downgrade or Churn Press 4,
- For Web Tv Account Operations Press 5,
- For your Campaign Result Press 6,
- For Repeat Menu List Press *,
- For Agent Transfer Press 0

If customer has this internet campaign, according to campaign status IVR can transfer customer to right agent group, that way caller can access to needed information more quickly and correctly. Chart 3.3 shows option 6 call flows.

Chart 3.3 Sub Menus, internet campaign flow chart



Another menu reengineering according to customer product ownership is STB has a recording attribute. Customers can use IVR to record most commonly watched TV shows by selecting menu options.

In October 2015, 454 times, remote recording sell service was requested on IVR.

Customer's packet type is variety. Therefore, sell packet service menu offers packet products according customer satellite type and packet ownership. When a customer already has a packet, IVR do not offer that packet to customer. This prevent confusion

long list of product to choosing and customer can clearly hear what kind of packets off the shelf to buy. Different kind of technical products needs different kind of technical support. Therefore, Broadcasting & Technical Problem Menu offers solution to customer product profile. While a satellite type can hear Reset Pin Code Menu option, other one do not. Also, while a customer profile can watch all broadcasting product without doing any special contract (DZDY), another one should buy it or change customer type etc.

3.2.2.7 Customer Feedback and Usability

Successfully utilizing customer feedback is a must for any business looking to provide users with the products or progress they need. Feedback guides and informs customers to make decision or even act on a purpose.

Sometimes feedbacks are about customer's service continuity or warning about account satiation. Digiturk has a certain day for payment due date and a customer do not pay in in time, with an announcement caller is informed and announcement includes which menu options helps to payment.

Latest month results shows that most of the overdue payment announcement was made in 21st November and the same day, pay bill service was executed 15.917 times by customers. Lowest announcement was made in 28th November and pay bill service was executed 5.183 times.

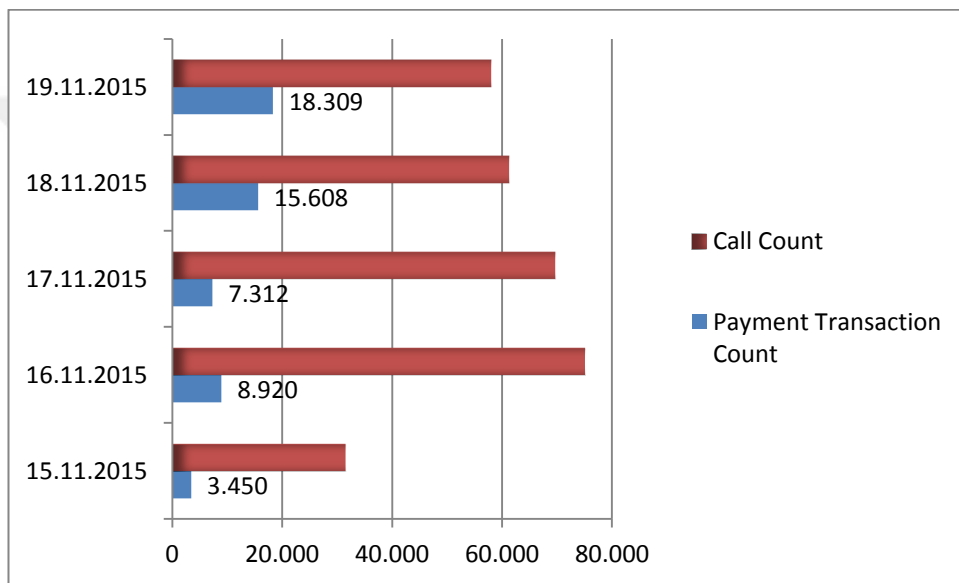
For October month, there is similar result. The day most announcements made, payment process was executed 15.093 times and the lowest announcement day has 1.480 payment results.

Another announcement was automated before broadcast off process per month so customer can pay the bill and can continue to receive service. Broadcast off process days are one of the peak days for call traffic and payment transaction. When potential suspended customers call IVR close to broadcast off days, before they start to use IVR, informative announcement is made about if they do not pay overdue bills, they would be suspended and announcement includes the path of payment menu. In November, one

of the peak times about informative announcement for potential suspender is 18th and 19th November and overall 26.643 times, this announcement was made and just only one time per call.

Figure 3.15 shows six days of November for call traffic and payment transaction count. As shown, suspend informative announcement days were most productive days for payment, even though call values was less other days.

