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Optimizing Customer Care Centre Performance: A Data Analytics Approach

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Abstract

Customer care centres are essential in today's competitive corporate environment for ensuring client loyalty and satisfaction. By utilizing data analytics approaches, one may gain important insights regarding performance overall, operational effectiveness, and customer interactions. Data analytics encompasses the analysing, interpretation, and extraction of valuable insights from data to aid decision-making and address intricate issues. Call centre analytics is the process of gathering and evaluating call data to assist companies in prioritizing their clients by offering a highly customized experience and exceeding their own targets for growth. This study covers the concepts of data analytics in customer care centre analysis data. The study presents an introduction to data analytics, its approaches, steps and applications. Then it clearly exhibits the overview of the problem, the challenges faced during solving it, followed by the data preparation and methodology used to solve the customer care centre challenges. Real time data is collected from the company which consists customer care data. The descriptive statistical approach involves summarizing and describing the key characteristics of a dataset. It includes the organization, summarization, and presentation of data in a meaningful manner to offer insights into the features of call centre data. A dashboard is created with different perspectives such as reason analysis, sentiment analysis and response time analysis. The detailed result analysis is presented in the graph format for better understanding. MS-Excel is used to analyse the data. It exhibits the results and insights from the problem solved. Dashboards provide for quick access to data, which facilitates improved decision-making. It is employed for data tracking, analysis, and presentation.

Keywords: Data analytics, exploratory data analysis, customer care analysis, dashboard analysis, statistical data analysis, descriptive data analysis

INTRODUCTION TO DATA ANALYTICS

Data is generally raw pieces of information that simply includes basic numbers or text. Analysing raw data to convert basic facts and numbers into targeted actions is known as data analytics. The goal is to assist people and businesses in making better choices and obtaining greater success [1].

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DATA ANALYTICS APPROACHES

Descriptive Analytics

This method involves searching for patterns, trends, and links in historical data through analysis. Descriptive analytics is used to summarize and characterize historical data and offers insights into what has occurred in the past [2].

Example: Patient data can be summarized to identify common health issues. For example, most of the people get the flu from October to June.

Diagnostic Analytics

Its purpose is to determine the underlying source of a problem or issue.

Example: In case of cyber threat, it is used to identify the source of a security breach and prevent future attacks [3].

Predictive Analytics

It involves using statistical models and algorithms to predict future trends and to identify opportunities and risks.

Example: Predictive analytics may be used in the medical field to identify people who are at risk of developing a specific disease [4].

Prescriptive Analytics

This strategy makes use of algorithms to determine the optimal course of action based on the anticipated results of various scenarios.

Example: Using Ref. maps on Google during peak hours to get routes [5].

Each of these strategies has advantages and disadvantages of its own, and the best strategy depends on the particular business issue or query being addressed. Organizations may obtain a more thorough knowledge of their data and make better decisions by combining these methods [6].

Steps of Data Analytics

The process of data analytics consists of the following steps [7, 8]:

1. *Defining the question:* Establishing the goal is the initial stage in any data analytics process. This is frequently referred to as the "problem statement" in data analytics terminology. Creating a hypothesis and determining how to test it are necessary steps in defining the goal.
2. *Collecting the data:* After defining the objective, the next step is to collect and segregate data. The information may be qualitative (descriptive), such as customer reviews, or quantitative (numeric), such as sales numbers.
3. All data fit into one of the three categories [8]:
    i. *First party data:* The data that is directly collected from customers by us or the company. Example: Customer satisfaction surveys.
    ii. *Second party data:* It is the primary data of other organizations. This may be obtained through a private marketplace or straight from the firm. For instance, an app or website.
    iii. *Third-party data:* Information gathered and combined by a third-party entity from many sources. For instance, Gartner.
4. *Cleaning the data:* This can be done by removing major errors, duplicates, outliers and removing unwanted data points. Then bringing a structure to the data and filling the major gaps.
5. *Analysing the data:* It can be done through descriptive, diagnostic, predictive and prescriptive analysis.
6. *Sharing results:* The final step of data analytics is to share the insights with the world. The insights must be 100% clear and unambiguous along with the evidence. In this process, honest and open communication is crucial.
7. *Embracing failures:* Accepting failures is the final stage. Errors happen in data analysis since it is by nature chaotic. Therefore, accepting failure as a necessary first step on the path to success.
8. *Summary:* All of the key phases in the data analytics process up until this point. These fundamental procedures can be modified, rearranged, and used again as needed [8].

Applications of Data Analytics

Data analytics can have variety of applications in different fields [9, 10].

1. Customer care centre:
    - Analytics in customer service centres gives agents objective insights on their interactions with customers, which helps them perform better. Analytics increases sales by seeing trends

in consumer behaviour and giving agents the knowledge they need to interact more personally with consumers and sustain high rates as a consequence.
- It helps in increasing customer's satisfaction and track agents process in real time.

2. *Security:* It uses data analytics to identify previous, ongoing and future occurrences of crime or security attacks.
3. *Risk Management:* It is a major concern of insurance sector. Insurance companies may obtain information on claims, actuarial, and risk data using data analytics.
4. *Customer Interactions:* It is about insurance. Different populations prefer different modes of communication. Insurers may enhance the customer experience by using demographic information and feedback based on consumer behaviour and insights.
5. *Education:* Data from students may be gathered to enhance the curriculum, and this data can be used to make better long-term management decisions and resource allocation.
6. *Marketing and data advertising:* Data analytics is a tool used by marketers to better understand their audience and improve engagement rates. Analytics are used by advertising experts to find information about the preferences, age, gender, and other characteristics of the audience. Professionals employ data analytics to find patterns and create content for long-term engagement in order to attain high conversation rates.
7. *Travel:* Data analytics may examine social media data to show the preferences and needs of various clients [10].

