ABC Call Volume
Trend Analysis

Final Project-4

Project Description

The goal of this project is to analyze the call volume trends for the inbound calling team of ABC, an insurance company. This analysis aims to derive valuable insights into average call duration, call volume trends, and manpower requirements to enhance customer experience by reducing abandoned calls and planning for night shift manpower.

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.

Approach

1. **Data Cleaning:**
    - Prepare the dataset by handling missing values, ensuring correct data types, and standardizing time formats.
2. **Data Analysis:**
    - Calculate average call durations for each time bucket.
    - Create a chart showing the number of calls received in each time bucket.
3. **Manpower Planning:**
    - Calculate the current call abandonment rate.
    - Use the Erlang C formula or simulation to determine the minimum number of agents required to meet the desired service level (90% answered calls).
    - Extend the analysis to night shift planning, considering the additional calls received at night.

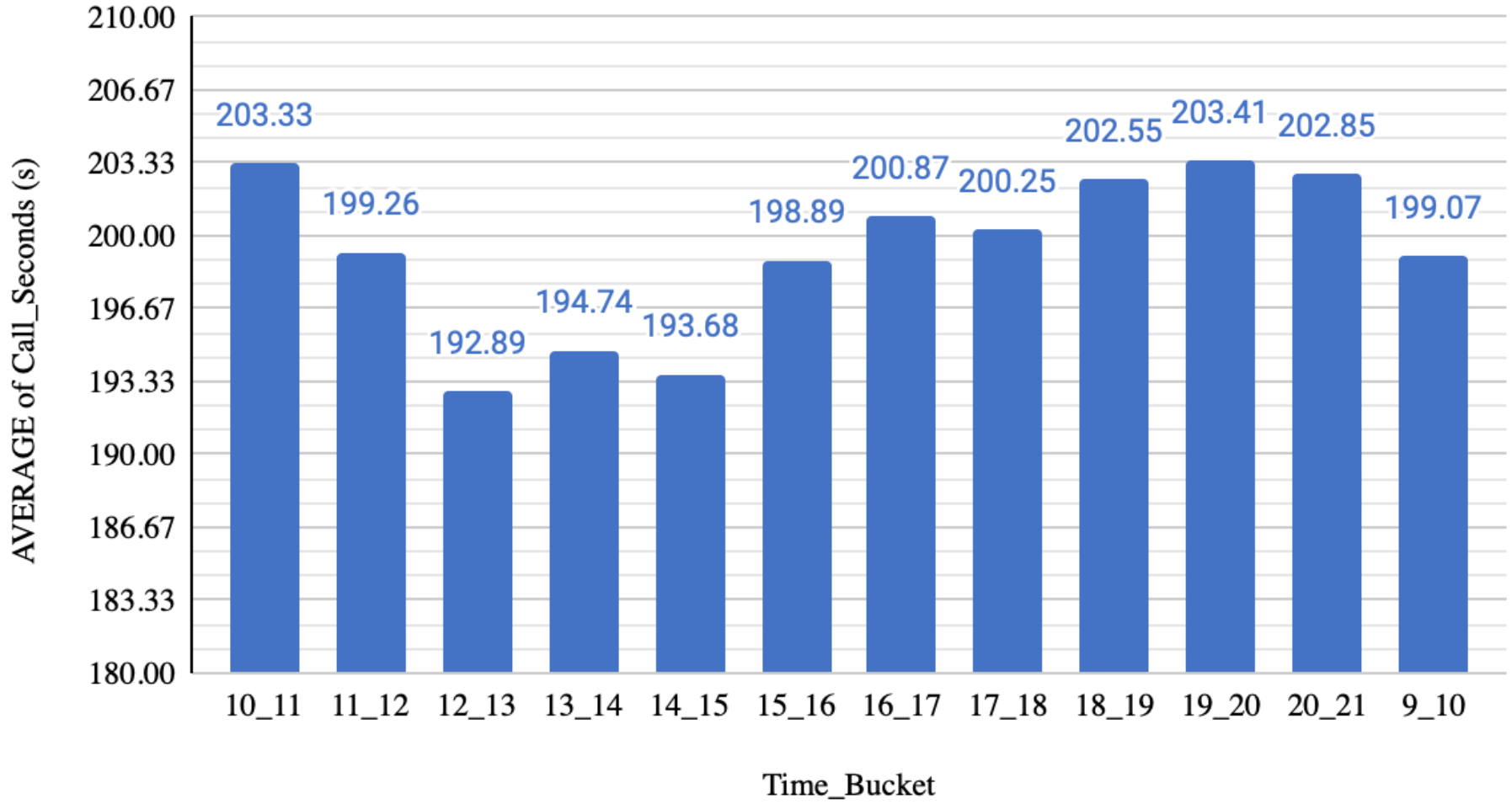
Tech-Stack Used:

- **Microsoft Excel 2022:** For data cleaning, analysis, and visualization.

