A Forecasting Case for TeleTech Customer Care Management Phils., Inc.

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Abstract: This study seeks to produce forecasts that would help TeleTech Customer Care Management Phils., Inc.-Makati manage its human resources well for the year 2014. Specifically, to address the problem of determining the inbound calls the company would need to handle for the year 2014 by use of a suitable quantitative model in Statistical Forecasting. In doing so, the company would be able to produce sound forecasts of the distribution of calls per hour, per day, and per week on a monthly basis for the year 2014 and provide empirical basis for allocating its human resource to handle the daily inbound calls of the company; providing for an efficient operational performance.

Implementing the forecast model, it can be observed that the total number of inbound calls the company is receiving on an annual basis is gradually decreasing from year 1 to year 5, with only a very small discrepancy of increase in year 3. This particular pattern of declining number of calls allows for the model of least squares method to be used with the resulting year 6 forecast figure to be 12,225,384 calls; an expected lower figure from year 5 of 12,504,447 calls (actual) – a 2.23% decrease. The average gap or variance for years 1 to 5 is 0.000158 or a percentage error of only 0.016%; a very acceptable margin for the forecast computation on year 6 (2014), to be highly reliable and significant.

Keywords: Forecasting, TeleTech

1. INTRODUCTION

1.1 Background

The forecasting of future demand for services is very important in production planning and control, as is forecasting demand for finished products; this is because good forecasting is essential to an efficient manufacturing and service operations. According to Diebold (2008), Forecasting is the use of historic data to determine the direction of future trends. Forecasting is used by companies to determine how to allocate their resources for an upcoming period of time. This is typically based on demand for the goods and services it offers, compared to the cost of producing them. In simpler terms, forecasting is concerned with determining what the future will look like, so as to aid managers in coming up with the most cost-efficient and effective decision-making strategies to manage the resources of the company in-line with achieving its objectives.

This is also true for call center companies and in managing their resources, especially its human resource in handling thousands of customer calls on a daily basis. The importance of being able to forecast the number of calls on a daily scale, and more so, on an hourly basis, would be highly useful for call center companies to know for managing their human resources well.

Such is the case for TeleTech Customer Care Management Phils., Inc. The company is a call center that handles inbound calls from different parts of the world. It is the Philippine subsidiary of TeleTech Holdings, Inc. a global business process outsourcing company that provides strategy consulting, technologies, and services for customer experience management. The Philippine subsidiary is engaged in customer care, talent support, sales advisory services, and technical support among many others for its industry partners in healthcare, retail sales, finance, and communications (TeleTech, 2014).

This paper aims to present an optimum forecasting solution for TeleTech Customer Care Management Phils., Inc.-Makati so as to aid management in the proper allocation of its human resources to satisfy the demands of its clients and meet the company's objectives. This paper will also complement studies on forecasting, in specific, determining a suitable and appropriate forecasting method to be used for a call center company.

1.2 Statement of the Problem & Objectives

In the narrow sense, this paper seeks to produce forecasts that would help TeleTech Customer Care Management Phils., Inc.-Makatimanage it's human resources well for the year 2014. In the broader sense, the objective is to improve organizational performance—more revenue, more profit, increased customer satisfaction as better forecasts, by themselves, are of no inherent value if those forecasts are ignored by management or otherwise not used to improve organizational performance.

In essence, the paper would ike to specifically address the problem of determining the inbound calls TeleTech Customer Care Management Phils., Inc.-Makati would need to handle for the year 2014 by use of a suitable quantitative forecasting model applicable to the variables involved in the call center company. In doing so, this study would be able to meet its objective of producing sound forecasts of the distribution of calls per hour, per day, and

per week on a monthly basis for the year 2014 based on empirical evidence and careful study for the benefit and use of the company.