Betul *et al.* discussed the difficulties of keeping monitoring on and evaluating call centre agent call logs. They used text mining and big data analytics to evaluate all recorded conversations and gauge the effectiveness of the agents [11]. The author transcribed audio recordings using text mining techniques to determine the speakers' emotions [12]. Based on performance data actually gathered in a large insurance company's call centres, the authors used well-known data mining techniques (like hybrid decision trees and neural networks), multi-layered perceptrons, probabilistic neural networks, support vector machines, classification and regression trees, and linear neural networks) to deal with the problem of predicting the quality of service in call centres [13].

OVERVIEW OF THE PROBLEM

Problem Study

Analysing the customer care centre data of the month October 2020. A customer care centre consists of a group of customer service representatives that answer calls from clients and assist them with their questions. People working in a customer care centre are called as Customer Service Representative (CSR). A CSR is a person who handles incoming or outgoing customer calls in the organization.

Customer Care Centre Working

First a customer makes a call and the interaction begins. They can use an app or product that is connected to make calls straight to the care centre. Interactive voice response prompts the consumer when they get in touch with the call centre (IVR). This technology allows callers to transition from a live call to a text message, recorded answers to frequently asked queries, and routes consumers to the appropriate agent. The correspondent agent gathers information on the client before resolving their issue, having already directed them to the appropriate agent. They will then enquire about the problems the clients are having. Throughout the interaction they must keep a good attitude and follow the call centre etiquette to make the customer feel valued, satisfied and to end up the interaction in a positive way. Sometimes an agent might be unable to solve the problem in one call. In that case they will follow-up with more information. If the problem is solved in one call, then they can ask the customers for a customer satisfaction survey. Through this survey, feedback can be gained and it helps greatly in business and can gain a credit point for the agent also [14]. The main study on the data is studying about the sentiments, satisfaction level, channel of calling, the main reason of the call of the customers towards the customer care centre.

Challenges of the Study

Challenges

The main challenge that was faced during the study revolves around the cleaning and altering of data in a huge data set. While receiving the raw data set, it was noticed that the category of the columns is different, for example a date column was under a general category etc. So, analysing each column was a bit challenging but it is interesting to do. It helps in gaining more and new knowledge.

Objectives

1. Identify the call day analysis on daily basis of October month.
2. Find the channel that people prefer to contact the most.
3. Find the state that holds highest number of enquiries.
4. Find the reason that people contact the most.
5. Identify the category in which the people interact the most in accordance with SLA.
6. Identify which call centre gets more calls.
7. To find the highest sentiment in accordance with response time.
8. Identify which channel has highest records in accordance with sentiment.
9. Forecast sheet analysis on call duration in minutes.

DATA PREPARATION

Data Collection

The data is examined for the month of October 2020. Data analysis indicates that the data is comprised up of US customer service records. The data set comprises of 12 columns and 32,942 rows (including header). This data set consists of 9 descriptive columns, 2 numeric (numbered) columns and 1 date column. The data set is collected by approaching the Deep space technology which is a start-up company which is located at Gandhi Nagar, Tirupur. It has domains at website development, website apps. The data set had been taken from the website 'https://medium.com/@Armonia1999/data-analysis-project-excel-dashboard-10c6160f2dbe' which is provided by the company.

Data Method

Data scientists utilize exploratory data analysis (EDA) to examine and evaluate data sets and enumerate their primary attributes, frequently utilizing techniques for data visualization. Data scientists may find trends, identify anomalies, test hypotheses, and verify assumptions more easily when they know how to effectively manipulate data sources to acquire the answers they need. EDA is mostly used to examine data before drawing any conclusions. It can assist in detecting obvious mistakes, better understanding data trends, and identifying outliers or unusual occurrences.

Exploratory Data Analysis Types

1. *Univariate non-graphical:* With only one variable in the data, it is the most basic type of data analysis. It deals just with one variable and does not address relationships or causation. The primary goal is to characterize the data and identify any patterns that may be there.
2. *Univariate graphical:* A complete image of the data is not possible using non-graphical approaches. Graphical approaches are needed in these situations. It is possible to employ graphic tools like box plots and histograms.
3. *Multivariate nongraphical:* It is the result of several factors. By using statistics, it often demonstrates the relationship between two or more data variables.
4. *Multivariate graphical:* Relationships between two or more pieces of data are displayed graphically [15].

In this data set, the pivot table, pivot charts (from insert) and forecast sheet (from data) is used for analysing. Pivot table was created by Pito Salas in 1986. This concept came from Lotus Software (Lotus Development Corporation). This data set falls under Multivariate nongraphical (forecast sheet) and Univariate graphical (all the other analysis falls under this category) [16].

Purpose of Data

In today's global market place, many companies have turned to a customer care centre model to assist, streamline and maximize customer services and sales needs at scale. An ideal call centre must find the optimal balance between caring and resources, with one eye on delivering exceptional assistance and the other on efficiency. The main purpose of the customer care centre data set is to find the day that received highest calls, the channel that receives most calls, the state from which most calls are enquired, major reason for calling, response time category under which people fall, the customer centre that received most inquiries, sentiment of interaction and their satisfaction level within the response time, the channel which people contact the most along with the sentiments can be found. A forecast sheet can be done for numeric columns. Here, call duration in minutes is a numeric column without any null values. So, forecast sheet can be done for call duration in minutes and values can be predicted using its average.

METHODOLOGY

descriptive Analysis and Method

ID vs. Call Day Analysis

- STEP 01: The columns Id and call day are taken as input.
- STEP 02: The columns are processed and analysed using Cross tabulation (pivot) table.
- STEP 03: Pivot table has many names such as cross tabulation, data summarization table, multidimensional analysis table, summary table, dynamic table, tabular analysis tool, spreadsheet analysis tool etc.
- STEP 04: From the analysis it is found that on day 21, 1170 calls were received and it is the highest number of calls received.