1. Average Call Duration

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

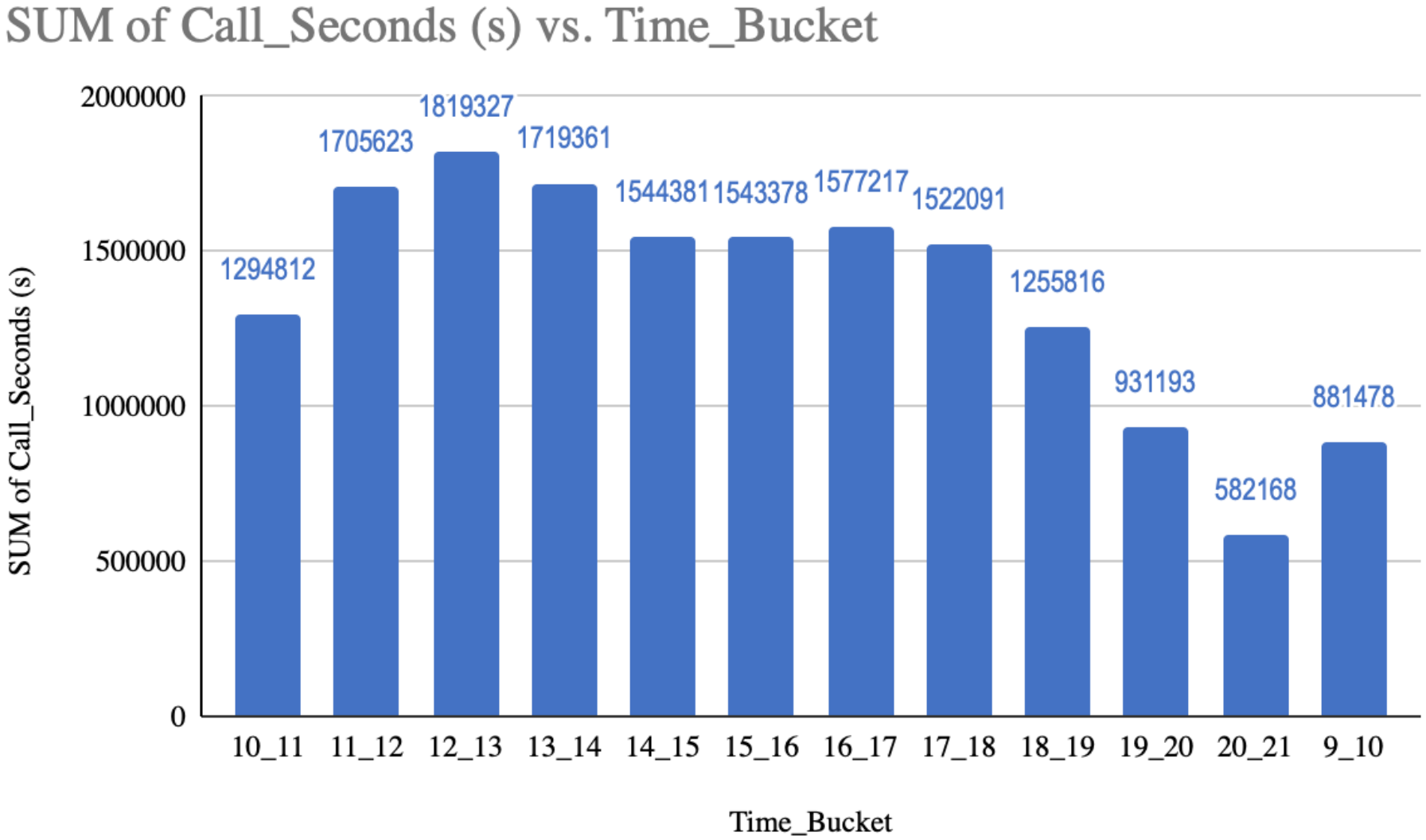
AVERAGE of Call_Seconds (s) vs. Time_Bucket



Average Call answered in seconds per time bucket

Time_Bucket	AVERAGE of Call_Seconds (s)
12_13	192.89
14_15	193.68
13_14	194.74
15_16	198.89
9_10	199.07
11_12	199.26
17_18	200.25
16_17	200.87
18_19	202.55
20_21	202.85
10_11	203.33
19_20	203.41
Grand Total	**198.62**