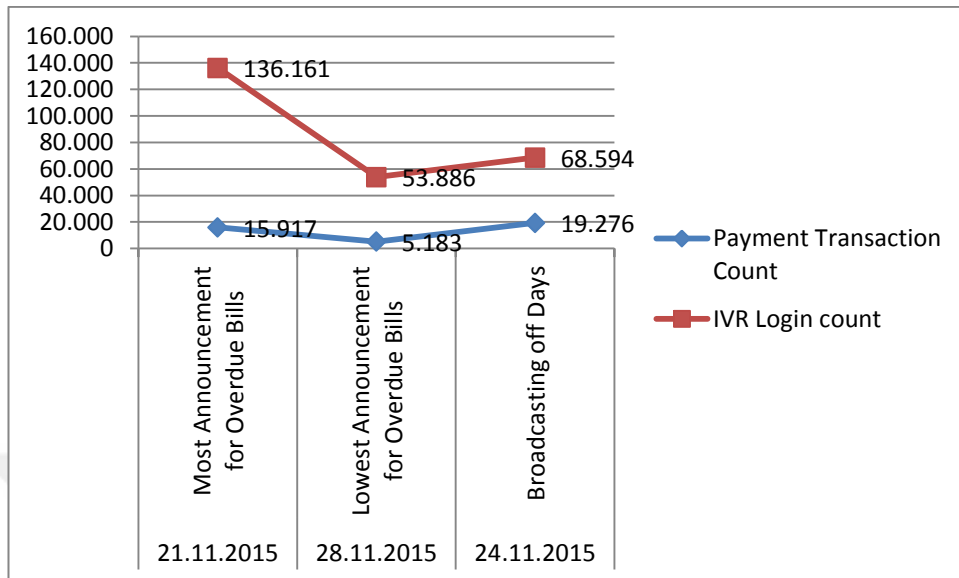
Figure 3.15: Warning about being potential suspend and payment transaction values



In these two days, total 33.917 times payment process was executed. The broadcasting off days are, the most payment transactions executed days at the same time in IVR and it is the 24th days of months.

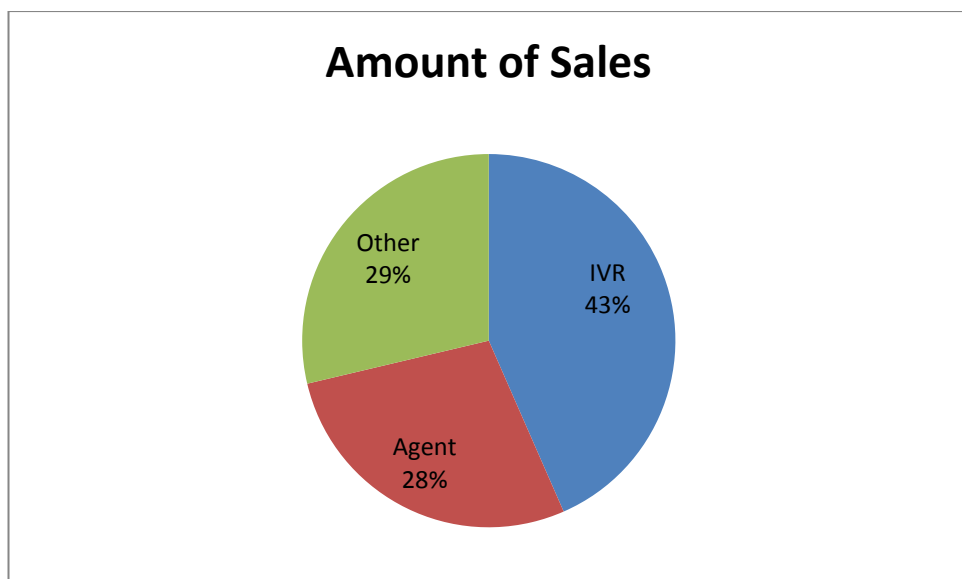
Therefore, customer feedback is additional support to motivate them to use IVR sell services. After all bills prepared and before broadcasting off days, if a customer has a unpaid bill, IVR reminds that customer to prevent overdue bill case. Figure 3.16 shows overdue bills warning announcement and payment relation and broadcasting off day and payment relation with the call count values.

Figure 3.16: Warning announcement and payment transaction relation



Sometimes, some events announce to customer to give information and make suggestion about buying the event. In August 2015 there was a Champions League football match and IVR sold 79.472 amount of PPV for this match, while agent sold 51.005 and overall sell count was 183.010. Figure 3.17 shows PPV sales amount on channel based.

Figure 3.17: Champions League PPV sales amount on channel based



Billing process is commonly used self-service and both customer and company wish it result positively. Any issues might cause negative result for payment should resolve before begin process. However, payment instruction is desired customer property, it may cause problem when customers trying to pay bill, especially in the payment period. IVR can check if a payment instruction is on progress, so it can warn the customers about double payment. If customer has the knowledge the credit card problem and payment instructions process do not result expected, they can still pay their bill on IVR after approve payment process. This way, IVR prevent to complaint about double payment or about payment instructions and payment. Table 3.8 shows payment request and warning counts about double payment transaction for a month.

Table 3.8: Payment Menu request count and double payment warnings count

Menu Request Count	Warning about Payment Instructions	Warning of Instructions in Progress	Process Cancel Count
181643	11335	4423	1498

Another informative announcement made for an unpaid football match event and most of customers called to buy or learn its price. Reduce call transfer to agent and improve customer satisfaction, announce played all caller after identified. Total incoming calls, %85 of the calls end on IVR, % 15 of calls transfer to agent.