ID vs. Channel Analysis

- STEP 01: The columns Id and Channel are taken as input.
- STEP 02: The cross-tabulation table (pivot table) is used for analysis.
- STEP 03: After processing, it is found that the call centre channel receives most calls.

ID vs. State Analysis

- STEP 01: The columns Id and State are selected for the analysis.
- STEP 02: The cross tabulation (pivot table) is used for analysis.
- STEP 03: After processing, it is found that California holds the highest number of enquiries.

ID vs. Reason Analysis

- STEP 01: The columns that are selected are Id and Reason.
- STEP 02: The cross tabulation (pivot table) is used for analysis.
- STEP 03: After processing, the main reason why people called are of billing question.

ID vs. Response Time Analysis

- STEP 01: Select the columns Id and Response time.
- STEP 02: The analysis is done using cross tabulation (pivot table).
- STEP 03: After processing, the output states that mostly interactions fall within SLA (Service Level Agreement).

Call Centre in Cities Analysis

- STEP 01: Select the call centre column.
- STEP 02: The analysis is done using Cross tabulation (pivot table).
- STEP 03: After processing, it is found that call centres present in Los Angeles received most inquiries.

Sentiment vs. Response Time Analysis

- STEP 01: Select columns Sentiment and Response time as input.
- STEP 02: The analysis is done using Cross tabulation (pivot table).
- STEP 03: From the analysis, it is found that the negative sentiments from the customers are higher in above, below and within SLA.

Sentiment vs. Channel Analysis

- STEP 01: The column Sentiment and Channel are taken as input.
- STEP 02: For analysis, cross tabulation (pivot table) is used.
- STEP 03: From the analysis above, it is found that call centres have the highest records and negative sentiments are higher.

Statistical Analysis Method

It focuses on making predictions on a larger data set based on a sample of those data. From the data of Call timestamp and Call duration in minutes of October 2020, the data of the next 8 days, that is, from 01/11/2020 to 08/11/2020 the call duration in minutes is shown in the Figure 1 and is predicted using forecast sheet from data tab.

- STEP 01: The data of call duration in minutes is taken.
- STEP 02: It is processed using forecasting sheet which is in data tab is shown in the Figure 2.
- STEP 03: The output found is that call duration in minutes is found for the first 8 days of September 2020 using the average of call duration in minutes and it shown in the Figure 3.

RESULTS, FINDING INSIGHTS AND DISCUSSION

Analysed Based on How Many Ids Called in Each Day on the Month October

The call day analysis is done using cross tabulation (pivot table) by selecting the columns Id and call day. It is found that on day-21, 1170 calls were received and it is the highest number of calls received. It is shown in the Figure 4.

Analysed Based on the Number of Id's Called to Each Channel

The Channel analysis is done using cross tabulation (pivot table) using the columns Id and Channel. It is shown in the Figure 5 and in Table 1. It is found that Call Centre holds the highest number of call records.

Analysed and Segregated Based on Id's Called from Each State

The State analysis is done using cross tabulation tool with the column Id, State. It is found that California holds the highest number of enquiries. It is shown in the Figure 6.

Analysed Based on The Reason of Calling

The analysis is done using cross tabulation. The column Customer Id and Reason are taken for analysis. It is shown in the Figure 7 and in Table 2. It is found that people call mostly for the reason of billing question.

Analysed and Segregated the Ids Based on the Response Time

The analysis is done using cross tabulation. The columns Id and response time are selected for the analysis. The above analysis shows that most of the people call are in within SLA category (SLA: Service Level Agreement). It is shown in the Figure 8 and in Table 3.

Analysis Based on Call Centres Available in Cities

The analysis is done using cross tabulation. The column selected is Call Centre. The output found is that the call centres present in Los Angeles received most inquiries. It is shown in the Figure 9 and in Table 4.

