

ABC Call Volume Trend Analysis

Trainity Project 8 (Final Project - 4) – Churn Data Analysis & Predictive Analysis



Figure 1 - <https://trainity.link/data/project08>

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DESCRIPTION

Problem Statement:

In this project, you'll be diving into the world of Customer Experience (CX) analytics, specifically focusing on the inbound calling team of a company. You'll be 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).

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.

Data Cleaning:

This step involves pre-processing the data to make it suitable for analysis. It includes handling missing values, removing duplicates, converting data types if necessary, and possibly feature engineering.

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, you'll be using your analytical skills to understand the trends in the call volume of the CX team and derive valuable insights from it.

Report and Data Story:

After your analysis, you'll create a report that tells a story with your data. This should include your initial problem, your findings, and the insights you've gained. Use visualizations to help tell your story and make your findings more understandable.

Remember, as a data analyst, your goal is not just to answer questions but to provide insights that can drive decision-making. Your analysis should aim to provide actionable insights that can help stakeholders make informed decisions.

Requirements –

1) Project Description:

The aim of the project was to find the incoming calls average call duration, frequency of calls to determine the ideal time for scheduling the rosters, breaks and shift switch times. The dataset involves Inbound customer support data that 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.

From the given data we tried to extract relevant data insights like the call volume frequency, peak hours, agents required to handle the calls, reducing the abandon rates, suggesting shift details & planning the manpower to accommodate as many customers grievances & improve the service.

Using various pivot charts, we concluded about the distribution of calls, average frequency, peak hours of work, productivity of agents, number of agents required in a shift and for particular time brackets, predicting manpower for night shifts from the given data and also handling the abandon rates to reduce it to 10% so as to provide better service to the customers. I have utilised various charts to depict the findings as well as used the pivot tables to showcase the relevant data. For the predictive analysis we looked into the given assumptions and formulated our findings accordingly (explained in depth in Q3 & 4).

For certain null values I have assumed to use the mode values of columns as in wrapped by category (explained in data cleaning part). I tried to change the case to standardize the whole columns to a single format so as to make the data cleaning more effective same with the datatypes of certain imported columns like datetime, time for duration etc. The dataset had imbalance in the wrapped up column which was dealt with necessary imputations as for the outliers part the data was spread across 23 days and over various time bracket and as it's a customer support & service data some folks might get resolution in few minutes while some calls might extend to longer duration so we can not just remove the outliers or treat them but as there frequency is not big enough we work with the average value for most of our calculations and insights. (see data cleaning for more details)

2) Approach:

I first analyzed the data and looked for null values, blanks, duplicates and treated them using basic functions like delete cells, find & replace, remove blank rows etc. For certain cell values I changed them to suit better with other values like – (Different case for column values or improper naming) etc. After confirming that the data has little to less outliers and saved the processed data to work on with the operations. Also, I removed the most irrelevant column (**Ringling** had a single value “YES” for all cells) from the dataset, we could also either remove the Agent_name or Agent_ID but I have kept as one of them can be used in filter function for 1 of the query asked, same with the customer phone number as no question revolves around it we can drop it or keep it and analyze further for some more insights. For the error values in **Agent_Name & Agent_ID** both had #N/A value which coincidentally were same because the call was not actually answered i.e. *Abandoned* so I kept them as it is and not treated them (because logically it make sense that if no one received the calls nothing would be assigned but they are added in dataset as an abandon call).

The analysis for two questions was simply done using *aggregate function like count, average, %, sum using pivot tables*. For the rest two question we needed to do predictive analysis using the given data and making some assumptions from them and calculating the desired results and then showcasing the insights found using relevant charts. (Explained in deep in the individual questions.)

3) Tech-Stack Used:

Excel – The basic data manipulation, handling and overall pivot charts and the statistics has been handled using MS Excel.

Google Sheets – Used to do the basic data manipulation and to get column stats (gif added)

Word – The report is written in word/docx format using MS Word and then exported to pdf.

Loom – To record and share the Video PPT to explain the overall analysis and approach used in the project.

Google Drive – To upload all the essential files attached in the report for reference & pdf upload.

ShareX – To capture gif recording and screengrabs and host the HD image used in the projects to see the details in more depth.

4) Insights:

The summary for each query is given with the screenshot but to summarize the overall thing I concluded that among the total data set we had **117988 data rows, 13 columns & a totals of 1485967** cells in the given dataset.

After removing the blanks, duplicates and adjusting the non-relevant columns we made the dataset to **117986 rows** (*3 phone numbers were alphabets so dropped them*), **14 columns** (*Date & time column separated for insights & Ringing column dropped*) & **1651790 cells** for our final calculation. The data needed to be treated for Q3 as it needed Predictive analysis to get the relevant numbers to reduce the abandon rates.

For more data insight on the questions look at the respective questions for screenshot and pivot charts & the dashboards or the video PPT for the insights.

5) Result:

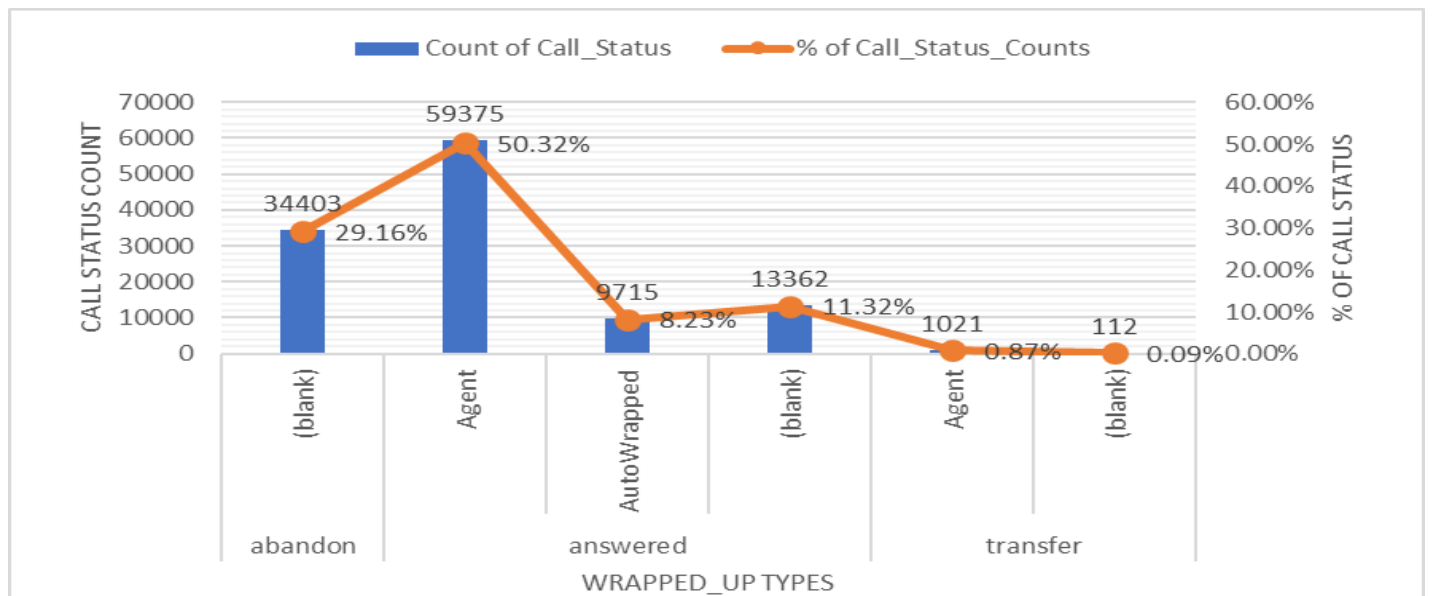
The Project has given me a good idea about the importance and vast variety of excel usage which helps us to look deep into plain numbers and generate a visually insightful data which can help business to gain knowledge and prepare for future as well as give out trends to focus on from the numerical data. The statistics section has helped me learn about the various concept which are useful for majority of the operation for handling and displaying basic charts and generate a meaningful insight as well as the use of Descriptive stats to get more from the data. The predictive analysis and assumptions helped me understand how companies and many industries plans the future plans or reduce the loss by analyzing the current data/capacity and feedbacks to work on devising strategies to improve the business & overall the customer experience. The provided [notes](#) on Customer experience analytics (CX analytics) helped me to understand & gain deeper insights on the topic.

Data Cleaning Task:

Will not explain much just have added the links of gif/process. (These were the basic steps to clean and adjust the data).