1.3 Significance of the Study

The output of this paper can be of great assistance to the company being studied in terms of providing empirical basis for managing its human resource to handle the daily inbound callsTeleTech Customer Care Management Phils., Inc.-Makati would receive for 2014 based on the forecast output that will be produced. In the academic landscape, this paper will complement forecasting theories and be of added literature to call center-related forecasting case studies. Furthermore, this study can serve as added insight to better understand the rigorous call-service demand nature of call center companies by focusing our lenses on one such company in TeleTech Customer Care Management Phils., Inc.-Makati.

1.4 Scope and Limitation

This paper will examine the 5-year inbound calls received by TeleTech Customer Care Management Phils., Inc.-Makati for the years 2009-2013 to be used as historical data and basis of computing the forecast of inbound calls for 2014 on an hourly, daily, weekly, and monthly basis. The paper would use a quantitative forecasting model in determining the output required and will focus on the number of calls received regardless of the type of service rendered or the industry of the customer/s involved.

The study does not aim to tackle at length all the aspects of forecasting in a call center industry but only those of which are related to the course of this research and seeks not to generalize the output of the study for all call center-related companies nor serve as a main basis for business process outsourcing-related forecasting studies. It only supplements, at most, what other forecasting cases have already proven related to call centers. This undertaking only depicts the inbound calls received by TeleTech Customer Care Management Phil., Inc.-Makati and only this main variable will be considered in determining the forecast objective of this paper; certain management issues and other related factors will not be considered. The data acquired in this study was from an inside company source and is strictly confidential and can only be used in the fulfillment of this academic endeavor.

2. REVIEW OF RELATED LITERATURE

2.1Forecasting: Statistical Forecasting and the Least-Squares Method

As previously discussed, forecasting is the use of historic data to determine the direction of future trends. It is used by companies to determine how to allocate their resources for an upcoming period of time (Diebold, 2008). In relation, statistical forecasting concentrates on using the past to predict the future by identifying trends, patterns and business drives within the data to develop a forecast. This forecast is referred to as a statistical forecast because it uses mathematical formulas to identify the patterns and trends while testing the results for mathematical reasonableness and confidence. (Galt, 2004)

Among the component factors in statistical forecasting used to make intermediate and long-term forecasts are trends. These patterns in a time series are essential factors to determine the future outcome or the forecast based on the historic data. A graphical plot is constructed to get a visual impression of the overall long-term movements in a time series; and if a straight-line trend adequately fits the data, the Linear Trend model of forecasting or the Least-Square Method is used (Berenson, Levine, and Krehbiel, 2011).

Least Square Method is a statistical method for finding a line or curve the line of best fit that best represents a correspondence between two measured quantities (e.g., height and weight of a group of college students). When the measurements are plotted as points on a graph and seem to fall near the same line, the least squares method is best to be used to determine the best-fitting line. The method uses calculus techniques to find the minimum of the sum of the squares of the vertical distances of each data point from the proposed line. More generally, the process is called regression or, when the fitted curve is a line, a linear regression (Britannica, 2014). Applying it to forecasting, this linear trend model is expressed and calculated with the formula: y = a + bx. The method computes for the sample slope, b, and the sample y intercept, a. We substitute then the values for x into the equation to predict y (Berenson et al., 2011). The y-intercept, or a, is solved using the equation: $a = \bar{y}$ - b$\bar{x}$. While b is solved using the equation:

$$b = \frac{\mathrm{cov}(x,y)}{\mathrm{var}(x)} = \frac{SC(x,y)}{SS(x)} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

See Research Findings for the complete equation process.

2.2 TeleTech Customer Care Management Phils., Inc.

TeleTech Customer Care Management Phils., Inc. is a call center company that handles inbound calls from different parts of the world. It is the Philippine subsidiary of TeleTech Holdings, Inc. a global business process outsourcing company headquartered in Englewood, Colorado, that provides strategy consulting, technologies, and services for customer experience management. The Philippine subsidiary is engaged in customer care, talent support, sales advisory services, and technical support among many others for its industry partners in healthcare, retail sales, finance, government, automotive, travel, and communications. Formed in 1982, TeleTech Holdings, Inc has grown to be a leader in the field of customer experience management globally and Business Process Outsourcing in the Philippines. As of August 2012, the main company has been operating in 24 countries, with a total of 58 call centers (TeleTech, 2014).TeleTech Customer Care Management Phils., Inc. maintains 15,000 employees for Philippine operations and provides a full range of front- to back-office outsourced solutions with operations in over 18 countries and on nearly every continent. It manages over 3.5 million interactions in over 29 languages.