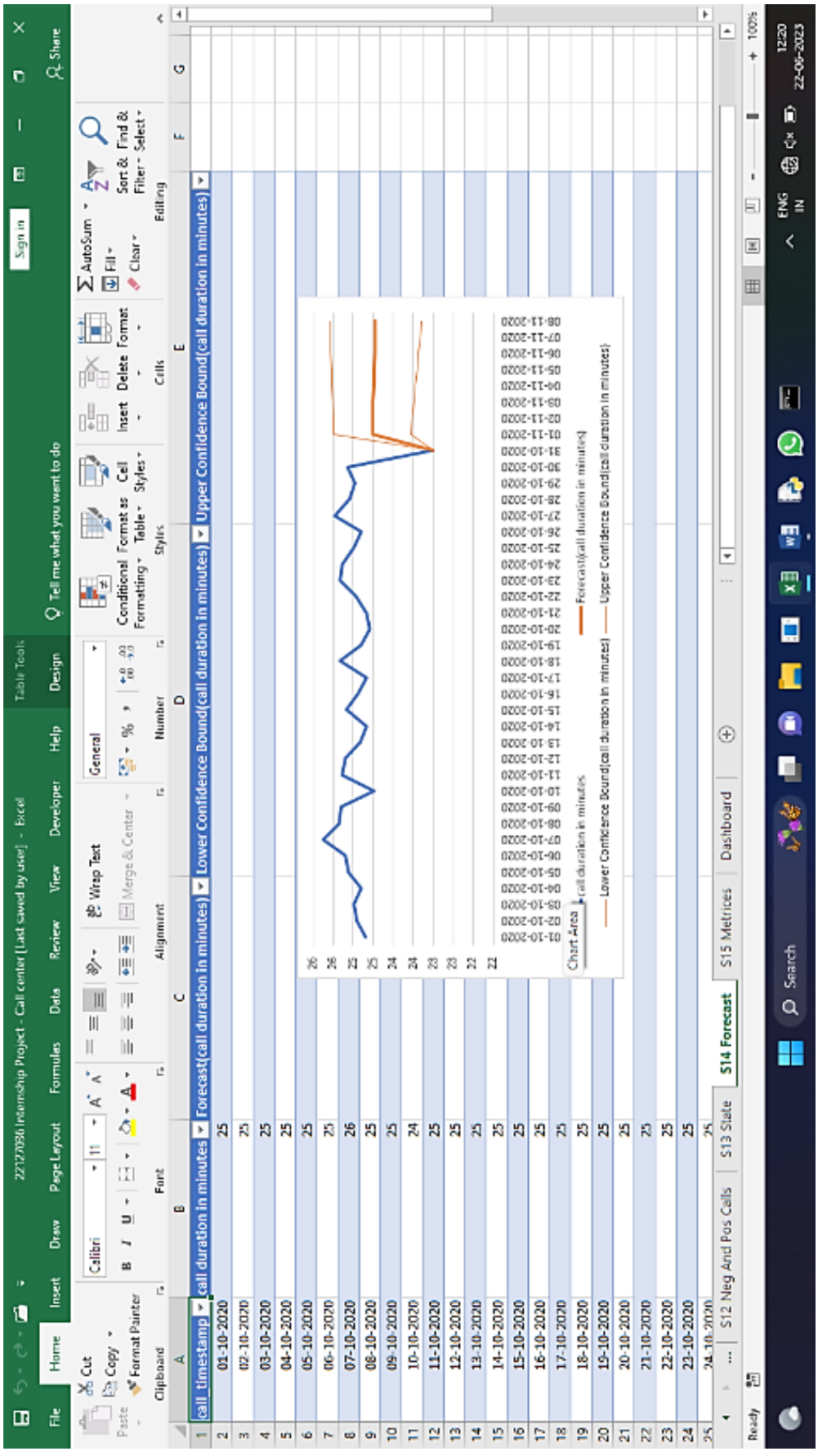

Figure 1. Call duration in minutes.

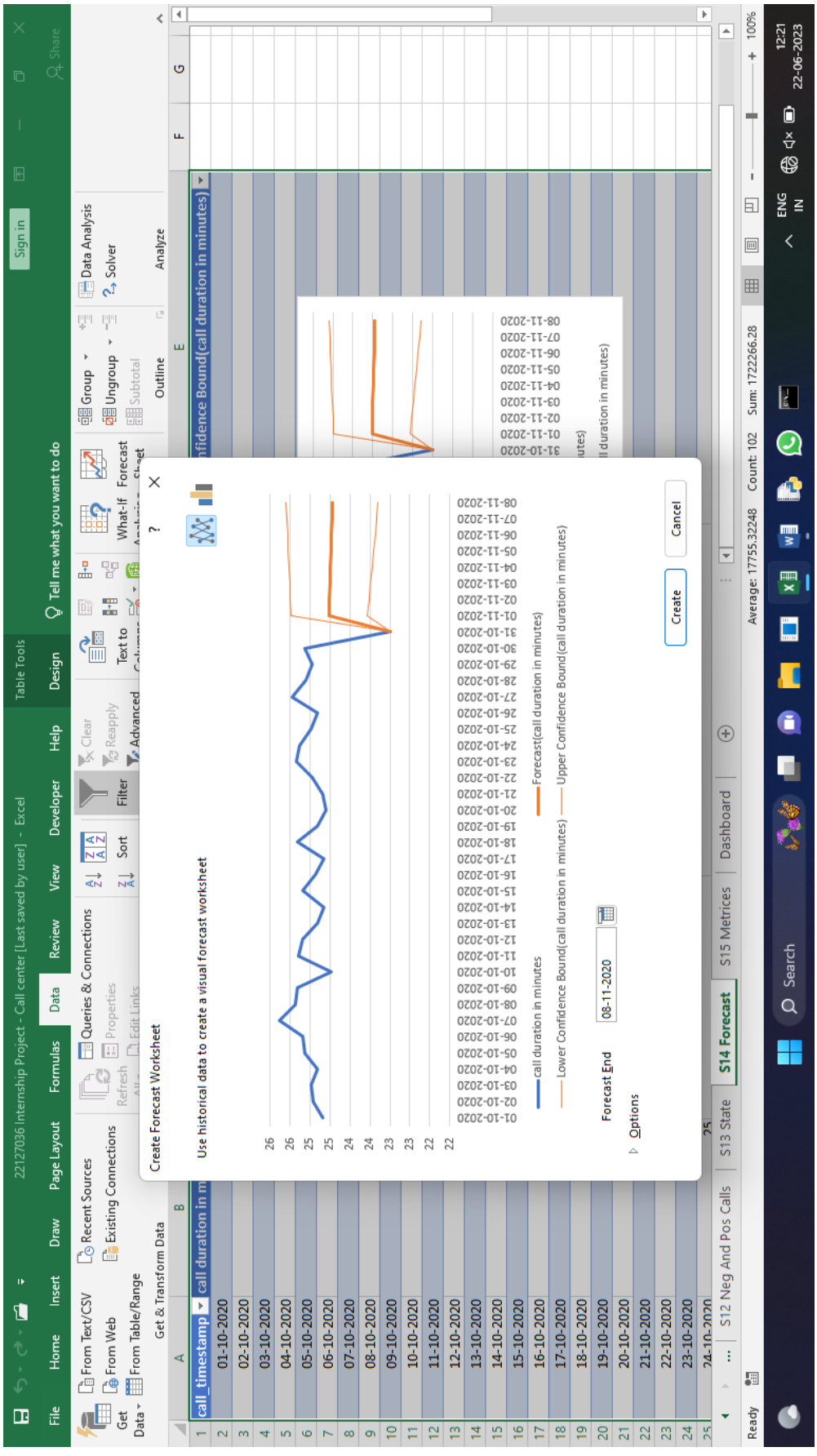

Figure 2. Forecast sheet.