- [Data Count & Column Stats \(Google Sheets/Docs Overview\)](#)
- The dataset had 0 duplicate rows so no need for treatment.
- [Data Import & Cleaning \(Duplicate Removal\)](#)
- There were certain null values which we treated by using mode values as it was the appropriate.

Blank Cell Treatment				Blank wrapped up Calculation(Mode)				Delete cells)	
Count(Before Treat)									
117988									
Columns	No. of blank	% Blanks	Decision	Call Status	Count of Call_Status	% of Call_Status	Treatment	Customer_Phone	Count of Customer_Phone
Agent_Name	0	0.0%	No Treatment	abandon	34403	29.16%		XXXXX	1
Agent_ID	0	0.0%	No Treatment	(blank)	34403	29.16%	New - Not Connected	CzentXXXXX	3
Customer_Phone_N	0	0.0%	No Treatment	answered	82452	69.88%		99999XXXXX	19
Queue_Time(Secs)	0	0.0%	No Treatment	Agent	59375	50.32%		99998XXXXX	12
Date_&_Time	0	0.0%	No Treatment	AutoWrapped	9715	8.23%		99997XXXXX	26
Time	0	0.0%	No Treatment	(blank)	13362	11.32%	Mode - Agent	99996XXXXX	19
Time_Bucket	0	0.0%	No Treatment	transfer	1133	0.96%		99995XXXXX	12
Duration(hh:mm:ss)	0	0.0%	No Treatment	Agent	1021	0.87%		99994XXXXX	25
Call_Seconds(s)	0	0.0%	No Treatment	(blank)	112	0.09%	Mode - Agent	99993XXXXX	53
Call_Status	0	0.0%	No Treatment	Grand Total	117988	100.00%		99992XXXXX	19
Wrapped_By	47877	40.6%	Treatment	Will Use Mode - Agent (See Pivot)				99991XXXXX	16
Ringing	0	0.0%	No Treatment					99990XXXXX	20
IVR_Duration	0	0.0%	No Treatment					99989XXXXX	13
								99988XXXXX	13



Before Treatment - Blanks Count & Stats , [ChartHD](#)

➤ [Blank Data Calculation Using \(CountBlank, Count, CountA, If, IsBlank etc.\)](#)

- Inside the customer phone number column there was one value with alphabet which is not possible in case of a call so I deleted the rows containing those 3 records as it was not valid.

Agent_Name	Agent_ID	Customer_Phone_No	Queue_Time(Secs)	Date_&_Time	Time	Time_Bucket	Duration(hh:mm:ss)	Call_Seconds(s)	Call_Status	Wrapped_By	Ringing	IVR_Duration
Executives 60	1000060	CzentXXXXX	18	19-01-2022	15.00	15_16	00:00:50	50.00	answered	Agent	YES	00:00:41
Executives 32	1000032	CzentXXXXX	8	19-01-2022	15.00	15_16	00:05:04	304.00	answered		YES	00:00:16
Executives 12	1000012	CzentXXXXX	52	20-01-2022	12.00	12_13	00:01:52	112.00	answered	AutoWrapped	YES	00:00:16

- [Removing Alphabet containing rows from Phone Number Column](#)
- [Mode Imputation \(Answered & Transferred Status Type Blank\)](#)
- [Mode Imputation \(Abandon Status – New Value = Not connected as Mode\(Agent\) will change the whole meaning\)](#)
- [Changing the Case of cells \(using Proper Formula\)](#)
- [Date Time Column Separation \(Text to column function\) \[Extra analysis\]](#)

- There were certain cell values which had formatting error or data did not match with rest of columns so we used **Proper function** in formula to rectify the column values like Wrapped_By.
- Overall for the blanks part in the wrapped by column I used the **Mode** value **"Agent"** for answered & transfer status type.
- For the status type *abandon* if we changed the blanks (every value was blank) it would create an anomaly so I created a new status type **"Not Connected"** instead to maintain the overall transparency of data as imputing with mode value "Agent" would mean that the call was actually handled and not dropped.
- I did not change the **#N/A** or often referred as error in power-query or simply blank data in the agent_id & agent_name column as they were the connected with the abandoned call status meaning that no agent was assigned to them so changing these values to mode of agent_id or agent_name would drastically change the results **so I kept them as it is**.

[Video PPT Loom Folder](#) (Drive [Folder](#))

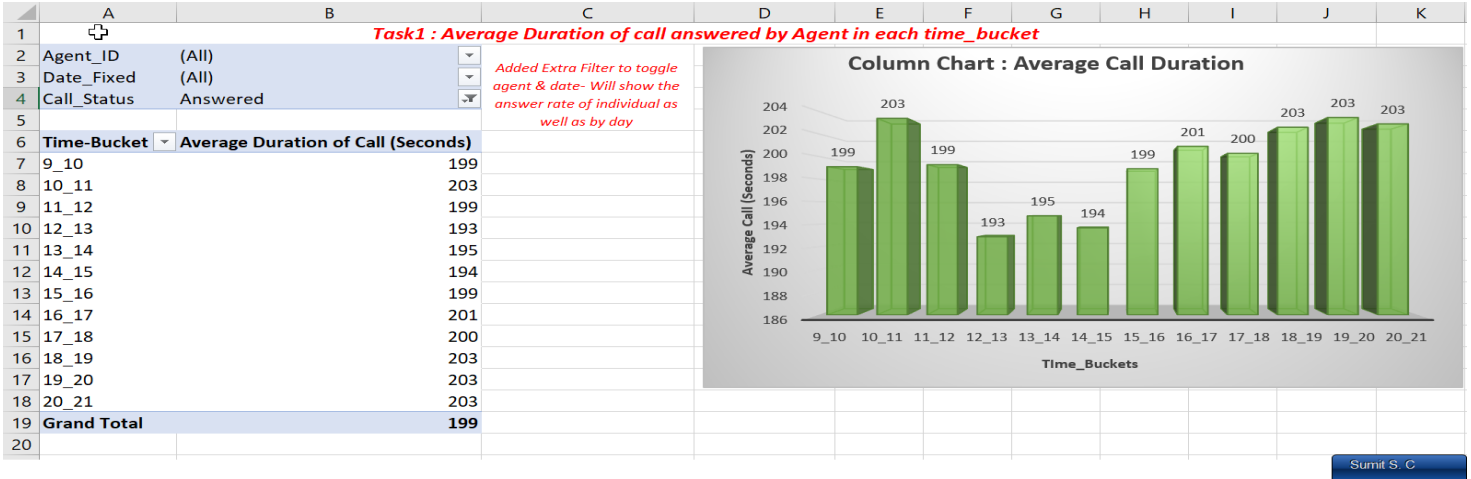
[Zip](#) (As google drive converts excel sheets to docs and then the connections & plots are lost)

Data Analytics Tasks:

