Intelligent Decision Making and Planning for Call Center

By

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Approval

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I dedicate this research work to my parents.

Abstract

There are two types of call centers, Inbound and Outbound Call centers. In inbound call centers, focus is always on multiple factors like customer satisfaction, customer retention etc. In outbound call centers, only focus in on revenue generation whether it is by making sales, selling products, successful surveys etc. The main challenge in all outbound call centers is to increase the revenue without increasing the expenses. Different techniques have been used, by call center management, to make their customer service representatives (CSRs) perfect sellers. Similarly, different systems have been developed to increase the productivity of CSRs. Different dialer system solutions have been developed for this purpose. Automatic Call Distributor (ACD) and Interactive Voice Response (IVR) systems are examples of such systems. These systems utilize techniques like skill based routing, predictive dialing and profile based dialing to execute call center operation in a smart way. All such techniques are studied, implemented and critically reviewed for inbound call centers. For outbound call centers, we do not find the same level of research done and systems developed. Intelligent systems have been developed for inbound call centers. These systems operates on the basis of the history of their customers, maintained in their data repository. CSR's performance has also been analyzed and utilized in few systems like IBM's RAMP (Real Time Analytics Matching Platform). All such systems lack one thing and that is the **Analysis of Dialing Data**. Our idea is to use dialing data (in addition to CSR's performance), in an intelligent manner, after analyzing it statistically and by using different data mining techniques. Our aim is to increase the number of sales (revenue) and decrease the expenses, by smart utilization of data and work force.

Certificate of Originality

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any degree or diploma at National University of Sciences & Technology (NUST) School of Electrical Engineering & Computer Science (SEECS) or at any other educational institute, except where due acknowledgement has been made in the thesis. Any contribution made to the research by others, with whom I have worked at NUST SEECS or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except for the assistance from others in the project's design and conception or in style, presentation and linguistics which has been acknowledged.

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Acknowledgment

In the name of Allah, **the most Beneficent, the most Merciful**

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Owais Rashid

Contents

List of Abbreviations

Abbreviations	Description
CSR	Customer Service Representative
SPH	Sales Per Hour
CPL	Contacts per lead i.e. On average how many contacts were dialed to get a Sale
SPA	Sales per Agent
DHPD	Dialing Hours per Day
KPI	Key Performance Indicator
SBR	Skill based routing

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Chapter 1

INTRODUCTION

This chapter provides an overview of this research, providing an introduction to the call center industry and our motivation for this research topic. A formal problem statement is presented in the problem statement subsection. Aims and Scope subsection define the aim of this research and limits its scope. A summary of the contribution of this thesis is presented in the Thesis Contribution subsection. This chapters ends with the brief description of the various chapters and the thesis organization.

1.1   Preface

A call center [1] is a centralized office used for receiving or transmitting a large volume of requests by telephone. There are two type of call centers. Inbound and outbound call centers.

An inbound call center [1] is operated by a company to administer incoming product support or information inquiries from consumers. Outbound call centers are operated for telemarketing, solicitation of charitable or political donations, debt collection and market research. The call center in which CSRs make calls to customers on behalf of organizations or business is known as outbound call center. These call can be for different purposes like telemarketing, surveys, follow up calls, services upgradation, fund raising etc.

For inbound setups, lot of research has been done and different state of the art setups are already in place for inbound operations. In case of outbound operations, we do not see many intelligent systems in market. Focus of researchers was on problems and challenges faced in inbound call centers. Different systems have been developed and proposed to solve all these

challenges. In inbound setups, history and information of customers are available, that is the main attraction for researchers. In case of outbound setups, customer information is not available in detail. Focus of our research will remain on outbound call centers.

1.2   Motivation

Existing setup in outbound call center is based on following components.
- Calling Data
- Dialer System
- CSR (Customer Service Representative)

In calling data, normally mixed data is available. If we talk in terms of states, calling data files have mixed data from all 52 states of USA. This data is loaded on Dialer Systems. Dialer Systems is used to route calls to CSRs on floor. Data flow is as follows.

Calling Data
- Data is loaded on Database Server
- Data is loaded on Dialer Systems in required format

Dialer Systems
- Throws calls to available agents based on settings

CSRs
- Talk to customers on phone calls thrown by Dialer System
- Dispose off the Call with suitable disposition
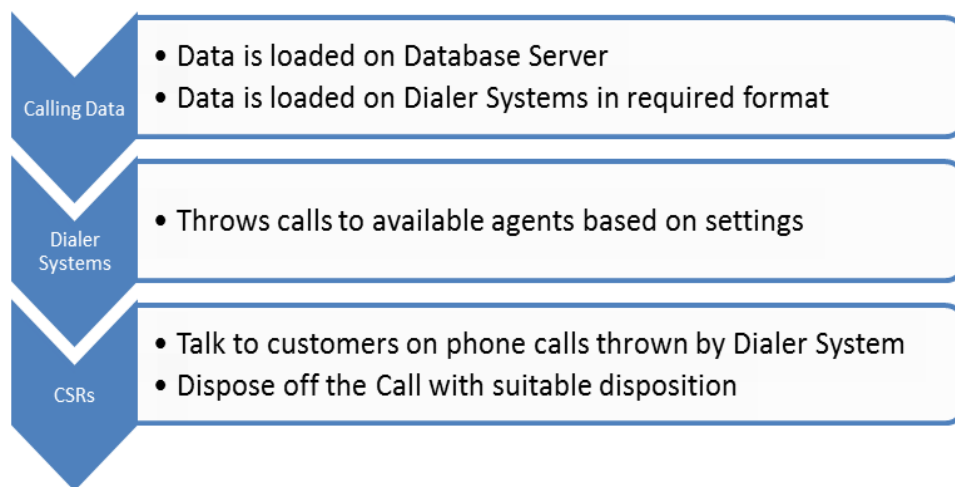
Figure 1.1: Data Flow in Call Center

Dialer System is controlled by dialer admin team. This team actually sets this system and controls different parameters to run the actual show. From data loading to call pacing, all functions are controlled by this team. This team is responsible for monitoring the calling stats and controls the running data using available filters. All dialer systems provide this functionality and are handled by dialer teams.
Data is tracked on two platforms.

1. Website/Desktop Applications:

Websites or desktop applications are used by CSRs to capture customer information based on requirements of specific campaigns. Websites are

designed to track customer information and CSR's activity regarding customers. The information captured by websites is used to analyze CSRs' performance and for different reporting purpose.

2: Dialer Systems

Dialer systems are capturing all CSR's plus system's activity in their own database and gives a detailed insight on CSR's activity, campaign's performance and data response.

By utilizing these tracking mechanisms, response of data and status of customers can be easily known. Data tracked by dialer system is purely related to calls status. Data captured by websites have all required information, based on requirement of campaign, of customers. In this existing system data is utilized in large amount to get the required target of sales.

SPH (Sales per Hour) is the benchmark used in outbound call centers to measure the success of campaigns. In outbound call centers, management is interested in increasing number of sales with higher SPH. Increasing SPH is clear indication of increasing performance. To increase SPH following tactics can be used.

- Increase the headcount
- Increase data utilization
- Increase dialing hours

Our goal is to increase SPH by utilizing less data, headcount and dialing hours. This is something beneficial for company and is our motivation i.e. decreases the expense and increase the revenue.

1.3   Problem Statement

"Increase revenue by utilizing available or less resources and increase SPH by utilizing less data, man power and dialing hours in Outbound Call Center"

1.4   Aims and Scope

Our aim is to use such technique that it requires existing setup of call centers rather than putting burden of new investment to implement the technique. Scope of our research is limited to application of our technique in outbound call center and increase the revenue by decreasing the expense. No new hardware implementation will be required and we will focus on implementation of technique on available resources in any outbound call center.

1.5   Thesis Contribution

This research work contributes in call center industry and specifically target outbound call centers. Our technique can be used in any call center no matter on which product they are working on. By using this technique, outbound call centers can increase their revenue and reduce their expenses.

We have implemented our technique in well know call center of Islamabad and results of our implementation will be shared in this research work.

1.6   Thesis Organization

This thesis is organized into chapters, sections, and subsections. Important aspects of our research work have been discussed in the chapters along with its corresponding sections and subsections. This thesis is organized as follows.

Chapter 1, contains the preface of this study in the first section, the second section provides the motivation of this work. A formal problem statement is presented along with the aims and scope of this study in the final sections.

Chapter 2, describes the previous work done in call center industry. We have reviewed previous work to know how different problems related to call center industry has been solved and what additional work can be done. In the last section we have stated that how our work is different from previous one and how will it make a difference.

In Chapter 3 we have formally introduced the research problem and the methodology employed.