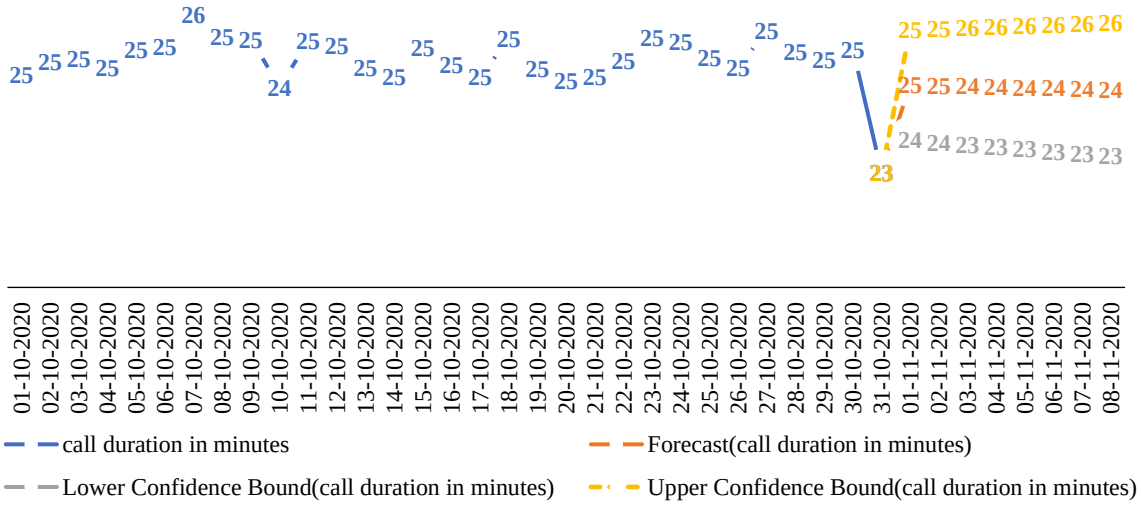

Figure 3. Output of forecast sheet.

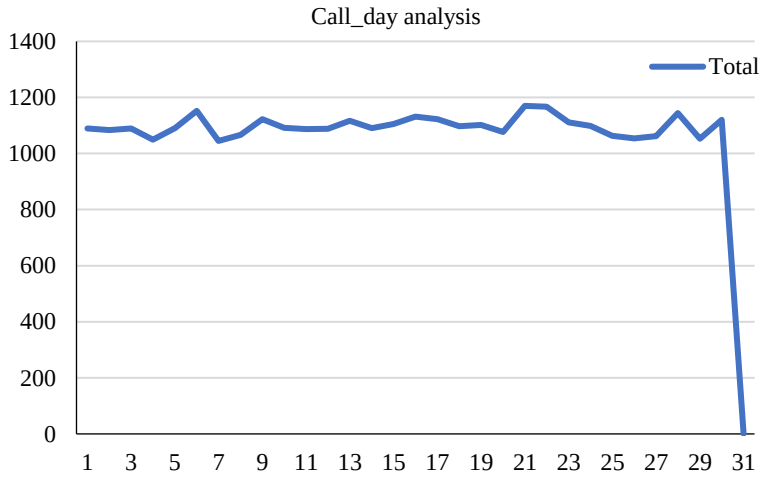

Figure 4. Call day Analysis.

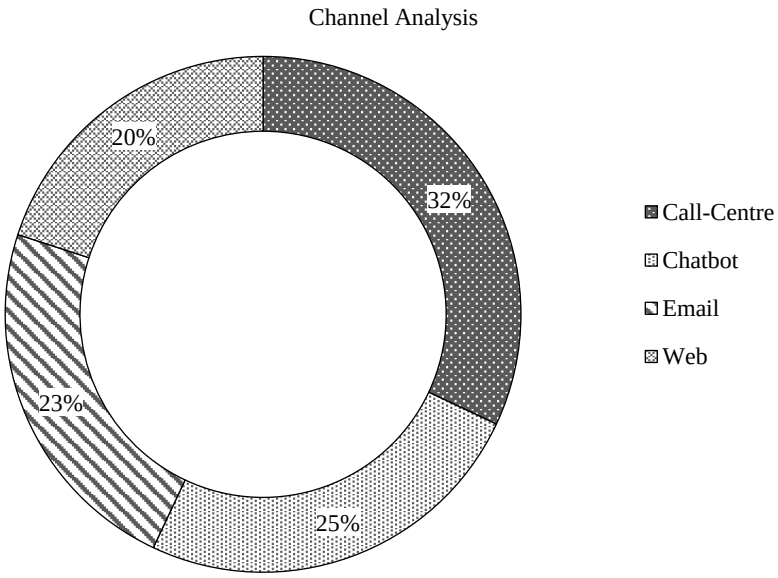

Figure 5. Channel Analysis.

