

# ABC Call Volume Trend Analysis

## Project Description

We are giving you a dataset of a Customer Experience (CX) Inbound calling team for 23 days to use in your final project. Agent\_Name, Agent\_ID, and other data Time [time at which a client placed a call in a day], Time\_Bucket [for ease, we have also given you with the time bucket], Queue\_Time [period for which a customer must wait before they are connected to an agent], Duration (length of time a customer and executives are on call), Call\_Seconds (we've also changed that time to seconds for ease of use), and call status (abandon, answered, transferred).

A customer experience (CX) team is made up of experts who examine data and consumer input before sharing their findings with the rest of the company. The roles and responsibilities that these teams typically carry out include: Customer experience programmes (CX programmes), Digital customer experience, Design and processes, Internal communications, Voice of the customer (VoC), User experiences, Customer experience management, Journey mapping, Nurturing customer interactions, Customer success, Customer support, Handling Customer Data, and Learning about the Customer Journey.

### **Business Understanding:**

Advertising is a technique for promoting your company in order to boost sales or raise audience awareness of your goods or services. Your advertising may contribute to the formation of a customer's initial perceptions of your company before they interact with you directly and make a purchase of your goods or services. Businesses may have a local, regional, national, or worldwide target audience, or a combination of them. Thus, they market in various methods. Internet/online directories, trade and technical press, radio, movies, outdoor advertising, national papers, magazines, and television are a few examples of the different sorts of advertising. The advertising industry is particularly cutthroat since many businesses would spend a lot of money to target the same market.

I'll address this question here:

- a. Calculate the average call time duration for all incoming calls received by agents (in each Time\_Bucket).
- b. Show the total volume/ number of calls coming in via charts/ graphs [Number of calls v/s Time]. You can select time in a bucket form (i.e. 1-2, 2-3, .....)
- c. As you can see current abandon rate is approximately 30%. Propose a manpower plan required during each time bucket [between 9am to 9pm] to reduce the abandon rate to 10%. (i.e. You have to calculate minimum number of agents required in each time bucket so that at least 90 calls should be answered out of 100.)
- d. Let's say customers also call this ABC insurance company in night but didn't get answer as there are no agents to answer, this creates a bad customer experience

for this Insurance company. Suppose every 100 calls that customer made during 9 Am to 9 Pm, customer also made 30 calls in night between interval [9 Pm to 9 Am] and distribution of those 30 calls are 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

Now propose a manpower plan required during each time bucket in a day. Maximum Abandon rate assumption would be same 10%.

## Assumption

An agent work for 6 days a week; On an average total unplanned leaves per agent is 4 days a month; An agent total working hrs is 9 Hrs out of which 1.5 Hrs goes into lunch and snacks in the office. On average an agent occupied for 60% of his total actual working Hrs (i.e 60% of 7.5 Hrs) on call with customers/ users. Total days in a month is 30 days.

## Approach

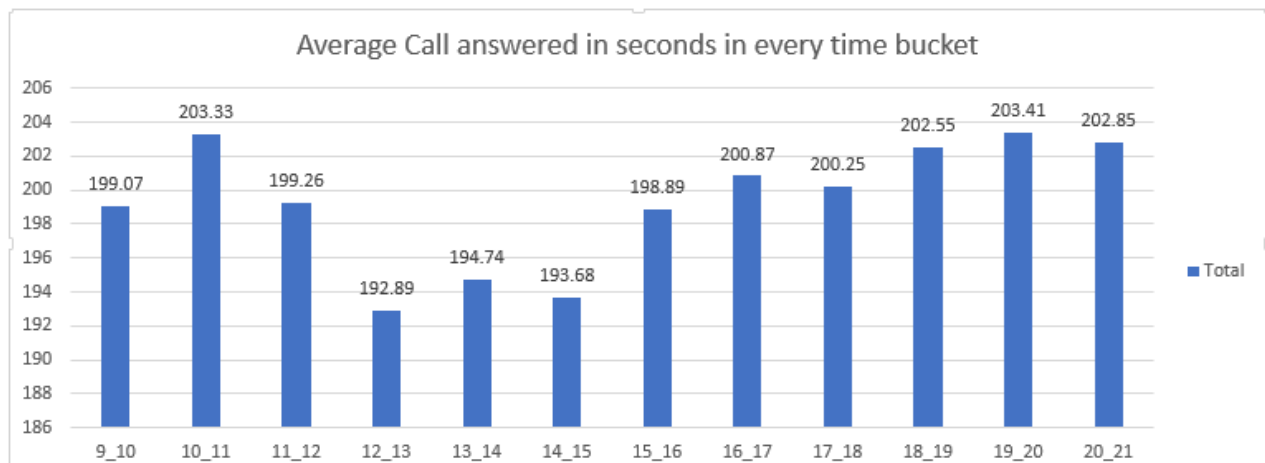
I must first comprehend the dataset, including the number of rows and columns as well as the number of numerical and categorical variables, before I can begin to clean the data. I'm going to fill in any null values throughout the data cleaning process and look for outliers. Then, in order to uncover insightful information I'll perform statistics analysis along with analysis using a pivot table and graph.

