

ABC Call Volume Trend Analysis

Final Project-4

Yashi Gupta

Project Description

This project focuses on analyzing the **inbound call volume** trends at **ABC Insurance Company**, identifying peak call hours, and optimizing manpower allocation to improve customer experience. The dataset covers **23 days** of customer calls, capturing key details such as **agent ID, queue time, call time, call duration, and call status (answered, abandoned, or transferred)**.

ABC Insurance currently lacks **night shift agents**, leading to a poor customer experience. By studying **historical call patterns**, we aim to propose a **manpower planning strategy** that ensures adequate staffing throughout the day and night, keeping the **abandon rate below 10%** while optimizing resource allocation.

Objectives

1. Analyze **hourly call volume trends** to determine **peak and low call periods**.
2. Calculate **agent handling capacity** based on call duration and working hours.
3. Propose an **optimized manpower plan** for both **day and night shifts** to improve response rates.
4. Ensure that at least **90% of incoming calls** are answered while keeping costs in check.
5. Derive **actionable insights** to enhance the **customer experience (CX)** through efficient staffing.

Approach

1. Data Exploration & Cleaning

- Analyzed **23 days of call records** to identify missing values and inconsistencies.
- Filtered calls based on **answered call durations** for accurate calculations.

2. Call Volume & Duration Analysis

- Examined **hourly call trends** to pinpoint peak and off-peak hours.
- Calculated the **average call duration (199 sec)** to determine agent workload.

3. Agent Capacity Estimation

- Defined working conditions: **4.5 productive hours per agent per day**.
- Derived **handling capacity** per agent using **total working seconds ÷ avg call duration**.

4. Manpower Planning

- Established required **agents per hour** to meet **90% call answer rate**.
- Compared **current vs. required agents** to highlight **staffing gaps**.

5. Night Shift Analysis

- Determined **night call volume** based on a **30% spillover from daytime calls**.
- Recommended **required agents per night shift hour** for optimal coverage.

Tech-Stack Used

Microsoft Excel 2022 – Used for **data cleaning, analysis, and visualization (pivot tables, graphs, regression, and forecasting)**.

Key Insights

1. Manpower Requirement for 90% Answer Rate

- The company **needs to add 257 + 57 agents** to ensure a **90% answer rate** for both the day and night shifts.(314 new agents)
- The **total manpower required for 90% efficiency** across the entire day is **518 agents**.

2. Peak Calling Hours (Day Shift & Night Shift)

Day Shift (9 AM - 9 PM)

- The **highest call volume occurs between 11 AM - 12 PM**, making it the busiest hour.
- Call volume **gradually declines** after this, with **9 PM marking the lowest call count** in the day shift.

Night Shift (9 PM - 9 AM)

- The **peak night hours** in descending order are:
 1. **8 AM - 9 AM**
 2. **7 AM - 8 AM**
 3. **6 AM - 7 AM**
- These hours require **the highest number of agents** in the night shift.
- The **least active period** is **1 AM - 5 AM**, suggesting **minimal manpower needed** during these hours.

Assumptions for Call Center Manpower Planning

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.

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. General Assumptions

Working days per week = 6

Working hours per day = 9

Break time per day = 1.5 hours

Actual working hours per day = 7.5 hours

Occupancy rate (Agent's productive time) = 60%

Total effective working hours per day = 4.5 hours

Total working seconds per day per agent = $4.5 \times 3600 = 16,200$ seconds

- Average call duration = 199 seconds (Based on answered calls only)
- Call handling capacity per agent per day:

$$\frac{16,200 \text{ sec}}{199 \text{ sec/call}} = 81 \text{ calls per agent per day}$$