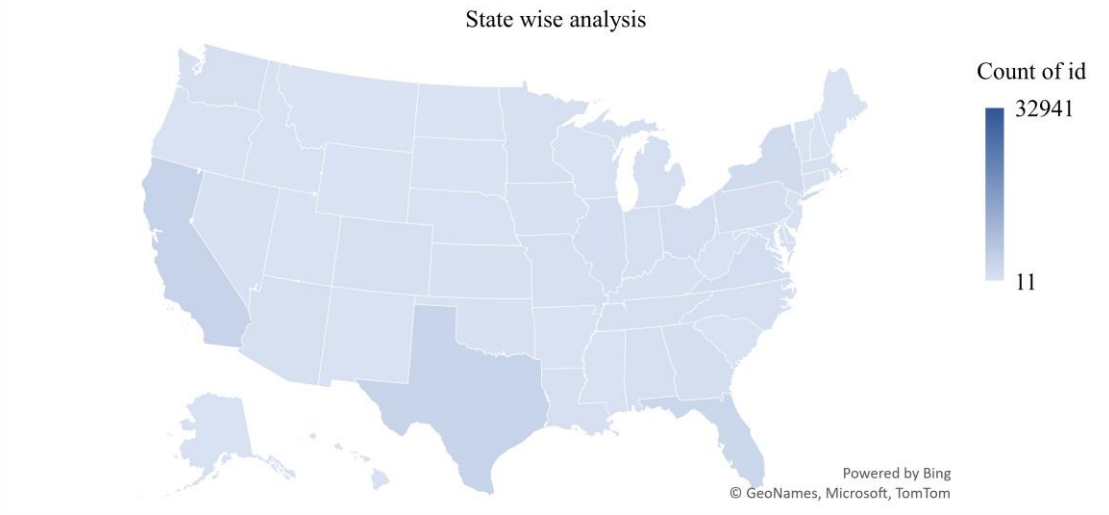

Figure 6. State Analysis.

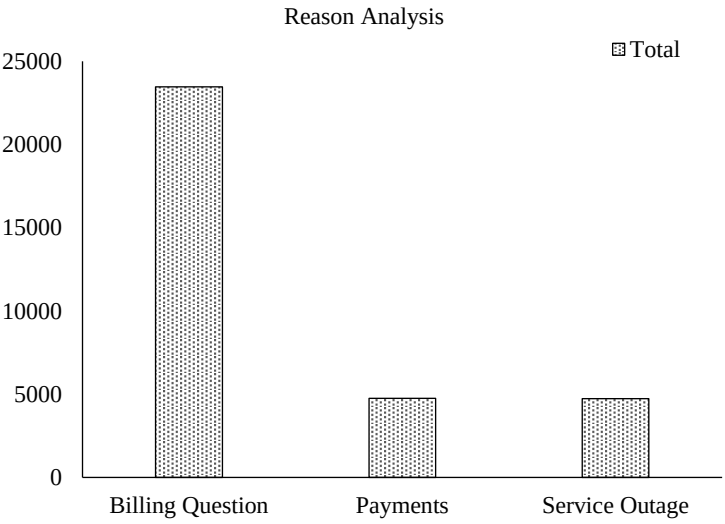

Figure 7. Reason Analysis.

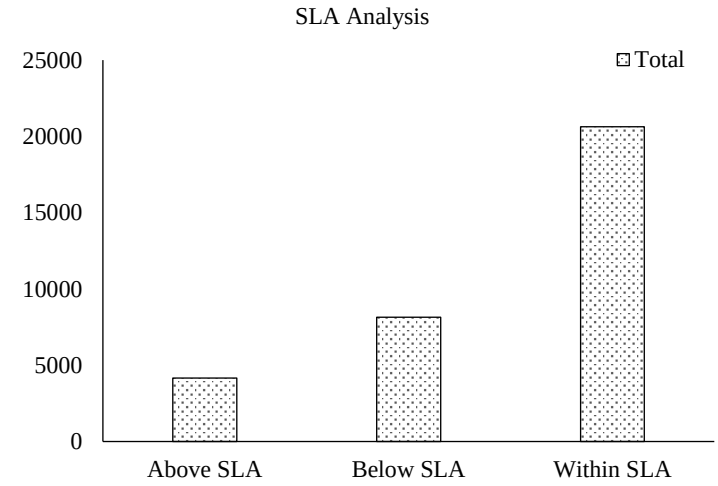

Figure 8. SLA Analysis.

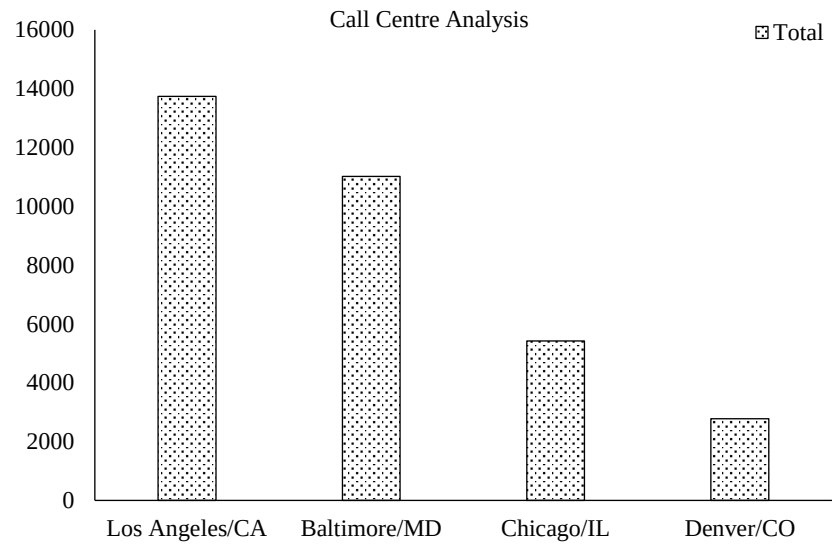

Figure 9. Call Centre Analysis.

Table 1. Channel Analysis using cross tabulation

Row Labels	Count of ID
Call-Centre	10639
Chatbot	8256
Email	7470
Web	6576
Grand Total	32941

Table 2. Reason Analysis using cross tabulation.

Row Labels	Count of ID
Billing Question	23462
Payments	4749
Service Outage	4730
Grand Total	32941

Table 3. SLA Analysis using cross tabulation.

Row Labels	Count of ID
Above SLA	4168
Below SLA	8148
Within SLA	20625
Grand Total	32941

Table 4. Call Centre Analysis using cross tabulation.

Row Labels	Count of call centre
Los Angeles/CA	13734
Baltimore/MD	11012
Chicago/IL	5419
Denver/CO	2776
Grand Total	32941

Analysed and Segregated Data Based on Sentiment and Response Time

The analysis is done using the cross tabulation. The columns selected are Sentiment and response time. From that it is found that, Negative sentiment is higher in all above, below and within SLA. It is presented in the Figure 10.