## Tech-Stack Used

Using Microsoft Excel 2013, which I will be using in this instance, I can clean the data and create a pivot table, which is helpful for data analysis. Excel graphs may be used to visualise data as well. Additionally, I use the Excel data analysis tool for statistics analysis.

## Insight

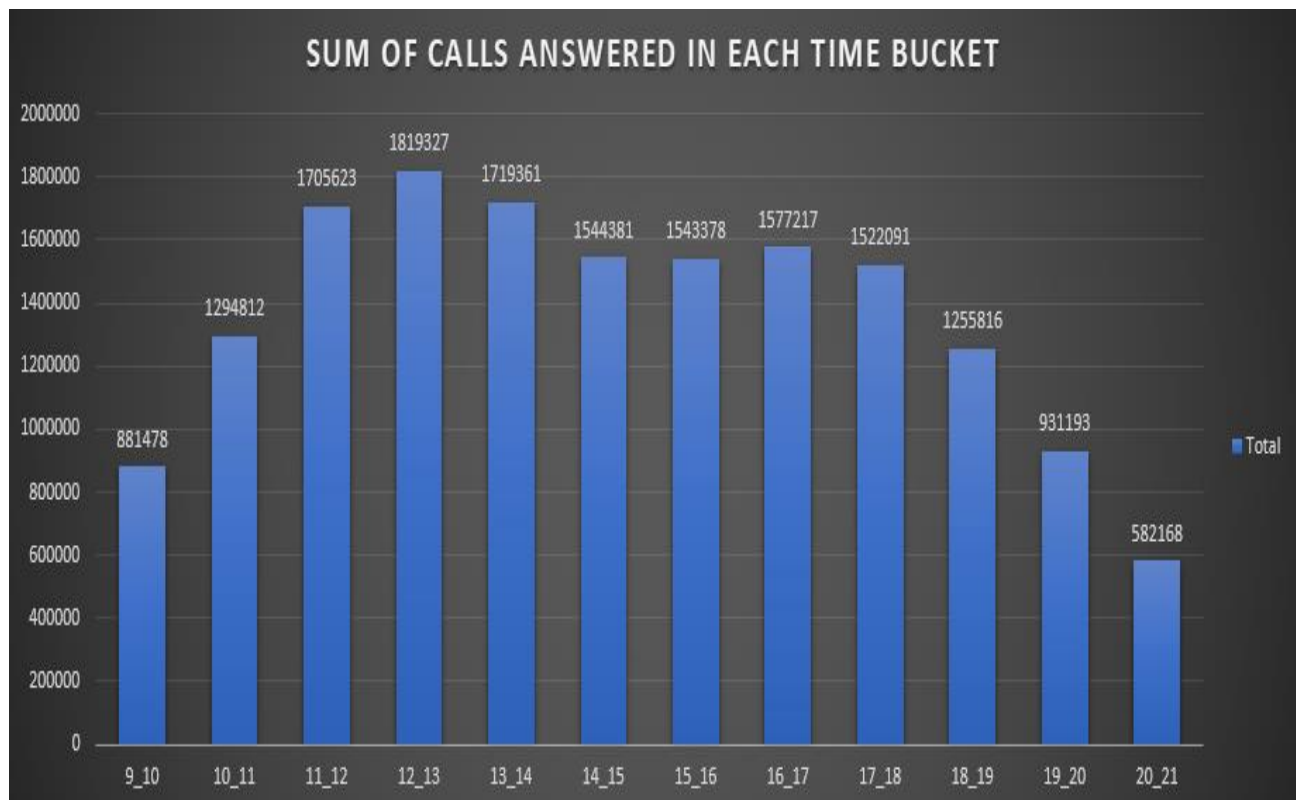
**1. Calculate the average call time duration for all incoming calls received by agents (in each Time\_Bucket).**



