Optimizing the staffing for a Business Process Outsourcing unit

End-term report for the BDM capstone Project

Submitted by

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1. Executive Summary

Tech Mahindra was established in 1986 as a joint venture between Mahindra & Mahindra and British Telecom. It initially operated under the name Mahindra British Telecom (MBT) before rebranding to Tech Mahindra. British Telecom divested its shares in December 2012. Tech Mahindra's vision is to "Rise to be an agile, customer-centric, and purpose-led company, delivering best-in-class technology solutions to our stakeholders." This project, within Tech Mahindra's Business Process Services (TechMBPS) division, aims to identify cost reduction opportunities by optimizing manpower requirements.

This project stems from the client's and the company's need to reduce costs and make this operation more profitable. It focuses on manpower cost optimization for 4 skill-sets (Retention, Care, Complaints and Sales) across one of the operations at the business process services wing of Tech Mahindra Ltd (TechMBPS).

In order to get to a savings figure, each skillset's calls offered data was analyzed. The analysis included initial exploratory data analysis, forecasting, staffing, shift optimization followed by weekly rostering to arrive at a final headcount requirement for each skillset. This requirement was further scaled up to account for absenteeism, leaves and buffer staff requirement at the rate of 17%, which is an industry standard. The final headcount numbers were then compared to the existing headcount numbers for each skillset to arrive at savings.

The project proposes to deliver a saving of INR 5.5 Cr annually if it is deployed. Additionally a behavioral coaching opportunity has also been identified and communicated to the business.

2. Detailed Explanation of Analysis Process/Method

The data for this analysis was extracted from Genesys (contact center workforce management tool) and spans across a duration of 14 months. After initial data cleaning, following information was used for the analysis:

- Skillset: Specifies the skillset to which the call was routed. This consists of HS Retention, Care Voice, Sales Voice and Complaints.
- Date: Indicates the date of the interval. Ranges from May'23 to Jun'24.
- IntSt: Represents the start time of the interval.
- IntEn: Denotes the end time of the interval.
- Offered: Records the number of calls offered during the interval.

- AHT: Average Handling Time (in seconds) for all calls received during the interval.
- Staff: Specifies the number of staff scheduled to be logged in during the interval.

SkillSet	Date	IntSt	IntEn	Offered	AHT	Staff
Care Voice	02-05-2023	08:00	08:30	371	642.27	117
Care Voice	02-05-2023	08:30	09:00	381	655.33	62
Care Voice	02-05-2023	09:00	09:30	585	716.9	125

Table 1:Sample layout of data

2.1.Data re-cut

As a result of a skillset reorganization activity done by the business between Feb'23 and Sep'23, skillsets were split and merged during this exercise resulting in inconsistent data continuity within the Genesys report. After analyzing data trends, the period from May 2023 to June 2024 was selected as suitable for the project. Call volumes for merged skillsets were aggregated across intervals, and a weighted AHT calculation was applied using array formulas in Excel.

2.2.Detailed data cleaning

The cleaned data was imported into a Pandas dataframe for further analysis. Initial data preparation included imputing to remove N/A values and feature engineering to create additional columns such as weekday, interval, and averages for offered calls, weighted AHT, and staff. The data was then segmented by skillset for individual analysis.

2.3.Forecasting

Forecasting was conducted for each skillset using the XGBRegressor. The performance metrics of the forecasting models are presented below. Further time series analysis was not pursued due to the results from this step, as detailed in the results section.

