ABC Call Volume Trend Analysis

Final Project-4

Project Description:

A Customer Experience (CX) team plays a crucial role in a company. They analyse customer feedback and data, derive insights from it, and share these insights with the rest of the organization. This team is responsible for a wide range of tasks, including managing customer experience programs, handling internal communications, mapping customer journeys, and managing customer data, among others.

In the current era, several AI-powered tools are being used to enhance customer experience. These include Interactive Voice Response (IVR), Robotic Process Automation (RPA), Predictive Analytics, and Intelligent Routing.

One of the key roles in a CX team is that of the customer service representative, also known as a call centre agent. These agents handle various types of support, including email, inbound, outbound, and social media support.

Inbound customer support, which is the focus of this project, involves handling incoming calls from existing or prospective customers. The goal is to attract, engage, and delight customers, turning them into loyal advocates for the business.

In this project, we'll be diving into the world of Customer Experience (CX) analytics, specifically focusing on the inbound calling team of a company. We have been provided with a dataset that spans 23 days and includes various details such as the agent's name and ID, the queue time (how long a customer had to wait before connecting with an agent), the time of the call, the duration of the call, and the call status (whether it was abandoned, answered, or transferred).

Business Understanding:

Advertising is a crucial aspect of any business. It helps increase sales and makes the audience aware of the company's products or services. The first impressions of a business are often formed through its advertising efforts.

The target audience for businesses can be local, regional, national, or international. Various types of advertising are used to reach these audiences, including online directories, trade and technical press, radio, cinema, outdoor advertising, and national papers, magazines, and TV.

The advertising business is highly competitive, with many players bidding large amounts of money to target the same audience segment. This is where the company's analytical skills come into play. The goal is to identify those media platforms that can convert audiences into customers at a low cost.

In this project, we have used analytical skills to understand the trends in the call volume of the CX team and derive valuable insights from it.

Tech Stack Used

- **Microsoft Excel 2021** — A spreadsheet editor software used mainly by professionals to enter data in table format, perform computations, plot graphs etc.

- **Microsoft Word:** A word processing application for preparing report.

Dataset Overview

The Dataset details are:
- Number of Data-Points: 1,17,988
- Number of Features: 13
- Column Details:

1. **Agent_Name**: Name of the Agent receiving the call.
2. **Agent_ID**: ID number of the Agent receiving the call.
3. **Customer_Phone_No**: Mobile number of the customer (encrypted).
4. **Queue_Time(Secs)**: Waiting time before receiving the call.
5. **Date_&_Time**: Date on which the call was made.
6. Time: Hour of the day in which the call was made.
7. **Time_Bucket**: The hourly time bucket in which the call was made.
8. **Duration(hh:mm:ss)**: Duration of the call in time format.
9. **Call_Seconds (s)**: Duration of the call in seconds.
10. **Call_Status**: Whether the call was answered or transferred or abandoned.
11. **Wrapped _By**: Whether the call was cut by the agent or it was automatically cut.
12. **Ringing**: Whether the system gave a ring when the call was made.
13. **IVR _Duration**: Duration of Interactive Voice Response in seconds.

Approach

Data Pre-Processing

Handling Duplicate Values

- Found no duplicate rows on analysis.

Handling Null Values

- We found that all the rows (34403) where **Agent_Name** and **Agent_ID** was **#N/A** are rows denoting **abandoned** calls.
- Some calls where **Wrapped _By** was **Null (47877) were answered** or **transferred or abandon** calls.

Feature Engineering

- Created one new column**,** Date **from** Date_&_Time **column.**
- The Data seemed pretty much clean. So, Data Analysis was started.

