Business KPIs Analysis Using Visual Basics

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Abstract*: Moving from network-oriented towards customers and service- oriented operations is vital in order to improve business KPIs. In this project we will attempt to create a code/algorithm via machine learning (VBA) to test the KPIs and weed out the troublesome sites from a network's traffic data dump spanning over a month. We will cover voice and data traffic of all the technologies- 2G, 3G, FDD-LTE and TDD-LTE. This will help identify the problematic sites thus addressing the customer's problems. Once the identified sites are dealt with, the overall CEI increases. Integrating CEM efforts throughout the organization in MSPs is imperative in order to provide superior telecom services and to manage churn.

Index Terms*: MSP (Mobile Service Provider), KPI (Key Performance Indicator), CEI (Customer Experience Indicator), CEM (Customer Experience Management), QOE (Quality of Experience).

I. INTRODUCTION

The telecom division is experiencing significant change and is confronting a few exceptional difficulties. Almost every individual uses a smart phone in this era. Mobile Service Providers (MSPs) are facing a surge in the number of mobile phones and applications. There is a huge traffic demand. Likewise, trends in customer service expectations are changing. Customers are educated and well informed now. They can look over a wide exhibit of operators and can rapidly and effectively alter their opinions. Cell phones are utilized not just for communication, but also additionally as a business and amusement gateways, profitability devices, and generally life coordinators. Customers utilize new complex applications that are being released day by day. Every one of these applications uses various conventions, segments, transcoding strategies and passages to give a reliable service to the end users, [1]. This incorporates a simple communication with the company and a pleasant collaboration.

II. CURRENT SCENARIO IN INDIA

India is presently the world's second-biggest telecommunications market with a subscriber base of 1.17 billion and has enrolled solid development in the previous decade and half.

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The Indian mobile economy is developing quickly and will contribute considerably to India's Gross Domestic Product (GDP), as indicated by report arranged by GSM Association (GSMA) in collaboration with the Boston Consulting Group (BCG). Application downloads in the nation grew roughly 215 percent in the range of 2015 and 2017. With daily increasing subscriber base, Indian telecom sector is experiencing certain difficulties regarding upholding the quality of the network. Market share of the telecom network is given in figure 1.

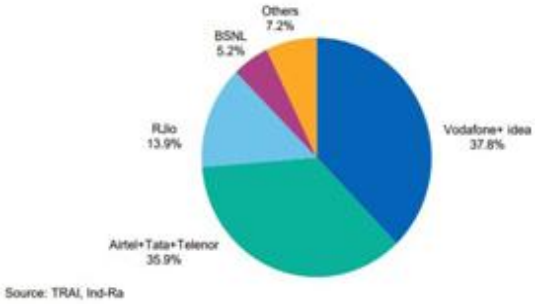

Fig. 1 Market Share

Network capabilities and good overall network performance are without doubt critical preconditions for progress among MSPs. However, MSPs will think that it is difficult to compete simply based on these characteristics, since it is progressively evident that the service empowering mobile systems will turn into a commodity, with numerous networks seeking system sharing commitment for better effectiveness. A service operations centre (SOC) monitors end-to-end services, empowering MSPs to take actions dependent on their impact on administrations and the client experience, [2].

III. MANAGING CUSTOMER EXPERIENCE

The Customer Experience Management (CEM) approach is intended to concentrate on techniques and a system to fulfil the network quality needs of each customer, [3]. Telecom operators are concentrating on answers to boost the customer experience on both audio and video levels. MSPs need to begin viewing the system from the perspective of the quality of services conveyed to the customer. CEM solutions basically provide a service quality monitoring architecture to manage and optimize end-to-end customer experience. Good CEM solutions can reinforce brand preference, increase revenue with increasing sales from existing customers and new sales, improve customer loyalty, lower costs by reducing churn, [4].