	Retention	Care	Sales	Complaints
MAE	27.68	35.50	14.23	5.43
MSE	1354.26	2977.72	329.49	50.67
RMSE	36.80	54.57	18.15	7.12

Table 2:Forecasting outcomes

2.4.Staffing model: Calculating staff requirement for each interval

A staffing model was developed using the Erlang C function from the pyworkforce.queuing module. This model, standard in contact centers, estimates the required staffing levels for each interval based on the offered calls and the expected service level.

$$P_w = \frac{\frac{A^N}{N!}\frac{N}{N-A}}{\left(\sum_{i=0}^{N-1}\frac{A^i}{i!}\right) + \frac{A^N}{N!}\frac{N}{N-A}}$$

Equation 1: Erlang C formula

The Erlang C formula incorporates the following elements:

P_w = probability of a delay when the customer waits to connect with a support agent, $P > 0$

A = total traffic (traffic intensity) of the call center in Erlangs

N = number of available call center resources/agents

Staffing outcomes for each interval were compared with the actual staff numbers to estimate potential staffing savings and average staff reductions per interval. It is important to note that these figures indicate a potential for savings.

2.5.Shift Modelling: Identifying best shifts to roster FTE

The staffing model identifies what is the requirement of FTE for each half hour interval. The shift model identifies what is the best way to schedule the FTEs so that the required staff is present in each half hour interval as expected. This was done across the following steps:

2.5.1. **Clustering**: KMeans clustering was done in the interval level FTE requirement data to identify the clusters. The intent of this clustering was to identify clusters which would then translate to the number of shifts required. For example, if Monday's follow 3 clusters we would use the following shift options to test for optimization. Since the service window is 08:00 – 20:00 and each shift is 9hrs, the first shift and last shift are fixed and the options vary across Shift 2.

Shift Pattern	Shift 1	Shift 2	Shift 3
1	08:00-17:00	08:30-17:30	11:00-20:00
2	08:00-17:00	09:00-18:00	11:00-20:00
3	08:00-17:00	09:30-18:30	11:00-20:00
4	08:00-17:00	10:00-19:00	11:00-20:00

Table 3: Shift Pattern Sample

2.5.2. **Shift Optimization**: Shift optimization aims at identifying the right shift patterns (out of the patterns identified in the earlier step) that cater to our specific need of staffing across intervals. This can be achieved in various ways and using various tools. For the purpose of this analysis, the underlying logic used is to check all patterns and all shifts in the pattern and calculate the Service Levels using Erlang C. This done from a starting FTE number (400) and reduced each time by a decrement. As soon as the model notices that the Service Level has dropped below the target, it uses the last identified FTE as the final requirement for the shift.