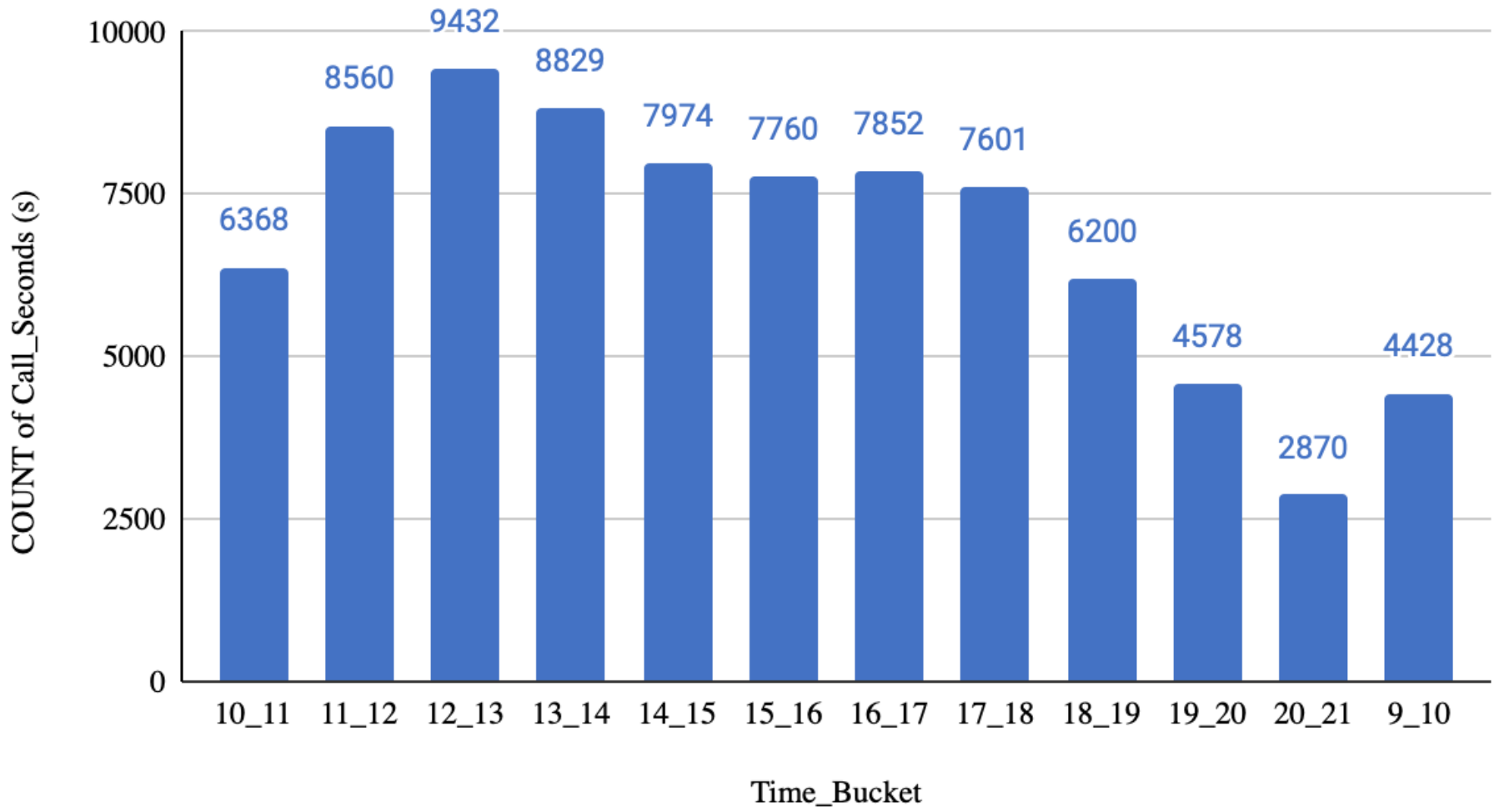
- From the bar plot, we can see that the time bucket 19:00 to 20:00 (7 PM to 8 PM) had the highest average call answer time, which was 203.4 seconds.


SUM of Call_Seconds (s) vs. Time_Bucket
SUM of Call_Seconds (s)
2000000
1500000
1000000
500000
0
1294812
1705623
1819327
1719361
1544381
1543378
1577217
1522091
1255816
931193
582168
881478
10_11
11_12
12_13
13_14
14_15
15_16
16_17
17_18
18_19
19_20
20_21
9_10
Time_Bucket

Total Sum of Calls answered in each Time Bucket

Call_Status	*Time_Bucket*	SUM of Call_Seconds (s)
answered	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
	9_10	881478
answered Total		16376845

- From the bar plot, we can see that the time bucket 12:00 to 13:00 (12 PM to 1 PM) had the highest total number of calls answered, totaling 1,819,327.


COUNT of Call_Seconds (s) vs. Time_Bucket
COUNT of Call_Seconds (s)
10000
7500
5000
2500
0
6368
8560
9432
8829
7974
7760
7852
7601
6200
4578
2870
4428
10_11
11_12
12_13
13_14
14_15
15_16
16_17
17_18
18_19
19_20
20_21
9_10
Time_Bucket