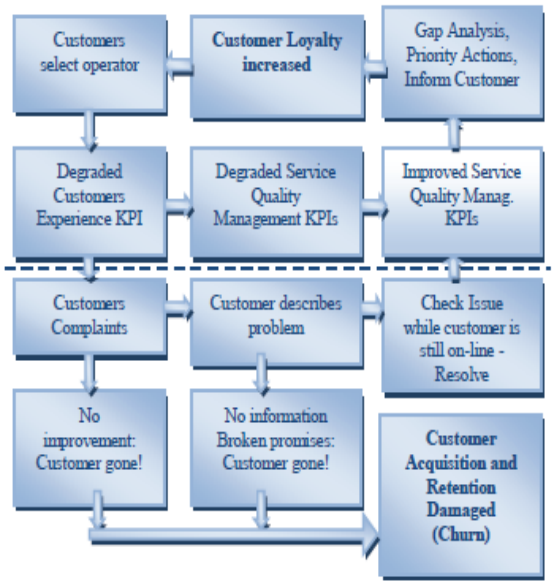

Fig. 2 The CEM process

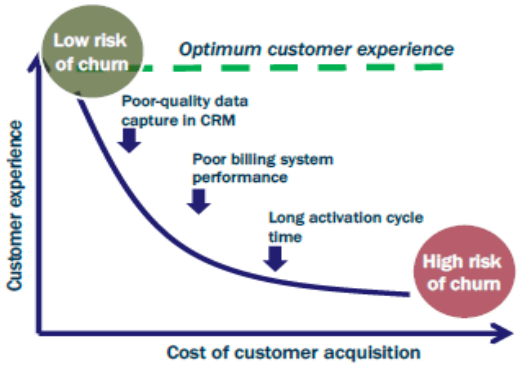

Fig. 3 Relationship between customer experience, cost and churn

IV. QUALITY OF EXPERIENCE MANAGEMENT

Quality of Service or QoS is focused towards estimating and controlling the network parameters. It has been recognized for quite a while that this isn't sufficient. In addition to the fact that it is imperative to comprehend what is really displayed to the user when an error occurs, it is vital to see how it influences the human experience. This has driven the meaning of Quality of Experience or QoE, as an idea that also incorporates the experience of the user, when utilizing a service, [5]. In layman terms, QoE is the measure of customer satisfaction levels with a service. User-friendliness, efficiency, reliability, privacy, cost, security are some of the major factors that affect QoE, [6]. QoE is one of the most important factors to perform a real time evaluation of user experience.

With client focused operations and management (OAM), more significance is given to client's QoE, [7]. All OAM assets are fixated on improving client experience. QoE management is progressively being viewed as the core of network OAM. Good OAM has customarily implied smooth network activity; now it is being viewed as good client experience. The guiding principle of network OAM is real time monitoring of QoE, assessing operator QoS, and taking measures to fix faults and recover services, [8].

Table. 1 The difference between customer oriented and traditional network oriented OAM

	Network Oriented OAM	Customer Oriented OAM
Orientation	Equipment or network oriented	End-to-end service or customer oriented
Focus	Network performance and fault	QoE
Assessment	KPI dominated	CEI—>KQI—>KPI
Analysis	Bottom-up approach	Top-down approach

V. TOWARDS CUSTOMER SERVICE ASSURANCE

In order to analyze the performance of the system, we consider certain network performance metrics such as Key Performance Indicators (KPIs), [9]. Key Performance Indicators (KPI) are a measure of effective network performance and its quality. With developing client base and constant expansion of capacity and coverage sites, MSPs need to consistently monitor the KPIs of their system to evaluate service quality.

Designing an appropriate KPI Framework for a telecom administrator could turn out to be a challenging assignment. The KPIs selected should allow benchmarking. This is to allow comparison with those of the competitors as well as to track the evolution of QoS, [10]. The KPIs should give a clear comprehension of the present state of the network's business. KPIs should be broken down properly into classifications, when dealing with multiple technologies. The resulting analytics should be as clear as possible for the users. It is essential to observe the evolution of the KPIs to survey the degradation or improvement of business performance. There are several KPI metrics:

- Business KPI
- Financial KPI
- Marketing KPI
- Sales KPI
- Agency KPI
- HR KPI
- Retail KPI
- Project Management KPI

In this paper, we will focus on business KPIs by considering technology-wise voice dip, technology-wise data dip, combined voice dip, combined data dip to identify dips in the traffic.