- Call handling capacity per agent per hour:

$$\frac{81}{4.5} = 18 \text{ calls per agent per hour}$$

3. Call Volume Assumptions

- Total day shift calls in 23 days = 117,988
- Average day shift calls per day:

$$\frac{117,988}{23} = 5,130 \text{ calls per day}$$

- Night shift calls per day (30% of day calls):

$$\frac{30}{100} \times 5,130 = 1,539 \text{ calls per night}$$

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

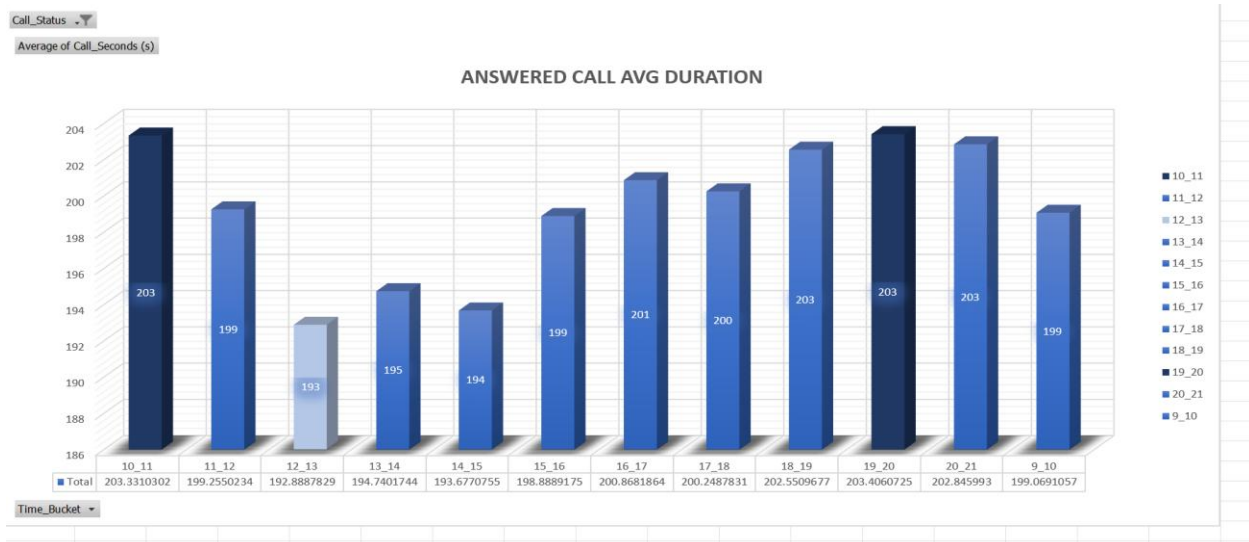
Your Task: What is the average duration of calls for each time bucket?

The avg duration of answered calls is 199 secs.

The **"Calls Received"** metric generally **includes both answered and transferred calls** unless specified otherwise.

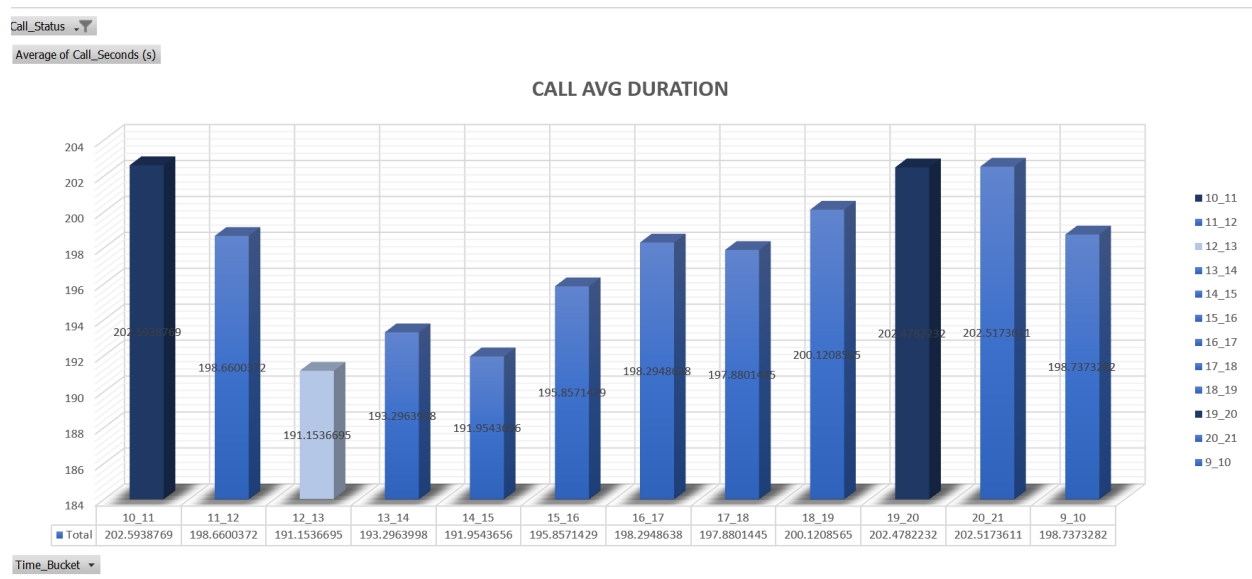
So the avg duration of incoming calls received by agents is 197.