Chapter 4, Provides experimental results of our implementation. We have compared the results of real system with and without our technique. All results shown in this work are real results of implementation of our methodology in well-known call center of Islamabad.

In Chapter 5 we have concluded that how did we solve an industrial problem and proposed a solution to increase the revenue and decrease the expense in call center industry. The second section provides direction for future work and proposed an enterprise level application based on our proposed technique.

Chapter 2

LITERATURE REVIEW

This chapter presents the overview of different work done in past in call center industry. We will discuss all these studies and share our critical review against each study.

Lot of research has been done to come up with different KPIs (Key Performance Indicators) to monitor the performance of CSRs.

2.1   Inbound Call Center

A call center setup may be comprised of either outbound or inbound setup exclusively or of combination of the two.

An inbound call is one that a customer initiates to a contact center or call center. Inbound calls are handled by help desk. Both employees and customers can make inbound calls. Different metrics are used to evaluate performance of agent/CSRs in inbound call center. These metrics include first call resolution (FCR), average handle time (AHT) and time in queue. In addition to telephone calls, email and chat are also used by agents to communicate with customers.

2.2   Outbound Call Center

A call center in which call center agents make outbound calls to customers on behalf of a business or client is known as outbound call center. Distinct metrics are used by an outbound call centers to measure CSR's success, such as cost per call, revenue earned, total calls made and tasks completed.

An outbound call center is a technology enabled business activity where call center agents make outgoing calls to existing or prospective customers. The most common technology used in outbound call center is predictive dialer so that large numbers of calls can be made per hour. The most common uses of outbound call centers are:

- Proactive customer service
- Sales calls to new (prospective) customers
- Sales calls to existing customers
- Up-selling sales calls to existing customers (known as Cross Sell)
- Debt collection
- Surveys (Customer satisfaction)
- Research based surveys
- Technical Support Surveys
- Administrative Support
- Finance and Accounting
- Human Resource Management

The traditional outbound call operation focused on making calls to existing customers for different purposes or to make new customers. However, cold calling has been affected by legislation and customer pressure. Result is the increased proportion of proactive outbound calls to existing customers to keep them informed about events and circumstances which affect them. Customer care has gained more importance and outbound calling is widely used for this purpose.

Outbound operations are totally different from inbound operations. Customers are more likely to be defensive and wary of the purpose of outbound calls due to intrusive and business driven nature of outbound operations. The only exception is the case of call backs (where customer requests to contact on specific time) Trust building with customers is key to improvement of outbound calls experience. Having right information of customer and protecting customer's privacy is vital for building healthy relationship among customers and call centers.

Few customers actively welcome most outbound calls, but agents get into lot of pressure and stress by customers' persistent refusal, lack of interest and rudeness. This situation gets worst when predictive dialers are used for dialing and agents have no idea about next outgoing call through dialer system. Such situations must be handled by management in outbound call center as their revenue is directly connected to successful calls made by their agents. Over-pressured and exhausted agents can result in poor quality interactions which can cause brand damage as well as drop in revenue.

Outbound call centers play a major role in increasing a revenue by using agents for cross selling new products to existing customers. Retaining existing customer is as much important as making new customers. In fact, dealing with existing customer is easier for agents than talking to new customers. Companies become proactive and contact their existing customers to either enhance their customer services or selling new products along with existing ones.

In today's competitive world, smart organizations have equipped themselves with a weapon to target market accurately and more effectively. This weapon is "Outbound call center". Advertisements on different communication channels like TV, radio, newspaper, billboards etc. will get attention but outbound calls to new customers has proven to be more effective way to get people's attention. By looking at commercial on TV, many questions can pop up in their minds. The best way to handle it is to provide them with a facility to ask anything about the product. This is where outbound call centers jump in because your agents on calls are there to give answer to any question of customers on calls. If follow-up is performed in effective and timely manner then marketing with a telephone call can increase interest tenfold.

Imagine the scenario, we have a real interest in some product and we are browsing its website but we cannot find the information we need. Website does not have a section to answer general questions of browsers. What do we do? We leave that site and move to next one as we have plenty of choice available in market.

It has been observed that there are many companies who have introduced a "Call Me" button on their website. When we click it, we get a call from company's call center and we can have all our questions answered by their agents. Getting information on call is a more preferred way than surfing websites. Some companies are even smarter than this, they collect information like name and contact number of visitor in initial stage of browsing and if visitor abandons the process then they pass that info to their outbound call center to contact them on call. Some studies show that some organizations have converted almost 20% of web surfers into potential customers just by approaching them through their outbound call centers.

Organizations' main goal is to increase revenue and for this purpose they are using outbound call centers. But in addition to making new customers, retaining existing customers is vital to organization's success. To retain customers, organizations have special retention teams but mostly they are active when customers decide to move away. They need to be proactive over here. Customer satisfaction surveys are very important for customer retention. This is where technology based outbound call centers play a great role because

manually dialing customers and listening to ringtone is frustrating exercise and can decrease the productivity of agents. Automatic predictive dialers are saviors of this situation because they automatically detect answering machines and connecting calls. It has been observed that dialing productivity has been increased by 300 percent by using automatic dialer systems.

2.3   Call Center Infrastructure

Call center infrastructure is the most vital part of call center setup, after human resource. Call center infrastructure is mainly comprised of
- Telecommunication network
- Hardware
- Software

According to [17], the telecommunication network is used to connect CSR with customer. The basic elements of such network are
- Public switched telephone network (PSTN)
- Router
- Long distance carrier (LDC)
- Ethernet switch
- Modem
- Contact center server

A call center should have the best hardware components to operate in the best possible way. Automatic dialer system, data center, desktop machines, monitoring tools, powerful display mechanism, IVRs, fax, local area network (LAN), router, switches and powerful internet services are main components of call center operations.

To capture information about customers, desktop or website applications are used. Some companies are using customer relationship management (CRM) software for this purpose. Different CRMs are available in market for such purpose. They are highly customizable and can be used according to particular requirements.

2.4   Performance Measurement in Call Center

In outbound call centers, productivity is defined in terms of performance. Identifying key performance indicators (KPIs) and their accurate measurement plays a vital role in maintaining quality of service and satisfaction level of customers. Performance can be tracked and trends can be identified by measuring such KPIs. Such tracking can help call centers to

identify the challenges and take corrective measures, both at individual and company level.

Most inbound centers measure the same things:
- Abandonment rate
- Hold time
- Calls per agent
- Calls per day etc.

Different companies have different strategies to define KPIs. The list below shows the common KPIs used by most inbound call centers.
1. Cost per call
2. Calls per CSR
3. Calls per Day
4. Calls per hour
5. Self Service
6. Resource Utilization
7. Resource Attrition
8. Resource ready time
9. Resource attendance
10. Abandonment
11. Call hold time
12. FCR
13. CSRs per team
14. Training

[18] According to ICMI (International Customer Management Institute) following KPIs are vital in providing better customer satisfaction
- First Call Resolution
- Service Level
- Response Time
- Adherence to Schedule
- Forecasting Accuracy
- Self Service Accessibility
- Contact Quality
- Customer Satisfaction

Another study indicates that model based on following measurements can be utilized for performance measurement.
- Total Calls offered
- Total Calls Blocked
- Total Calls handled
- Abandonment rate

- Average time to handle call
- Average speed to answer call
- First Call Resolution
- Quality of calls
- Attendance of Agents
- Customer satisfaction

[19] Allocation of correct amount of resources for given operation is dependent on accurate forecasting of incoming call volume. Accurate forecasting algorithm is required for this purpose. That algorithm must be capable of dealing with the variables involved in the dynamics of the environments. Availability and quality of data is the basic problem in assessing such algorithms. Generating synthetic data or using historical data for training the forecasting algorithm and using future data for testing the forecast data, in order to assess the performance of different forecasting algorithms could be a great idea.

It has been observed that lot of KPIs have been defined for performance measurement of agents in inbound call center but in outbound call centers, performance is measured in terms of revenue generation. Making new customers and retaining existing one is KPI in outbound call centers. Higher the number of sales, higher is the performance of agent, off course along with quality of service.

2.5   CSR to Customer Mapping

In order to find the ideal mapping between CSR and customers, solution is proposed by Abbas and Abbas [3] in which he focused on application of descriptive, predictive and prescriptive analytical techniques to psychographic and demographic insights. Hundreds of features can be mapped and by application of intelligent call routing, contact center throughput can be boosted. Switch and Mapper module is proposed to get optimized CSR-Customer pair mappings. Principles of artificial intelligence are at work behind this module. Best CSR-Customer mapping is achieved by using advanced analytics.