Call_Status	answered
Row Labels	Average of Call_Seconds (s)
9_10	199.0691057
10_11	203.3310302
11_12	199.2550234
12_13	192.8887829
13_14	194.7401744
14_15	193.6770755
15_16	198.8889175
16_17	200.8681864
17_18	200.2487831
18_19	202.5509677
19_20	203.4060725
20_21	202.845993
<b>Grand Total</b>	<b>198.6227745</b>

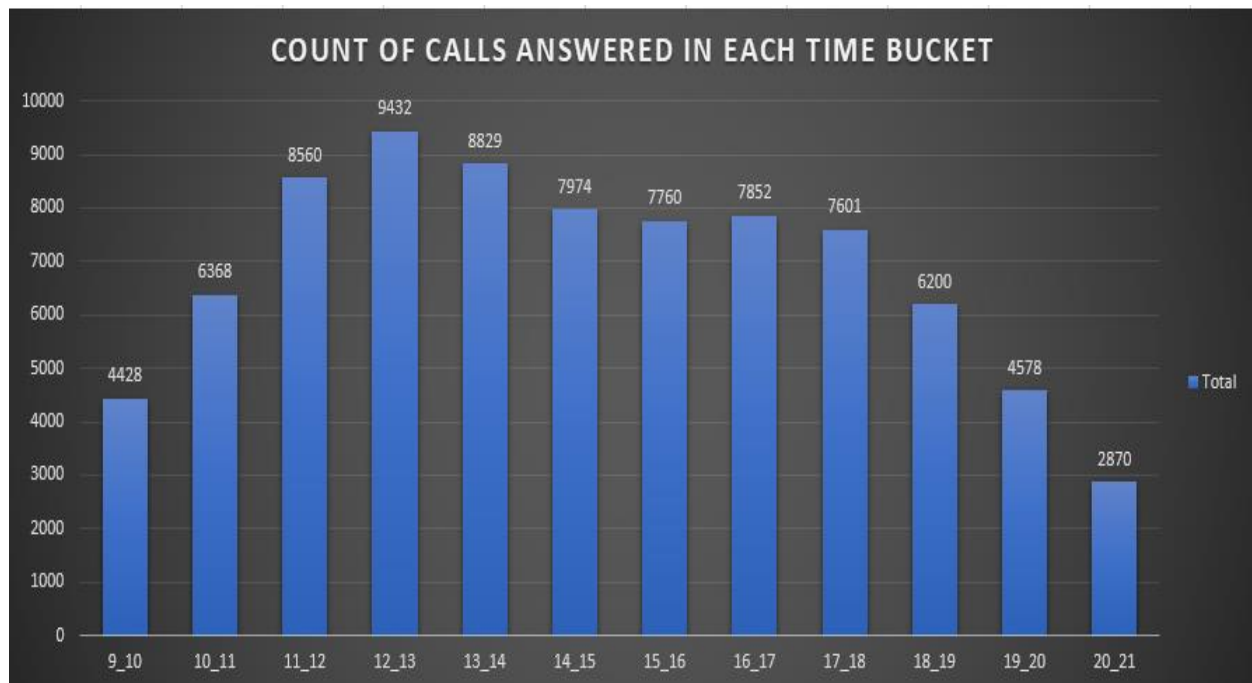
**Observation :** The time\_bucket 19\_20, or 7 PM to 8 PM, had the greatest average number of calls answered in seconds, at 203.4, according to the aforementioned column plot.

Call_Status	answered
Row Labels	Sum of Call_Seconds (s)
9_10	881478
10_11	1294812
11_12	1705623
12_13	1819327
13_14	1719361
14_15	1544381
15_16	1543378
16_17	1577217
17_18	1522091
18_19	1255816
19_20	931193
20_21	582168
<b>Grand Total</b>	<b>16376845</b>



**Observation :** The time\_bucket 12\_13, or from 12 to 1 PM, had the largest overall number of calls answered, with 1819327, according to the above column plot.