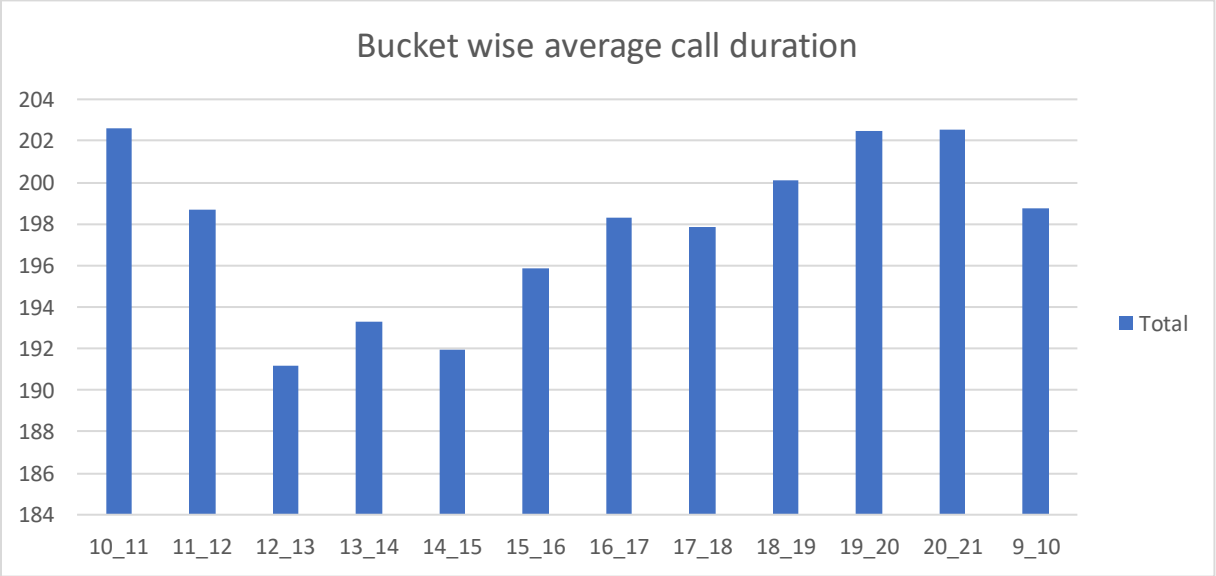
Data Analytics Tasks:

A dataset that contains information about the inbound calls received by a company named ABC, which operates in the insurance sector was Provided. The task is to use this data to answer the following questions:

1. **Average Call Duration:** Determine the average duration of all incoming calls received by agents. This should be calculated for each time bucket.

Task: What is the average duration of calls for each time bucket?

Call_Status	(Multiple Items)
Row Labels	**Average of Call_Seconds (s)**
10_11	202.5938769
11_12	198.6600372
12_13	191.1536695
13_14	193.2963998
14_15	191.9543656
15_16	195.8571429
16_17	198.2948638
17_18	197.8801445
18_19	200.1208565
19_20	202.4782232
20_21	202.5173611
9_10	198.7373282
Grand Total	**196.9626009**



INSIGHTS:

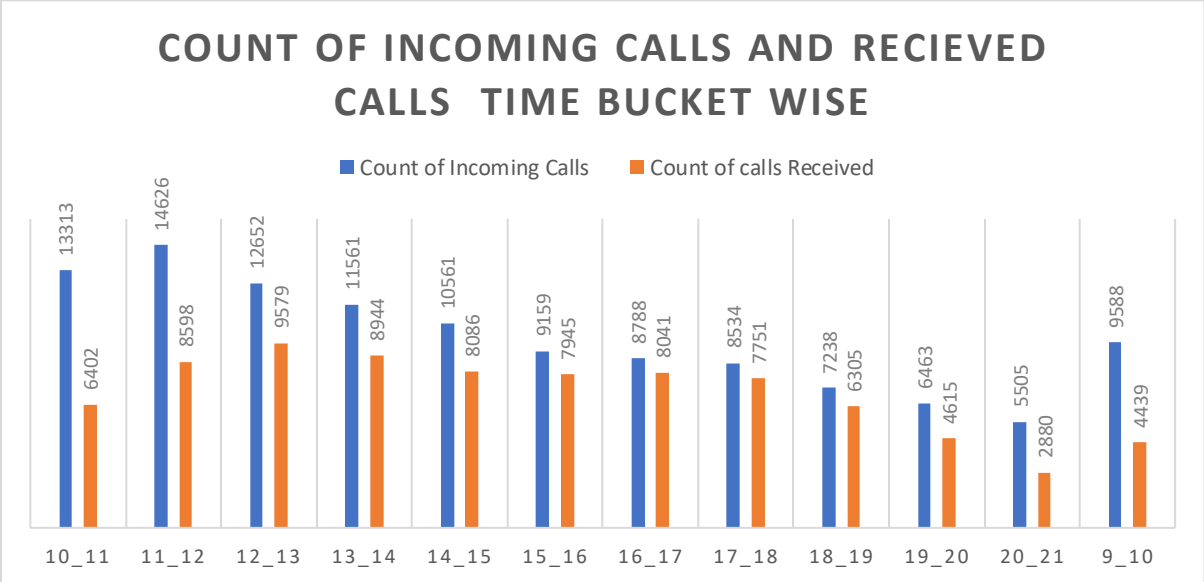
- The overall **Average Call Duration (Answer and Transfer)** is **196.963 seconds**.
- We can observe that the Average Call Duration first peaks in the morning hours before dropping to below average value during the lunch hours and then again increasing to above average value.