VI. BUSINESS KPIS ANALYSIS TOOL

Here, we are analyzing the business KPIs of Idea Cellular Ltd, one of the biggest network service providers in India. Idea Cellular, AP&T Circle has 10000 2G, 3G, FDD-LTE, TDD-LTE and mMIMO sites. Each site has 2-6 sectors each of the above mentioned technologies. Idea also has different vendors with 2G, FDD-LTE and TDD-LTE being from Nokia and 3G and TDD-LTE Massive MIMO being from Huawei.

These sites have to process a very high amount of traffic which poses a challenge in maintaining the quality of the network.

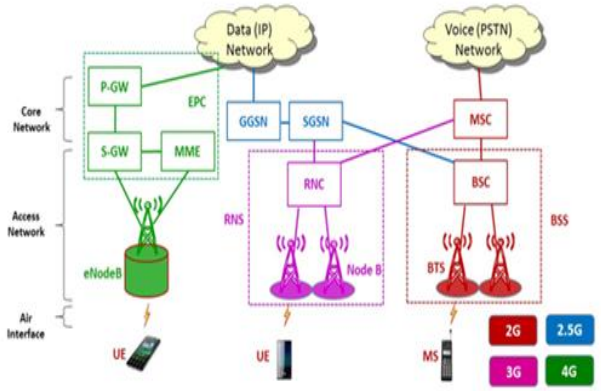

Fig. 4 2G, 3G, 4G Network Architecture

The following table gives an idea of the vast number of sites belonging to various technologies that need to be analyzed and monitored.

Table. 2 Site types

Type	Site Count
2G	xxxx
2G+3G	xxx
2G+3G+4G	xxxx
2G+3G+4G+mMIMO	x
2G+3G+4G+TDD	xxx
2G+3G+4G+TDD+mMIMO	x
2G+4G	Xxx
3G	Xxx
3G+4G	Xxx
3G+4G+TDD	x
4G	xxx
Total Physical Locations	xxxxx

The tool we have designed aims to analyze the entire network at once and identify the problematic sites.

There are several iterations to this project. First, developed a dynamic chart which displays the traffic trend of the entire network or any site that is selected in the combo box. This allows the user to get a better idea of how the traffic is and to identify dips in the graph. We can select the criteria ie., the traffic trends of the technologies that we want to be represented in the graph. The graph is completely dynamic. It changes according to the site and criteria chosen which makes it very user friendly.

Proceeded to develop a macro that displays site Ids along with site type, minimums, maximums, weekly averages, zeros, voice dips and data dips for a sample of 20 sites. Identified locked sites. The raw data is taken from the sheets Physical Verification, 2G-Data, 2G-Voice, 3G-Data, 4G-Data where Physical Verification is the sheet containing all the site Ids, their types and locations. The rest contain daily traffic of the sites. The thresholds based on which the dips are identified are taken from the "thresholds" sheet. Updated the database with recent traffic, made changes in the code and ran the macro for all 10000 odd sites. Here, the runtime was observed to be very large – 10.5 hours.

Recoded the macro ie., created a more feasible version to display only those sites where combined voice dips and/or combined data dips occurred. Also added the ability to add or delete sheets that need to be analyzed, thus making it more dynamic and user friendly. This feature can be utilized in the "Configuration" sheet.

Table. 3 Configuration

Voice Configurations			
Sheet Name	Description	Absolute Threshold	% Threshold
-	Combined	-100	-20%
2GV	2G (900) Voice (Erl)	-100	-20%
3GV	3G (2100) Voice (Erl)	-100	-20%
FDDVoLTE	FDD (1800) Voice (Erl)	-100	-20%
TDDVoLTE	TDD (2500) Voice (Erl)	-100	-20%
Data Configurations			
Sheet Name	Description	Absolute Threshold	% Threshold
-	Combined	-25600	-20%
2GD	2G (900) Data (MB)	-25600	-20%
3GD	3G (2100) Data (MB)	-25600	-20%
FDDD	FDD (1800) Data (MB)	-25600	-20%
TDDD	TDD (2500) Data (MB)	-25600	-20%
mMIMO	mMIMO (2500) Data (MB)	-25600	-20%

Optimized the code to reduce the runtime drastically – from 10.5 hours to 4-5 minutes