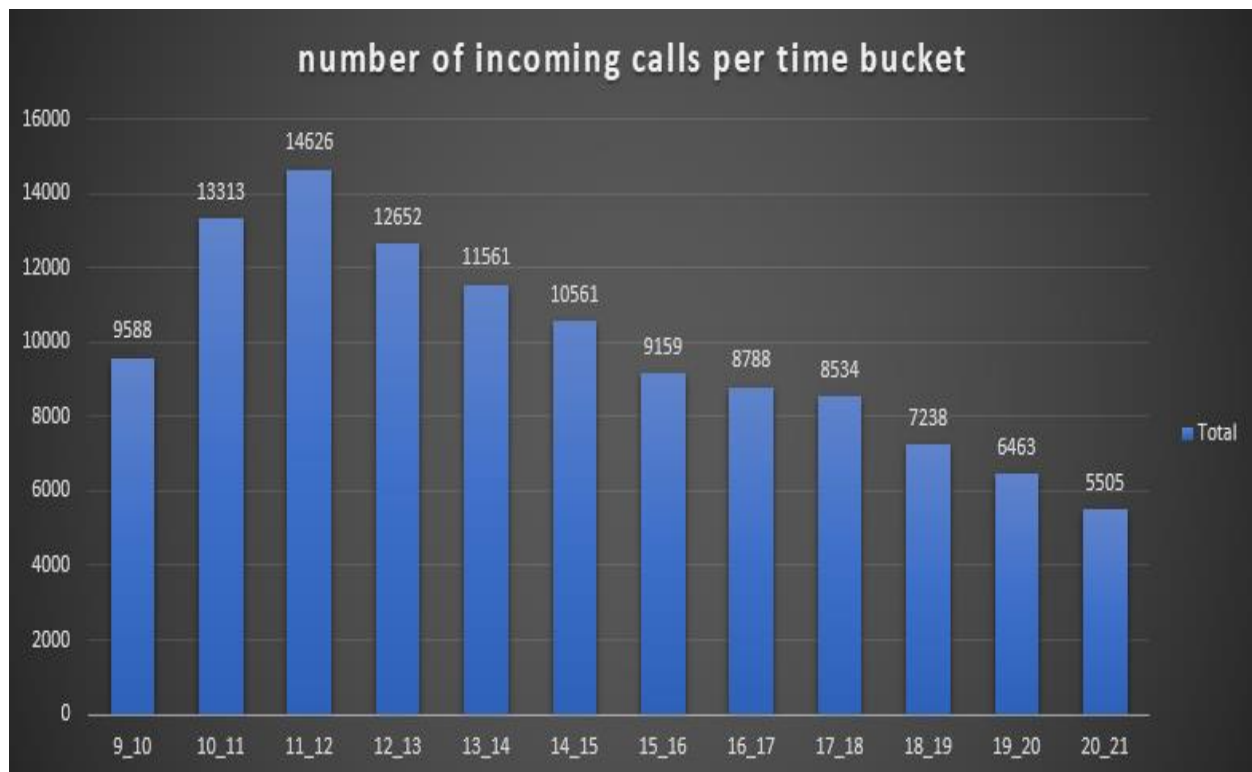
Call_Status	answered
Row Labels	Count of Call_Seconds (s)
9_10	4428
10_11	6368
11_12	8560
12_13	9432
13_14	8829
14_15	7974
15_16	7760
16_17	7852
17_18	7601
18_19	6200
19_20	4578
20_21	2870
<b>Grand Total</b>	<b>82452</b>



**Observation :** The time\_bucket 12-13, or 12 PM to 1 PM, had the greatest total of calls answered, with 9432, according to the above column plot.