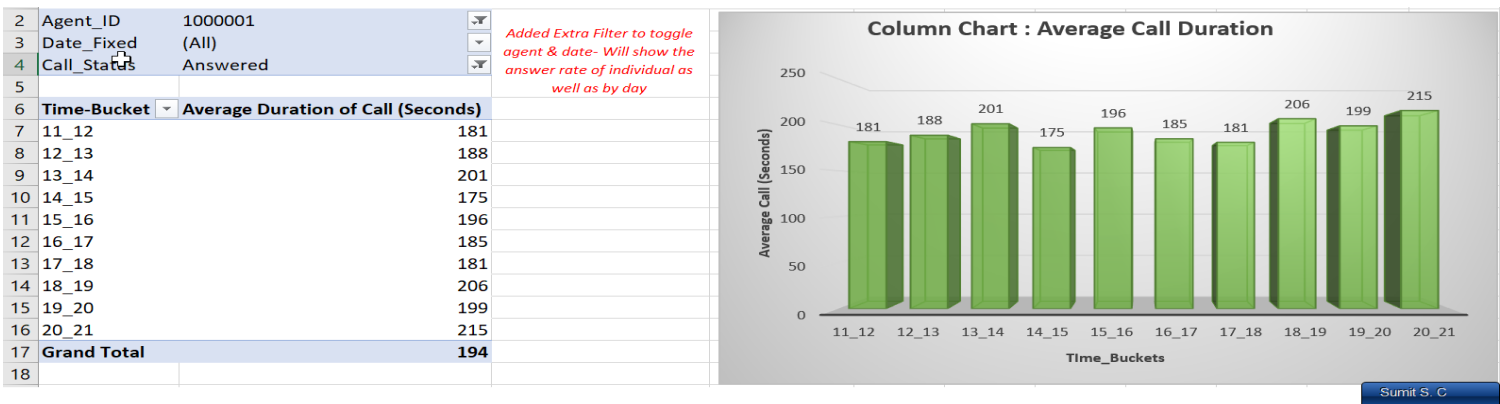
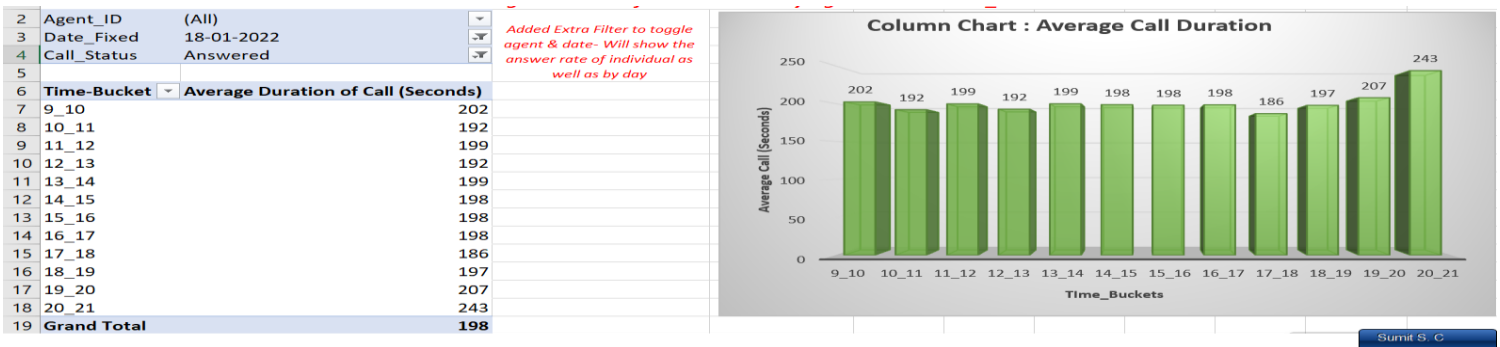
- 1) Average Call Duration:** Determine the average duration of all incoming calls received by agents. This should be calculated for each time bucket. How does the popularity of a car model vary across different market categories.

[Q1 - Excel Answer File](#)

- Task 1:** What is the average duration of calls for each time bucket?



Task 1 - Avg call duration for various Time buckets (Whole Month data) [HD Image](#) [The question asked to showcase only the Answered calls 3rd filter values.]



Task 1(Extra) – Applied two extra filters 1 that gives data of agentId wise charts & table & 1 that gives according to date.

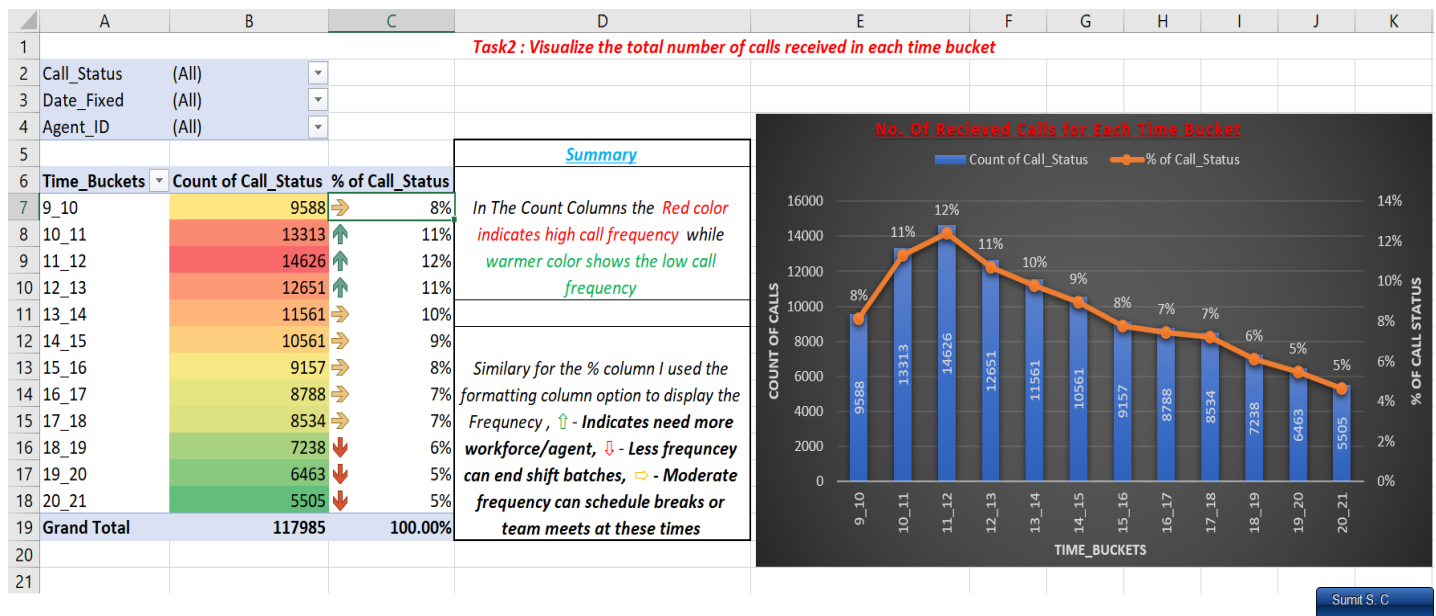
Insights:

1. The task helped us drill down the average duration of calls received by the agents throughout the day. The average call duration of calls comes to be around *199 seconds*.
 2. In the given question we were asked to find about the calls attended by the agents meaning we need to apply a filter on call_status of only the **answered** calls and then according to the data of calls we need to get the avg call duration of time_buckets.
 3. The analysis was done on basis of various time buckets this helped us analyze the frequency of avg call duration that came during particular hour bracket.
 4. The slots 10_11,18-21 has higher average of 203 sec as compared with the overall average duration data.
 5. In our question it was mentioned to find the average of calls answered so we used a filter on status – “Answered” to get the call details of received calls by an agent, as an extra analysis I have added a filter on “Date” to so one can toggle the relevant details of each date if required.
 6. In the extra analysis I have added two filters: -
 - 1st Filter is to toggle the agent number > this will help us to drill the data on the average call an agent takes to handle the customer in various time buckets and train him better to solve the queries in least time possible also this toggle can help us identify the best resolver or performer of the month and so on.
 - 2nd filter is on the date column > this will help us to narrow down the avg call duration ranges for particular days or to see the busiest or least busy days of the month.
 - If we combine all the three filters we can get a lot of different results such as productivity of an agent on a particular day and his call status type or one could find the average rate of duration handled by an agent across time brackets etc.
-

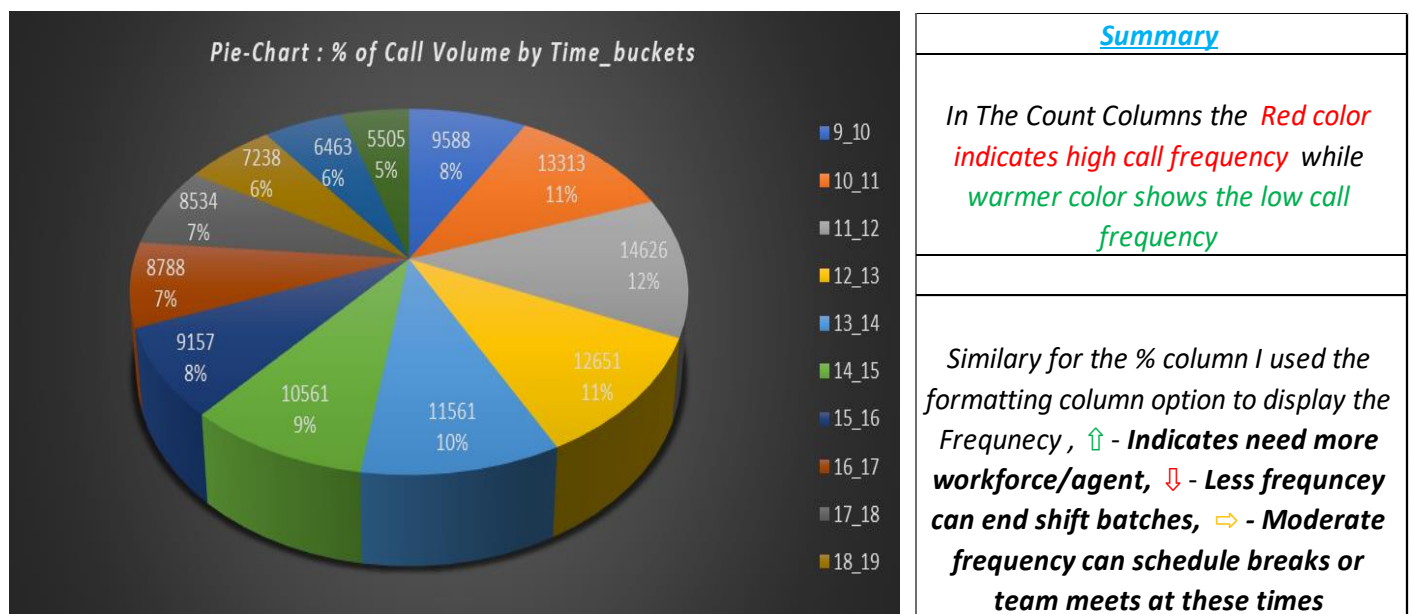
2) Call Volume Analysis: Visualize the total number of calls received. This should be represented as a graph or chart showing the number of calls against time. Time should be represented in buckets (e.g., 1-2, 2-3, etc.).