Analysed Based on Sentiment and Channel

The Sentiment, Channel analysis is done with cross tabulation tool. The columns for analysis are Sentiment and Channel. The output is that in all the sentiments, call centre channel has the highest calls. Negative sentiment has the highest count. It is shown in the Figure 11.

Dashboard

The Figure 12 shows the dashboard contains eight charts in it. The first chart is a line chart which tells about call day analysis, the second chart is a doughnut chart which tells about analysis on channel that people prefer the most, the third chart is a map chart that tells about analysis on states, the fourth chart is a column chart which shows about the reason analysis, the fifth chart is a bar chart it tells about the category that people fall in (SLA category), the sixth chart is about sentiment and response time analysis, the seventh chart is about Sentiment, channel analysis, the eighth chart is about the call centre analysis. There are slicers created for its easy access on a single page. Dashboard helps to make decisions easier and faster.

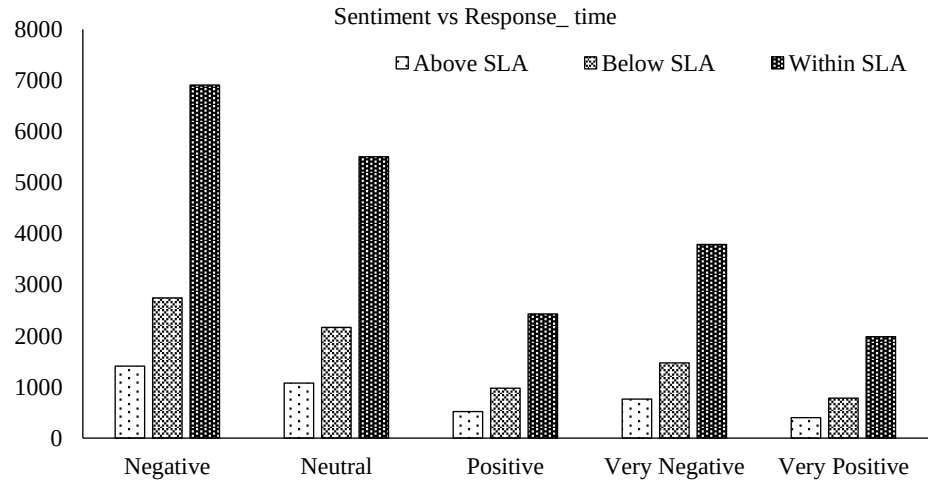

Figure 10. Sentiment, response time analysis.

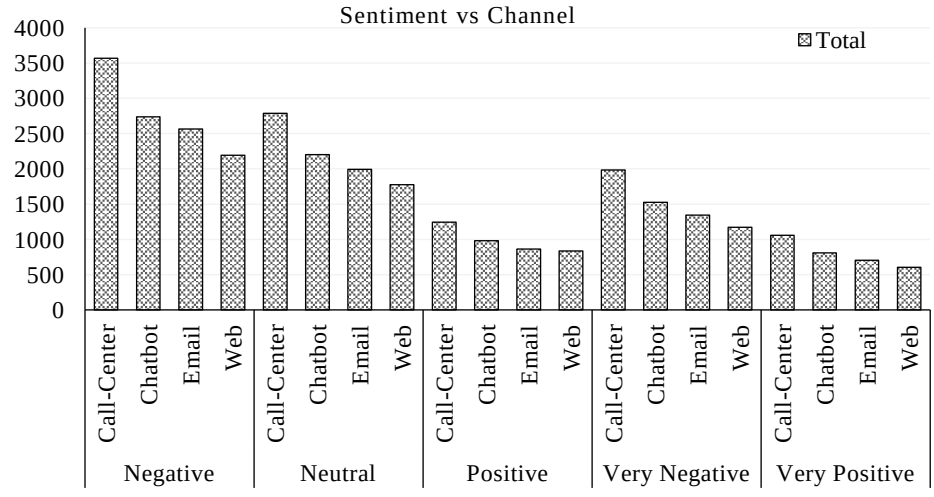

Figure 11. Sentiment, channel analysis.