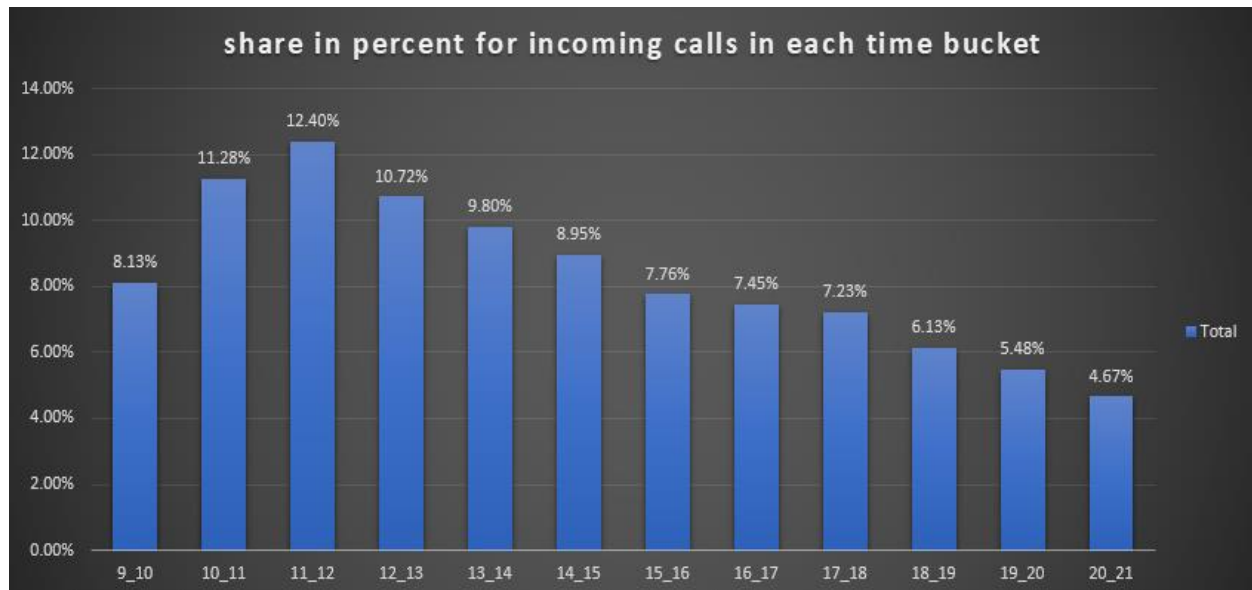
2. Show the total volume/ number of calls coming in via charts/ graphs [Number of calls v/s Time]. You can select time in a bucket form (i.e. 1-2, 2-3, .....).

Row Labels	Count of Customer_Phone_No
9_10	9588
10_11	13313
11_12	14626
12_13	12652
13_14	11561
14_15	10561
15_16	9159
16_17	8788
17_18	8534
18_19	7238
19_20	6463
20_21	5505
<b>Grand Total</b>	<b>117988</b>



**Observations :** The time bucket 11\_12, or 11 AM to 12 PM, has the greatest count for the total number of incoming calls, with a count of 14626, according to the above column plot.

Row Labels	Count of Time
9_10	8.13%
10_11	11.28%
11_12	12.40%
12_13	10.72%
13_14	9.80%
14_15	8.95%
15_16	7.76%
16_17	7.45%
17_18	7.23%
18_19	6.13%
19_20	5.48%
20_21	4.67%
<b>Grand Total</b>	<b>100.00%</b>



**Observation :** The time bucket 11\_12, or 11 AM to 12 PM, has the biggest percentage of incoming calls (12.40%), according to the aforementioned column plot.

**3. As you can see current abandon rate is approximately 30%. Propose a manpower plan required during each time bucket [between 9am to 9pm] to reduce the abandon rate to 10%. (i.e. You have to calculate minimum number of agents required in each time bucket so that at least 90 calls should be answered out of 100.)**