[Q2 - Excel Answer File](#)

Task 2: Can you create a chart or graph that shows the number of calls received in each time bucket?



Task 2 - Total number of calls received by the ABC Insurance company for the month (Jan) over various time buckets [HD Image](#)



Task 2(Extra) – Pie-Chart: To show the % distribution of total calls over different buckets; Summary of conditional formatting used in pivot

Insights:

1. The question is similar to previous question just that there we needed to get the average call duration while in these one we need to find the volume of calls received i.e. Count of all calls not just answered but the whole lot to get the idea of the customer support needed for the company on basis of total volume of received calls.
2. For the filtering part we used the call_status as All value and in the columns table we used count function to get the total count of calls received for each time_buckets.
3. From the analysis we can see that the time period between 10am to 3pm are the busiest of all so we need to adjust the agents such that most are on line to answer the calls 11am-12pm being the busiest hrs of the shift.
4. Also from the same analysis we can see that after 3 pm or so the call counts start decreasing so we can plan the lunch breaks and other activities like meetings, trainings etc. for the agents such that the incoming calls can be handled by the available agents with ease. Also, after 7pm the frequency of call drops so we could plan for shift changes or EOD times so as to conclude the day.
5. For the extra analysis part I added the previous 2 filters in the question:
 - 1st filter helps us to toggle the date wise count of calls to get a gist about the activities throughout the month.
 - 2nd filter is according to agent_id so it will help us analyze how much calls an individual handles and in turn check their efficiency.
 - Applying all the 3 filters and tweaking them would change the pivot data & charts to get idea about working capacity of an individual across various days of the month or to check the frequency of busy days and working of individuals etc.

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.

Sumit B. G.

Assumption : For 3rd & 4th question calculation and prediction part

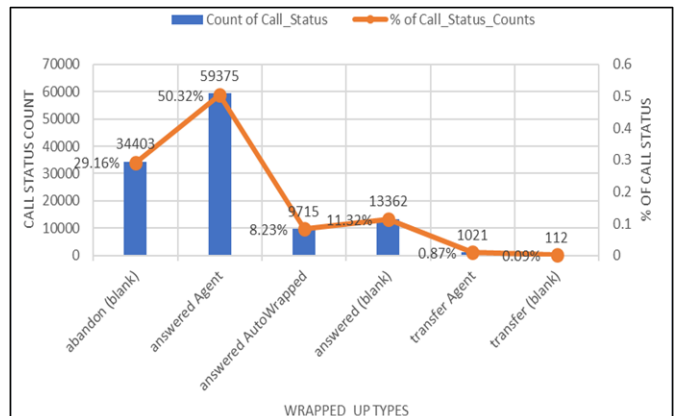
3) Manpower Planning: The current rate of abandoned calls is approximately 30%. Propose a plan for manpower allocation during each time bucket (from 9 am to 9 pm) to reduce the abandon rate to 10%. In other words, you need to calculate the minimum number of agents required in each time bucket to ensure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

[Q3 - Excel Answer File](#)

Task 3: What is the minimum number of agents required in each time bucket to reduce the abandon rate to 10%?

Calculation & Analysis Part:

1 - Abandon Rate & Question			
Call Status & Wrapping	Count of Call_Status	% of Call_Status	
Abandon	34403	29.44%	Call Abandon Rate ~ 30%
Answered	82449	70.56%	Graph
Grand Total	116852	100.00%	
Current Abandon Rate	30%	Of 100 calls 30 are missed	
Target Abandon Rate	10%	Of 100 calls 90 should be answered	
Handling Calls	90 out of 100	Increase the Agents Number to attain target	



Calculation 1 - Abandon rate calculation & pivot

2 - Avg, Sum, total of call duration (sec) for agent						
Call Status & Wrapping	Count of Call_Status	Average of Call_Seconds (s)	Sum of Call_Seconds (s)	Total Average of Call_Seconds (s)	Total Sum of Call_Seconds (s)	
Abandon	34403	199.1	881478	92.0	881478	
Answered	82449	203.3	1294812	97.5	1294812	
Grand Total	116852	202.8	16376379	140.1	16376379	

3 - Abandon & Answer Rate Pivot			
Date_Fixed	(All)		
Count of Call_Status	Column Labels		
Row Labels	Abandon	Answered	Grand Total
9_10	5149	4428	9577
10_11	6911	6368	13279
11_12	6028	8560	14588
12_13	3073	9431	12504
13_14	2617	8829	11446
14_15	2475	7974	10449
15_16	1214	7758	8972
16_17	747	7852	8599
17_18	783	7601	8384
18_19	933	6200	7133
19_20	1848	4578	6426
20_21	2625	2870	5495
Grand Total	34403	82449	116852

Calculation 2 - Avg Call sec, Total call duration, sum of calls ; Calculation 3 - Abandon & Answer rate pivot over Time_bucket

4 - Calculation for 10% Abandon rate using previous pivot values (Maths & Percentage per day)						
Calculation (90% of Grand total)						
Target Counts to be Answered (0.9 * T)	Per Day Average Call Counts (Divide by 23 days)	Abandon Average Rate Count Per Day (Abandon)	Answered Average Rate Count Per Day (Answered Total/23 days)	Total (Answered+Abandoned) calls per day (Total/23 days)	Percentage of abandon rate per day average by time_bucket (H col/J Col)	
8620	375	224	193	417	54%	
11952	520	301	277	578	52%	
13130	571	263	373	635	41%	
11254	490	134	411	544	25%	
10302	448	114	384	498	23%	
9405	409	108	347	455	24%	
8075	352	53	338	391	14%	
7740	337	33	342	374	9%	
7546	329	35	331	365	10%	
6420	280	41	270	311	13%	
5784	252	81	200	280	29%	
4946	216	115	125	239	48%	
105167	4573	1496	3585	5081	29%	

Calculation 4 - Calculating 10% abandon rate call frequency from the current 30% rate data (considering 23 days)

5 - Assumptions (Given) & Rough Calculations				
Assumptions	Logic	Title	Days/Hours/No. Of calls	
Workdays (1 week)	Given 6 days of workweek	WorkDays/Week		6
Workdays (1 month)	6*4 = 24 days (neglecting 2 days to adjust with given data - 23 days)	WorkDays/Month		24
Unplanned Leaves (avg)	Mentioned avg UL per agent per month	Unplanned Leaves (Avg)		4
Working Days (Actual Monthly)	Total working days - Avg UL	Actual WorkDays (Each Agent)		20
Total Working Hours	Mentioned Shift Hours	Shift Hours		9
Breaks (Lunch-Snacks)	Given Break Time	Breaktime		1.5
Remaining Working Hours	Total - Break hours			7.5
Actual Working Hours(On calls)	60% productivity of remaining workhours (Given)	Productive Workhours(In hrs)		4.5
Actual Working Hours(In Sec)	Actual Working hrs * 3200 Sec	Productive Workhours(In Sec)		16200
Average Call time (23 days)	Average of Call Duration Column(Pivot Cal)	Average Call Time(whole month data)		140.1
Average Call time (1 day)	Calculated using pivot below	Average Answered CallTime		199
Agent Call Handling Cap/Day	Actual Working hrs (In sec) / Average Call Time	Individual Call Handling Per day		82
Average Call per agent/Hr	Calls Handled in an hr (Individual call/4.5hr)	Avg Calls Handled/Hr by 1 Agent (in Productive Hrs : 4.5)		19