2. **Call Volume Analysis:** Visualize the total number of calls received. This should be represented as a graph or chart showing the number of calls against time. Time should be represented in buckets (e.g., 1-2, 2-3, etc.).

Task: Can you create a chart or graph that shows the number of calls received in each time bucket?

Count of Customer_Phone_No	Column Labels			
Row Labels	abandon	answered	transfer	Grand Total
10_11	6911	6368	34	13313
11_12	6028	8560	38	14626
12_13	3073	9432	147	12652
13_14	2617	8829	115	11561
14_15	2475	7974	112	10561
15_16	1214	7760	185	9159
16_17	747	7852	189	8788
17_18	783	7601	150	8534
18_19	933	6200	105	7238
19_20	1848	4578	37	6463
20_21	2625	2870	10	5505
9_10	5149	4428	11	9588
Grand Total	**34403**	**82452**	**1133**	**117988**

Time Bucket	Count of Incoming Calls	Count of calls Received
10_11	13313	6402
11_12	14626	8598
12_13	12652	9579
13_14	11561	8944
14_15	10561	8086
15_16	9159	7945
16_17	8788	8041
17_18	8534	7751
18_19	7238	6305
19_20	6463	4615
20_21	5505	2880
9_10	9588	4439



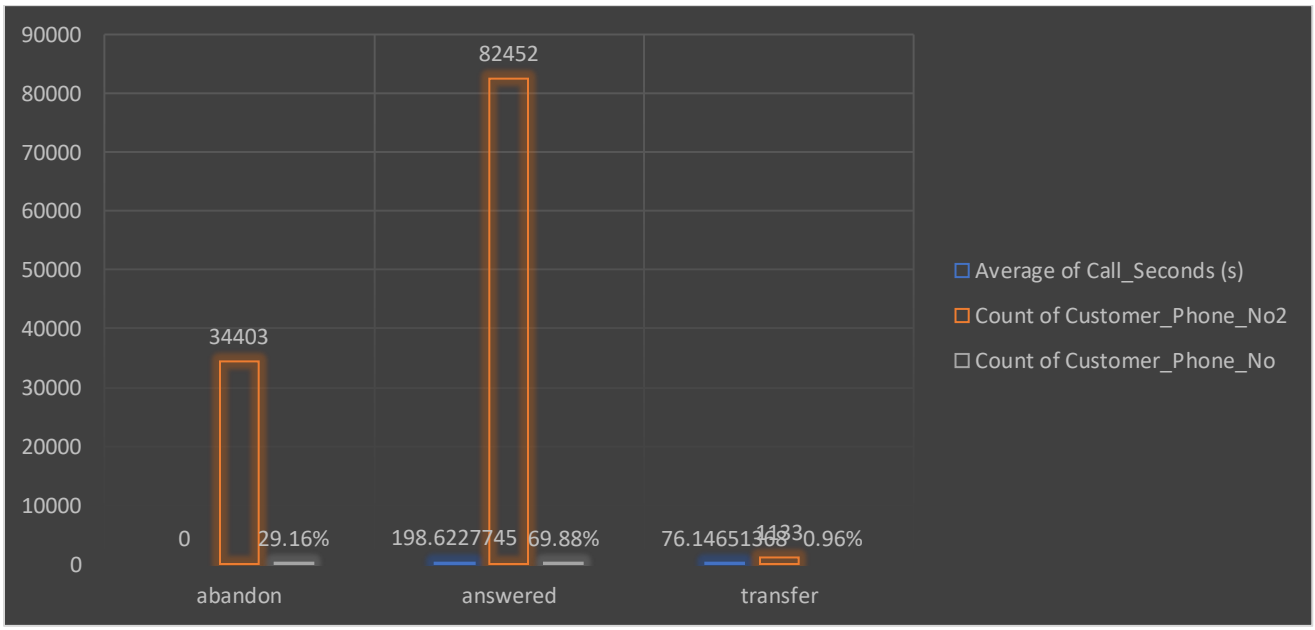
INSIGHTS:

- We can observe that the number of received calls received first increases with time before dropping down.
- We can also observe that the number of abandoned calls is very high in the morning hours and as the day progresses, the number of abandoned calls reduces.

3. **Manpower Planning:** The current rate of abandoned calls is approximately 30%. Propose a plan for manpower allocation during each time bucket (from 9 am to 9 pm) to reduce the abandon rate to 10%. In other words, you need to calculate the minimum number of agents required in each time bucket to ensure that at least 90 out of 100 calls are answered.

Task: What is the minimum number of agents required in each time bucket to reduce the abandon rate to 10%?

Row Labels	Average of Call_Seconds (s)	Count of Customer_Phone_No2	Count of Customer_Phone_No	
abandon	0	34403	29.16%	~30%
answered	198.6227745	82452	69.88%	
transfer	76.14651368	1133	0.96%	
Grand Total	**139.5321473**	**117988**	**100.00%**	



Date_&_Time2	01-01-2022

Row Labels	Sum of Call_Seconds (s)
9 AM	35313
10 AM	53087
11 AM	67751
12 PM	72680
1 PM	59693
2 PM	76137
3 PM	65689
4 PM	59464
5 PM	68155
6 PM	53096
7 PM	40141
8 PM	25281
9 PM	177
Grand Total	**676664**

01-01-2022 sum of all call seconds		Total hour spent in answering call	
	676664	187.9622222	
1 Agent works for approx 5 hours per day			
No. of Agents required for answering 60% of calls		37.59244444	38
No. of Agents required for answering 90% of call		56.38866667	56
Now we need to divide these number of agents based on demand of calls during working hours i.e 9 AM to 9 PM			

Row Labels	Count of Call_Seconds (s)	No .of Agents
10_11	11.28%	6
11_12	12.40%	7
12_13	10.72%	6
13_14	9.80%	5
14_15	8.95%	5
15_16	7.76%	4
16_17	7.45%	4
17_18	7.23%	4
18_19	6.13%	3
19_20	5.48%	3
20_21	4.67%	3
9_10	8.13%	5
Grand Total	**100.00%**	55

INSIGHTS:

In order to find out the extra agents required a day for example 01-01-2022 was taken to analyse.

- To determine the total number of agents required we can use the formula:
- Total Agents= (Average call/Time per second).
- Given the following information:
- Average calls on single day :187.96 hr
- Total time spent by one person in a single daya:5 hrs
- Using the formula we find:
- Total Agents =187.96/5=37.59
- To achieve a 90% call connection rate (instead of the current which is 60%), we calculate the number of additional agents required.
- Applying the unitary method, we find that approximately we need minimum 55 or 56 in total agents to reduce the abandon call rates from 30% to 10%.
- We can observe that to maintain a maximum of 10% abandon rate, we need to increase the availability of agents in the morning hours by a large margin as in these hours, the number of incoming calls is quite high and the number of agents available currently are quite low.
- During afternoon hours and during late evening hours, we need to increase the availability of agents by a slight margin to maintain a maximum of 10% abandon rate.

4. **Night Shift Manpower Planning:** Customers also call ABC Insurance Company at night but don't get an answer because there are no agents available. This creates a poor customer experience. Assume that for every 100 calls that customers make between 9 am and 9 pm, they also make 30 calls at night between 9 pm and 9 am. The distribution of these 30 calls is as follows:

Distribution of 30 calls coming in night for every 100 calls coming in between 9am - 9pm (i.e. 12 hrs slot)											
9pm- 10pm	10pm - 11pm	11pm- 12am	12am- 1am	1am - 2am	2am - 3am	3am - 4am	4am - 5am	5am - 6am	6am - 7am	7am - 8am	8am - 9am
3	3	2	2	1	1	1	1	3	4	4	5

Task: Propose a manpower plan for each time bucket throughout the day, keeping the maximum abandon rate at 10%.