Call_Status	answered
Row Labels	Average of Call_Seconds (s)
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
9_10	199.0691057
Grand Total	199



Avg duration of calls answered.

6	Call_Status	(Multiple Items)	
7			
8	Row Labels	Average of Call_Seconds (s)	
9	10_11	202.5938769	
0	11_12	198.6600372	
1	12_13	191.1536695	
2	13_14	193.2963998	
3	14_15	191.9543656	
4	15_16	195.8571429	
5	16_17	198.2948638	
6	17_18	197.8801445	
7	18_19	200.1208565	
8	19_20	202.4782232	
9	20_21	202.5173611	
0	9_10	198.7373282	
1	Grand Total	197	



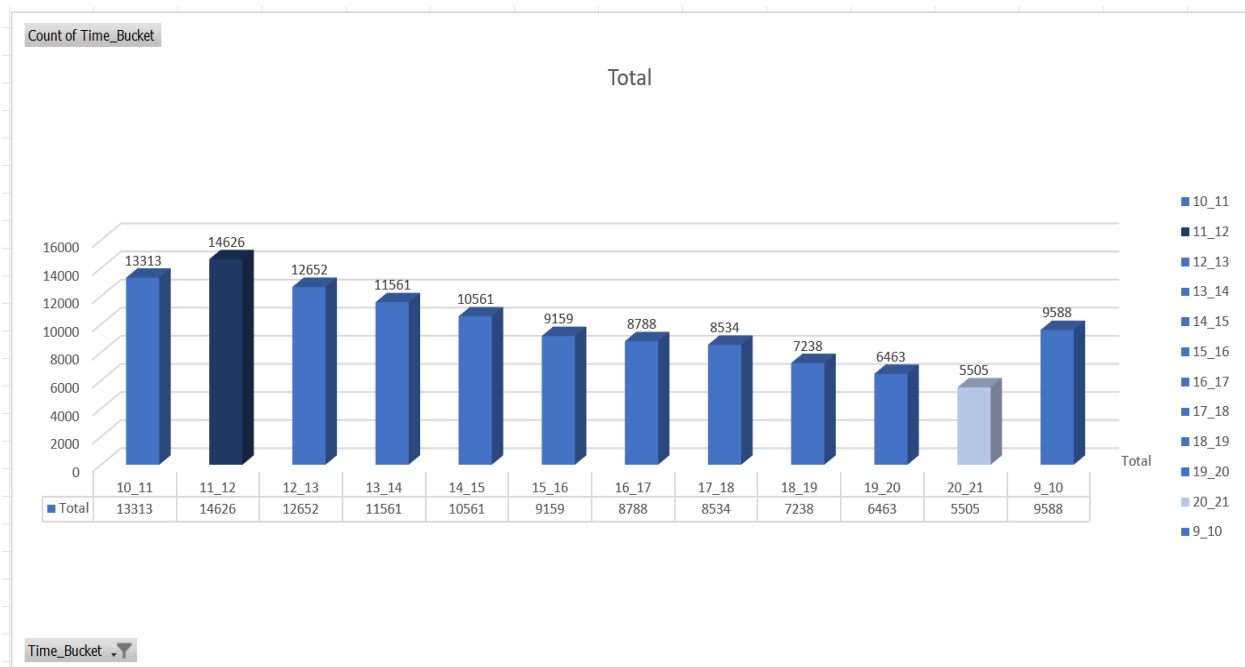
Avg duration of calls received(answered+transferred).

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.).