Calculation 5 - Given Data & basic assumptions on day basis

6 - Final Data from assumption & pivot calculations		
Name	Values (In seconds)	Cell No & or Calculation
Call Average (In Seconds)	199	C34
Calls Answered (30% Abandon rate)	82449	C53
Call duration calculation	16376379	B61*B62
Total Call Duration(In Sec - Pivot)	16376379	E34
Agent Work Calculations		
1 Day work (In sec)	16200	H13
6 days ideal work	97200	B66 * 6
1 month ideal work	388800	B66 * 24
Actual 1 Month work (4 Days UL)	324000	B68 - (B66*4) [1M - 4D (work)]
Agents Count (Distinct - Pivot)	66	I34
All Agents Ideal 1 Month work (NO UL)	21384000	B70 * B69 [Agents * 1 Month work]
Due To Leave We Need to Account for Extra Hrs each day for available agents		
Compensation Time for a Month (sec)	5007621	B71 - B64 [All agents work(ideal) - Actual Input]
Compensation Time (%)	23%	B73/B71 [% of compensation]
Extra workhrs (sec) for all agent [single day]	208651	B73/24 [Comp Time/24 days]
Extra workhrs (sec) for each agent per day	3161	B75/66 [Extra hrs-perday/66 agents] ~ 1 hr/day

7 - Manpower Calculation for 10% Abandon rates (Using pivot & final data calculation values)		
Name	Values	Cell
Average Call (Sec) [Same as avg data]	199	C34
Calls to be answered [New Value]	105167	E53
Total Call Duration [for 10% rate]	20888726.97	F61 * F62 [Avg call duration * Calls to be answered]
Agent workhrs (1 day)	16200	B66
Agent workhrs (6 days)	97200	B67
Agent workhrs (1 month - 24 days) [Ideal]	388800	B68
Agent workhrs (1 month with 4 avg leaves) [Actual]	324000	B69
Compensation time	5007621	B73
Total Expected Workhours (Monthly)	25896347.97	F63 + F68 [Total Call Duration + Compensation Time]
Total Workhours (Daily) [Ideal]	1079014.50	F69/24 days [per day workhours]
Total Agents Needed	80	F69/F67

Calculation 6 & 7- Calculation using pivot data & assumptions given in question ; Final calculation of Number of agents required in Shifts

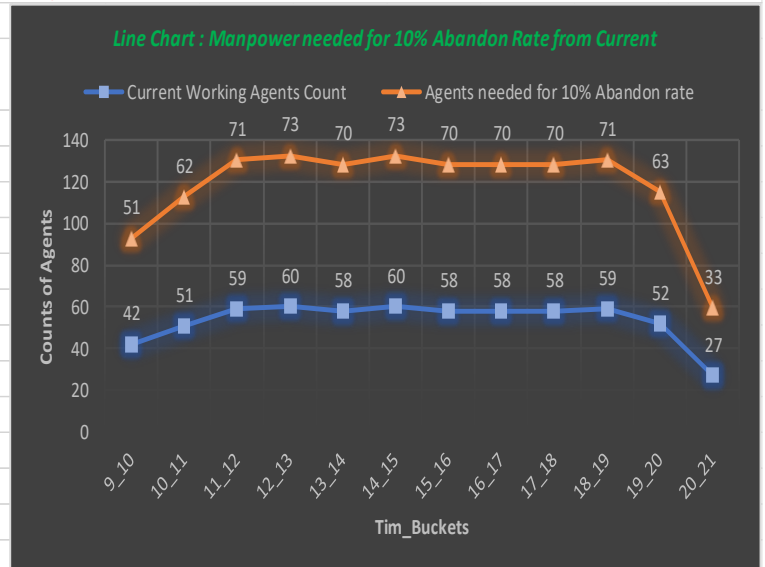
8 - Calculation Agents Count Using Pivot & Assumptions Calculation (Right table)					
Call_Status	All				
Time Bucket	Distinct Count of Agent_ID	% Distinct Count of Agent_ID	Required Agents (% agent * Req. cal ie 80)	% Of new Agent Counts [10% Abandoned Rate]	
9_10	42	64%	51	64%	The Green color in required agents or J column is the number for particular time_bucket to achieve the target of 10% abandon rates. ↑ - Indicates need more workforce/agent to handle calls, ↓ - Less frequency so need less agents can end shift batches, ⇌ - Moderate frequency can arrange meets or other activities.
10_11	51	77%	62	77%	
11_12	59	89%	71	89%	
12_13	60	91%	73	91%	
13_14	58	88%	70	88%	
14_15	60	91%	73	91%	
15_16	58	88%	70	88%	
16_17	58	88%	70	88%	
17_18	58	88%	70	88%	
18_19	59	89%	71	89%	
19_20	52	79%	63	79%	
20_21	27	41%	33	41%	
Grand Total	66	100.00%	80	100%	

Calculation 3 - Final Calculation of no. of agents required from current to bring down abandon rate to 10% in different time_buckets

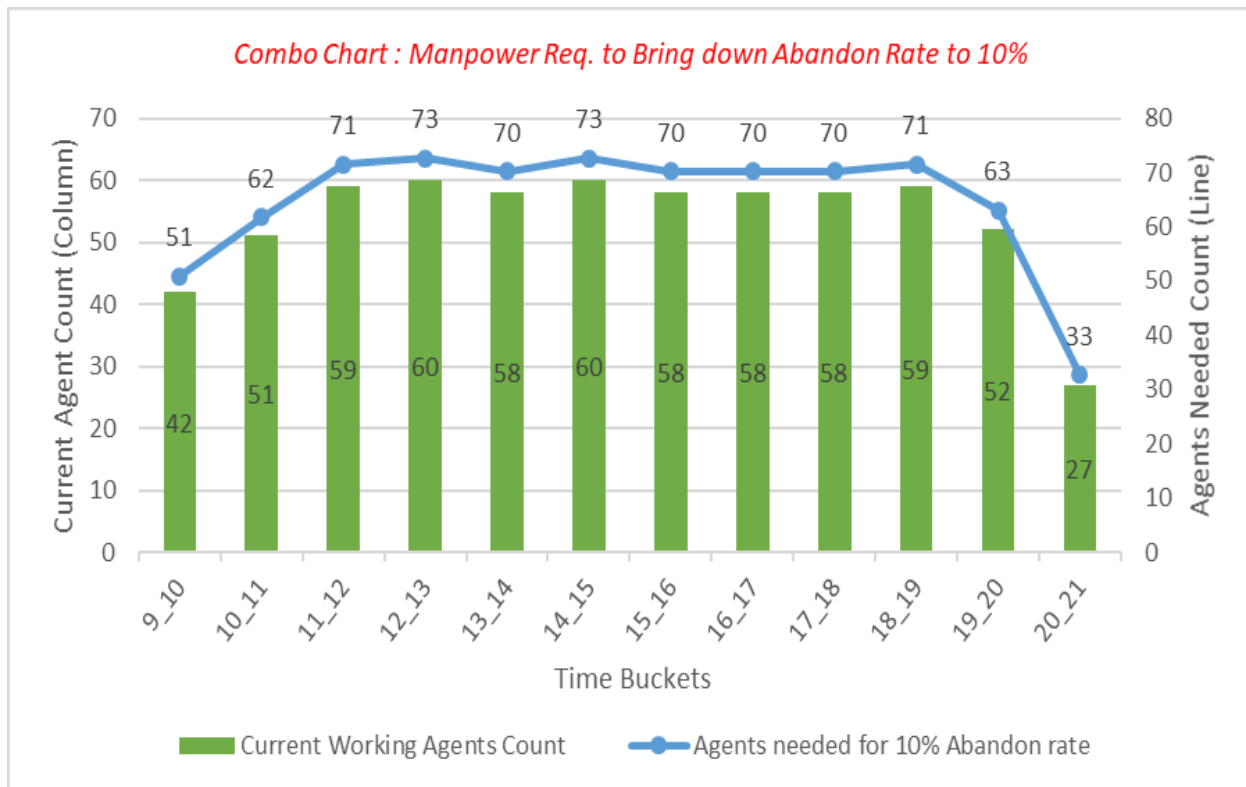
Considering the leaves in calculation part shown above for getting the number of agents

Task 3) Manpower Planning : Minimum number of agents required in each time bucket to reduce the abandon rate to 10%?