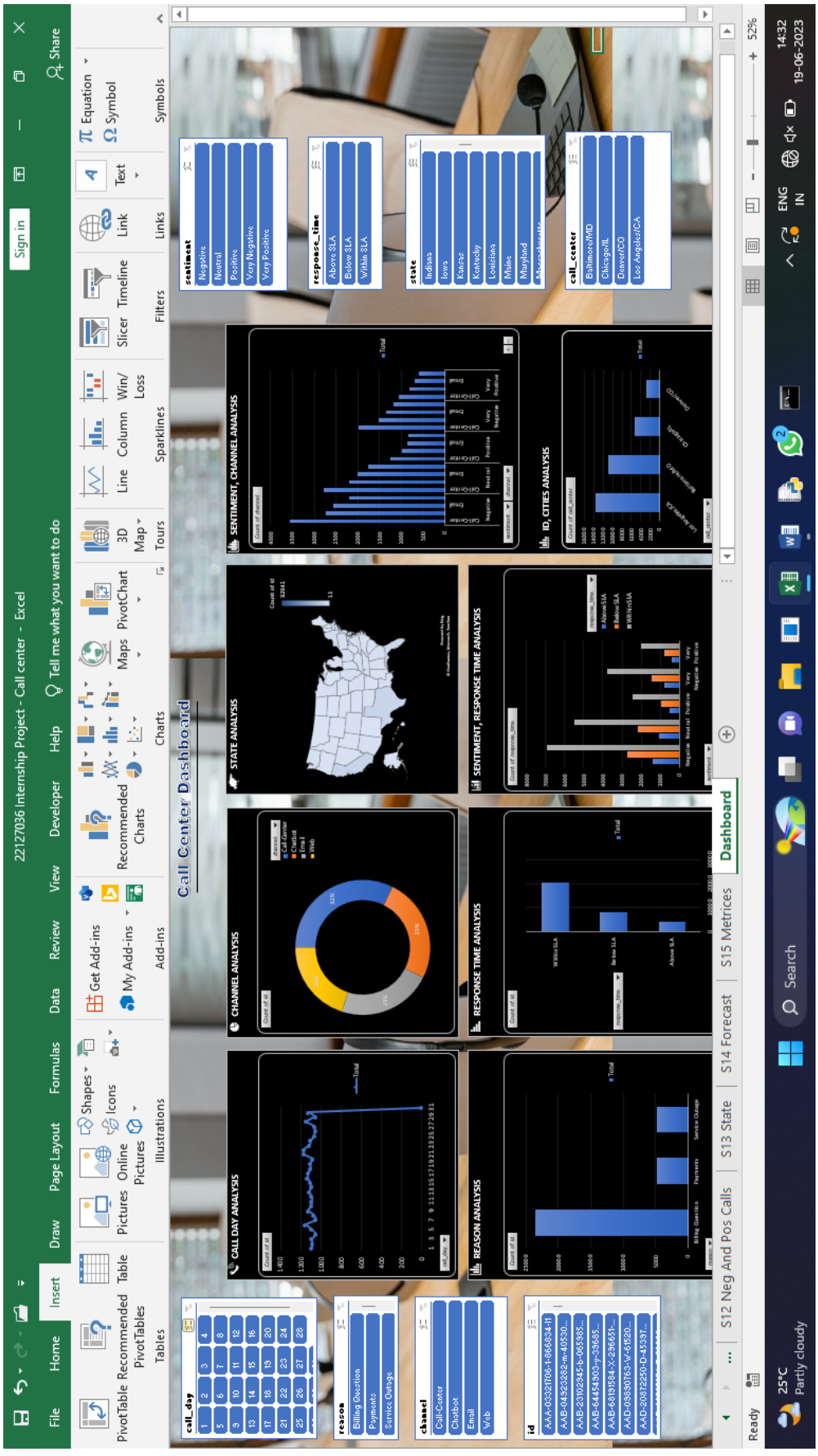

Figure 12. Dashboard.

Table 5. Sentiment, Response time Analysis.

	Column Labels			
Row Labels	***Above SLA***	***Below SLA***	***Within SLA***	***Grand Total***
Negative	1406	2745	6912	11063
Neutral	1076	2169	5509	8754
Positive	520	979	2429	3928
Very Negative	766	1472	3788	6026
Very Positive	400	783	1987	3170
Grand Total	4168	8148	20625	32941

The overall analyses found are (Table 5):

- For the entire month of October 2020, there were a total of 32941 inquiries.
- The typical call durations last for an average of 25 min (25.02).
- The average of customer satisfaction rating is around 6 (5.55).
- From the analysis it is found that on 21/10/2020, 1170 calls were received and it is the day that received highest number of calls.
- Call centre channel holds the highest number of call records.
- California state holds the highest number of inquiries followed by Texas and Florida.
- Most of the interactions between the caller and customer fall within SLA.
- 75% of the entire records billing questions holds as the reason.
- With respect to sentiment, negative sentiment holds the highest record.
- The call centres present in Los Angeles received most inquiries.

Hardware and Software Requirements

Hardware

The system used in this project is Windows 11. It has 11th Gen Intel(R) Core (TM) i3-1115G4 @ 3.00 GHz, 3.00 GHz processor with 8.00 GB RAM and 64-bit operating system, x64-based processor system type.

Software

- The software used in this summer internship project is Microsoft Office Excel which is a 2016 version and the analysis is done using pivot table and forecast sheet.
- Pivot table is used for analysis both descriptive, statistical as well as combination of both. It is an interactive way to quickly summarize large amounts of data.
- Pivot charts are also used for graphical diagrams.
- A forecast sheet is used to predict a future value by using the historical data that is currently present.

CONCLUSION

In the call centre data set, first the category of all columns were checked and changed accordingly. Indentation, font and column width were changed accordingly. A column name call day was newly created. The analysis was done in pivot table and different pivot charts were created for better understanding and the results were found accordingly. Then a forecast sheet was created for call duration in minutes for first 8 days of September month. Finally, a dashboard is created for better understanding. Dashboards are used to access data at a glance, it helps in better decision making. It is used to track, analyse and display data.

The above data set has data of the month October 2020. From the analysis it is found that there was a total of 32941 calls and day-21 has received 1170 calls which is the highest number of calls received on the entire month. The average of call duration lasts about 25 min and the average of customer satisfaction score is about 6. Call centre channel holds the highest number of call records. California state holds the highest number of analysis and mostly the customers fall with SLA category. Billing

question was the main reason for the interactions and mostly the interactions end up with negative sentiment. The call centres present in Los Angeles received most inquiries. Customers mostly call to call centres. So, if the people working in call centres try to interact with a good attitude, then any of the conversations will not end up in a negative way and it increases the customers' satisfaction too.

Acknowledgment

I would like to express my sincere gratitude to everyone who contributed to the completion of this project on Customer Care Centre analysis. Special thanks to my advisor/guide for their valuable insights and guidance throughout the process.

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APPENDIX

This project is done in MS Excel. Analysing part had been done with pivot table and pivot chart for descriptive and forecast sheet for statistical method.

The following analyses are found:

- Id vs. Call Day analysis.
- Id vs. Channel analysis.
- Id vs. State analysis.
- Id vs. Reason analysis.
- Id vs. Response time analysis.
- Call centre as per cities analysis.
- Sentiment vs. Response time analysis.
- Sentiment vs. Channel analysis.
- Forecast sheet analysis.