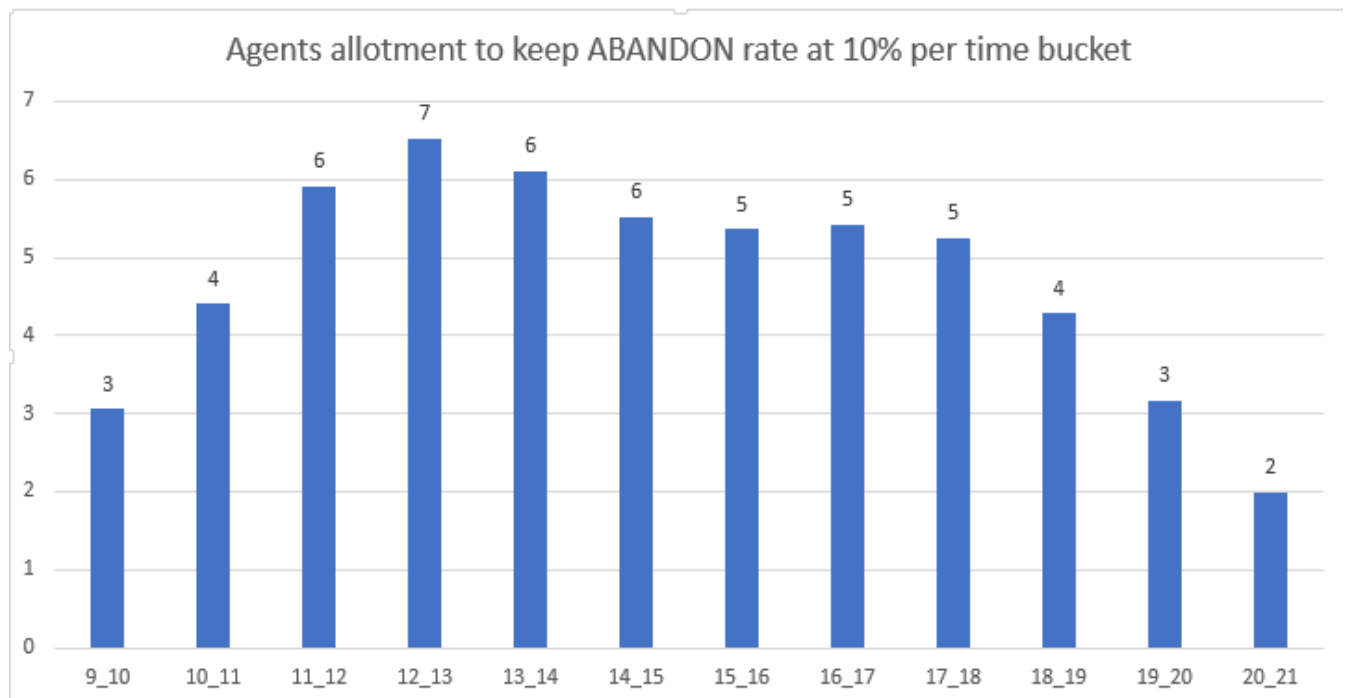
The data indicates that the current abandon rate is about 30%. A manpower plan, or the new average number of employees working each day, has to be proposed.

Count of Call_Status	Column Labels			
Row Labels	abandon	answered	transfer	Grand Total
Jan				
1-Jan	684	3883	77	4644
2-Jan	356	2935	60	3351
3-Jan	599	4079	111	4789
4-Jan	595	4404	114	5113
5-Jan	536	4140	114	4790
6-Jan	991	3875	85	4951
7-Jan	1319	3587	42	4948
8-Jan	1103	3519	50	4672
9-Jan	962	2628	62	3652
10-Jan	1212	3699	72	4983
11-Jan	856	3695	86	4637
12-Jan	1299	3297	47	4643
13-Jan	738	3326	59	4123
14-Jan	291	2832	32	3155
15-Jan	304	2730	24	3058
16-Jan	1191	3910	41	5142
17-Jan	16636	5706	5	22347
18-Jan	1738	4024	12	5774
19-Jan	974	3717	12	4703
20-Jan	833	3485	4	4322
21-Jan	566	3104	5	3675
22-Jan	239	3045	7	3291
23-Jan	381	2832	12	3225
Grand Total	34403	82452	1133	117988
Avg calls in daily basis	1495.782609	3584.87	49.261	5129.913
% Avg calls in daly basis	29.16%	69.88%	0.96%	

- We may infer from the preceding study that the average number of calls answered by each agent in each time bucket is **198.6**.
- The abandon rate has to be decreased by 30% (actual) - 10% (desired) = 20%. Specifically, we must raise the call responded rate by 70% (current) + 20% (change), **which equals 90%**.
- In order to lower the abandon rate to 10%, we must answer 90% of all incoming calls.
- Total avg calls incoming per day = **5130**
- Avg calls answered per second = 198.6
- Answered rate = 90% i.e. 0.9
- Seconds per hour = 3600
- Time needed to answer 90% of incoming calls is calculated as follows:  $5130 * 198.6 * 0.9 / 3600 = \mathbf{254.7001826}$
- Therefore, the new average number of agents working each day is 255 divided by the actual number of hours each agent works (on a customer contact), or 4.5, which is 56.67. This results in 57 agents working each day .
- In order to achieve a **10% abandon rate, 57 agents** must be working each day.

Call_Status	answered	
Row Labels	Count of Customer_Phone_No	Agents allotment
9_10	4428	3
10_11	6368	4
11_12	8560	6
12_13	9432	7
13_14	8829	6
14_15	7974	6
15_16	7760	5
16_17	7852	5
17_18	7601	5
18_19	6200	4
19_20	4578	3
20_21	2870	2
<b>Grand Total</b>	<b>82452</b>	<b>57</b>





The distribution of the manpower plan by time bucket to maintain a 10% abandon rate, or a 90% call response rate.