The Philippine subsidiary has branches mostly all over the Luzon island in the Philippines with the Makati branch among the first to be established in the country and serves major clients of the company worldwide. The branch operates 24 hours with three 8-hour shifting schedules ready to assist global clients on a regular daily basis. Technical support and health-related industries are the primary clients handled by the Makati hub (TeleTech, 2014).

3. FRAMEWORK OF THE STUDY

3.1 Theoretical and Operational Framework

The theoretical framework that is used for the study is the Input-Process-Output (IPO) model. Based on the IPO model, the process is presented as a series of elements connected together as like an inflow to outflow or as an input to output. Information or material objects flow through a series of activities based on a set of rules or decision points (Harris & Taylor, 1997). What goes in is the input; what causes the modification is the process; then what comes out is the output. The IPO model will provide the general structure and guide for the direction of the study.

The inputs of the study are the Forecasting concept of Linear Squares Method as well as the primary data of number of inbound calls received by the company for a 5-year span. Under the process box will be the analysis of this forecasting concept through the related literature and the scrutiny of the model as conducted in the previous chapter. The inbound calls data will be analyzed using linear regression or the least squares method calculated with the formula: y = a + bx, to produce the 2014 forecast requirements. The output of the study will be the conclusions based on the results of the regression analysis.

3.2 Operational Definition of Terms

Forecasting is the use of historic data to determine the direction of future trends. It is used by companies to determine how to allocate their resources for an upcoming period of time (Diebold, 2008).

Least Square Method is a statistical method for finding a line or curve the line of best fit that best represents a correspondence between two measured quantities. It is synonymous and similar to the Linear Trend Model of Forecasting and The Linear Regression Model.

Inbound calls pertain to the number of calls received by the company on an hourly basis, 24/7 (24 hours a day, 7 days a week), for the last 5 years. For confidentiality purposes, the nature of the calls and client information has been removed.

4. METHODOLOGY

4.1 Sampling Plan

The historical data of inbound calls for TeleTech Customer Care Management Phils., Inc-Makati came from an internal source in the firm. The data reflect the typical number of calls received by the company on a 24-hours hourly to weekly basis (for the entire 7 days a week), obtained from the Automatic Call Distributor (ACD) database. All weeks follow almost the same pattern. Files are official records kept for a monthly period from 2009 to 2013, or a 5-year span. Note that client detail information has been removed for confidentiality purposes. The nature and classification of the calls were also removed as per request of the official from the company.

4.2 Method of Data Analysis

It is reasonable to assume a uniform distribution of calls per week in a certain month (each month of course comprising of 4 weeks) coming from the pattern given by the ACD on a weekly basis. Call handling time ranges from ½ minute to 3 minutes while wrap-up time takes 30 seconds on the average. With this information, it is logical to see that a common trend is present in the number of inbound calls received per week, which is why the Least Squares Method would be the suitable model to use in forecasting case.

5. RESEARCH FINDINGS

For a better understanding and appreciation of the research findings and the logic behind the forecast computation, a step-by-step process of solving for the statistical forecast is presented:

Step 1 – Compute the total number of calls received for Year 1 (2009) through Year 5 (2013).