This idea is applicable only when information and history about customer is maintained. This information can be compromised of anything related to specific campaign. Only inbound call centers are maintaining such history and information because most call received, in inbound call centers, is from their existing customers. Systems implemented by such centers are maintaining database of client interactions in the form of warehouse or any data repository. But in outbound call centers, CSR has no idea about the next call in the queue. Only basic customer information is available in outbound centers and

application of this idea becomes a great challenge if other important customer information is missing.

2.6   Skill Based Routing

Skill based routing (SBR) is routing of calls to CSRs based on their specialized skills. CSRs are divided in groups, based on their specialized skills, and call are routed to them by system.

Thomas et al. [4] proposed this idea of SBR in call centers. Performance analysis and resource pooling were focused by them. Again, this idea is suitable for inbound operations because, based on performance if CSR and history of customer, SBR will be used to route call from specific customer to specific group of agents to increase the chances of successful interaction. Success of interaction can be defined by customer satisfaction level. The authors have focused on all problems related to SBR but they didn't discuss any such implementation for outbound call centers. Increasing number of sales is outbound call center's main challenge and it was not covered by them.

2.7   Knowledge Based Solution

Application of knowledge based solutions, is proposed by Farzad et al [5], to overcome different challenges in call centers. Two algorithms have been proposed by them. These algorithms will work on search based expert systems.

Their idea is also based on availability of search systems where CSR can search about customer. Efficiency of search based systems have been discussed and two new efficient algorithms were proposed by them. Their idea was related to inbound setups and has nothing to do with outbound setups.

2.8   Simulation Based Solution

Paulo et al [6] focused on the simulation based results to analyze different parameters to see how occupation and abandoned rate is affected. This model is designed to get the best adapted dialing rate for dialer system. Based on the simulation results, the best dialing rate is proposed and call center can implement the dialing rate and see its results. The use of simulation model instead of analytical or statistical model is its quick adjustment to volatile behavior of outbound call center conditions. Varying performance matrices can lead to poor performance. This is where simulation based model can be utilized. Very smart approach to use the existing systems and just on the basis of simulation, they can propose some value for very important variables used in existing Dialer Systems to increase the productivity.

2.9   Performance Based Solution

Performance based decision making is proposed by Decision Craft [7]. According to them, simulation techniques are used to categorize CSRs in different ranks. Calls will be routed to CSRs based on their ranks. Assigning right people to right job is their motto.

Their idea is very good and is already implemented by many call centers. Call centers are using management feedback and quality assurance score to determine ranks of CSRs. Clustering algorithms is used by them for grading purpose. This makes them different from others.in short, they are using inputs from three sources to implement this idea and those source are as follows
1. Clustering Algorithm
2. Management Feedback
3. Quality Assurance Department Feedback

2.10   Traffic Jam Problem

New call broker strategy was proposed by Rafiq et al [8]. They discussed the problem of traffic Jam in call center industry. System based on CSR's personalized distribution is implemented by them to enhance the capability of existing call distribution functionality. Their focus was on providing solution to the traffic jam situations in call centers.

2.11   Operational Business Intelligence

[20] In both academic and professional literature, the advantages of business intelligence are becoming well documented. Call centers can provide clear competitive advantages for insurance companies. Research work can be done on data collocated by call centers to gain benefit from operation business intelligence in call center world. Kyper et al. [20] chose decision trees because they are easy to interpret for managers that likely are not well trained in data analysis (i.e. low learning curve). System proposed by them is primarily an exploratory system for call center managers. The system will identify factors that have the greatest impacts on service levels, possibly leading to a reallocation of resources, but ultimately it is the responsibility of a decision-maker to put these insights to good use.

Idea of using business intelligence, especially decision trees, in call centers is a very practical idea and managers can benefit from the system output. Again it is applicable in inbound call centers and can be used by managers for resource allocation.

2.12   Business Intelligence in Call Centers

[21] Practical implications of business intelligence can be seen in many organizations especially in dynamic call centers. KPIs allow management to keep check not only on agents' performance and effectiveness but also on business process strength and weaknesses. Implementing business intelligence in call center does have challenges. KPIs include, average speed of answer, cost per call, agent utilization rate, first contact resolution rate and customer satisfaction. Different studies have proved that longer the customer waits on call, lesser the satisfaction level will be. It does not mean that answering call immediately will satisfy a customer, this is just the beginning. Customer satisfaction is mainly dependent on how well their queries have been handled. It depends on how well the agent, taking customer call, is trained on product knowledge and solutions to known customer issues. Cost per call is directly proportional to call duration. Business intelligence can be applied on data captured form call center in a data warehouse. Cost per call can be measured from this data, and by analyzing it for different points in time, comparison can be made for cost per call. Agent utilization is inversely proportional to downtime of call center. It shows that agent utilization is one of the key player in performance measurement in call center. Business intelligence can be used to increase the agent utilization by discovering trends in call center data stored in warehouse. Trend monitoring can be used for proactive management of agents during operational hours. First call resolution (FCR) is key to customer satisfaction. It shows that customer had to make only one call to find the solution to his/her problem. FCR can be used to rank agents in call center. Business intelligence should be used to capture customer complaints and save them in a repository. All these KPIs can be aggregated to get a single value for overall performance. Weights can be assigned to different KPIs and it can vary from organization to organization. In the end, single value for aggregated KPI can be taken into consideration by management while decision making.

2.13   Summary

Different studies have been conducted to increase call centers' revenue by utilizing data mining and business intelligence techniques but all those studies were applicable only on inbound call centers. CSR to customer mapping, skill based routing, knowledge based solution, performance based solutions and application of business intelligence are mainly focused on inbound call centers. Different traffic jam problems have been solved especially for inbound call centers. Research has been made on improving the efficiency of CSRs and smart dialer systems have been built in order to run call center operations in an efficient way. Major research was done on KPIs used in inbound call centers and different solutions have been suggested/provided for

KPIs monitoring in inbound call centers.

We are trying to achieve something different. Our focus is on outbound call centers and we are going to utilize the existing systems and technologies. We will use data mining techniques so as to use available data intelligently to increase revenue by decreasing expenses (in term of data purchasing, head count and dialing hours).

Chapter 3

RESEARCH METHODOLOGY

This chapter contains details of the research methodology applied in this work.

3.1   Introduction

Our idea is to do such analysis that number of sales can be increased by using less data with less number of CSRs. For this purpose, we have named this solution as **3R**. **R**ight Data to **R**ight CSR at **R**ight Time.

In order to implement 3R, we have developed the following three systems.
- Monitoring Cell (To get Right CSR)
- Monitoring Cell + Stats from Dialer System (To get Right Data)
- Clustering on Captured Data (To get Right Data and Right Time)

Monitoring cell captures data from websites, used by CSRs, to evaluate their performance. Along with monitoring cell, six different reports from dialer system's stats are also used to evaluate the CSR's performance. This performance is monitored by dialer admin team. By using the combination of monitoring cell and reports extracted from dialer system's stats, this team identifies those agents who are outperforming other CSRs. These stats provide one R i.e. Right CSR of our proposed solution.

