Contact Centre Forecasting using Prediction Methodologies

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Abstract- Forecasting is a process of predicting or estimating the future based on past and present data. Forecasting provides information about the future events and their consequences for the organization. It may not reduce the complications and doubt of the future [1]. But it increases the confidence of the management to make important decisions. Forecasting is the basis of assumption. Forecasting uses many statistical techniques.
Therefore, it is also called as statistical analysis. In virtually every decision executives make, consider some kind of forecast such as sound predictions of demands and trends are no longer affluence items, but a necessity, if managers are to cope with seasonality, sudden changes in demand levels, and price-cutting action of the competition, strikes, and large swings of the economy [2]. Forecasting can help them to deal with these troubles; but it can benefit them more, the more they know about the general principles of forecasting, what it can and can't do for them currently, and which techniques are suited to their needs of the moment. This explain the potential of forecasting to managers, focusing special attention call to forecasting. Also included is a rundown of forecasting techniques. Predict tool is developed for call center forecasting which decide workload and efficient use of resources and future planning.

Index Terms- Forecasting; Moving Average; LOB; Seasonality Index.

1. INTRODUCTION

Accurate forecasting is crucial to successfully managing your contact centre. In order to meet call demand and avoid under or over-staffing, you required the methods that precisely predicts how many agent are needed to handle the centre call volume, and also those methods that help you to "re-calculate" if the call volume fluctuates more than anticipated[1].

There are multiple methods which is used for forecasting contact call volumes. Like simple average, moving average, time series method.
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2. WHAT DETERMINES ACCURATE FORECASTING?

Providing the required accuracy, by taking into account all the historic and future dynamics [2], requires a sophisticated forecasting tool. Singly no accepted methodology is optimal for all circumstances however, all below four factors should be taken into consideration:-

2.1 *Correlated forecasting*

Only the most sophisticated, refined systems can perform correlated forecasting that is, forecasting for specific events such as catalogue drops or other marketing events that cause wide variation in the volume of calls that must be processed.

2.2 *Integrated approach to support multi-skilled issues*

It is necessary to have forecasting algorithms that directly measures requirements in a multi-skilled environment, while prevent repetitive analytical simulations [3]. A single forecasted set of requirements should be calculated for all inter-woven skilled activities, regardless of the type of work being offered, such as chat, email etc. Recognizing secondary skills and accounting for call overflow to available secondarily skilled agents (CSP) will help eliminate overstaffing [2]. Forecasts that are based solely on primary skills will generally overstaff, since overflow can't be considered as a factor.

2.3 *Collecting enough historical data*

It is imperative to maintain the detailed data for past few years in order to produce an accurate forecast. Many workforce scheduling systems can use only last 16 weeks of historical inbound calls data to generate a forecast [3], and most fail to gather information on billing cycles, marketing campaigns or other variables that can affect call volume.

2.4 *Algorithms that include curve mapping and pattern recognition*

In variable environments, Historical Trend Analysis is the only way to ensure about proper hiring. It is the

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methodology that can incorporate complex historical trends in its calculations [3]. Without pattern matching to predict customer behaviour for different events, the risk of over- or understaffing increases dramatically. Historical trend analysis also determine pattern recognition for special events, days like promotional mailings, holiday, special day Each time an event reoccurs, then forecasted volume is adjusted to reflect the increase or decline in in call volume, based on historical occurrences[4]. The scheduling tool should be able to assign agents to multiple skills during the day or interval, each skill (line of business) associated with different queues, where each queue represents a skill set.

2.5 *Wrong forecasting fore casting effects*

If the forecasted calls distribution of work is incorrect (more or less), both situation cause business loss and may be both of these situations could occur within the same day.

Justification for the cost of a good forecasting system:-
- Average Revenue per Call x Abandoned Calls = Lost revenue
There are 2 simple effects of getting the forecast wrong they are:-

2.5.1 *Forecasting too high*

- Too many agents get roistered.
- Low agent occupancy.
- Low occupancy leads to agents getting bored and distracted.
- Which will lowers agent morale and quality of work.
- Costing your company money.

2.5.2 *Forecasting too low*

- Too few agents are scheduled.
- Contributing to poor customer service, long waiting times.
- Agents get overworked and frustrated.
- Resulting in low morale and poor quality work leading to
- High number of callers abandon – possibly find author option to go elsewhere; which means lost business, and costing your company money

The amount of lost revenue through caller's calls abandoning can be important, particularly in a sales environment. Consider that the average revenue generated per sales call and then multiply this by the number of abandoned calls you recorded for last month. The answer would probably specify the cost of a good forecasting tool on its own.

3. PROPOSED SYTEM

3.1 *Contact centre forecasting using combination of prediction methodology*

Existing search sate that till now many of the technique is developed for forecasting like Simple average, simple moving average, weighted moving average, Linear prediction.

In Proposed system user will forecast by using combination of current trend and moving average along with seasonal index of data.

3.2 *Simple moving averages (SMA)*

In applications a simple moving average (SMA) is the unweight mean of the previous N data. However, in science and engineering mathematics the mean is normally taken from an equal number of data point on either side of a central value [5].This guarantee that variations in the mean are closely related with the fluctuation in the data rather than being shifted in time [4]. An example of a simple equally weighted running mean for all n-day sample of closing price is the mean of the all previous n days' closing prices.