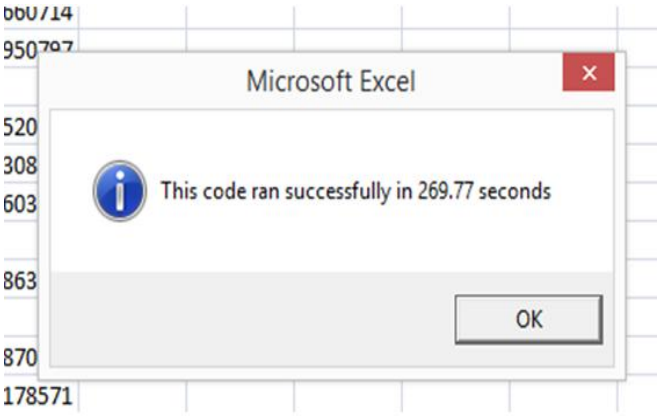

Fig. 5 Runtime

Further developed the weekly macro to identify individual voice and data dips. The dips in each of the technologies greater than the specified thresholds in the "Configuration" sheet are displayed. Furthermore built the algorithm to analyze the traffic daily and identified individual voice dips and data dips.

Interfaced the obtained results with the dynamic chart. The database is the last 14 days traffic of the problematic sites identified by the macro. Users are also given the ability to choose to display only their chosen traffic trends. A selection box has been placed under the graph which allows to user to select the technologies whose trends they wish to display – 2GV, 2GD, 3GV, 3GD, FDD and TDD. The database of the chart automatically gets updated as one updates the raw data files containing the day to day traffic of the sites. This identifies new problematic sites once the macro runs thereby updating the chart's database on its own.

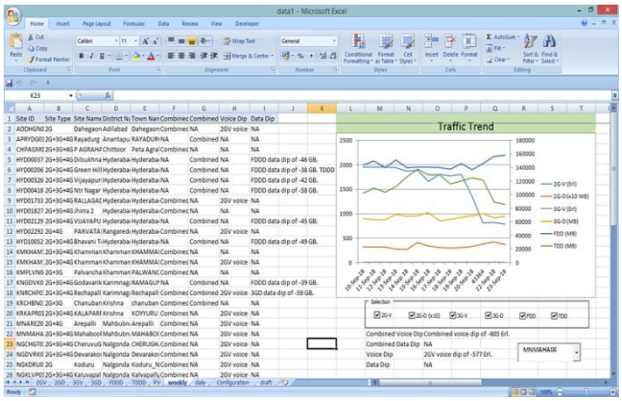

Fig. 6 Weekly output

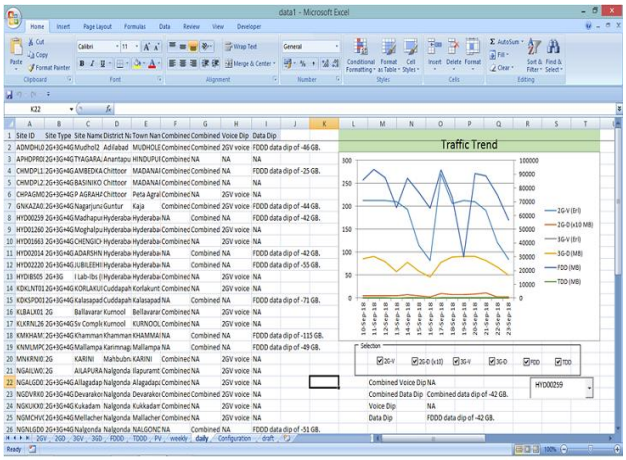

Fig. 7 Daily output

VII. CONCLUSION

MSPs are moving from network-oriented towards customers and service- oriented operations. In order to improve the customer service it is vital to monitor the performance metrics of the network. In this paper we developed weekly and daily macros in VBA to test the KPIs and weed out the troublesome sites from a network's traffic data dump spanning over a month which covers voice and data traffic of all the technologies- 2G, 3G, FDD-LTE and TDD-LTE. This helps identify the problematic sites thus addressing the customer's problems. Once the identified sites are dealt with, the overall CEI increases. Integrating CEM efforts throughout the organization in MSPs is imperative in order to provide superior telecom services and to manage churn.

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