	Year 1	Year 2	Year 3	Year 4	Year 5
January	972,000	928,000	905,070	850,766	832,664
February	856,920	942,612	959,250	901,695	882,510
March	886,410	975,051	930,731	874,887	856,273
April	764,250	856,345	833,100	783,114	766,452
May	1,140,870	937,829	1,329,000	1,249,260	1,222,680
June	1,254,000	1,176,493	1,235,879	1,161,726	1,137,009
July	1,503,600	1,653,960	1,585,680	1,490,539	1,458,826
August	1,239,000	1,362,900	1,300,950	1,034,564	1,196,874
September	1,276,500	1,436,270	1,106,640	1,040,242	1,018,109
October	1,296,000	1,139,240	1,452,820	1,240,593	1,359,484
November	1,447,500	1,239,053	1,325,020	1,423,904	1,219,018
December	1,204,700	827,402	602,770	734,029	554,548
Total	13,841,750	13,475,155	13,566,910	12,785,319	12,504,447

Except for what may seem to be an aberration (increase in number of calls received from Year 2 through Year 3), there was in general, a **steady decline** in annual number of calls received from Year 1 through Year 5.

Given this trend, we will need to apply least-squares method to support our projected number of calls received for Year 6 (2014).

Step 2 – Of the given data, we utilize the time period (Years 1 through 5) as independent variable (x) and the number of calls received for Years 1 through 5 as dependent variable (y).

To complete the least squares trend equation, we derive the following inputs: **Σx**, **Σy**, **Σx²**, **Σxy** and **n**.

Year	Time Period (x)	Number of Calls Received for the Year (y)	x^2	xy
1	1	13,841,750	1	13,841,750
2	2	13,475,155	4	26,950,310
3	3	13,566,910	9	40,700,730
4	4	12,785,319	16	51,141,276
5	5	12,504,447	25	62,522,235
Total	15	66,173,581	55	195,156,301
Average	3	13,234,716		

From the table above, we gather that **Σx** = 15, **Σy** = 66,173,581, **Σx²** = 55,
Σxy = 195,156,301, and **n** = 5.

Step 3 – Compute for the average of the x-values (x bar) and average of the y-values (y bar).

x bar = $\Sigma \mathbf{x}/n$ = 15/5 = 3
y bar = $\Sigma \mathbf{y}/n$ = 66,173,581/5 = 13,234,716

Step 4 – Compute for the slope of the regression line (b).

b = $(\Sigma \mathbf{xy} - \mathbf{n}(\mathbf{xbar})(\mathbf{ybar}))/(\Sigma \mathbf{x}\text{^}\mathbf{2} - \mathbf{n}(\mathbf{x\ bar})\text{^}\mathbf{2})$
b = $(\mathbf{195,156,301} - \mathbf{5}(\mathbf{3})(\mathbf{13,234,716}))/(\mathbf{55} - \mathbf{5}(\mathbf{3})\text{^}\mathbf{2})$
b = $(\mathbf{195,156,301} - (\mathbf{15})(\mathbf{13,234,716}))/(\mathbf{55} - \mathbf{5}(\mathbf{9}))$
b = $(\mathbf{195,156,301} - \mathbf{198,520,740})/(\mathbf{55} - \mathbf{45})$
b = $-\mathbf{3,364,439}/(\mathbf{10})$
b = $-\mathbf{336,443.9}$

The fact that b is equal to **-336,443.9** (*or in the negative*) only means that there was indeed a declining trend in number of calls received over the five (5) year period in review.

Step 5 – Compute for the y-axis intercept (a).

a = $(\mathbf{ybar}) - \mathbf{b}(\mathbf{xbar})$
a = $(\mathbf{13,234,716}) - ((-\mathbf{336,443.9})(\mathbf{3}))$
a = $(\mathbf{13,234,716}) - (-\mathbf{1,009,331.7})$
a = $\mathbf{14,244,047.7}$

Step 6 – Construct the least squares trend equation $\mathbf{y_F} = \mathbf{a} + \mathbf{bx}$, where y_F is the projected number of calls received. Thus, we get

$\mathbf{y_F} = \mathbf{a} + \mathbf{bx}$
$\mathbf{y_F} = \mathbf{14,244,047.7} + (-\mathbf{336,443.9})(\mathbf{x})$