In next section we will discuss the methodology we have used to get 3 **Rs** of our solution. In next section, we will share some tables and figures, based on real time stats, captured during experimental analysis. These figures and stats will help to understand the mechanism we adopted and results we have achieved by implementing this solution.
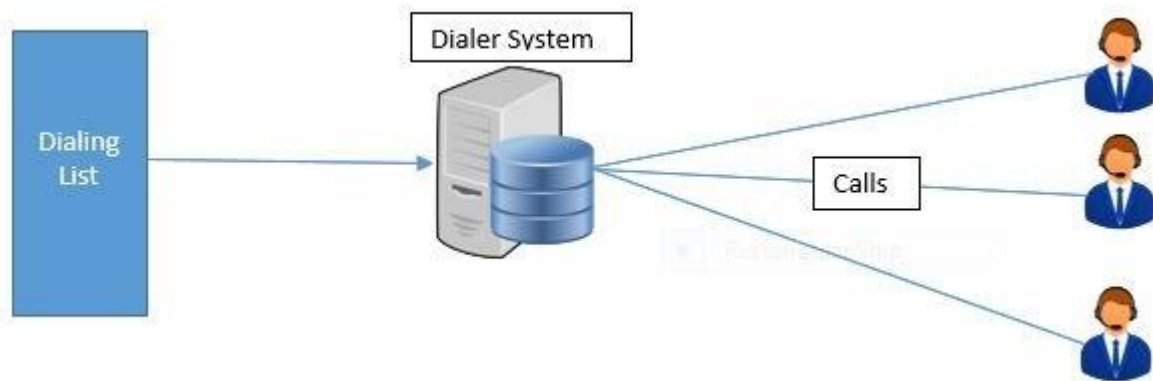
Figure 3.1: Existing Dialing Setup
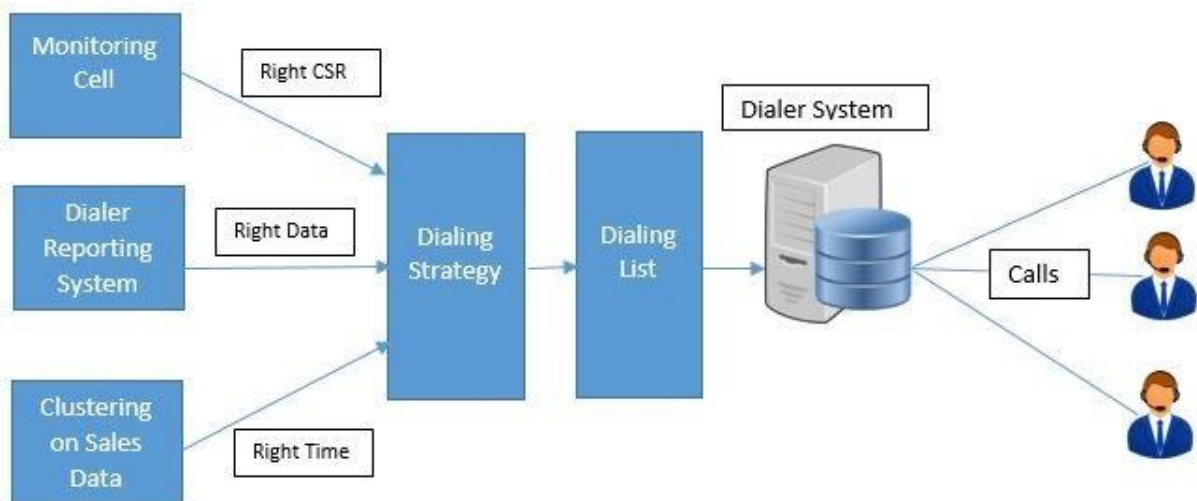
Figure 3.2: Proposed Dialing Setup

3.2   Methodology and Implementation

As discussed in previous section, **Monitoring Cell** is being used to capture CSRs' stats on runtime and is used to categorize CSRs as good, bad, average and excellent. This tool gives an hourly breakdown of CSRs' performance and if someone is not performing up to the mark, he will get immediate attention of campaign's management and will be temporarily shifted to different dataset to preserve responsive data. CSRs with good performance will take his place because he must have earned this position through his performance.

This tool also gives an hourly breakdown of data files' response. These stats help us in deciding data strategy throughout the dialing day. If any file is not responsive, that file will be analyzed in detail to know the actual situation. This is the initial tool developed to practically implement one part of our proposed solution that is **Right CSR**.

Figure 3.3 shows screenshots from Monitoring Cell.

Assigned Campaign	Data Type	Landline/Wireless	9 CST	10 CST	11 CST	12 CST	13 CST	14 CST	15 CST	16 CST	17 CST	18 CST	19 CST	20 CST	Total
Auto1	STL	LandLine	0	5	0	0	0	0	0	0	0	5	0	0	10
		Wireless	1	22	29	31	28	39	10	23	29	26	31	4	273
Auto2	STL	LandLine	0	4	0	0	0	0	0	0	0	1	0	0	5
		Wireless	0	18	16	12	21	21	6	18	15	15	18	0	160
Auto-2B	STL	LandLine	0	0	0	0	0	0	0	0	0	1	0	0	1
		Wireless	0	22	21	15	27	24	5	24	16	13	20	0	187
Auto3	STL	LandLine	0	2	0	0	0	0	0	0	0	2	0	0	4
		Wireless	0	16	10	15	14	17	0	11	14	13	14	1	125
Autocare	Auto Care	Wireless	0	8	23	9	23	22	7	7	16	19	26	3	163
	STL	Wireless	0	1	2	1	0	0	1	0	0	0	0	0	5
Autocare-2	Auto Care	Wireless	0	1	6	3	6	4	0	4	5	5	4	1	39
	STL	Wireless	0	2	1	1	0	0	0	0	0	0	1	0	5
		Total	1	101	108	87	119	127	29	87	95	100	114	9	977

Campaign	Data Type	Outcome	9 CST	10 CST	11 CST	12 CST	13 CST	14 CST	15 CST	16 CST	17 CST	18 CST	19 CST	20 CST	Total
Auto1	STL	Sale	0	24	27	30	28	39	10	23	28	31	31	3	274
		Only Paper Warranty	1	3	1	1	0	0	0	0	0	0	0	0	6
		Only Live Warranty New(6)	0	0	1	0	0	0	0	0	1	0	0	0	2
		Only HomeIns	0	0	0	0	0	0	0	0	0	0	0	1	1
Auto2	STL	Sale	0	22	16	11	16	21	6	18	15	16	18	0	159
		Only Paper Warranty	0	0	0	1	5	0	0	0	0	0	0	0	6
Auto-2B	STL	Sale	0	19	20	15	27	24	5	23	16	14	19	0	182
		Only Paper Warranty	0	3	1	0	0	0	0	1	0	0	0	0	5
		Only HomeIns	0	0	0	0	0	0	0	0	0	0	1	0	1
Auto3	STL	Sale	0	15	10	15	14	17	0	11	14	15	14	1	126
		Only Paper Warranty	0	2	0	0	0	0	0	0	0	0	0	0	2
		Only Live Warranty New(6)	0	1	0	0	0	0	0	0	0	0	0	0	1
Autocare	Auto Care	Sale	0	8	23	9	23	22	7	7	16	19	26	3	163
	STL	Only Paper Warranty	0	1	2	0	0	0	0	0	0	0	0	0	3
		Only Live Warranty New(6)	0	0	0	0	0	0	1	0	0	0	0	0	1
		Only Live Warranty(3)	0	0	0	1	0	0	0	0	0	0	0	0	1
Autocare-2	Auto Care	Sale	0	1	6	3	6	4	0	4	5	5	4	1	39
	STL	Only Paper Warranty	0	2	0	1	0	0	0	0	0	0	0	0	3
		Sale	0	0	1	0	0	0	0	0	0	0	1	0	2
		Total	1	101	108	87	119	127	29	87	95	100	114	9	977

Sales Hour	Auto	Additional Vehicle	Rejected Leads	Rejected Additional Vehicle Leads	Paper Health	Paper Warranty	Live Warranty	Live WarrantyNew	MLSSales	HOMEINS	Total Prorated
9	0	0	0	0	0	1	0	0	0	0	2
10	89	36	1	1	0	15	0	9	0	24	189.75
11	103	50	1	0	0	9	1	5	0	29	182.25
12	83	43	0	0	0	5	4	5	0	29	162.5
13	114	48	0	0	0	12	3	3	0	36	201
14	127	60	0	0	0	8	5	1	0	40	208
15	28	17	0	0	0	0	1	5	0	13	70
16	86	42	1	0	0	1	0	5	0	30	145
17	94	44	0	0	0	6	1	7	0	21	170.75
18	100	39	1	1	0	4	4	0	0	28	149.5
19	113	50	1	0	0	10	0	0	0	45	178.25
20	8	3	0	0	0	1	0	0	0	4	13.75
Total	945	432	5	2	0	72	19	40	0	299	1672.75

Agent Report		9 CST	10 CST	11 CST	12 CST	13 CST	14 CST	15 CST	16 CST	17 CST	18 CST	19 CST	20 CST	Total
Muhammad Harris Khan	865609	0	4	1	3	5	3	2	4	0	1	4	0	27
Irfan Ahmed Rana	549657	0	3	1	1	2	4	1	2	2	4	3	1	24
Kamran Baig	218251	0	4	4	2	1	3	1	2	0	4	3	0	24
Rizwan John	165275	0	1	2	4	2	3	1	2	3	2	2	1	23
Muhammad Ahsan Rafique	486337	0	3	3	1	3	3	1	1	2	1	4	0	22
Muhammad Usman Ali	671965	0	3	2	3	1	1	0	1	2	4	5	0	22
Fahad Mehmood	933169	0	1	2	1	4	3	1	2	4	2	2	0	22
Ali Raza	768305	0	2	0	1	4	4	1	1	3	3	2	0	21
Sheheryar Khalid Malik	723999	0	3	0	2	1	2	1	3	2	2	4	0	20