Ordinary day call is not required additional effort to control call flow. Sudden emergencies alarm all teams; especially according to case related unit should be fast and prepare these kinds of situations. IVR is like a buffer for these conditions because emergent bad condition means increase call count. Announce the necessary information or transfer calls to related agent group helps to lower tension and problem solutions. An adverse weather condition is one of the bad cases for broadcasting industry. Buffer Zone is help to take action quickly and call center management do not need an IVR developer or a strict production deployment. An application which a part of IVR and Buffer Zone, they can manage informative or warning type announcement with it.

3.2.2.8 Improve Self-Service Usage with Product Recommendation

Digiturk is the unique satellite company that provides Turkey Champions League and every year, league start week, call center has high call traffic.

Customers mostly call for new price and product condition and also to buying required content.

IVR has the knowledge account and its entitlement so it can offer products that includes Champions League and its privileges.

Table 3.9 shows call count and product recommendation count for the account that has not sport channel and packet service sales count.

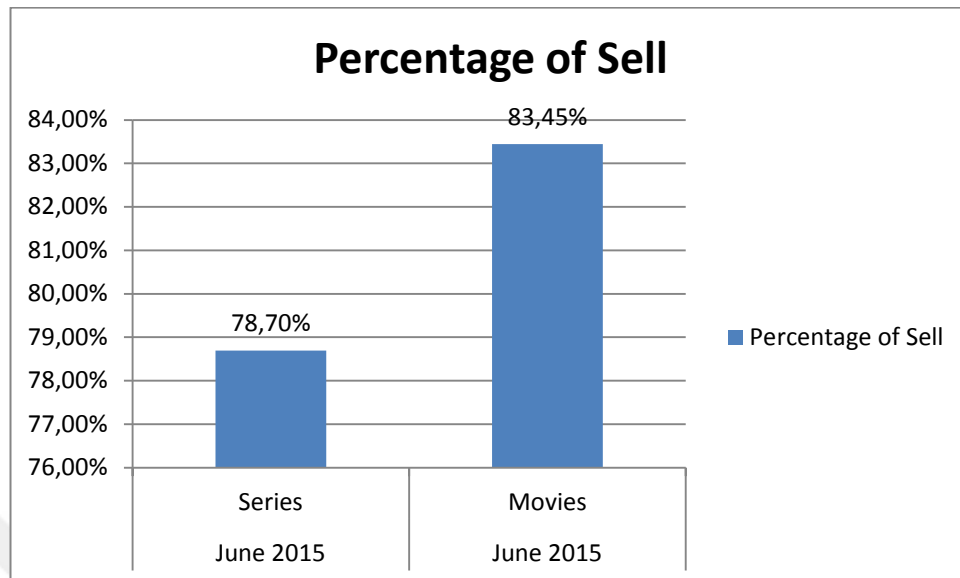
Table 3.9: Champions League start week and sales count

Champions League Start Week		
Date	Recommendation Count	Packet Sales Count
14.08.2015	59285	2529
13.08.2015	26304	549
22.08.2015	101451	1069
23.08.2015	82653	1037
Further Weeks in the League		
19.09.2015	-	641
13.09.2015	-	526
20.09.2015	-	407
18.09.2015	-	196

In Digiturk platform, there are eight movies, four serial channels and product variety is grand. Almost every day, either there is a popular movie or winning film or most watched series on these channels. In stable days, recommendation about a movie or a series can help to improve self-service usability for PPV. June and September months were most productive for new content recommendation.

In June, one of the weeks was used recommendation with new movie or series promotions. When the sales rate compared to other months, it shows that it improved self-service usage with selling packet, especially movie packet. Figure 3.18 shows June 2015 sell service improvement percentage according to July 2015.

Figure 3.18: Improvement sell service with recommendation help



3.2.2.9 Customer Status, Customer Property and IVR Relation

Usually alternative distribution channels (ADC) prepares for active accounts and most of the IVR system transfer inactive or suspend account to agents.

Therefore inactive/suspend accounts are lost for IVR, actually they can use at least payment menu so if their customer status reason is overdue bills, they can solve their own problem on IVR. Table 3.10 shows account status and billing operations usage ratio.

Table 3.10: Billing Operation usage according to customer status

Daily Log Info		
Login Count	Inactive Account Count	Inactive Account Percentage of Login
35435	1141	3,22%
Customer Status and Billing Operations Ratio		
Status	Billing Operations	Percentage of Billing Operations
AC	76.023	98%
IN	1.600	2,10%

One of the main goals of Customer Relations is preventing losing customer. They take variety of actions about it such as less expansive products, giveaways etc. IVR contributes to the customer satisfaction. After identified account, it checks customer risk status such as downgrade or churn, if caller has any of them, without distraction transfer customers to churn skill group that has a high priority queue.

Customer that has special technical products or campaign is significant to be aware so when a new campaign requires a special technical support, IVR can recommend new campaign these groups.

Right now, IVR can identify customers have special STB that capable of recording broadcast. When customers visit product operations menu, they can hear remote recording menu option because they have the capable type of STB.

Complainant customers are another important and should follow kind of accounts and they defined as radar. They can use IVR as they wish, though while they transfer agent, their agent group is different and IVR take notice about it and make these logical decisions.