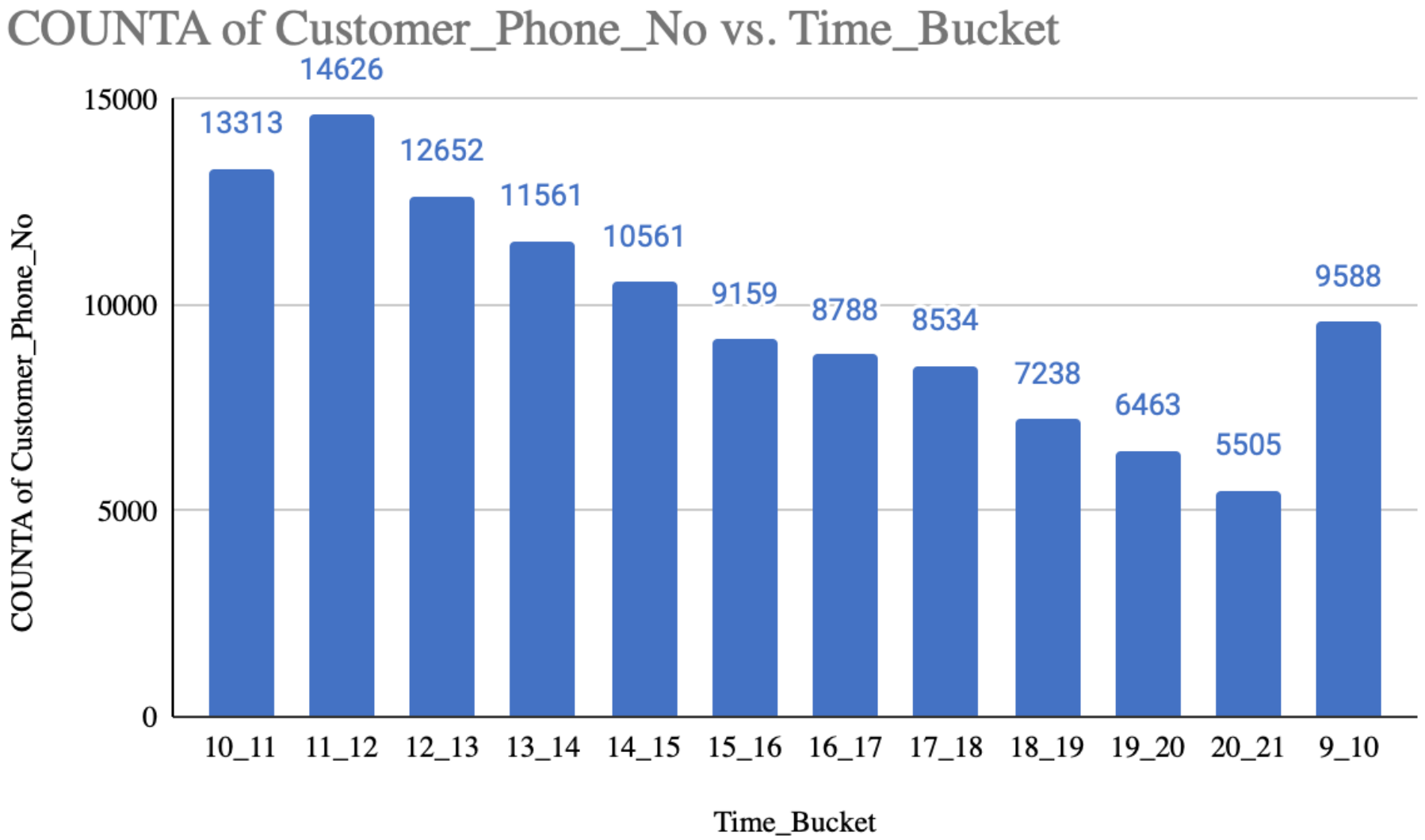
Total Count of Calls answered in each Time Bucket

Call_Status	*Time_Bucket*	COUNT of Call_Seconds (s)
answered	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
	9_10	4428

- From the bar plot, we can see that the time bucket 12:00 to 13:00 (12 PM to 1 PM) had the highest number of calls answered, with a total of 9,432 calls.