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

Row Labels	Count of Time_Bucket
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



- **Peak Call Hour:** The highest number of calls occurred between **11 AM - 12 PM (14,626 calls)**, making it the busiest hour.
- **Morning Rush:** Calls start increasing from **9 AM (9,588 calls)** and peak between **10 AM - 12 PM**, indicating a high customer engagement period.
- **Afternoon Decline:** After **12 PM (12,652 calls)**, the call volume gradually decreases, with a steady drop from **1 PM (11,561 calls)** to **4 PM (9,159 calls)**.
- **Evening Drop:** Calls continue to decline from **5 PM (8,534 calls)** onwards, reaching the lowest between **8 PM - 9 PM (5,505 calls)**.
- **Total Calls:** Over 23 days, a total of **117,988 calls** were received, averaging **5,130 calls per day**.

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.

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

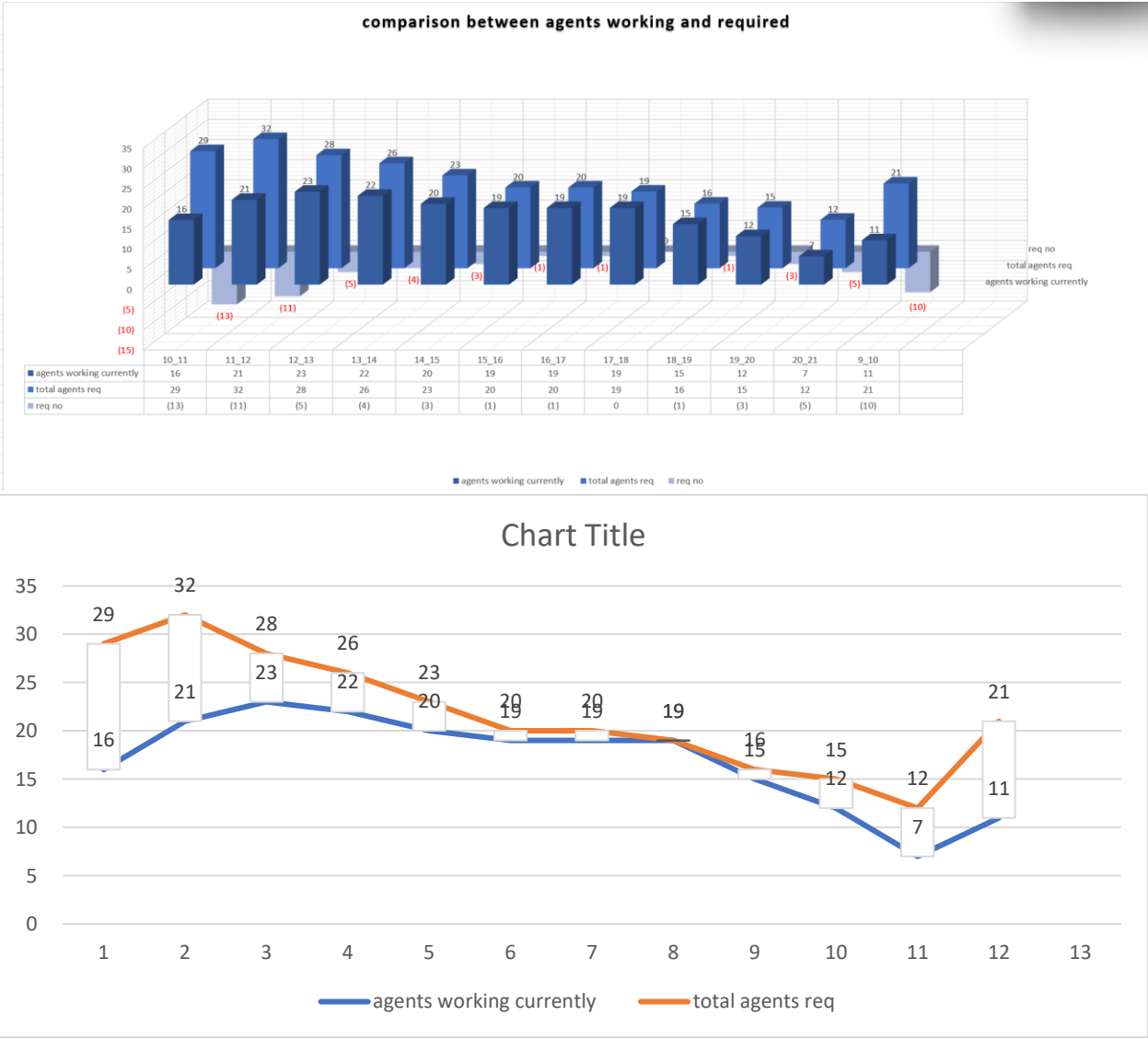
Insights on Agent Requirement and Staffing Gaps:

1. **Overall Shortage:** The company currently has **204 agents**, but **261 agents** are required to meet the demand, leaving a shortage of **57 agents**.
2. **Peak Deficiency:** The largest staffing gap occurs during **10 AM - 11 AM (13 agents short)** and **11 AM - 12 PM (11 agents short)**, aligning with the highest call volumes.
3. **Gradual Decrease:** The gap reduces in the afternoon, with a **shortfall of only 1-4 agents from 12 PM to 6 PM**.
4. **Evening Deficit:** After **6 PM**, the shortage starts increasing again, with a notable gap of **5 agents from 8 PM - 9 PM**.
5. **Understaffed Morning Slot:** **9 AM - 10 AM** has a **deficit of 10 agents**, suggesting an earlier ramp-up in staffing is necessary.
6. **Adequate Staffing Period:** **5 PM - 6 PM** has **no shortage**, meaning current staffing levels are sufficient at this time.

Recommendation:

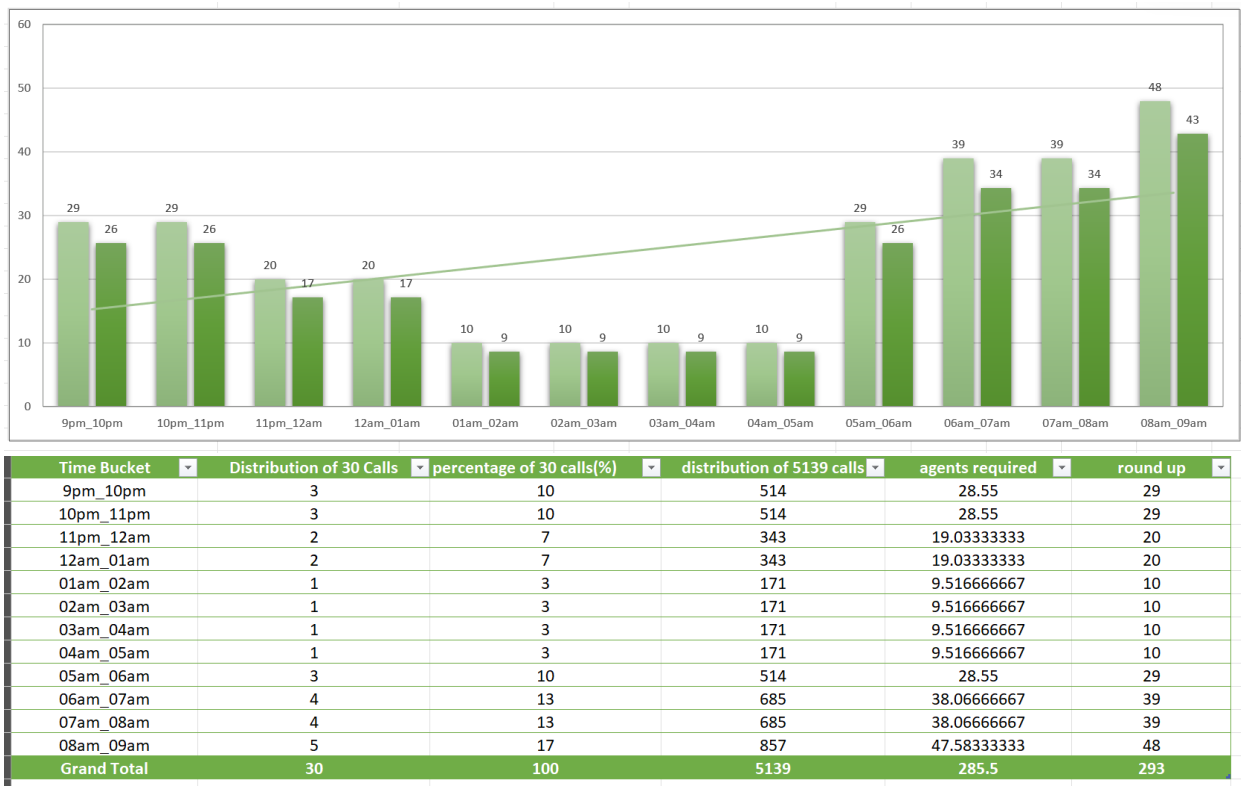
- **Prioritize hiring for peak hours (10 AM - 12 PM).**
- **Increase morning shift staffing to handle early call surges.**
- **Evening shifts (7 PM - 9 PM) need moderate reinforcements.**