Sometimes, customer status or customer property is used to modify customer's some values such as recommend to use e-bill with a predictive IVR call. It is a low cost call center task and also lowers other progress about paper billing. Table 3.11 shows predictive IVR outbound call and success result values.

Table 3.11: Predictive IVR outbound call and success rate

E-Bill Recommend Call Count	Acceptance Count	Call Success Rate
195.525	39.229	20,06%

3.2.2.10 IVR Usage for Information Security and Long Informative Texts

While customers can complete desired task on IVR, they may still want to do it with an agent. Whenever it's possible and easy issue, agents try to transfer back caller to IVR

and it is called Send2IVR. Even sometimes it is necessity and most of the customers prefer use IVR too. Usually the issue is about information security like credit card information. Thus agent can avail for more complicated task or for another customer who needs more help.

According to income call count and emergency Send2IVR call counts are variable. Most commonly used Send2IVR scenario is take credit card information or payment transaction.

Another most commonly used scenario is Churn Informative Send2IVR. It has a very long announce that tell customers what should they do. If they take notes, they can play it again and again.

Table 3.12 most commonly used Send2IVR scenarios and their call counts.

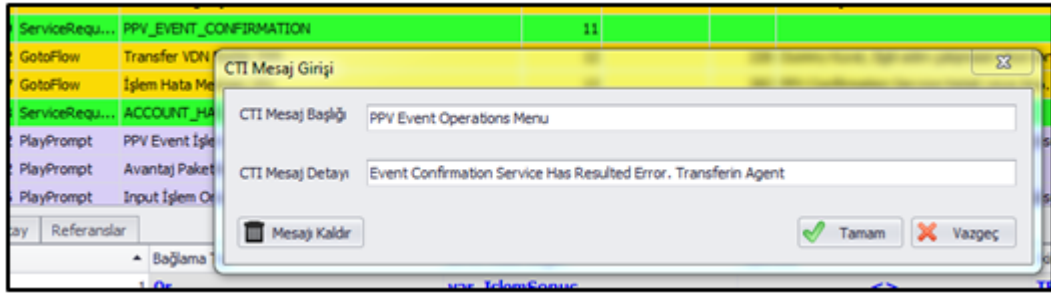
Table 3.12: Send2IVR scenarios and call counts

Scenario	Average Call Count per Month
All Scenarios	111.732
Payment without Go Backing Agent	26.300
Payment with Go Backing Agent	1.328
Churn Procedure Information	62.877

3.2.2.11 Agent Transfer and CTI Messages, Account Info Attachments

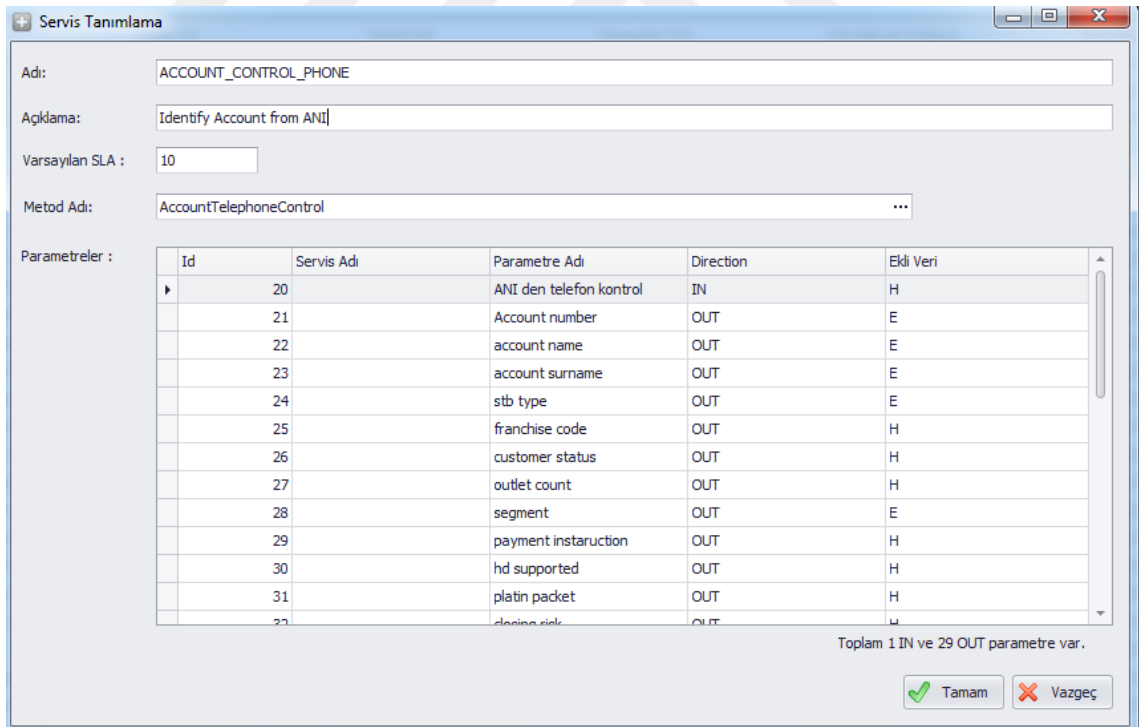
Customers do not like to use IVR, it's a well-known fact, at the same rate customers also do not like to introduce himself agent again. Actually IVR has most of customer information, though it is not passed to agent with the help of CTI. Actually, it makes easy so many things and avoid of time wasting such as identify account, reach account information and which operation is concern him etc. In Digiturk IVR, very useful customer information is sent to agents. Figure 3.19 shows IVR development interface for a PPV event confirmation and it includes extra informative message for agent so he can continue process more quickly.