Count of Call_Status	Column Labels			
Row Labels	abandon	answered	transfer	Grand Total
01-01-2022	684	3883	77	4644
02-01-2022	356	2935	60	3351
03-01-2022	599	4079	111	4789
04-01-2022	595	4404	114	5113
05-01-2022	536	4140	114	4790
06-01-2022	991	3875	85	4951
07-01-2022	1319	3587	42	4948
08-01-2022	1103	3519	50	4672
09-01-2022	962	2628	62	3652
10-01-2022	1212	3699	72	4983
11-01-2022	856	3695	86	4637
12-01-2022	1299	3297	47	4643
13-01-2022	738	3326	59	4123
14-01-2022	291	2832	32	3155
15-01-2022	304	2730	24	3058
16-01-2022	1191	3910	41	5142
17-01-2022	16636	5706	5	22347
18-01-2022	1738	4024	12	5774
19-01-2022	974	3717	12	4703
20-01-2022	833	3485	4	4322
21-01-2022	566	3104	5	3675
22-01-2022	239	3045	7	3291
23-01-2022	381	2832	12	3225
Grand Total	34403	82452	1133	117988

Average call Daily	5130		
For Night(9PM to 9AM)	1539		
Average of call seconds for all time bucket		198.62	(Refer Task 1)
Additional Hr Required	76		
1 Agent works for 5 hours			
Total No. of agents required to work 76 hrs		15	

Night_Time_Bucket(9 PM to 9 AM)	Call Distribution	Time Distribution	Agent required	AGENT REQUIRED
9_10	3	10	1.5	2
10_11	3	10	1.5	2
11_12	2	15	1	1
12_1	2	15	1	1
1_2	1	30	0.5	1
2_3	1	30	0.5	1
3_4	1	30	0.5	1
4_5	1	30	0.5	1
5_6	3	10	1.5	2
6_7	4	7.5	2	2
7_8	4	7.5	2	2
8_9	5	6	2.5	3
Total	30		15	19

INSIGHTS:

- Average of total number of incoming calls daily (1-23) is:
  (Total incoming calls/Total number of days) i.e. 117988/23 = approx. 5130
- Out of these many calls per day 30% calls are abandoned so 30% of 5130 is 1539
- We Know Average of call seconds for all time bucket is 198.62 (Refer Task 1)
- Additional Hour required: (1539*198.62*0.9)/3600= Approx. 76 Hours
- We Know that each agent works for 5 hrs so 76/5= approx. 15
- There is a requirement of at least 15-19 agents at night so that customers get response at that time.
- For individual time buckets, the greatest number of agents required is in the morning hours from 9 A.M to 1 P.M and the least number of agents required is at night hours from 12 A.M to 5 P.M.

Assumptions: An agent works for 6 days a week; On average, each agent takes 4 unplanned leaves per month; An agent's total working hours are 9 hours, out of which 1.5 hours are spent on lunch and snacks in the office. On average, an agent spends 60% of their total actual working hours (i.e., 60% of 7.5 hours) on calls with customers/users. The total number of days in a month is 30.

CONCLUSION: This project, helped me in understanding the importance of Data Analytics in Customer Experience Analysis as it provides valuable insights which helps in making Data-Driven Decisions.

In this project I was able to get insights like call abandon rates, distribution of call duration, number of calls, agents, how to create a manpower plan so as to decrease abandon calls etc. I also got experience in Data Preprocessing like Data Cleaning, handling Outliers, Feature Engineering etc. in this project. I can now communicate the insights to relevant stakeholders as per the requirements.

Excel sheet Link:

https://docs.google.com/spreadsheets/d/1Z0fNtyJPiPvGBmDYKIrY6NsL44LFsF8g/edit?usp=sharing&ouid=104742351045324653369&rtpof=true&sd=true

Video Link:

https://www.loom.com/share/970fa82b6379429bafe60766b8323070?sid=ef3cf037-1a97-4711-a93c-47886ba5c303