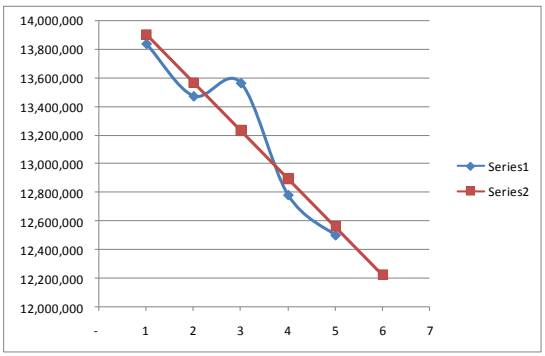
The table below summarizes the variance between the actual and projected number of calls received from Year 1(2009) through Year 5 (2013). Note that the total variance is zero (0).

Year	Time Period (x)	Number of Calls Received for the Year (y)	Forecast using least squares trend equation	Variance
1	1	13,841,750	13,907,604	(65,854)
2	2	13,475,155	13,571,160	(96,005)
3	3	13,566,910	13,234,716	332,194
4	4	12,785,319	12,898,272	(112,953)
5	5	12,504,447	12,561,828	(57,381)
	Total	66,173,581	66,173,580	0

Step 7 – Using the least squares trend equation derived in Step 6, we compute the projected number of calls received for Year 6 ($\mathbf{y_{6F}}$), or for 2014.

$\mathbf{y_{6F}} = \mathbf{a} + \mathbf{bx}$
$\mathbf{y_{6F}} = \mathbf{14,244,047.7} + (-\mathbf{336,443.9})(\mathbf{6})$
$\mathbf{y_{6F}} = \mathbf{14,244,047.7} + (-\mathbf{2,018,663.4})$
$\mathbf{y_{6F}} = \mathbf{12,225,384.3}$

The image below shows the graph of actual and projected number of calls received from Year 1 through Year 6.



Time Period (x)	Number of Calls Received for the Year (y) -- **Series 1**	Forecast using least squares trend equation -- **Series 2**
1	13,841,750	13,907,604
2	13,475,155	13,571,160
3	13,566,910	13,234,716
4	12,785,319	12,898,272
5	12,504,447	12,561,828
6		12,225,384

The gaps or variances between the two series from year 1 to year 5 are as follow: 0.00475, 0.00712, -0.02449, 0.00883, and 0.00458. The average gap is 0.000158, or a percentage error of only 0.016% (a very acceptable margin).

Step 8 – Compute the seasonal indexes using actual monthly demands for Year 1 through Year 5 and then, use these (seasonal indexes) to determine forecasted monthly demand for Year 6.

Month	Average Demand from Year 1 through Year 5	Average Monthly Demand	Seasonal Index	Forecasted Average Monthly Demand (Year 6)	Forecasted Monthly Demand (Year 6)
January	897,700	1,102,893	0.814	1,018,782	829,238
February	908,597	1,102,893	0.824	1,018,782	839,304
March	904,670	1,102,893	0.820	1,018,782	835,677
April	800,652	1,102,893	0.726	1,018,782	739,591
May	1,175,928	1,102,893	1.066	1,018,782	1,086,247
June	1,193,021	1,102,893	1.082	1,018,782	1,102,037
July	1,538,521	1,102,893	1.395	1,018,782	1,421,187
August	1,226,858	1,102,893	1.112	1,018,782	1,133,293
September	1,175,552	1,102,893	1.066	1,018,782	1,085,900
October	1,297,627	1,102,893	1.177	1,018,782	1,198,665
November	1,330,899	1,102,893	1.207	1,018,782	1,229,399
December	784,690	1,102,893	0.711	1,018,782	724,846
Total	13,234,716	13,234,716		12,225,384	12,225,384

Step 9 – Compute the forecasted weekly demand for each month of Year 6. The case assumes that a month consists of 4 weeks.