Time Bucket	Current Working Agents Count	Agents needed for 10% Abandon rate
9_10	42	51
10_11	51	62
11_12	59	71
12_13	60	73
13_14	58	70
14_15	60	73
15_16	58	70
16_17	58	70
17_18	58	70
18_19	59	71
19_20	52	63
20_21	27	33
Grand Total	66	80



Task 3 - Pivot & Combo Chart: Agents distribution to bring abandon rate to 10% over time_buckets & current situation (Agent counts comparison)



Task 3 - Same Distribution but using Clustered Column & Line Plot

Ignoring the leaves instead using the assumptions & avg calculations based on avg call handling capacity etc.

9 - Calculation to skip leaves and extra part and simply use the assumptions and treat the abandon rate to get the no. of agents (few calculations from pivot directly 3rd pivot)

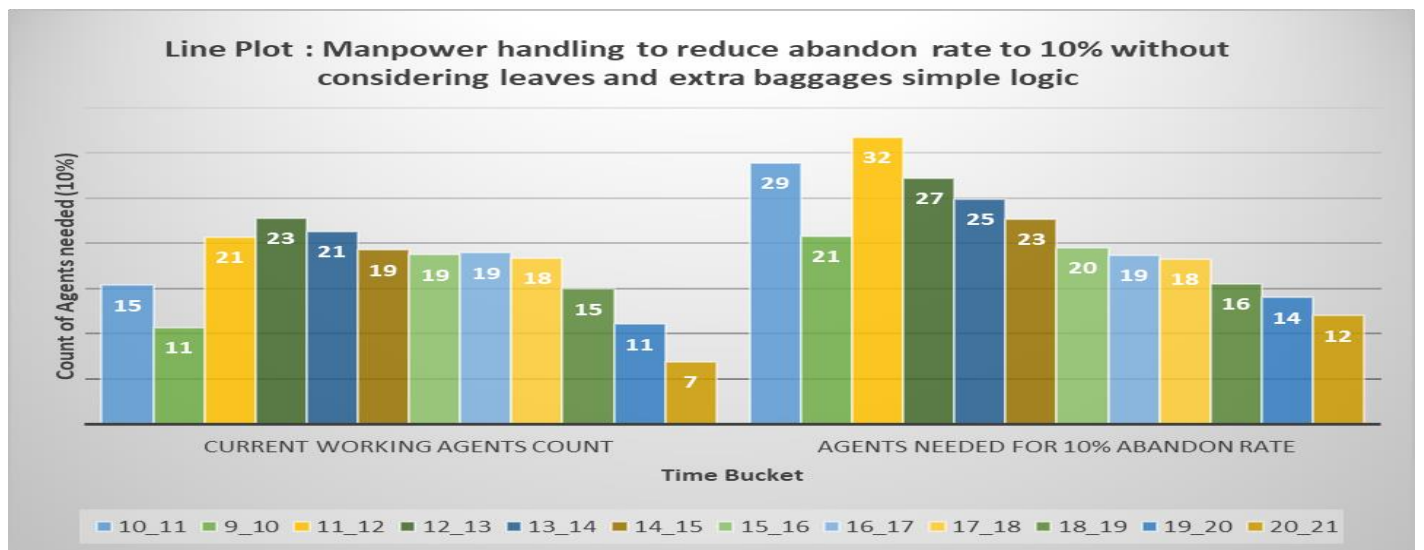
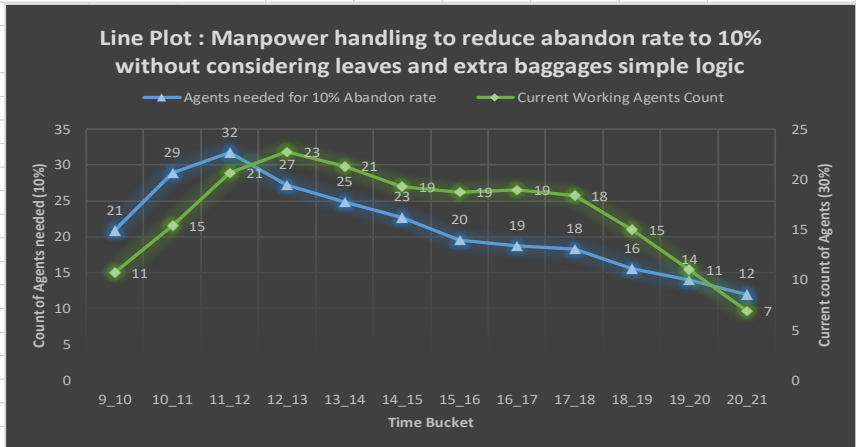
Time Bucket	Count of answered calls @ 30% abandon rate	Per day Count of answered calls B/23 days [See 3rd pivot]	Current Working Agents		No. of agents require dto bring down the abandon rate to 10% (N/18 calls) ie. Call frequency/call handling capacity per hour
			Count (Count/individual avg cap) i.e - C/18	Count of answered calls @ 10% abandon rate [See 3rd Pivot]	
9_10	4428	193	11	375	21
10_11	6368	277	15	520	29
11_12	8560	372	21	571	32
12_13	9431	410	23	490	27
13_14	8829	384	21	448	25
14_15	7974	347	19	409	23
15_16	7758	337	19	352	20
16_17	7852	341	19	337	19
17_18	7601	330	18	329	18
18_19	6200	270	15	280	16
19_20	4578	199	11	252	14
20_21	2870	125	7	216	12

Task 3 - Calculating the no. of required agents without considering leaves and on basis of avg call duration & handling capacity (18 calls per hr.)

Calculation if we ignore the leaves from data and calculate the avg agents by dividing the answered rate by avg call handling capacity of individuals directly

Calculation done in Pivot 9

Time Bucket	Current Working Agents Count	Agents needed for 10% Abandon rate
9_10	11	21
10_11	15	29
11_12	21	32
12_13	23	27
13_14	21	25
14_15	19	23
15_16	19	20
16_17	19	19
17_18	18	18
18_19	15	16
19_20	11	14
20_21	7	12



Task 3 - No. of agents calculation with basic assumptions & ignoring leaves in calculation

Insights:

1. In the question we needed to do various predictive analysis by using the given assumption it will be lengthy steps to explain the whole calculation so I would request to look at the [video ppt](#) for the explanation part, I have added the calculation screenshot here along with charts for reference.
 2. In short to explain we have calculated the sum, total, avg of calls and duration using pivot for the given data (23 days) and 30% abandon rate. And then using the given assumptions and basic math's we calculated the daily avg working of a productive agent and then using these data we tried to get the ratio of ideal works and workhours i.e. Without leaves or wasting any time then multiplying the % value with 10% abandon rate to the grand total then with new values calculating the required numbers accordingly.
 3. For ideal situation and dataset we might have considered 24 days but dataset is shy of 1 day so for division of single days steps we take 23 days instead of 24 same with actual working days agents take 4 avg UL so in actual they work for 20 days so we need to compensate the absence of such agents each day so we need to calculate the overall extra time that is generated due to ULs and then calculating the actual values for calculation.
 4. From the whole dataset predictive calculation, we came to conclude that with the current dataset of 30% abandon rate we see avg call duration to be 199sec, around 66 agents work on avg, in an hour an agent handles around 18 or 19 calls and so on.
 5. Using predictive analysis and calculation assuming 10% abandon rate from the given data we concluded that at least 80 agents are needed for the shift so as to handle the calls across various time_bucket distribution to attain the ideal abandon rate of 10%.
 6. ***I have done 2 analysis 1 considering leaves taken by agent and compensating them over the whole data which brings the overall numbers to 66 (distinct count of agent in data) & 80 avg needed agent from calculation (see distribution for more deeper insights).***
If we ignore the leaves and distinct count and instead use math's to get the avg call handling capacity of individual the current value comes to 17 agents for current data & 21 avg agents needed for 10% abandon rates (see charts for distributions).
 7. From my understanding & logic we should consider leaves as well in calculation and then summing up the excess hours each day for attending the calls alongside the actual productive hrs. to attend the much needed 10% abandon rates.
 8. For in depth calculation analysis and how the numbers came and were distributed either go through the [excel sheet](#) or watch the [video PPT](#) to understand the logic and math's behind them.
 9. See point 4 of task 4 insight for details on multiple calculations & agent numbers.
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- 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

[Q4 - Excel Answer File](#)

Task 4: Propose a manpower plan for each time bucket throughout the day, keeping the maximum abandon rate at 10%.

Task 4) Night Shift Manpower Planning: Propose a manpower plan for each time bucket throughout the day, keeping the maximum abandon rate at 10%.