Data File Report		9 CST	10 CST	11 CST	12 CST	13 CST	14 CST	15 CST	16 CST	17 CST	18 CST	19 CST	20 CST	Total
STL_wirelessEduFreshDataAll_140k_60K_28May2015		0	0	0	44	85	100	21	49	2	15	80	5	401
STL_wirelessSTL_EduFreshDataAll_180k_14May2015		0	53	73	12	0	0	0	0	1	11	0	0	150
STL_wirelessEduFreshDataAll_48k_44k_28May2015		0	0	4	11	25	23	7	9	0	10	24	4	117
STL_wirelessEduFreshDataAll_200k_22May2015		0	2	1	14	0	0	0	26	70	2	2	0	117
STL_wirelessACL_EduFreshDataAll_90k_14May2015		0	9	25	1	4	3	0	2	3	3	5	0	55
STL_wirelessLeadReport2015_5_22_11_05		0	1	0	0	0	0	0	0	0	35	1	0	37
STL_wirelessACL_EduFreshDataAll_100k_22May2015		0	0	0	0	0	0	0	0	18	11	1	0	30
Paper Warranty ID's		1	11	4	3	5	0	0	1	0	0	0	0	25
STL_LandlineSTL_TS_SalesData_20k_23Apr2015Landline		0	11	0	0	0	0	0	0	0	9	0	0	20
STL_wirelessFreshAIData_STVHO_30k_05May2015		0	11	0	0	0	0	0	0	0	0	0	0	11
STL_wirelessEduFreshDataAll_180k_07May2015		0	2	0	1	0	0	0	0	0	0	1	0	4
STL_wirelessSTL_TS_SalesData_20k_23Apr2015Cellphone		0	0	0	0	0	0	0	0	0	4	0	0	4
LiveWarrantyNewIds		0	1	1	0	0	0	1	0	1	0	0	0	4
BlankID		0	0	0	0	0	1	0	0	0	0	0	0	1
LiveWarrantyIds		0	0	0	1	0	0	0	0	0	0	0	0	1
Total		1	101	108	87	119	127	29	87	95	100	114	9	977

Team Lead Report		9 CST	10 CST	11 CST	12 CST	13 CST	14 CST	15 CST	16 CST	17 CST	18 CST	19 CST	20 CST	Total	
Naveed Akhter	Total with Agents=16	0	22	21	15	27	24	5	24	16	14	20	0	188	Watch Trend
Haroon Iftikhar Chaudhry	Total with Agents=12	0	22	16	12	21	21	6	18	15	16	18	0	165	Watch Trend
Usman Anwar Mirza	Total with Agents=13	1	15	17	18	12	18	4	15	13	15	17	3	148	Watch Trend
Usama Raheem	Total with Agents=10	0	12	12	13	16	21	6	8	16	16	14	1	135	Watch Trend
Immad Hassan Abid	Total with Agents=10	0	18	10	15	14	17	0	11	14	15	14	1	129	Watch Trend
Mubashir Liaqat	Total with Agents=8	0	6	15	7	11	12	4	4	9	5	14	3	90	Watch Trend
Sheikh Tayyab Amjad	Total with Agents=7	0	3	10	3	12	10	4	3	7	14	12	0	78	Watch Trend

State Report	9 CST	10 CST	11 CST	12 CST	13 CST	14 CST	15 CST	16 CST	17 CST	18 CST	19 CST	20 CST	Total
FL	0	14	7	14	13	21	5	9	7	10	18	2	120
TX	0	7	8	15	18	19	4	15	10	8	8	0	112
CA	0	4	13	3	5	4	2	7	18	7	7	1	71
GA	0	7	9	4	11	8	3	5	2	4	6	1	60
PA	0	1	7	2	8	6	2	2	5	5	2	1	41
NC	0	8	7	3	5	0	0	4	3	7	4	0	41
IL	0	5	4	3	5	3	1	3	5	4	6	0	39
MI	0	5	0	3	3	2	1	7	6	8	1	1	37
KY	0	0	1	1	3	7	2	2	4	6	4	0	30
TN	0	1	2	2	6	2	1	3	5	3	5	0	30
NY	0	5	4	3	1	3	0	3	4	2	5	0	30

Figure 3.3: Screenshots of Monitoring Cell

To get the remaining two **Rs** (**R**ight Data and **R**ight Time), we build another reporting system which provides us with such reporting that will give us an inside story of previous day's dialing. This reporting will help us a lot to know about the detailed dialing response of data. Based on these stats, we will decide about the next dialing strategy. Following are the names of reports automated for this purpose.

1. Time wise Production Report
2. State wise production report
3. Agent wise disposition report
4. Penetration Report

Out of these four reports, the most important report is the Penetration Report. This report gives us the detailed breakdown of every single data files ran on any campaign.

Important sections of this report are
- Application Name
- Service Name
- Table Name
- Disposition breakdown in Workable (W) and Non-Workable (NW)

- Total Dialed Contacts
- Expired Contacts
- Penetration of Table in percentage
- CPL (Contacts per lead i.e. On average how many contacts were dialed to get a Sale)

CPL (Contacts per lead): CPL is the most important factor we use to know the response of data file in terms of number of sales generated from that file. CPL defines the number of contacts dialed to get a sale. For example CPL of 10 shows that after every 10 contacts dialed, we get a sale. Just by looking at CPL of any file, we can know the productivity of that file.

Based on this report, we get a detailed response of our data files. To carry on the research, we selected Auto Insurance Campaign and started looking at its data in more detail. To get the Right data, we must have something which will help us to decide the exact strategy to be implemented on any campaign to increase the number of sales.

In Auto Insurance Campaign's data, following information is available before dialing
- First Name
- Last Name
- City
- State
- Address
- Zip code
- Gender
- Vehicle Make
- Vehicle Model
- Vehicle Year

Out of these attributes, "First Name" and "Last Name" could not help in our results. Remaining attributes can be utilized in our project. Following are the steps we took to get 2nd R (Right Data). These steps are based on analysis of original sales data available from well-known call center of Islamabad.

3.2.1 Decision Trees

We used WEKA to make any decision tree based on the following attributes
- State
- Zip code
- Gender

Results were not up-to the mark and our tree was not leading us to any strategy. We divide this group into pairs and used following combinations.

- State & City & Sale Time
- Zip-code & Sale Time
- Gender & Sale Time

At this stage, these group led us to some decisions. Different states have different response time zones. They have separate **responsive time zones** and **dead time zones**. Within states, we saw same division on zip-codes level as well and surprisingly, we found that response times vary with Gender as well. We started our experiment by running our data on basis of first group and got significant increase in our number of sales and when we switched to second group, it was even more beneficial. At this stage, we had something in our hand to decide about Right Data (this can vary from campaign to campaign).

Then we combined these **R**s i.e. **R**ight Data and **R**ight CSR on **R**ight Time. We got
- Right CSR from Monitoring Cell and Reports
- Right Data and Right Time from Dialer Reports and trends using three groups

3.2.2   Data Mining on Sales Data

Up to this point, we had not utilized data mining strategies to include in 3R. Then we decided to use clustering on available data and used clustering results to increase the efficiency of system. For clustering purpose, we decided to focus on **Area Codes** to know the trends in each state.

We made three groups and applied K-Means clustering algorithm. Based on the results of clustering algorithm, we implemented dialing strategy in real time and observed the results. Based on results, we increased the number of attributes to be passed to K-Means. With every addition, we were getting better results. All three groups, their implementation and results are discussed below and in the end we will show the comparison of real time results of 1 year with and without our proposed solution.

Following are the three groups of attributes we used in K-Means
- Area Code & Sales Hour
- Area Code & Age & Sales Hour
- Area Code & Age & Gender & Sales Hour

In these groups, all four attributes were available to us from reports discussed previously. We started with Texas (TX) state and did our analysis on 7K records of Texas. Results of three groups are as follows.

Area Code & Sales hour

Area Code & Sales hour is our Group 1. Following steps were performed in this activity.

- We prepared the data file based on specific area codes (based on results of clustering algorithm)
- We took 5 best CSRs (based on Monitoring Cell's Report)
- We chose one specific hour (based on clustering results) for 3 consecutive days

We made those 5 best agents dialed for that specific hour on those specific area codes and got following results. Based on one hour dialing, we were doing clustering on results of that specific hour to prepare better dataset for next day's dialing. Results of three days are as follows.