Figure 3.19: Informative agent CTI message



Also, all DB services have a property for output that if they would attach to account data when call transferring agent. Figure 3.20 shows IVR development interface for account identifying from ANI process. Right column indicate to attachment state, E is dedicate for YES.

Figure 3.20: Customer information attachment values



4. FINDINGS

4.1 EVALUATION METHODS AND METRICS

In this thesis, several different menu structures, product recommendations, importance of identifying customers and methods that improve sell service usability were analyzed to discuss their effects on IVR usability. For critical satiations, technical issues and emergencies IVR is like a buffer to control high rate incoming call to both giving information and transferring right menu or skill agent group.

In these kinds of cases, customer dissatisfaction is probable. In a daily call stream, it helps to manage customers and their issues without waste of time or adding confusion to the case. Sometimes, informative announcement is enough to bend calls to flow through agent while it's not necessary or cure the satiations such as bad weather conditions or a simple technic configuration description.

High self-service using rate one of the main goals of CM and all parts of the company's try to improve it with technic modification for performance or interface for ease of use. Input long data through telephone keypad is not an easy thing, especially for elderly customers. In IVR systems, these kinds of menus require input has a high fault tolerance to ensure customers to ease of retries and input waiting time is long enough to customer has time to input them without stress. One of the other things is feedback for error reason for payment transaction and it makes it possible to try process with a new credit card. Table 4.1 shows payment transaction values for ADC and agents and their rates.

Table 4.1: Payment transaction source rating

Source	Count	Rate Payment Source
IVR	268.868	76,31%
WEB	78.522	22,29%
Agent	4.929	1,40%

When a company has a new service for its customers, it's necessary that it should support as long as possible.

Personal Video Recorder (PVR) STB has capability of remote recording any broadcasting is on the platform. Although, the best and the easiest way to request for a movie or series to remote recording order on web, both IVR and agent support it too. For an agent, doing a remote record order job cost 2 TL. One of the most intensive operations performed for this job values are for agent is 7747 and for IVR 3718. Table 4.2 shows operation counts based on source and amount of IVR reduce for agent costs.

Table 4.2: IVR remote recording order reduce cost

Agent Process Count	IVR Process Count	Cost Accounting	Reduce Cost
7.747	3.718	3.700 * 2	7.400 TL

While IVR has a capability run a desired task, it is usually provided that way to include most required subjects. Send2IVR is a convenient for to achieve this goal. Agent can transfer caller back to IVR, even to redirect it to needed menu. Most commonly used process is pay billing menu and it also provide security for customers too.

Some announcement is required and it can be very long text. Even listening it from an agent can be more slowly than IVR because caller might want to ask questions without listen to text till end. Send2IVR is very good solution these kind of processes too. It saves quite good cost for CC budgets.

In a year, average call transfer to IVR, in other name Send2IVR count is 822.000 and average call duration for IVR is 100 seconds. Agent can does the same kind of task average in 130 second and per transaction is accepted 30 seconds. So Send2IVR saving money value is 165.000 TL. Table 4.3 shows IVR and agent call durations and saving money value.

Table 4.3: IVR and agent call time per transaction

Send2IVR Count	IVR Call Duration	Agent Call Duration	Saving Money Value
822.000	100 second	130 second	165.000 TL

4.2 EVALUATIONS

4.2.1 Important of Customer Identifying and Segmentations

As it was stated in data preprocessing section identifying customer helps IVR process very much. Directing call to a skilled agent group or modifying menu structure according to customer profile is improve both customer satisfaction and IVR usability, even improve self-service usage rating.

ID was added identification metrics recently and it helped to increase the recognition rate of 19%. Following table shows average ratio and saving cost values per month.

Table 4.4: ID Identification saving cost values

Average Identification Rate	85%
Average ID Identification Rate	19%
Average ID Saving Product Value	207.000 minute
ID Identification Saving Cost Values	~85.000 TL

Usually unidentified customers transfer to agents. Instead of propose them a menu structure which has all the real menus. Except technical problem menu, customers still transfer to agent but now agent can know what operations customers want to do. This way reduced to agent's call duration time. If customers come for technical problem, they can listen solutions and can complete their task without assistant of any agents.

Table 4.5: NonSegment IVR saving cost values

	Resolved on IVR Call Count	NonSegment Agent Transfer Count	Result
Before Algorithm	44,93%	106.566	%62,87 NonSegment transfer count was decreased
After Algorithm	47,20%	67.000	Technic Menu usage count 27K was increased

Reengineering IVR structure helps to customer find their way among crowded IVR menus. Through the peak times, creating shortcut for the most desired menu reduces call durations. Caller can solve their problem or make their task without wasting times.