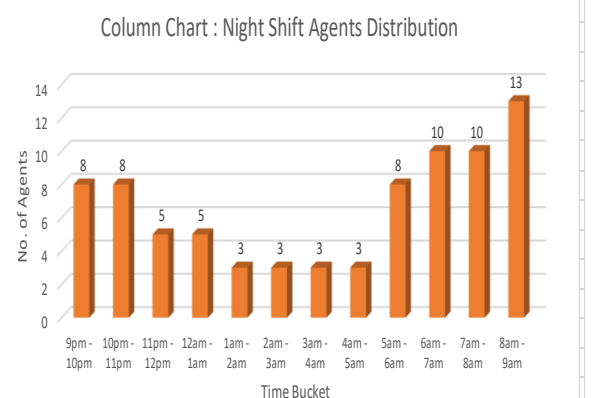
Distribution of 30 calls coming in night for every 100 calls coming in between 9am - 9pm (i.e. 12 hrs slot)											
9pm- 10pm	10pm - 11pm	11pm- 12am	12am- 1am	1am - 2am	2am - 3am	3am - 4am	4am - 5am	5am - 6am	6am - 7am	7am - 8am	8am - 9am
3	3	2	2	1	1	1	1	3	4	4	5

1 - Data Collection

Sr. no.	Findings	Description	Values (Sec)	Columns
1	Total calls during daytime (9am-9pm)	Calls @ 30% abandon rate	2392	C35 -Task 3
2	Total calls during daytime @ 10% abandon rate(9am-9pm)	Calls @ 10% abandon rate	4573	F53 - Task 3
3	Total calls during night time (9pm-9am)	Calls @ 10% abandon rate	1372	30% of dayshift(10% abandon rate ones
Calculations				
4	Abandon rate (10%)		137	10% of Night Call Seconds
5	Answer Rates (90%)		1235	90% of attended calls in seconds at night
6	Average Call Duration of 1 call (same as dayshift)		199	C34 -Task 3 (avg call seconds)
7	Call Duration calculation	Avg call(sec) * Answer call	245261	D15 * D14 (Calls * Avg Call duration)
8	Agents 1 day(Shift work) 4.5hrs* 3600sec		16200	
9	Call Handling capacity of individual in 4.5hrs productive time	Agent Average call handling cap for the shift	82	D17/D15 (Proudctive shift hrs * Avg Call Duration)
10	Call handled by 1 agent / hr (Avg)	Avg Call handling in 1 hr per agent	18	D18/4.5 (Calls capacity / productive hrs)

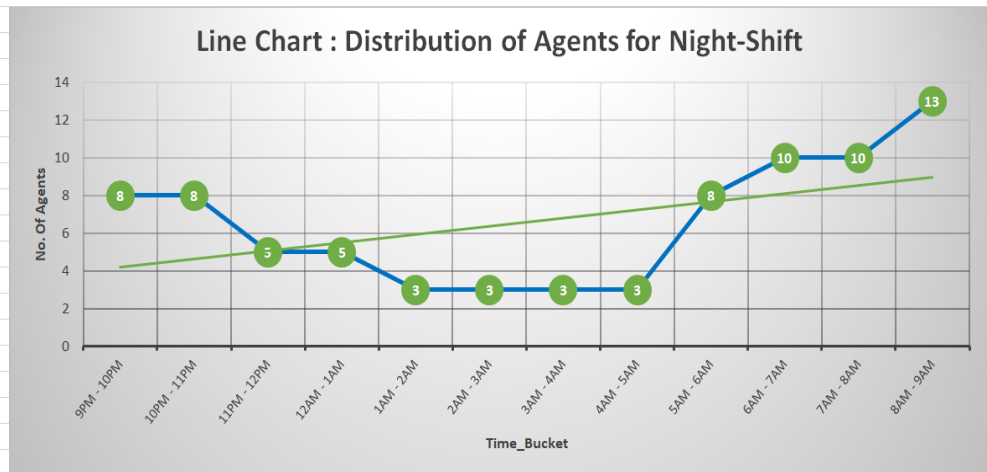
Task 4 - Calculation of night shift manpower planning

2-Agent Calculation for Night Shift to work @ 10% abandon rate											
Time Bucket	Distribution of 30 calls at Night	% of Distrubted Calls	Distribution of Calls	No. of Agents							
9pm - 10pm	3	10%	137	8							
10pm - 11pm	3	10%	137	8							
11pm - 12pm	2	7%	91	6							
12am - 1am	2	7%	91	6							
1am - 2am	1	3%	46	3							
2am - 3am	1	3%	46	3							
3am - 4am	1	3%	46	3							
4am - 5am	1	3%	46	3							
5am - 6am	3	10%	137	8							
6am - 7am	4	13%	183	11							
7am - 8am	4	13%	183	11							
8am - 9am	5	17%	229	13							
Total	30	100%	1372								



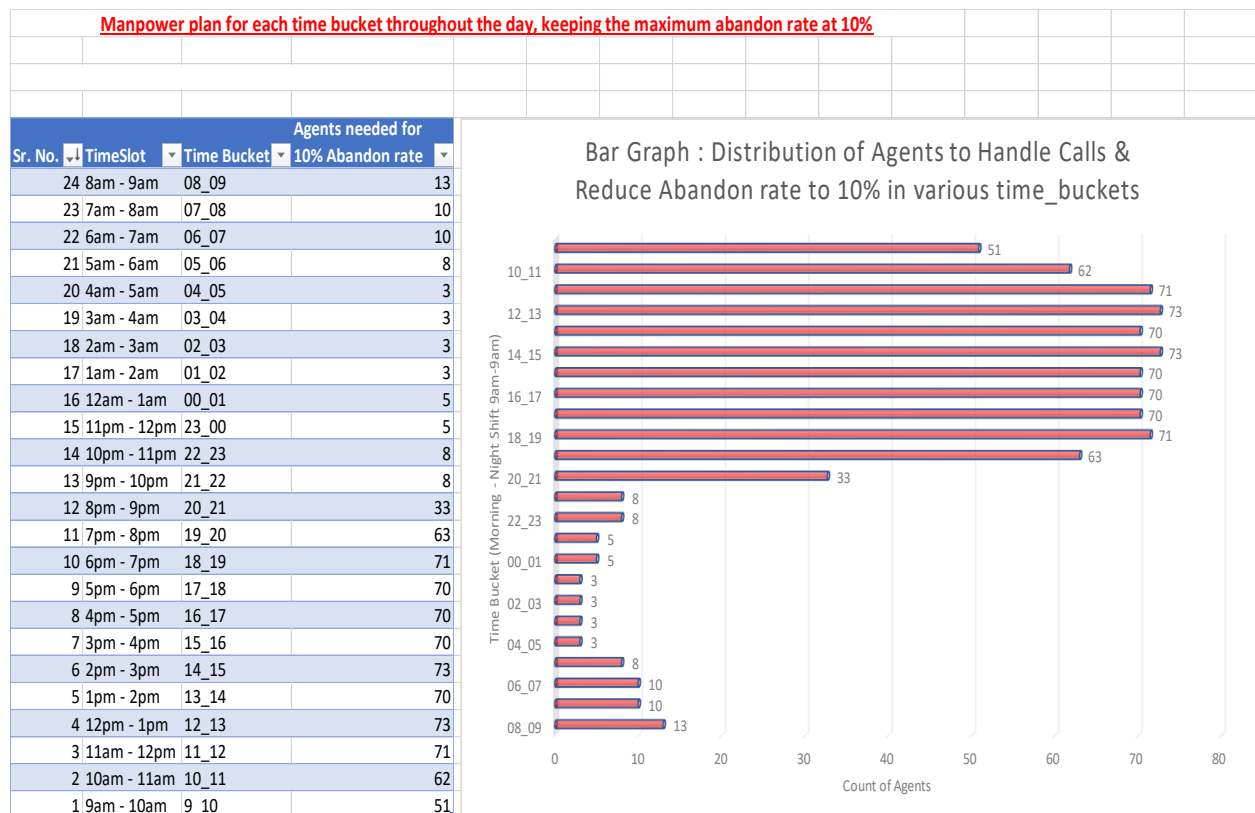
Task 4 - Basic Column chart to show the distribution of agents (Note – we considered the calculation using avg call handling capacity and not subtracting leaves)