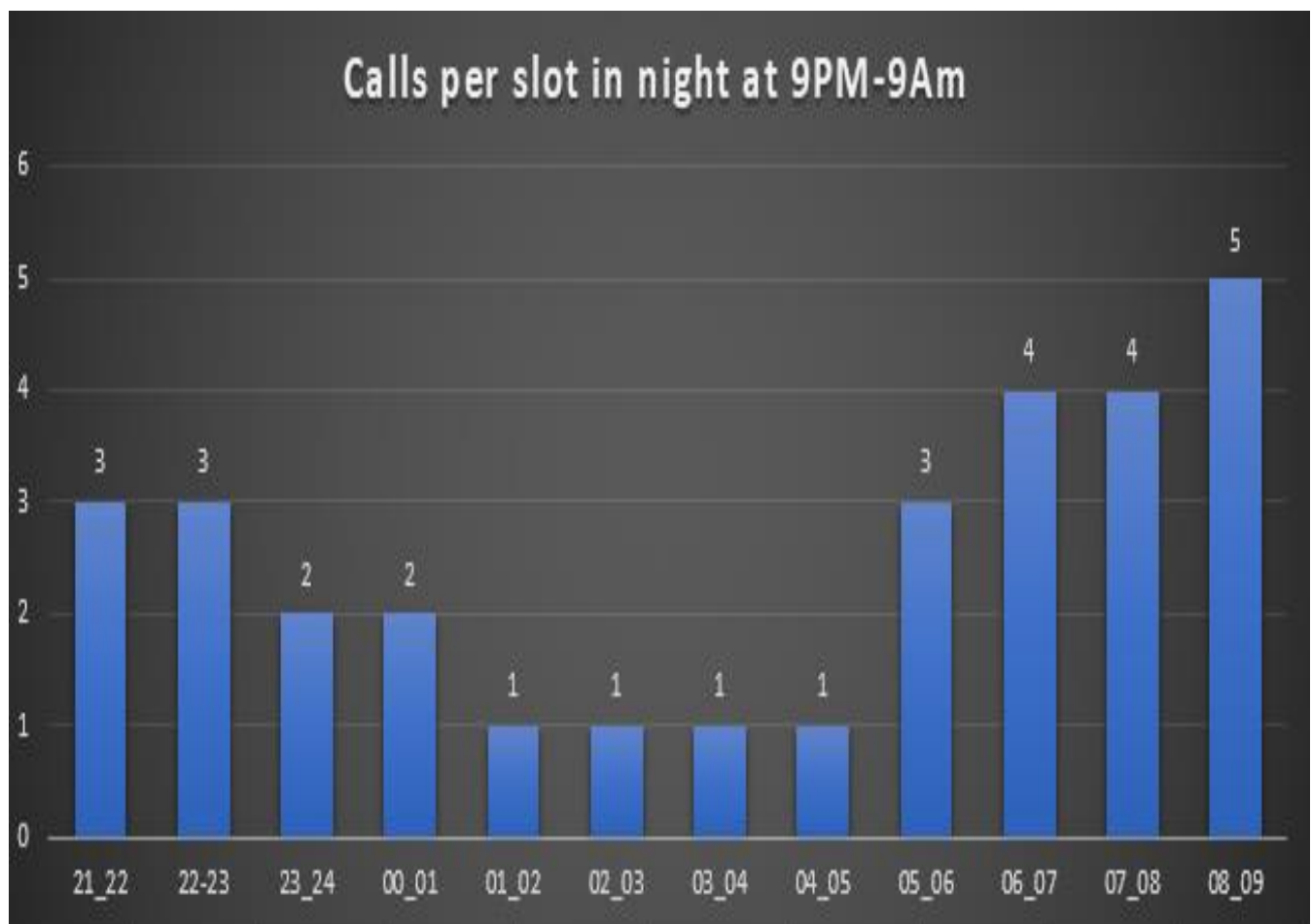
**The following observations were made based on the assumptions made:-**

- An agent works for 9 hours in a day.
- Out of that total, 1.5 hours are taken for lunch and coffee/tea breaks. That leaves 9 minus 1.5 hours, or 7.5 hours. Of those 7.5 hours, an agent is on consumer calls for only 60% of the time, or  $0.6 * 7.5$  hours. This means that an agent spends only 4.5 hours per day out of a total of 7.5 hours on consumer calls.
- 6 days a week are worked by an agency.
- In a month of 30 days, there are 6 days per week; there are 4 weeks in a month of 30 days; 7 days per week means a total of 28 days, of which 4 days are unplanned leave; the number of days an agent spends on the floor is  $20 * 7/28$ , or 5 days; the number of days left is  $28 - 4 = 24$ ; there are 4 Sundays in a month of 30; the number of days an agent can work is  $24 - 4$ , or 20; as