2. Call Volume Analysis

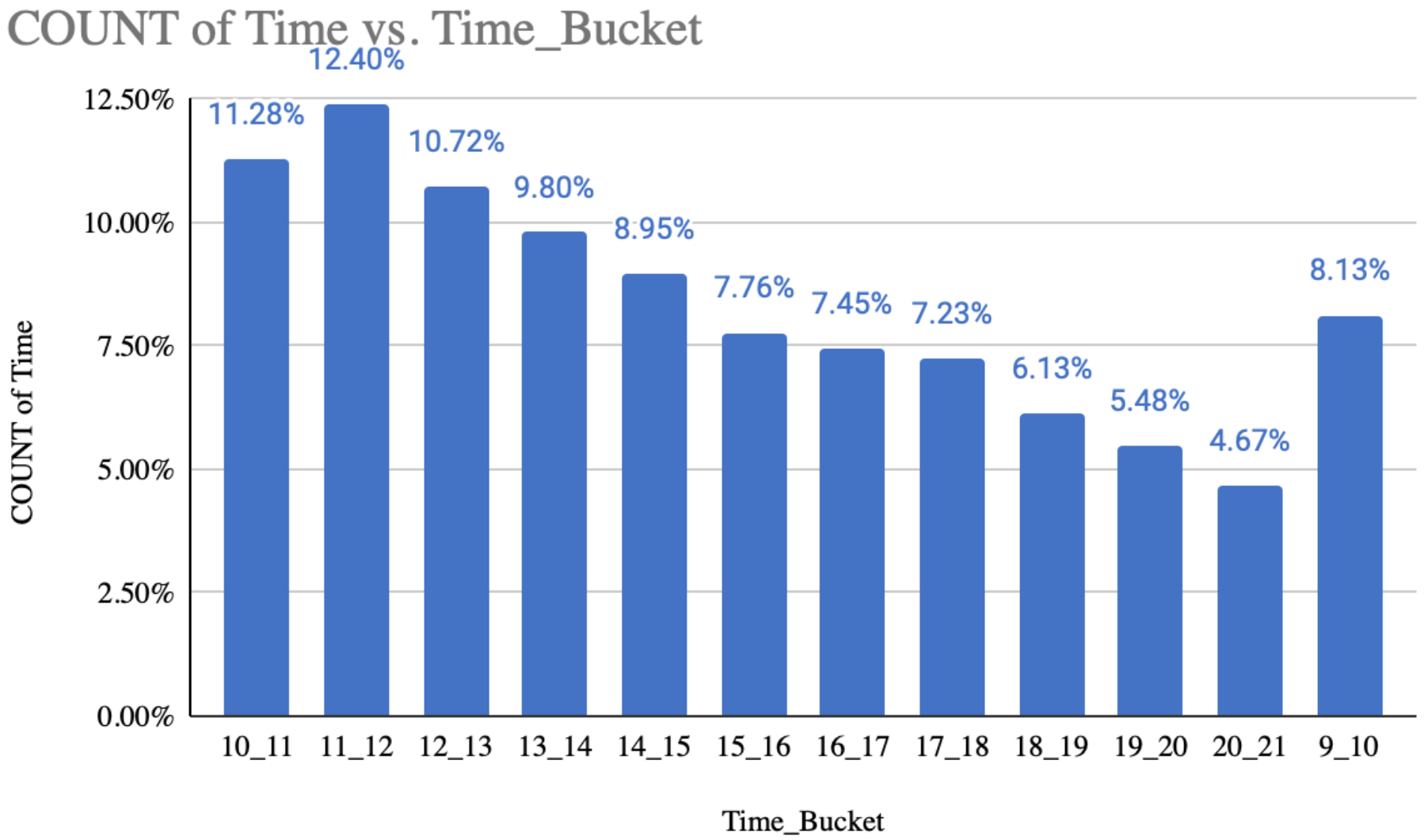
Create a chart or graph that shows the number of calls received in each time bucket.


COUNTA of Customer_Phone_No vs. Time_Bucket
COUNTA of Customer_Phone_No
15000
10000
5000
0
13313
14626
12652
11561
10561
9159
8788
8534
7238
6463
5505
9588
10_11
11_12
12_13
13_14
14_15
15_16
16_17
17_18
18_19
19_20
20_21
9_10
Time_Bucket

Total number of incoming calls per time bucket

Time_Bucket	COUNTA of Customer_Phone_No
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
9_10	9588
Grand Total	**117988**

- From the bar plot, we can see that the time bucket 11:00 to 12:00 (11 AM to 12 PM) had the highest total number of incoming calls, with a count of 14,626.


COUNT of Time vs. Time_Bucket
12.40%
11.28%
10.72%
9.80%
8.95%
7.76%
7.45%
7.23%
6.13%
5.48%
4.67%
8.13%
12.50%
10.00%
7.50%
5.00%
2.50%
0.00%
COUNT of Time
10_11
11_12
12_13
13_14
14_15
15_16
16_17
17_18
18_19
19_20
20_21
9_10
Time_Bucket

Total share in percent for incoming calls in each time bucket

Time_Bucket	COUNT of Time
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%
9_10	8.13%
Grand Total	**100.00%**

- From the bar plot, we can see that the time bucket 11:00 to 12:00 (11 AM to 12 PM) has the largest share of incoming calls, accounting for 12.40%.

3. Manpower Planning

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

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

Analysis

From the table, we can determine that the current abandon rate is approximately 30%. To address this, we need to propose a new manpower plan to adjust the total number of staff working per day.

Here's the approach:

1. **Current Analysis**: Each agent answers an average of 198.6 calls per time bucket.
2. **Goal**: Reduce the abandon rate from 30% to 10%. This requires increasing the call answer rate from the current 70% to 90% (30% + 20% increase).
    - **Calculation**:
    - **Total Average Incoming Calls per Day**: 5,130
    - **Desired Answer Rate**: 90% (0.9)
    - **Seconds per Hour**: 3,600
    - **Time Required to Answer 90% of Incoming Calls**:

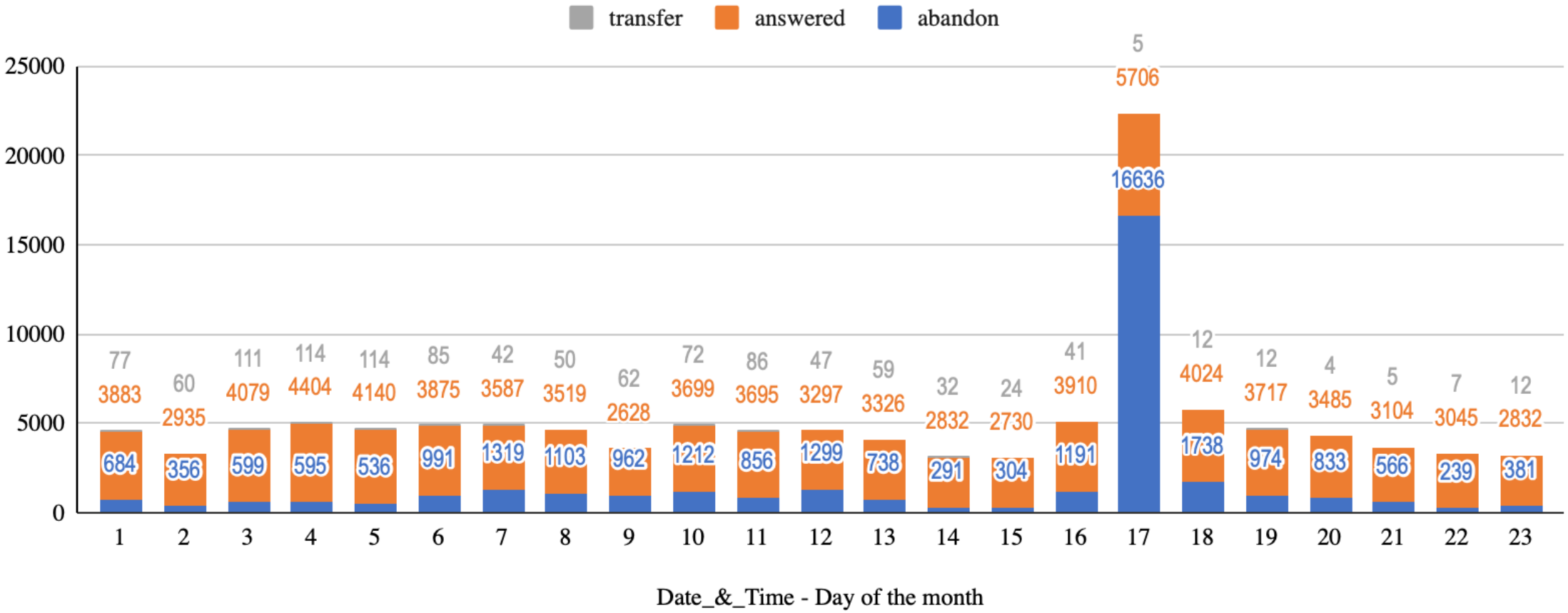
$$\text{Time Required} = \frac{5,130 \times 198.6 \times 0.9}{3,600} \approx 255 \text{ hours}$$

3. **Manpower Needed**:
    - **Average Call Handling Time per Agent**: 4.5 hours
    - **Required Number of Agents**:

$$\text{Agents} = \frac{255}{4.5} \approx 57$$

To achieve a 10% abandon rate, we need approximately 57 agents working each day.