Weekends usually busy day for call center for there are football match to selling and there's technical problem possibility or customer thinks they have and call IVR. Table 4.4 shows two different values for main IVR menu counts for two different customer types.

Table 4.6: IVR menu structure and usage according to customer profile

	Count	Percentage of Usage
Main Menu Announcement without Campaign	86.207	95,22%
Main Menu Announcement with Campaign	4.324	4,78%
Products Operations Menu without PVR Ownership	6.626	58,29%
Products Operations Menu with PVR Ownership	4.742	41,71%

In the same IVR tree, there can be mini IVRs or we can say that IVR has different path for different type of customers. New kind of customer type needs little different type billing operations menu and it's most important part for their products. HERO is the non-invoiced kind of customer and they download credit their account to buy any products. Billing is the most likely to useful menu so instead of located in the third level in the main menu, billing operations menu is the first option their main menu structure. Table 4.5 shows IVR call numbers for call distributions for the new type customers.

Table 4.7: Hero customer type IVR login and process count

Active Customer Count	Overall Login Count	Hero Account Login Count	Process Count
2.654	1.474.482	3.018	1.063

Usually when an account could not identified, it is transferred to agent because it is difficult to use any self-service or IVR menus. Though, this is not true for all of the menus. Some menus do not need to know account such as technical problems menu etc. or some part of it needs, at least until the requirement part, caller can use some menus. When IVR knows it's not identified user, it canalize user to other IVR paths. Using IVR that way helps to improve usability and lower agent's workloads. Table 4.6 shows basic IVR usage values for unknown accounts during a month.

Table 4.8: Identified and Non identified accounts on IVR

Non Identified Account Requested Menu	Count
Main Menu	91.685
Technical Problems Menu	21.553
Billing Operations Menu	13.506
Product Operations Menu	10.211
Downgrade and Churn Menu	12.216
Web TV Menu	5.489
Release Call	1.581
Identified Account Requested Menu	Count
Main Menu	1.683.529
Technical Problems Menu	424.390
Billing Operations Menu	405.646
Product Operations Menu	235.825
Downgrade and Churn Menu	332.966
Web TV Menu	44.016
Release Call	30.991

While IVR identified caller and reengineered menu and transfer callers to right agent groups is important step for call center management. Every month CC management prepares reports about call center and its components working performance. Table 4.7 shows important of identifying user in IVR.

Table 4.9: Benefit of IVR Identification

IVR Account Identification Count	Direct Agent Transfer Count	Agent Transfer Request Count	IVR Identification Benefit for Production	Additional Production Costs without IVR
2.060.000	540.000	511.000	207.000 minute	1.767.987 minute

4.2.2 Peak Times Menu Shortcut and Announcement

Every call center has peak times and its important manages all channels for call center production and using self-service.

IVR can convince callers to stay and use IVR menus for their desired actions. Buffer Zone is used in these kinds of busy days and sometimes offers a shortcut path to most

commonly used self-service in that day, sometimes offers technical solution information.

When calls cannot be managed properly, they flow through agents and after a while agent number is not enough to reply all calls and call queues are formed. This is most probably causing customer dissatisfaction.

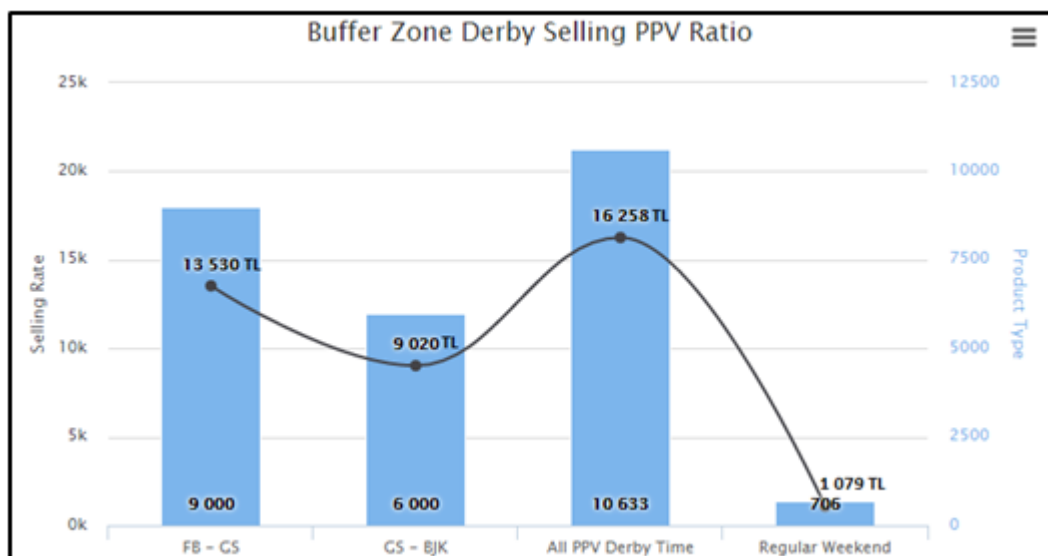
Another bad result is increasing of production time. When IVR helps to calls melting and resolve without agent, it shows on the production results. Table 4.8 shows derby match times' production values for both agent and IVR.