Example:-

Daily closing price:-20, 21, 22, 23, 24, 25
First day of 4-day SMA= (20+21+22+23)/4=21.5
Second day of 4-day SMA= (21+22+23+24)/4=22.5
Third day of 4-day SMA= (22+23+24+25)/4=23.5

3.3 *Weighted moving average*

A weighted average is an average that has multiplying factors (dependency) to give different weights to data point at different positions in the sample window. Mathematically, the moving average is the convolution of the action points with a fixed weighting function [4]. An application is removing pixelisation from a digital graphical image. In technical analysis of any financial data, a weighted moving average (WMA) has the specific meaning and dependency of weights that decrease in arithmetical progression. In an n-day WMA the latest day has weight n, the second latest n − 1, etc., down to one.

Example:-
For a 5-day weighted moving average the Sum of Days is 1+2+3+4+5 = 15. The weighting is shown in below table:-

Day	1	2	3	4	5
Price ($)	26	27	27	20	27
Weighting	=1/15	=2/15	=3/15	=4/15	=5/15

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Weighted value	1.7	3.6	5.4	5.3	9
5 Day WMA					25.06

Let's take example of moving average method for forecasting of day 1-Feb-16 it will take all last 4 Sunday's calls and take average of it below will be the data for any financial bank. (Refer Table 1 given below)

Date	Day	Calls
4-Jan-16	Monday	10000
11-Jan-16	Monday	8000
18-Jan-16	Monday	9000
25-Jan-16	Monday	10200
	Sum=	37200
1-Feb-16	Sum/n=	37200/4
	For. calls=	9300

Table 1

3.4 Drawbacks in existing method

If we are considering financial data for bank, Bank is having more number of calls at start of month and at the end of month for financial activity of workers payment (salary) so obviously on 31-Jan-2016 calls will be more than 9500 and now in above solution we will derived wrong forecast.

3.5 How proposed system will solve issue

Proposed system will consider latest data for processing so that we will consider current market trend and forecasting should be accurate according to current situation.
And also we will consider week of the month and day of week also.
We will take same example which is already taken for calculating forecast of 1-Feb-16.

Date	Day	Calls	Day of Month
4-Jan-16	Monday	10000	1st Monday
7-Dec-15	Monday	9500	1st Monday
2-Nov-15	Monday	10500	1st Monday
	Sum=	**30000**	
1-Feb-16	Sum/n=	30000/3	1st Monday
	F. calls=	**10000**	

-In above case bank is having more number of calls at month start and end week as all financial deals, payment are done at month end.
-We will consider only last 3 month data so that all data will be consider as per current trend and using

latest data for consideration i.e. data will not be as dead data.

3.6 How algorithms works

3.6 .1 Calculate yearly and monthly data

We will use simple moving average method for forecasting monthly data for which we will use last 3 year data.
We will take percent (%) of distribution of moth with year for last 3 year.
I.e. if any line of business (LOB) is having 120000 call yearly.
And in January LOB get 109580 calls then month distribution will be= (9966/109580)*100=9.09%
Now for forecasting of month we will consider % distribution for same month in last three year and take average of % distribution and this will be forecast for month.
For forecasting yearly and monthly we are using last year and same month's last 3 years data so that we will consider seasonality index automatically with data. Also we will take prevention so that user can edit data in exceptional case for any month or year depend on business situation.
(Refer Table 2 for yearly and monthly forecast is shown at the end of this paper).

3.6 .2 Day wise distribution

After deciding month wise data user will define day wise data and then weekly data.
We will not forecast week wise data because seasonality index of data is not depend on weekly in most of the business scenario.
Still we will keep facility to select the user his method and can compare data with another method by using charts and take decision whatever method he is familiar an suitable.

4. ADVANTAGES

1. Implementation of method is simple and algorithmic. Complex system in analytics is creating problems for user i.e. they look that solution is more complex than problem.

2. System will take consideration of seasonality index so that derived data from past data will be dynamic and actually realistic.

3. System will help management to take the actual decision immediately as all result and comparison can be done online.

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5. CONCLUSION

The proposed system will solve the current issue in contact center forecasting which is currently depend on desktop, excel application also system will give benefit of 24/7 system make it will be transparent for business.

6. SCOPE FOR FURTHER DEVELOPMENT

May be some of the business is fully dynamic and not stable i.e. (may not depend on last year's data) for that this methods may not be implementable and user have to write his own modification as this is generic method.

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Year	2013	% Of dist	2014	% Of dist	2015	% Of dist	dist. AVG	2016
Calls	109580		125628		138115			155093
Month								
JAN	9966	9.095	11559	9.201	13324	9.647	9.314	14445.7
FEB	9392	8.571	12917	10.28	13840	10.02	9.624	14926.9
MAR	10333	9.43	12547	9.987	13503	9.777	9.731	15092.4
APR	7687	7.015	10746	8.554	11399	8.253	7.941	12315.4
MAY	7500	6.844	10020	7.976	10614	7.685	7.502	11634.6
JUN	9659	8.815	10679	8.5	11372	8.234	8.516	13208.1
JUL	10241	9.346	9150	7.283	10980	7.95	8.193	12706.7
AUG	7399	6.752	9114	7.255	10299	7.457	7.155	11096.2
SEP	9723	8.873	9419	7.498	10211	7.393	7.921	12285.2
OCT	7076	6.457	9013	7.174	11936	8.642	7.425	11515
NOV	9861	8.999	10934	8.703	10220	7.4	8.367	12977.1
DEC	10743	9.804	9530	7.586	10417	7.542	8.311	12889.2
Call Increment %			14.645		9.93966		12.29	

Table 2:-Year and monthly forecast (dark colour is derived from faint colour blank colour is actual past year data used for processing)