Table 3.1: Group 1 Sales Summary

Day	Customers	CSRs	Sales	Dialing Hrs.	SPH
1	4K	5	156	1	156
2	3K	5	171	1	171
3	2.5K	5	151	1	151
Total	9.5K	15	478	3	159
Avg	3.16K	5	159	1	159

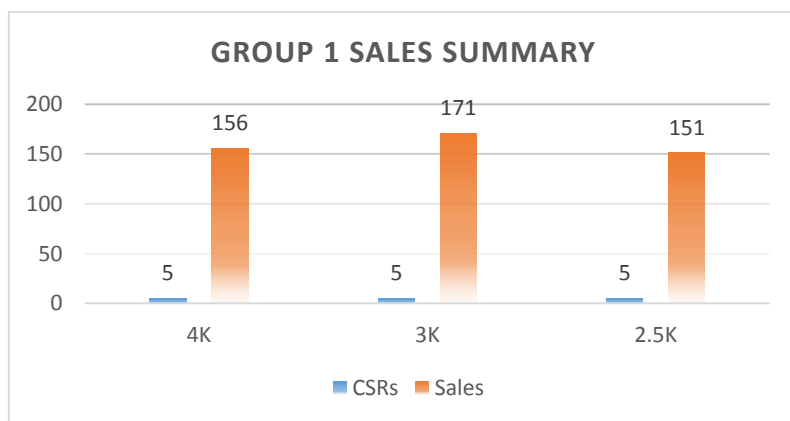Customers= Number of contacts dialed, SPH=Sales per Hour
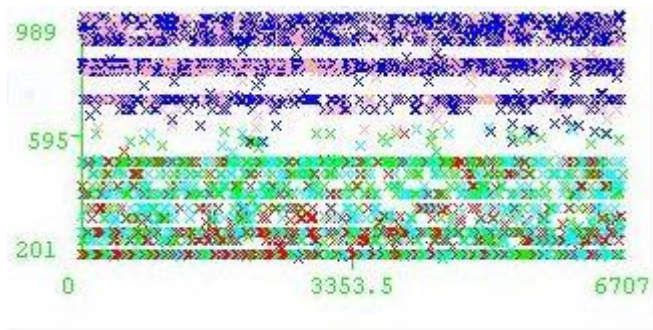

Figure 3.4: Group 1 Sales Summary

Figure 3.5: Results of applying K-Means algorithm on Group 1

Table 3.1 shows the real stats for Group 1 (Area Code & Sales Hour). If we look at these stats then
- Number of CSRs was constant
- Data utilization had been decreased
- SPH results were positive

Clustering helped us to increase the number of sales by utilizing less data. On day 3rd, data utilization was decreased by 37.5%. When we were using 4K data to generate SPH of 156, we utilized 2.5K data to get SPH of 156 on 3rd day. **What we did is to use Right Data on Right CSRs on Right Time.**

Area Code & Age & Sales hour

In group 2, we introduced Age to the existing group of area code and sales hour. Strategy was same as of group 1 but based on the results of clustering algorithm, we used three attributes instead of two. Results are as follows.

Table 3.2: Group 2 Sales Summary

Day	Customers	CSRs	Sales	Dialing Hrs.	SPH
1	3K	5	179	1	179
2	2K	5	162	1	162
3	2K	5	166	1	166
Total	7K	5	507	3	169
Avg	2.33K	5	169	1	169

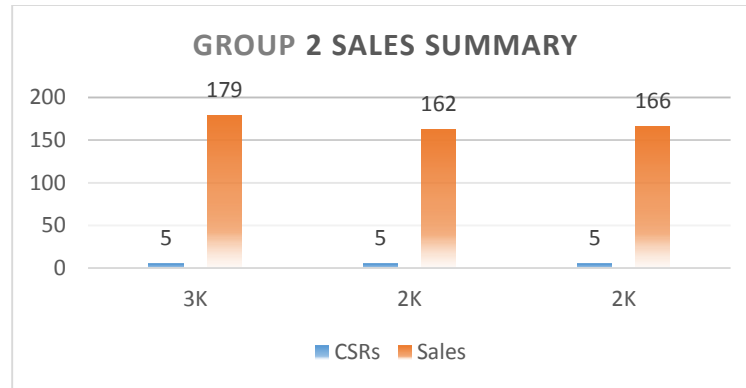Customers= Number of contacts dialed, SPH=Sales per Hour
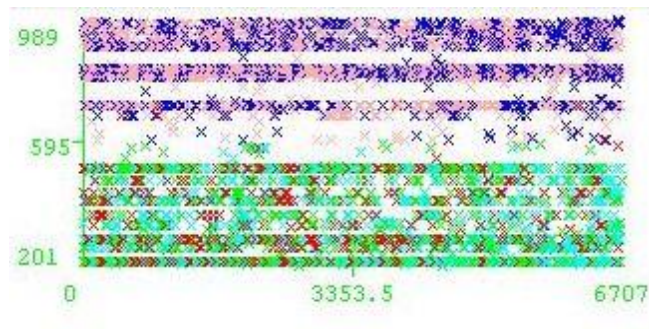
Figure 3.6: Group 2 Sales Summary

Figure 3.7: Results of applying K-Means algorithm on Group 2

Table 3.2 shows the real stats for Group 2 (Area Code & Age & Sales Hour). If we look at these stats then
- Number of CSRs was constant
- Data utilization had been decreased
- SPH results were positive

Clustering helped us to increase the number of sales by utilizing less data. On day 3rd, data utilization was decreased by 33.3%. When we were using 3K data to generate SPH of 179, we utilized 2K data to get SPH of 166 on 3rd day.

If we compare the results of Group1 and Group2, we have following stats available. Table 3.3 shows the comparison of average stats of two groups.

Table 3.3: Comparison of Average Results of Group 1 and 2

	Day	Customers	CSRs	Sales	Dialing Hrs.	SPH
Group 1	3	3.16K	5	159	1	159
Group 2	3	2.33K	5	169	1	169

Table 3.3 clearly shows that
- Data Utilization has been decreased
- SPH has been increased

Addition of Age attribute to the clustering algorithm had positive results. Then we added another attribute i.e. Gender, to the clustering algorithm. Idea was to target customers based on their gender as it was observed that customers' response time varies with Gender as well.

Area Code & Age & Gender & Sales hour

In group 3, we introduced Gender to the existing group of Area Code, Age and Sales Hour. We changed the strategy for third group because it was obvious that data utilization was becoming smart by using clustering algorithm. For this group, we reduced the number of CSRs and observed the following results.

Table 3.4: Group 3 Sales Summary

Day	Customers	CSRs	Sales	Dialing Hrs.	SPH
1	1.56K	3	129	1	129
2	1.54K	3	131	1	131
3	1.49K	3	119	1	119
Total	4.59K	3	379	3	126
Average	1.53K	3	126	1	126

Customers= Number of contacts dialed, SPH=Sales per Hour

Figure 3.8: Results of applying K-Means algorithm on Group 3

Table 3.4 shows the real stats for Group 3 (Area Code & Age & Gender &

Sales Hour). If we look at these stats then
- Number of CSRs was constant
- Data utilization had been decreased

SPH results were positive Clustering helped us to increase the number of sales by utilizing less data with less number of CSRs. On day 3rd, data utilization was decreased by 4%. When we were using 1.56K data to generate SPH of 129, we utilized 1.49K data to get SPH of 119 on 3rd day.

Comparison of 3 Groups

If we compare the results of all three groups, we will have following results (based on average results of three groups).

Table 3.5: Comparison of Average Results of Group 1 ,2 and 3

	No. of Days	Customers	CSRs	Sales	Dialing Hrs.	SPH
Group 1	3	3.16K	5	159	1	159
Group 2	3	2.33K	5	169	1	169
Group 3	3	1.53K	3	126.33	1	126

Table 3.5 clearly shows that, in group 1 and 2, we utilized 5 CSRs and data utilization was 3.16K and 2.33K on average respectively. In group 3, we reduced the number of CSRs to 3 and they generated SPH of 126 by utilizing 1.53K data on average.
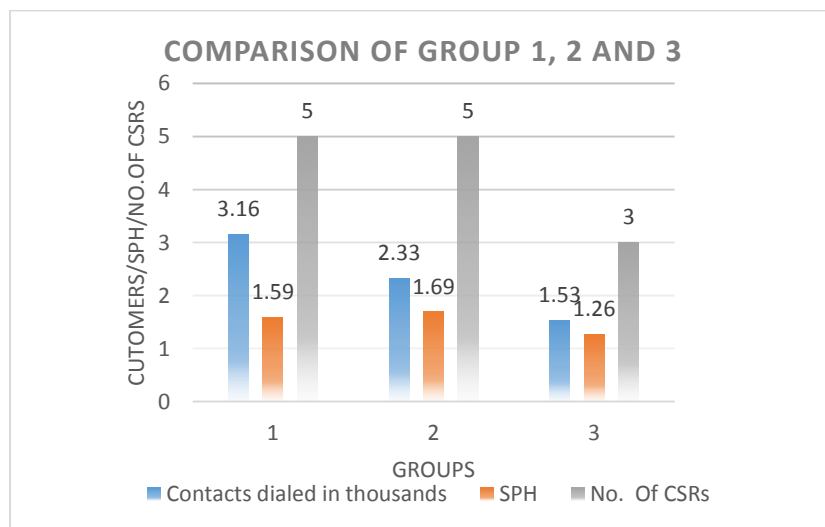

Figure 3.9: Comparison of Group 1, 2 and 3

Figure 3.9 shows that
- Data utilization has been decreased
- Number of CSRs has been reduced
- SPH has positive results

Thus clustering has helped us to increase the number of sales along with decreasing our expenses in terms of headcount and data utilization.