Month	Forecasted Average Monthly Demand (Year 6)	Forecasted Monthly Demand (Year 6)	Number of Weeks in a Month	Forecasted Weekly Demand (Year 6)
January	1,018,782	829,238	4	207,309
February	1,018,782	839,304	4	209,826
March	1,018,782	835,677	4	208,919
April	1,018,782	739,591	4	184,898
May	1,018,782	1,086,247	4	271,562
June	1,018,782	1,102,037	4	275,509
July	1,018,782	1,421,187	4	355,297
August	1,018,782	1,133,293	4	283,323
September	1,018,782	1,085,900	4	271,475
October	1,018,782	1,198,665	4	299,666
November	1,018,782	1,229,399	4	307,350
December	1,018,782	724,846	4	181,212
Total	12,225,384	12,225,384		

Step 10 – Convert the data provided in Table 1 into a distribution table which we will then, use to compute the forecasted number of calls per hour per day per week for each month of Year 6.

This approach is justified by the fact that the company provides the following information:

- All weeks follow almost the same pattern.
- It is reasonable to assume a uniform distribution of calls per week in a certain month.

Summary of results can be obtained from the author, detailing the 2014 (Year 6) inbound calls forecast for TeleTech Customer Care Management Phils., Inc-Makati for an hourly, daily, and weekly basis per month, from January 2014 to December 2014.

6. CONCLUSION and RECOMMENDATION

It can be observed that the total number of inbound calls the company is receiving on an annual basis is gradually decreasing from year 1 to year 5, with only a very small discrepancy of increase in year 3. This particular pattern of declining number of calls allows for the model of least squares method to be used with the resulting year 6 forecast figure to be 12,225,384 calls; an expected lower figure from year 5 of 12,504,447 calls (actual) – a 2.23% decrease. The average gap or variance for years 1 to 5 is 0.000158 or a percentage error of only 0.016%; a very acceptable margin for the forecast computation on year 6 (2014), to be highly reliable and significant. In support of the computed forecasts is the discussion on the Least Squares Method in calculating for linear trend highlighted in the review of literature. The model used is clearly the suitable method to be implemented due to the statistical pattern or trend of the data of inbound calls.

Overall, the concern on specifically addressing the problem of determining the inbound calls TeleTech Customer Care Management Phils., Inc.-Makati would need to handle for the year 2014 by use of a suitable quantitative forecasting model was met. This study was also able to meet its objective of producing sound forecasts of the distribution of calls per hour, per day, and per week on a monthly basis for the year 2014 based on empirical evidence and careful statistical forecasting. Further recommendation regarding this case would be on how to objectively and properly allocate the resources of the company in handling the forecasted number of inbound calls so as to be truly cost-efficient and effective in meeting the demands of its clients. This should cover particularly the shifting schedule of its current human resource to manage soundly the inbound calls to be received as well as proper logistics/equipment allocation for the employees of the company to meet the demands of its clients. In addition, being able to classify the nature of inbound calls received would be of great complement to this study so as to match well the competency of the employees to that of the required service from the clients. It would also be good to revisit this study after 2014 to see whether the forecasted numbers were satisfactory and to investigate the cause of the declining number of inbound calls received by the organization so as to be able to address this issue.

7. REFERENCES

Berenson, M., Levine, D., and Krehbiel, T. (2011). Basic Business Statistics (12th Ed.) Pearson. ISBN: 10: 0132168383

Britannica (2014). Encyclopedia Britannica: Least Squares Method. [Electronic Version]. Retrieved from http://www.britannica.com/EBchecked/topic/334063/least-squares-approximation

Diebold, F. (2008). Elements of Forecasting (4thEd.). South Western, Mason, OH. ISBN:10: 0-324-35904-6

Galt, John (2004). The Forecast Xperts: Glossary. John Galt University. Retrieved from: http://www.johngalt.com/statistical_forecasting.shtml

Harris, R. and Taylor, T.J. (1997). Landmarks in Linguistic Thought 1: The Western Tradition from Socrates to Saussure. 2nd edition. London / New York: Routledge; 1-19

TeleTech Customer Care Management Phils., Inc. (2014) Teletech Company Profile. Retrieved from: http://www.teletech.com