Time Bucket	No. of Agents
9pm - 10pm	8
10pm - 11pm	8
11pm - 12pm	5
12am - 1am	5
1am - 2am	3
2am - 3am	3
3am - 4am	3
4am - 5am	3
5am - 6am	8
6am - 7am	10
7am - 8am	10
8am - 9am	13

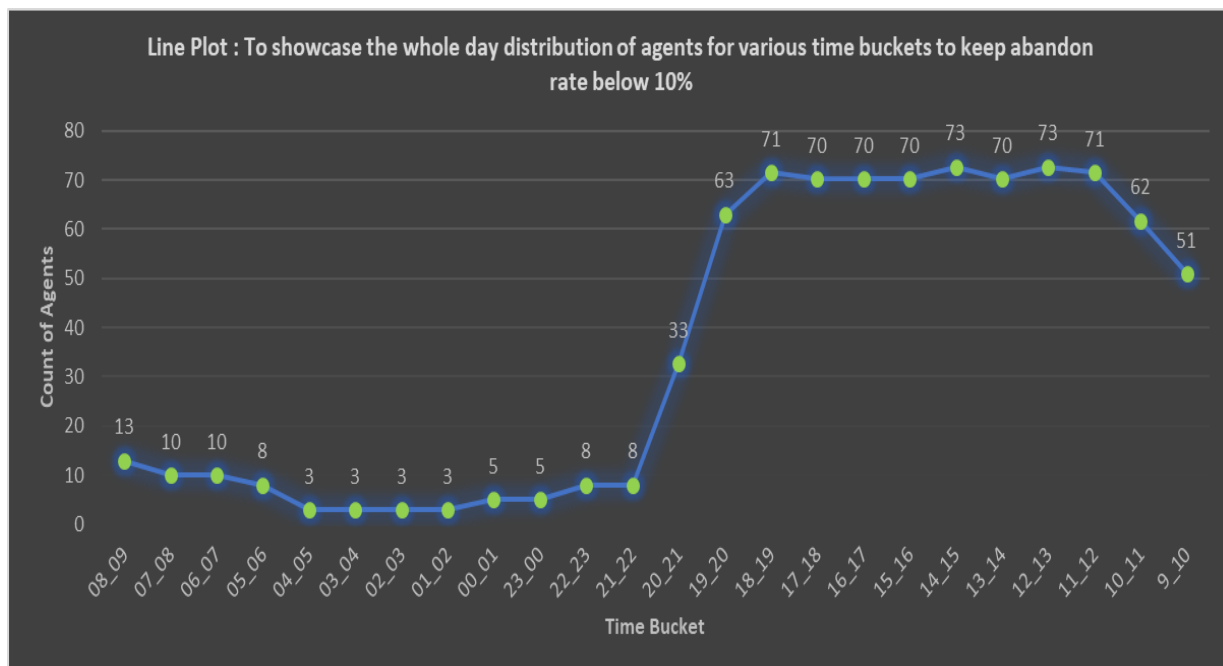


Task 4 - Basic line chart showing the distribution of agents at night (Trendline showing that as the morning happens the call frequency starts increasing ie. more agents needed to attend)

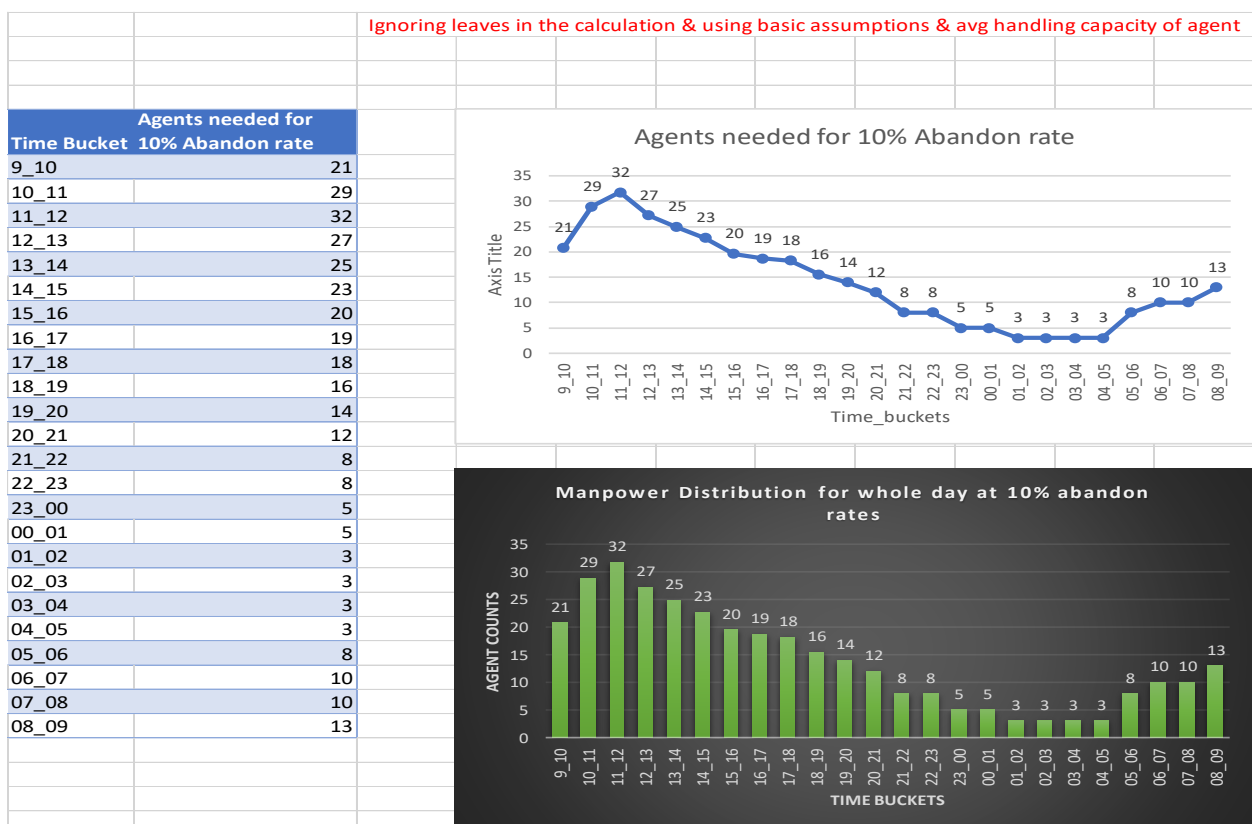
Task 4.B) To Find Manpower for each time bucket throughout the day while keeping 10% abandon rates.



Task 5 - Copy pasted the data from task3 & task4 to get the manpower of both shifts for 10% abandon rates. (Considering the leaves in calculation)



Task 4.B) - Distribution of manpower for whole day shift at 10% abandon rates using line chart.



Task4.B : Manpower calculation using simple assumptions , maths logic & without taking into the load of leaves & extra time calculation

Insights:

1. In the given question 1st we calculated the night shift manpower or agents requirement by the given assumption that if 100 calls are made in a morning shift than for same shift at night 30 calls occur assuming this data we calculated the required numbers (Note – I used simple logic in these one by using the average handling capacity of agent and leaving out the leaves from calculation.)
 2. After getting the distribution I used a bar chart & line chart with trend to analyze the call distribution of 30 said calls which showed that as the morning shift starts the agents number need to increased as frequency of calls rises. For these I used the logic given that for every 100 calls in day 30 are handled during the night and used the avg handling capacity per hr of an agent to distribute the calls on time_buckets for the 10% abandon rate data calculated in task3.
 3. For the next part of the question we were asked to plot the manpower of the whole day i.e. morning + night shift. We simply copied the data got from task3 & task4 in time_bucket and made few basic charts on the same.
 4. Do Note that I have used two distribution & charts :
 - a. 1 in which I did calculation of data considering the leaves & then transferring those 4 days avg data of each agent for each day or total month and distributing the time which increases the number of agents but it actually comes close too the distinct agent number got from the time_bucket in pivot.
 - b. In 2nd calculation I simply ignored the leaves and the overburden of calculating the overtime duration and then calculating other things instead used the avg call handling per hr. capacity and used it against the count of calls for time_bucket to get the agent counts.
 5. The above point is valid for question 3rd tasks too of manpower calculation i.e. using two calculations (1 with leaves & extra workhrs and 1 without these things).
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Important Links

1. [Google Drive Folder](#)
2. [Loom PPT Folder](#)
3. [Reports Folder](#)
4. [Excel Files Folder](#)
5. [Zip Folder](#) (Download the zip files as the drive converts the excel sheets into docs which loses pivot integration & chart highlights)

Thank You