3.2.3   30 Days Activity

Activities performed on Group 1, 2 and 3 were for one state i.e. Texas. By looking at the results, we applied same strategy on all available states. We utilized our team for 30 days (10 days per group strategy) and monitored the results.

We performed the same activity on all states and monitored the results for 30 days. Here are the real stats of 10 days of dialing per strategy on Auto Insurance Campaign.

Table 3.6: Comparison of average results of 3 Groups (10 Days Stats)

Group	Data	Day	CSR	Sales	DHPD	HOC	SPH	SPA
1	25K	10	22	12654	9	1980	6.39	575
2	18K	10	17	11784	9	1530	7.7	693
3	10K	10	13	9573	9	1170	8.18	736

Customers= No of Contacts dialed
HOC= Hours on Calls =CSRs x Days x Dialing Hrs. per Day
DHPD=Dialing Hours per day
SPH=Sales per hour=Sales/Hours on calls
SPA=Sales per Agent=Sales/CSRs

Table 3.6 shows that strategy of group 3 is the most efficient because
- Data utilization has been decreased
- Headcount (No. of CSRs) has been decreased
- SPH has been increased

These results clearly shows that if we implement 3R (Right Data to Right CSR

at Right Time) then revenue can be increased and expenses (in term of data used and headcount) can be cut down.

3.3   Summary

3R can be summarized as follows.

1. Determine the best CSRs based on performance
2. Determine the best data based on data response
3. Determine the best time to dial by applying data mining (Clustering using K-Means)
4. Utilize the best data on top CSRs during the best time to dial
5. At the end of dialing day, use dialing data and repeat steps 1 to 4

3R can be used in any outbound call center and, based on the nature of campaign, if attributes to be used in clustering are well chosen then it will definitely increase the revenue on that campaign by reducing the expense.

Chapter 4

RESULTS

This chapter provides a comparison of Auto Insurance Campaign with and without 3R System.

4.1   Comparison

Before application of 3R, we were using (from June 2012 to May 2013) 439K contacts on 60 CSRs for 21 days to generate 14352 number of sales (Auto Insurance) on average. Our average revenue was $43,057 with average SPH of 1.07. Table 4.1 shows the detailed results of system from June 2012 to May 2013.

Table 4.1: System results without 3R

Month	Number of Dialed Contacts in Thousands	Days	CSRs	Sales	Dialing Hrs. Per Day	SPH	SPA	Rev	Cost	
Jun-12	465	21	65	15654	11	1.04	241	$ 46,962.00	$ 18,850.00	
Jul-12	490	22	63	14784	11	0.97	235	$ 44,352.00	$ 18,270.00	
Aug-12	455	23	65	15532	11	0.94	239	$ 46,596.00	$ 18,850.00	
Sep-12	512	21	60	14985	10	1.19	250	$ 44,955.00	$ 17,400.00	
Oct-12	515	23	61	15322	10	1.09	251	$ 45,966.00	$ 17,690.00	
Nov-12	430	22	63	15128	10	1.09	240	$ 45,384.00	$ 18,270.00	
Dec-12	350	20	62	12457	10	1.00	201	$ 37,371.00	$ 17,980.00	Without 3R
Jan-13	400	23	55	13574	10	1.07	247	$ 40,722.00	$ 15,950.00	
Feb-13	415	20	57	12651	10	1.11	222	$ 37,953.00	$ 16,530.00	
Mar-13	420	21	60	14442	10	1.15	241	$ 43,326.00	$ 17,400.00	
Apr-13	405	22	58	14487	10	1.14	250	$ 43,461.00	$ 16,820.00	
May13	415	23	55	13214	10	1.04	240	$ 39,642.00	$ 15,950.00	
Avg	**439**	**22**	**60**	**14352**	**10**	**1.07**	**238**	**$ 43,057.50**	**$ 17,496.67**	

 In June 2013, we implemented 3R and utilized 500K contacts on 45 CSRs for 20 days to generate 24386 sales. Our revenue for June 2013 was $73,158 on auto insurance campaign with SPH of 3.01. Our cost on this campaign was $13,050 in June 2013 where SPA in June 2013 was 542. This was our first full month of 3R and results were very positive.

In July 2013, we utilized 287K contacts on 38 CSRs for 23 days to generate 31127 sales. Our revenue for July 2013 was $93,381 on auto insurance campaign with SPH of 3.96. In July 2013, our cost was reduced to $11,020 and SPA was increased to 819. These results were amazing and 3R was really a difference maker.

Table 4.2 shows the system results from June 2013 to Dec 2013.

Table 4.2: System results with 3R

Month	Number of Dialed Contacts in Thousands	Days	CSRs	Sales	Dialing Hrs. Per Day	SPH	SPA	Rev	Cost	
Jun-13	500	20	45	24386	9	3.01	542	$ 73,158.00	$ 13,050.00	
Jul-13	287	23	38	31127	9	3.96	819	$ 93,381.00	$ 11,020.00	
Aug-13	317	22	33	28514	9	4.36	864	$ 85,542.00	$ 9,570.00	
Sep-13	315	21	30	27654	9	4.88	922	$ 82,962.00	$ 8,700.00	**3R in Place**
Oct-13	290	23	25	28153	9	5.44	1126	$ 84,459.00	$ 7,250.00	
Nov-13	275	21	25	27938	9	5.91	1118	$ 83,814.00	$ 7,250.00	
Dec-13	250	19	22	23574	9	6.27	1072	$ 70,722.00	$ 6,380.00	
Avg	**319**	**21**	**31**	**27335**	**9**	**4.83**	**923**	**$ 82,005.43**	**$ 9,031.43**	

If we compare the average results of system with and without CSR, we have following observations.
- Average number of dialed contacts in a month was reduced from 439K to 319K
- Number of CSRs dialing on auto campaign was reduced from 60 to 31.
- Our average sales had been increased from 14352 to 27335.
- Average dialing hours per days had been reduced from 10 to 9.
- Average SPH had jumped to 4.83 from 1.07
- SPA was increased to 923 from 238
- Our average monthly revenue on campaign had jumped from $43,057 to $82,005
- Our cost on campaign had been reduced to $9031 from $17,496

These were amazing results and was a clear proof of the fact that if we start utilizing dialing data intelligently then we can increase the revenue by decreasing expenses.

Figure 4.1 shows the comparison (From June 2012 to Dec 2013) of Data Utilization, Revenue Generated and Cost of Campaign on Auto Insurance Campaign. This comparison shows us the difference that 3R has made in the existing setup.

From June-12 to May-13, 3R was not part of system. 3R was in place from June-13 to Dec-13. Figure 4.1, Table 4.3 and Figure 4.2 shows the comparison of system with and without 3R. Considering SPH as a benchmark, the difference that 3R made can be seen in these results.
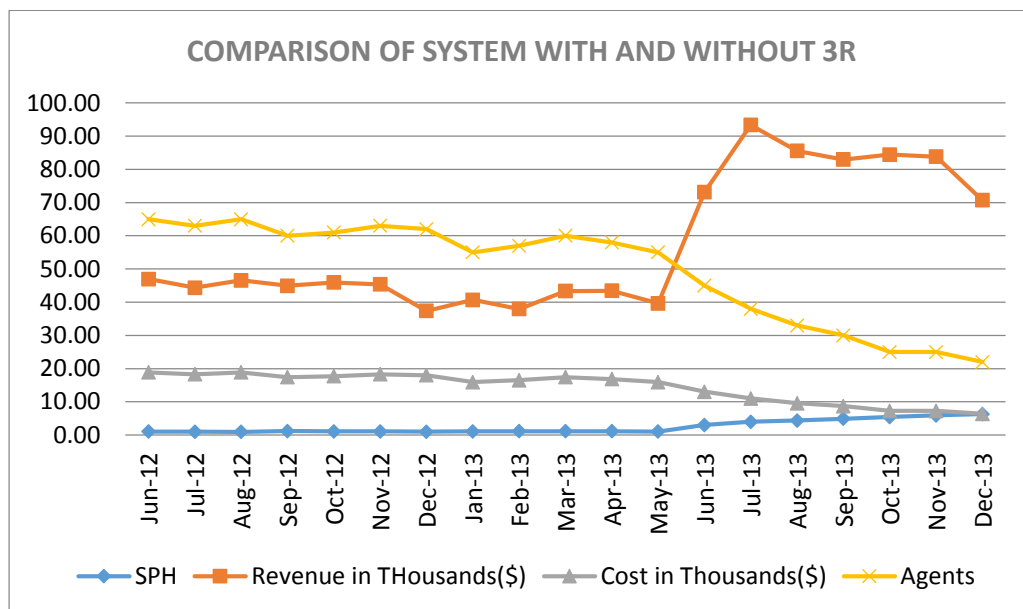