abandon, answered and transfer



4. Night Shift Manpower Planning

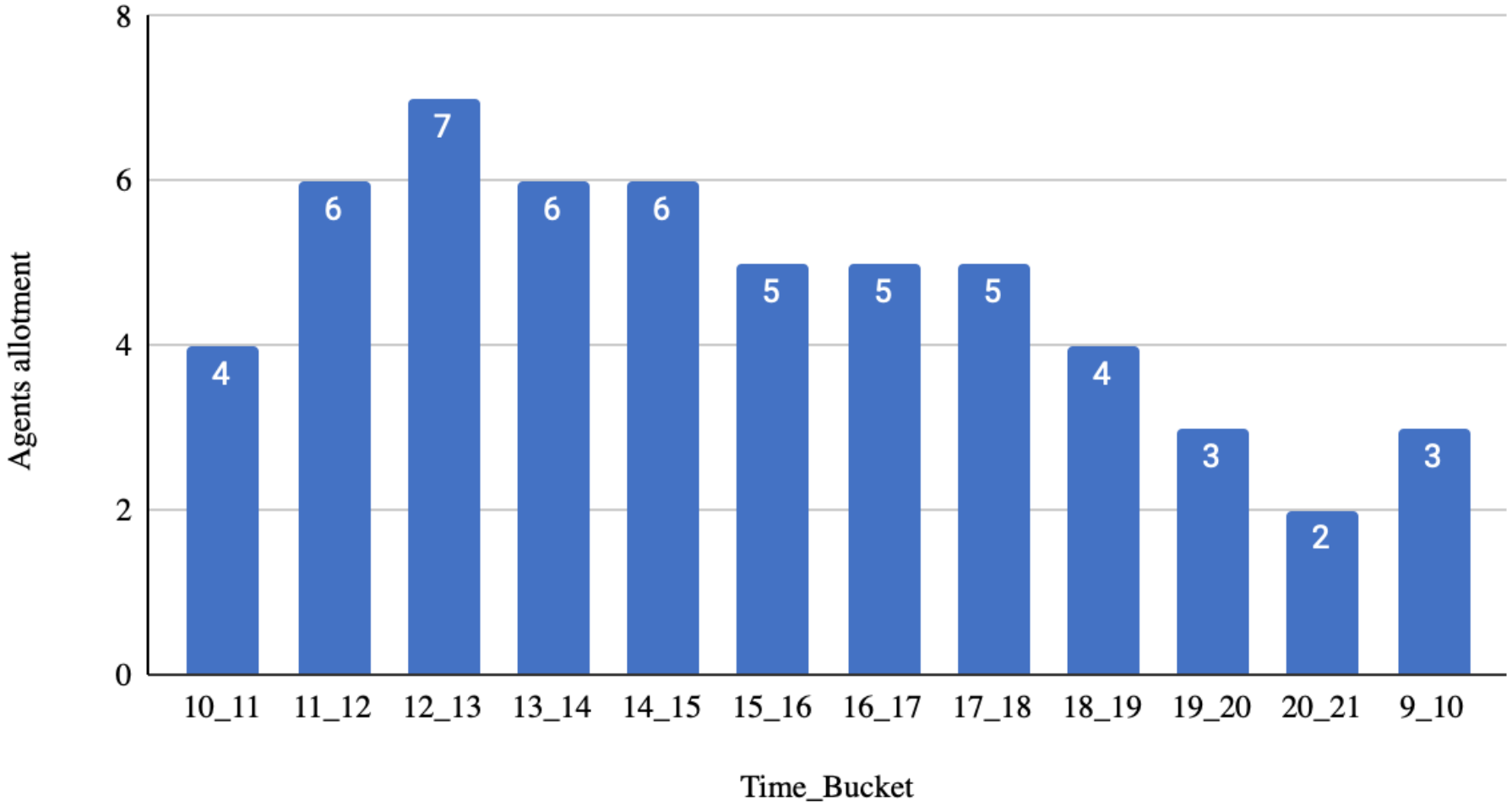
A manpower plan for each time bucket throughout the day, keeping the maximum abandon rate at 10%.

Agents Allotment per Time Bucket to keep Abandone Rate at 10%

Call_Status	Time_Bucket	COUNTA of Customer_Phone_No	Agents allotment
answered	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
	9_10	4428	3

- The distribution of the manpower plan per time bucket needed to maintain an abandon rate of 10% (i.e., achieving a call answer rate of 90%).

Agents allotment vs. Time_Bucket



Analysis

Based on the given assumptions, the following points were noted:

- **Daily Working Hours**: Each agent works for 9 hours per day.
- **Break Time**: Out of the 9 hours, 1.5 hours are allocated for lunch and coffee/tea breaks, leaving 7.5 working hours.
- **Call Handling Time**: Agents spend 60% of the 7.5 hours handling consumer calls, which amounts to 4.5 hours per day.
- **Weekly Work Schedule**: Agents work 6 days a week.
- **Monthly Work Calculation**:
  - In a 30-day month, there are 4 weeks.
  - With 6 working days per week, there are 24 working days in a month.
  - Each week has one Sunday, an official holiday, totaling 4 Sundays in a month.
  - Subtracting these 4 Sundays, 20 working days remain.
  - Additionally, accounting for 4 days of unplanned leave, the final total is 20 working days in a 30-day month.

Analysis

In a certain scenario, there are calls from consumers not only during the day but also at night. If no agents are available at night to answer these calls, it can negatively impact the company's reputation. Therefore, we need to distribute the total manpower for each time bucket from 9 AM to 9 PM and from 9 PM to 9 AM, while maintaining an abandon rate of 10% (i.e., a call answer rate of 90%).

For every 100 day calls, there are 30 night calls. Given 5,130 day calls, the night calls would be:

$$\text{Night Calls} = \frac{5130 \times 30}{100} = 1,539 \text{ calls}$$

The additional working hours required to maintain a 90% answer rate for 1,539 night calls are calculated as:

$$\text{Additional Working Hours} = \frac{1539 \times 198.6 \times 0.9}{3600} = 76.41 \text{ hours}$$

The additional agents needed to answer night calls are:

$$\text{Additional Agents} = \frac{76.41}{4.5} \approx 17$$

Thus, the total number of agents required per day to maintain a 90% answer rate is:

$$\text{Total Agents} = 57 \text{ (day calls)} + 17 \text{ (night calls)} = 74 \text{ agents}$$

Therefore, to answer consumer calls both during the day and at night while keeping the answer rate at 90% (and the abandon rate at 10%), we need a total of 74 agents per day.