Table 4.4: Peak time IVR production saving cost

	FB-GS Derby Sell Count	GS-BJK Derby Sell Count	Average Sell Count	Production Cost for Agent
IVR	9.000	6.000	7.500	27.500
Agent	4.000	4.000	4.000	14.667

Following figure shows saving costs values for a derby time and a regular weekend. IVR could handle more call with less capacity. While call duration was less than agent, it could sell more PPV than agent.

Figure 4.1: Buffer Zone derby selling PPV ratio



Bad weather condition is caused sudden and high rate call count. Before call queue is formed, informing customers without need to transfer agent is partly IVR's responsibility. When customers do not know what happening, they want to transfer agent and open case for a technical problem. Table 4.9 shows call counts and call result for a bad weather conditions days and how IVR prevented calls to flow through agents.

Table 4.5: Bad weather announcement and saving production time

Average Call Count for a Bad Weather Conditions Day	Percentage of Resolve Call Count on IVR	Saving Production Time
413.159	44%	714.913 minute

4.2.3 IVR According to the Customer Profile

Simple and easy structures are the best design for most of customers. Sometimes easy way understanding might be different for customer to customer. Customer log is very valuable data to investigate and understand customer path and habits.

Creating new structures or algorithms for per customers need a strong CRM system. Each company may not have this kind of system. Even though lack of a solid and reliable CRM system retains IVR full potential, yet it is not obstacle to use its talent. Customer identification and learned customer data helps to create a few kinds of IVR algorithm according to customer profile.

Therefore, Digiturk create two levels IVR structure for its customers. First level is to dissociate customer to their type such as an individual customer, potential customer, commercial customers etc.

After identified customers than offer an IVR algorithm according to customer's some property values and segmentations. It is called that "Customer Profile IVR". Table 4.10 shows call distribution first level Profile IVR call log for a month.

Potential Account IVR

Table 4.6: Profile IVR Call Distribution for Unidentified Customers

Subject	Percentage	Count
Inbound Total Call Count		45117
Potential Account IVR	2,68%	1211
Commercial Account IVR	0,46%	207
Multiple Account IVR	2,19%	986
Inactive Account IVR	2,62%	1181
Unknown Account IVR	4,10%	1851
Identified Account IVR	73,54%	33180
Release Call	1,66%	750
Other	12,75%	5751

Figure 4.2: Profile IVR Call Distribution for Unidentified Customers

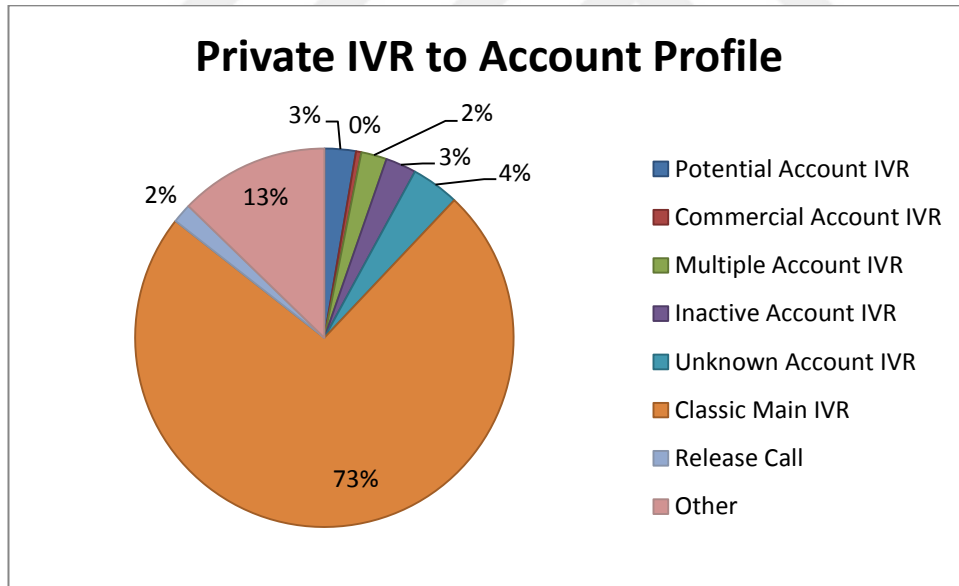
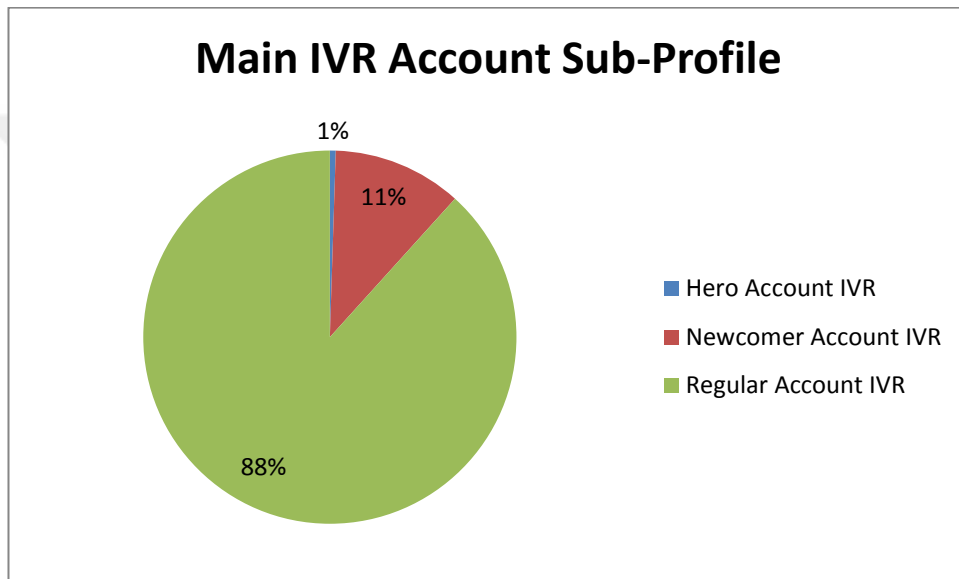