Figure 4.1: Month wise Comparison of System with and without 3R

Table 4.1 and Figure 4.1 show that when 3R was not implemented (from June 2012 to May 2013), following were the results
- Average revenue generated is $40.06 thousand.
- Average Cost is $17.5 thousand
- Average SPH is 1.07
- Number of CSRs is 60

Table 4.3: Comparison of system with and without 3R (Average Results)

	Duration	SPH	Revenue in Thousands($)	Cost in Thousands($)	CSRs	
Average Results	June 12-May 13	1.07	43.06	17.50	60	Without 3R
	June 13 - Dec 13	4.83	82.01	9.03	31	With 3R

When 3R was implemented (from June 2013 to Dec 2013), following were the results
- Average revenue generated is $82.01 thousand.
- Average Cost is $9.07 thousand
- Average SPH is 4.83
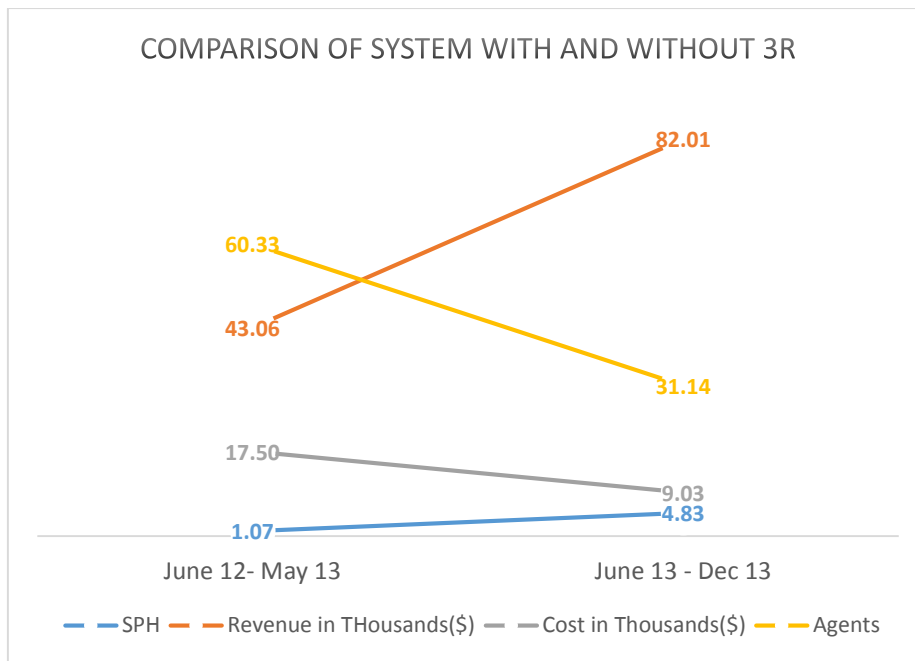- Number of CSRs is 31

Figure 4.2: Comparison of System with and without 3R

Table 4.1, Figure 4.3 shows that when 3R was implemented then
- Cost has been decreased by 48%
- Revenue has been increased by 90.45%
- SPH has been increased by 351%
- Number of CSRs has been reduced by 48.3%

Chapter 5

CONCLUSION AND FUTURE WORK

In this chapter short conclusion is presented. It also describes future prospects in this research work.

5.1   Conclusion

By implementing concept of 3R, we have solved an industrial problem by practically increasing the revenue of one of the well-known call centers of Islamabad. All this implementation was done on Auto Insurance Campaign and based on the results, we have got approval to implement this system companywide.

By using 3R (Right Data to Right CSR at Right Time), company has gained following benefits.
1. Purchasing new data has been reduced
2. By utilizing available data based on 3R, less head count is required to achieve targets
3. Revenue has been increased and expenditure has been reduced in terms of data purchasing and CSRs.
4. Improved performance monitoring has resulted in better plans on the floor
5. CSR's compensation has been increased in terms of bonuses and base salary

In this research work we presented the idea of using data intelligently in outbound call centers to increase the revenue along with decreasing the

expense. Based on this idea, automated system can be built in future. In that system, if steps proposed in our solution of analyzing data and applying filters can be automated then companies can have a system in hand which will design smart dialing strategies for them to increase the revenue by utilizing minimum resources in term of data, headcount and dialing time.

5.2   Future Work

- Enterprise Solution can be developed for Call Centers
- This system will automatically take input from multiple systems and provide efficient dialing strategy to increase production by utilizing minimum resources available

System will apply different clustering algorithms to come up with most efficient dialing strategy.
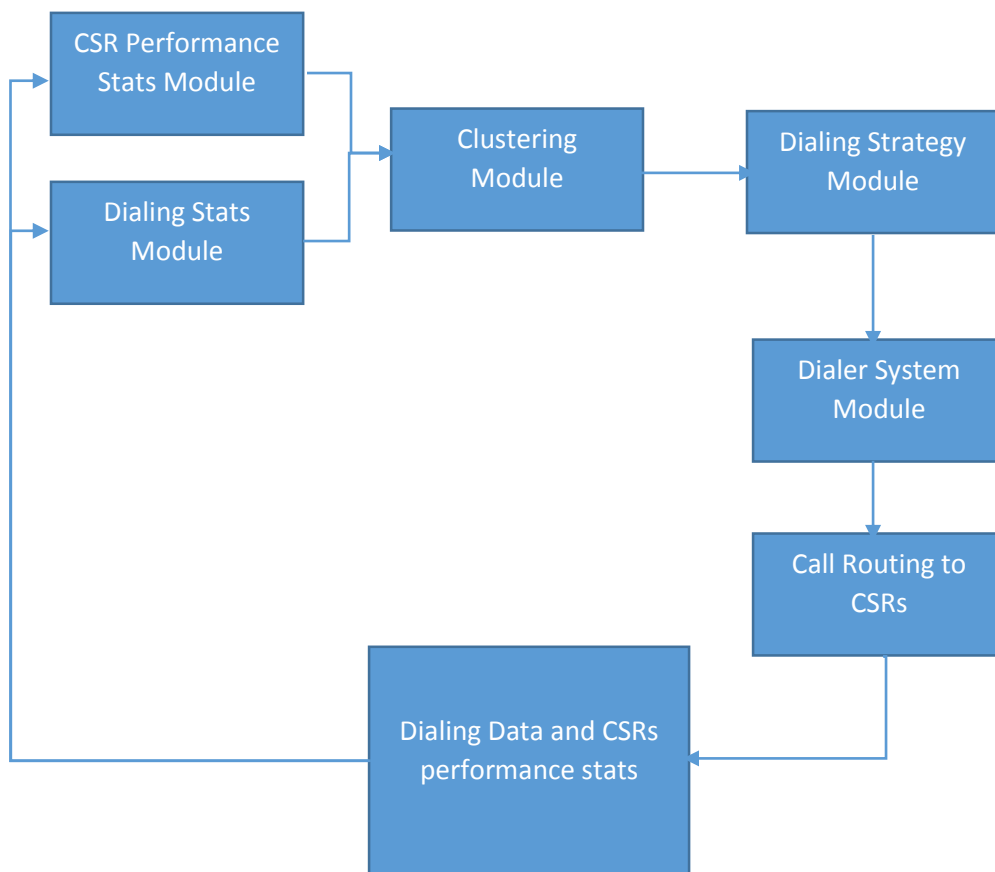
Following is the proposed model of this system.

Figure 5.1: Proposed Model of Future System

Proposed Process:

1. CSRs' performance will be captured through Performance Monitoring Module
2. Dialing Stats will be captured through Dialing Stats Module
3. Both the stats will be used in Clustering module where system will apply different clustering algorithms to come up with best dialing strategy. 3R will be used as basis for designing dialing strategy.
4. Dialing strategy will be passed to Dialer System Module which will route the calls to CSRs on the basis of dialing strategy
5. CRM will be used to capture both CSRs' performance stats and dialing stats
6. These stats will be used as input to clustering module
7. Steps 3 to 6 will be repeated

This is just an overview of our proposed solution. Each module can be discussed in greater detail. This solution can be made customizable so that it can work for any type of campaign in outbound call center. This is a big project and requires lot of effort. Based on our idea, call center in Islamabad has approved this project and have started hiring.

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