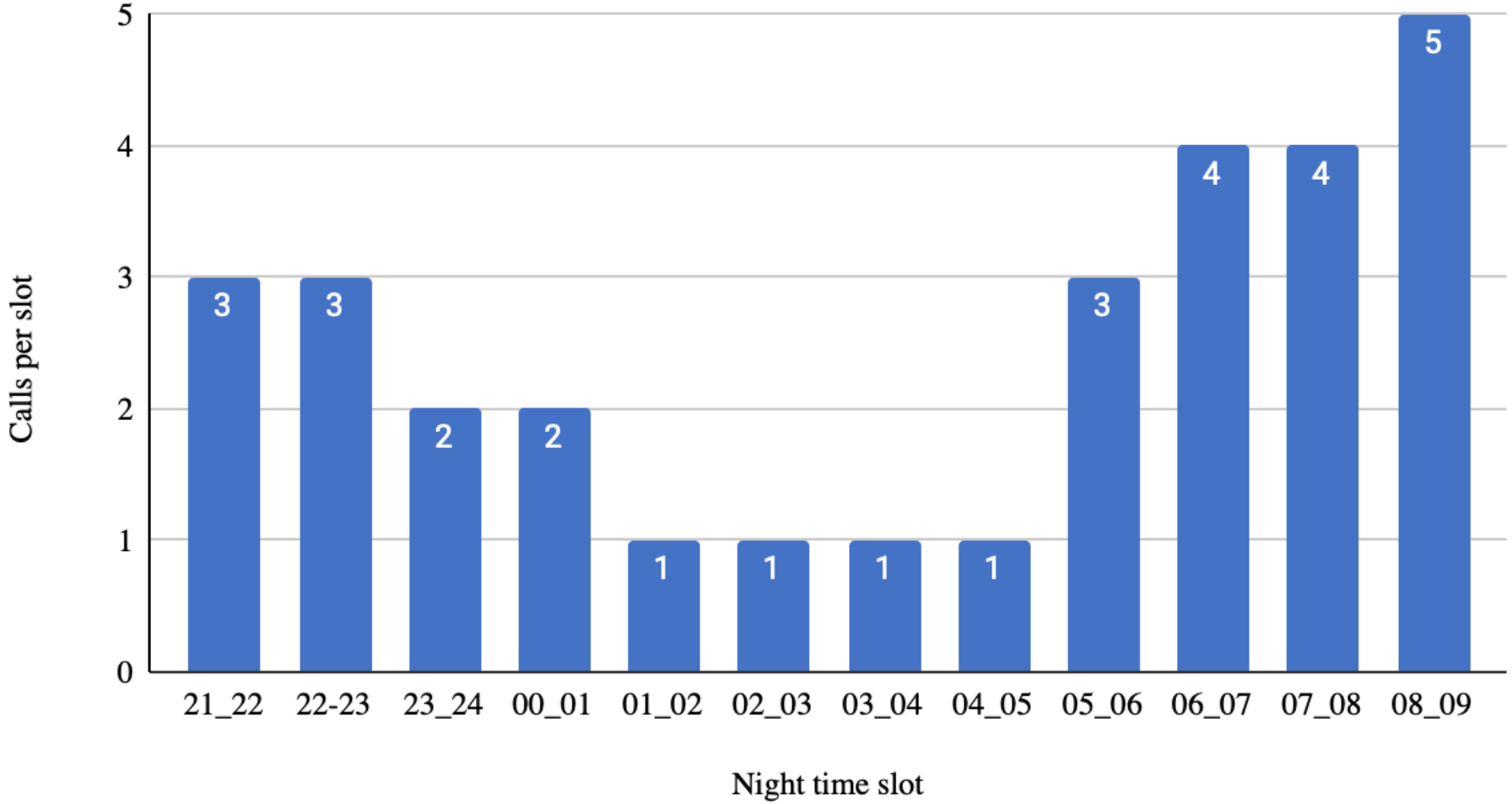
Total hours needed

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%

- The table shows the desired distribution of night calls to maintain an abandon rate of 10%.

- Given that we have only 17 agents available at night, we need to distribute their shifts in a non-analytical manner:
  - Agents working in the 19_20 and 20_21 time buckets can extend their shifts to cover the 21_22 and 22_23 time buckets.
  - Agents working in the 9_10 and 10_11 time buckets can be asked to work during the 7_8 and 8_9 time buckets as well.
  - Agents working in the 1_2, 2_3, 3_4, and 4_5 time buckets can be asked to cover the 6_7, 7_8, and 8_9 time buckets to maintain the abandon rate at 10%.

Calls per slot vs. Night time slot



Insights

- Identification of peak call times and average call durations for better scheduling.
- Visualization of call volume trends, highlighting periods of high call activity.
- A proposed manpower plan to reduce call abandonment rates, improving customer satisfaction.
- Addressed night shift call handling to enhance overall customer experience.

Results

- **Average Call Duration:** Detailed per time bucket.
- **Call Volume Trends:** Visualized through charts showing call distribution throughout the day.
- **Manpower Plan:** A comprehensive plan ensuring at least 90% of calls are answered during both day and night shifts.

Thank You.

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