**4. Let's say customers also call this ABC insurance company in night but didn't get answer as there are no agents to answer, this creates a bad customer experience for this Insurance company. Suppose every 100 calls that customer made during 9 Am to 9 Pm, customer also made 30 calls in night between interval [9 Pm to 9 Am] and distribution of those 30 calls are 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

- Keeping the abandon rate at 10%, or keeping the answered rate at 90%, we must now distribute the total manpower available for each time bucket, starting from 9 AM to 9 PM and then from 9 PM to 9 AM.
- There are 30 night calls for every 100 day calls, therefore there will be 1539 night calls for every 5130 day calls ( $5130 \times 30 / 100$ ). In all, there are 5130 day calls and 1539 night calls.
- Consequently, 1539 more working hours will be required to maintain a 90% response rate.  $\ast 198.6$  (average number of answered calls per second)  $\ast 0.9 / 3600$  (number of seconds in an hour) = **76.41135**.
- Therefore, the organisation needs more employees to handle nighttime calls ( $76.41135 / 4.5 = 16.98 \approx 17$ ).
- We thus require an extra 17 agents to answer night calls, bringing the total number of agents working each day **to 57 (day call answer 90%) + 17 (night call answer 90%), or 74 agents**.
- Therefore, we require **74 agents per day** to handle customer calls from day and night **while maintaining an answered rate of 90% and an abandon rate of 10%.**



Night time slot	Calls per slot	76.41135	Agents needed	Time distribution
21_22	3	7.641135	13	10%
22-23	3	7.641135	13	10%
23_24	2	5.09409	8	7%
00_01	2	5.09409	8	7%
01_02	1	2.547045	4	3%
02_03	1	2.547045	4	3%
03_04	1	2.547045	4	3%
04_05	1	2.547045	4	3%
05_06	3	7.641135	13	10%
06_07	4	10.18818	17	13%
07_08	4	10.18818	17	13%
08_09	5	12.735225	21	17%
Total	30	76.41135	126	100%

### Observation :

- The agents that work in the 19\_20, 20\_21 time buckets must wait and work in the 21\_22, and 22\_23 time buckets as well because we only have 17 agents available at night.
- Additionally, agents that work during the time buckets 9\_10 and 10\_11 may be requested to work during the time buckets 7\_8 and 8\_9.
- To keep the abandon rate at 10%, the agents who operate in time buckets 1–2, 2–3, 3–4, and 4–5 might be instructed to work in time buckets 6–7, 7–8, and 8–9.

### Result

1. According to the aforementioned column plot, the time\_bucket 19\_20, or 7 PM to 8 PM, had the highest average number of calls answered in seconds, at 203.4.
2. According to the aforementioned column diagram, the time\_bucket 12\_13, or from 12 to 1 PM, had the highest total number of calls answered (1819327).
3. According to the above column plot, the time\_bucket 12-13, or 12 PM to 1 PM, had the most calls answered overall with 9432.
4. According to the aforementioned column plot, the time bucket 11\_12, or 11 AM to 12 PM, has the highest count for the overall number of incoming calls, with a count of 14626.
5. In order to achieve a 10% abandon rate, 57 agents must be working each day.
6. According to the aforementioned column plot, the time bucket 11\_12, or 11 AM to 12 PM, has the highest percentage of incoming calls (12.40%).
7. We only have 17 agents accessible at night, thus the agents that work in the 19\_20 and 20\_21 time buckets must wait and work in the 21\_22 and 22\_23 time buckets as well.
8. Additionally, it is possible to require that agents who work in the time buckets 9\_10 and 10\_11 also work in the time buckets 7\_8 and 8\_9.
9. The agents who work in time buckets 1-2, 2-3, 3-4, and 4-5 may be told to work in time buckets 6-7, 7-8, and 8-9 in order to maintain the abandon rate at 10%.

I have done data cleaning only one column because it have more null values some columns also have large amount of null values but they are irrelevant for our analysis which have relevant columns they are not required any data cleaning process.

Google Drive Link : [Clean and Analyzed data with presentation video and pdf](#)