Table 4.7: Identified Account Profile IVR Call Distribution

Subject	Percentage	Count
Classic Main IVR Total Count		33180
Hero Account IVR	0,51%	168
Newcomer Account IVR	11,20%	3715
Regular Account IVR	88,30%	29297

Figure 4.3: Identified Account Profile IVR Call Distribution



5. CONCLUSIONS

In this thesis study, new IVR structures were designed and implemented according to a lot of research and analysis. For new customers, Newcomer account algorithm was created, menu order and menu contents were changed to their probable needs. New menu structure was used without notice of the callers

Another new IVR structure prepared for new type of customers that are called HERO. These customers are non-invoiced and therefore, their product pricing and sales policies are different from other users. IVR structure was formed to their needs and though, they are different, yet they use same call line and same inbound IVR without feeling the difference.

IVR usually process on identified customers and its main role is trying to resolve call on itself without transferring agent. Non identified customers increase call transfers to agents. Unknown Customer algorithm was created to prevent this problem. If customer profile is labeled unknown, IVR offers them new structure to their use. Callers can listen technical problem solutions menu or they can choose any operations they want to use so that they can be transferred to the correct agent groups if needed.

Buffer Zone is one of the useful and helpful solutions for customer satisfaction improvement, increase self-service usability and divert call in emergency situations. According to daily events, peak times, emergency status or customer profile, Marketing or Call Center Management team can take action in Buffer Zone. IVR log result showed how Buffer Zone is handy and useful. Some actions on Buffer Zone helped to increase self-service usability and helped customers to solve their problem or achieved their desired task quickly. Customers with debts were warned in payment period to prevent customer skip or forget their payment.

Another one is about derby times which are peak times for our call center. Towards to derby starting time, there are big call volumes and it is almost impossible to manage all calls properly. In those times, IVR had announcement that offers a shortcut to customers who do not have any sport products. That way, they could buy desired product quickly as a result, it reduced call time on IVR and increased IVR service capability for more customers in a short period of time and also, it improved IVR usability and customer satisfaction. DB log results showed that IVR sold these products more than agents and

this result is always desired but almost impossible to catch for any IVR systems. Actually, this case indicates that IVR is easier to reach and also faster than agent.

Emergency cases cause to call increasing and sometimes, they make huge call queues. When these kinds of things happen sudden and agent head count is not enough to answer these calls, it makes customers unhappy and makes call management very difficult. Therefore, these kinds of situations require rapid intervention. Sometimes, technical problem can be very basic like a bad weather condition. Though, customer would like to know why they cannot watch their broadcasting. CM could announce about problem without any need IVR development and they could resolve call without transfer to agent. Therefore, they could improve customer satisfaction and reduce call center cost with resolving call on IVR.

Final example is about potential suspend customers. While customers do not pay bill three times, they lost their legal rights about broadcasting products. Before they became suspend, IVR warned these callers immediately in Buffer Zone. Warning announcement that includes menu path helped to increasing self-services usage. This area is open any new suggestion for guide to customers any desired structure or self-service usability. Buffer Zone offer huge advantaged to both technical stuff and call center management team such as minor warning announcement, transaction kind of process, or redirect a call to an account profile algorithm or a menu,.

Menu size and menu order affect customers to use IVR options. According to customer profile, some menu options were not included to relate main menu. That prevented customers waste their time long menu and get confused. Technical Problems Menu was reengineered that way, different type of satellite customers hears different kinds of solution menus. Product Operation menu was designed same way and also, products were listed on the menu according to eligibility. If customer had a product, it dynamically removed from offer menu list. Therefore, if customer's account properties do not need a menu option, they removed from menu such as Remote Recording menu option or Superonline Internet Campaign.

In the future, IVR can be managed by its user like a web site. Callers can change menu order to their preference, even they can remove some menu they do not use and it will most probably called Personalized IVR.

Like any web site, IVR system can offer new products to callers according their customer profile. These improvements will increase IVR usability; no doubt even it will affect customer perspective positively about IVR technology.



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