time slot	agents working currently	total agents req	req no
10_11	16	29	(13)
11_12	21	32	(11)
12_13	23	28	(5)
13_14	22	26	(4)
14_15	20	23	(3)
15_16	19	20	(1)
16_17	19	20	(1)
17_18	19	19	0
18_19	15	16	(1)
19_20	12	15	(3)
20_21	7	12	(5)
9_10	11	21	(10)
	204	261	(57)



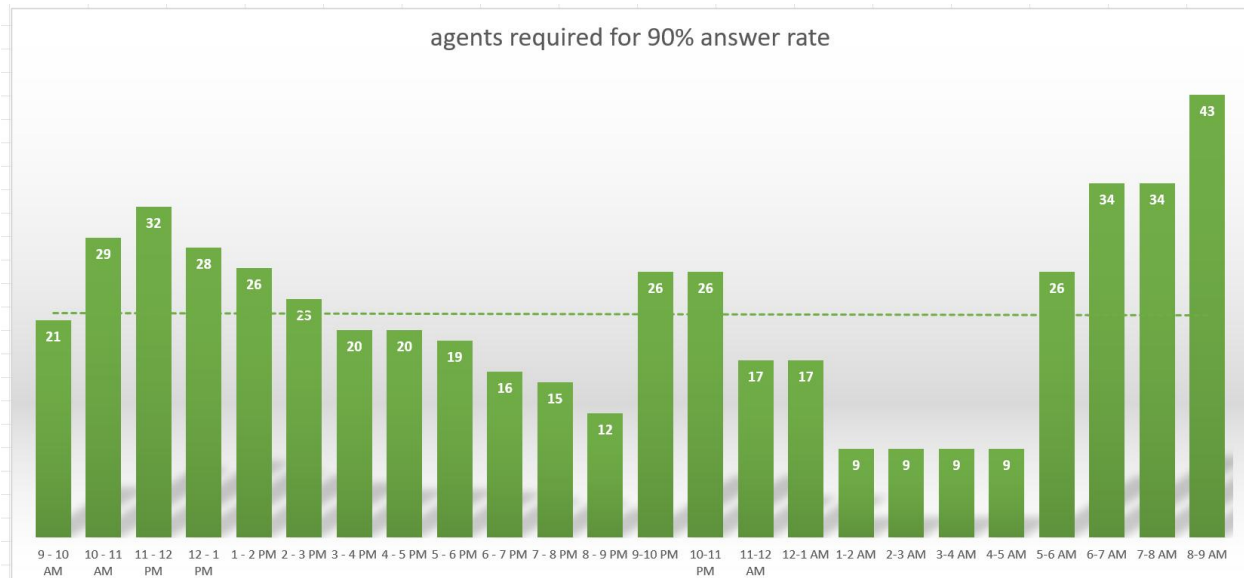
4. Night Shift Manpower Planning: Customers also call ABC Insurance Company at night but don't get an answer because there are no agents available. This creates a poor customer experience. Assume that for every 100 calls that customers make between 9 am and 9 pm, they also make 30 calls at night between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

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



Time Bucket	agents req for 100%	agents for 90% answer rate
9pm_10pm	29	26
10pm_11pm	29	26
11pm_12am	20	17
12am_01am	20	17
01am_02am	10	9
02am_03am	10	9
03am_04am	10	9
04am_05am	10	9
05am_06am	29	26
06am_07am	39	34
07am_08am	39	34
08am_09am	48	43

time slot	agents required for 90% answer rate
9 - 10 AM	21
10 - 11 AM	29
11 - 12 PM	32
12 - 1 PM	28
1 - 2 PM	26
2 - 3 PM	23
3 - 4 PM	20
4 - 5 PM	20
5 - 6 PM	19
6 - 7 PM	16
7 - 8 PM	15
8 - 9 PM	12
9-10 PM	26
10-11 PM	26
11-12 AM	17
12-1 AM	17
1-2 AM	9
2-3 AM	9
3-4 AM	9
4-5 AM	9
5-6 AM	26
6-7 AM	34
7-8 AM	34
8-9 AM	43
total	517.95



Insights on Agent Distribution and Staffing Trends

1. Peak Staffing Hours:

- The highest number of agents (**43**) is assigned between **8 - 9 AM**, aligning with the highest call volume during the night shift.
- **6 - 8 AM** also has **34 agents**, ensuring coverage during a high-call period.

2. Day Shift Trends (9 AM - 9 PM):

- Staffing starts at **21 agents (9 - 10 AM)** and peaks at **32 agents (11 AM - 12 PM)** before gradually reducing throughout the afternoon.
- The lowest staffing in the day shift is at **8 - 9 PM (12 agents)**, which might need reinforcement if calls persist.

3. Night Shift Trends (9 PM - 9 AM):

- **Late-night staffing (1 AM - 5 AM) remains minimal at 9 agents**, indicating low call volume and minimal support needed.
- Staffing increases significantly from **5 AM onwards (26 agents)**, **peaking at 43 agents at 8 - 9 AM**.

4. Manpower Allocation Strategy:

- Morning and early afternoon shifts (**9 AM - 1 PM**) have the highest staffing to handle peak call times.
- Gradual reduction in agents from **1 PM to 9 PM** aligns with the declining call volume.
- Night shifts maintain **low staffing between 1 AM - 5 AM**, reflecting fewer customer calls.

Recommendations:

- **Reallocate agents from overstaffed early morning periods (6 - 9 AM) to slightly under-resourced evening shifts (6 - 9 PM).**
- **Consider increasing night shift coverage after 9 PM if call volume is higher than expected.**
- **Ensure that peak staffing (11 AM - 12 PM and 8 - 9 AM) is maintained to handle the highest workload efficiently.**

Result: ABC Call Volume Trend Analysis

Through this project, I successfully analyzed the **call volume trends** of the inbound calling team, identifying peak hours, agent requirements, and customer behavior patterns. The key achievements and insights gained include:

1. Understanding Call Volume Trends:

- The highest call volume occurs between **10 AM - 12 PM** during the day and **6 AM - 9 AM** during the night shift.
- The lowest call volume is recorded between **1 AM - 5 AM**, requiring minimal staffing.

2. Optimizing Workforce Allocation:

- A total of **518 agents** are required to achieve a **90% answer rate**, with an additional **257 + 57 agents** needed for improved efficiency.
- Redistributing agents based on peak and non-peak hours can significantly enhance operational efficiency.

3. Customer Experience Improvement:

- High **queue times during peak hours** indicate a need for better staffing strategies.
- **Minimizing abandoned calls** and optimizing response time can enhance customer satisfaction.

4. Operational and Strategic Insights:

- Implementing **AI-powered solutions** like IVR and intelligent routing can help manage peak loads.
- Understanding customer behavior enables **better scheduling and forecasting** for future staffing needs.

This project provided valuable insights into **customer service operations, workforce planning, and call center efficiency**. I learned how **data-driven decision-making can improve resource management, enhance customer experience, and optimize business processes**.

Links

<https://www.loom.com/share/d276fd07c20744c9921bd4667c5deb5d?sid=01a8ac82-2490-4da5-8bbe-1d0f09afb453>

<https://docs.google.com/spreadsheets/d/1ThPbUvHUsvwVlyyGBJBLmIQXUdulX16H/edit?usp=sharing&oid=108286913145936487778&rtpof=true&sd=true>