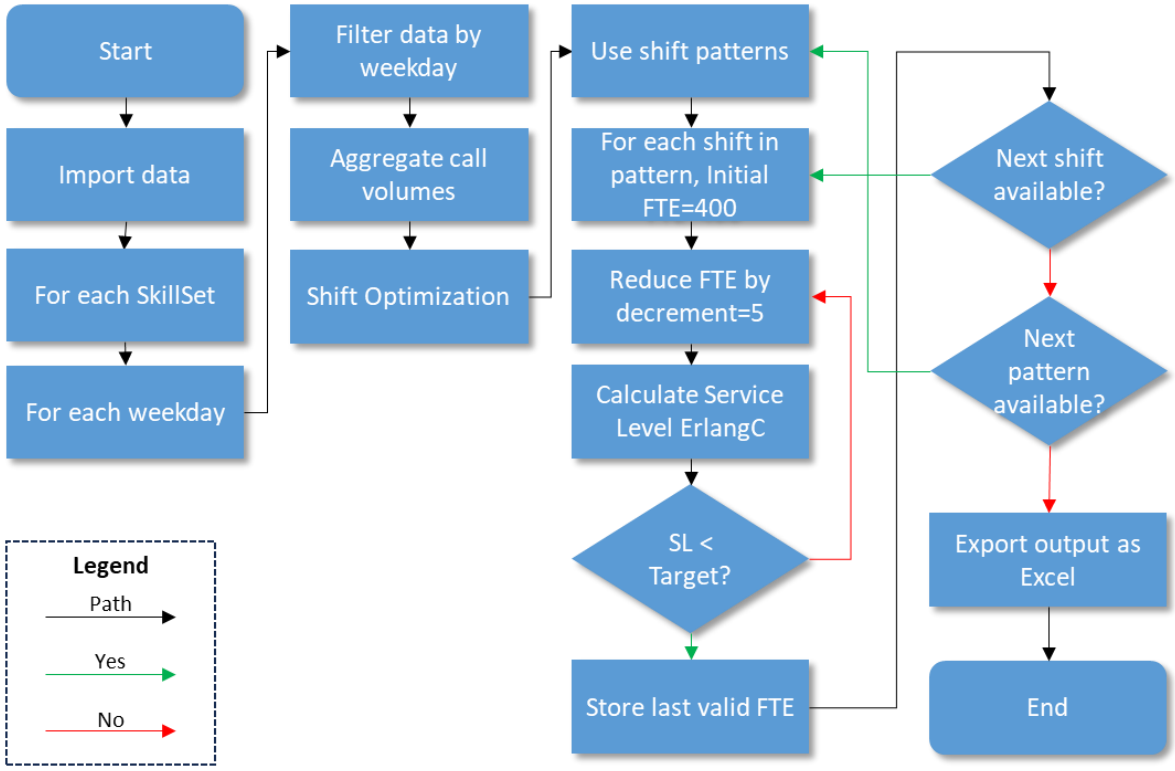

Figure 1: Shift Optimization Logic

Weekday	Shift Pattern	Total FTE
Monday	08:00-17:00: 35, 11:00-20:00: 35	70
Monday	08:00-17:00: 5, 08:30-17:30: 30, 11:00-20:00: 35	70
Monday	08:00-17:00: 5, 09:00-18:00: 35, 11:00-20:00: 20	60
Monday	08:00-17:00: 5, 09:30-18:30: 40, 11:00-20:00: 30	75
Monday	08:00-17:00: 25, 10:00-19:00: 20, 11:00-20:00: 20	65
Monday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 30, 11:00-20:00: 20	60
Monday	08:00-17:00: 5, 08:30-17:30: 5, 09:30-18:30: 35, 11:00-20:00: 30	75
Monday	08:00-17:00: 5, 08:30-17:30: 25, 10:00-19:00: 10, 11:00-20:00: 25	65
Monday	08:00-17:00: 5, 08:30-17:30: 30, 10:30-19:30: 5, 11:00-20:00: 25	65
Monday	08:00-17:00: 5, 09:00-18:00: 5, 09:30-18:30: 35, 11:00-20:00: 30	75
Monday	08:00-17:00: 5, 09:00-18:00: 25, 10:00-19:00: 15, 11:00-20:00: 30	75
Monday	08:00-17:00: 5, 09:00-18:00: 35, 10:30-19:30: 5, 11:00-20:00: 20	65
Monday	08:00-17:00: 5, 09:30-18:30: 35, 10:00-19:00: 5, 11:00-20:00: 25	70
Monday	08:00-17:00: 5, 09:30-18:30: 40, 10:30-19:30: 5, 11:00-20:00: 25	75
Monday	08:00-17:00: 25, 10:00-19:00: 20, 10:30-19:30: 5, 11:00-20:00: 20	70

Figure 2: Sample Output of Shift Optimization

Note: The number of FTE required for each shift are calculated by the model and summed up to show that total FTE needed by the shift pattern.

2.5.3. **Filtering best shift patterns**: Next step in this process is to identify the best shift from all of the patterns listed above and this is done using the minimum Total FTE. In case there are more than one shifts with minimum Total FTE, a standard shift (as far as possible) is selected throughout the week so that the rostering process is easier. The minimum across each weekday were found using conditional formatting in Excel

Formula =C2=MINIFS(TotalFTE, WeekdayRange, WeekdayRequired)

Weekda	Shift Pattern	Total F
Monday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 30, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 5, 08:30-17:30: 15, 09:30-18:30: 20, 11:00-20:00: 20	60
Wednesday	08:00-17:00: 5, 09:00-18:00: 25, 10:00-19:00: 10, 11:00-20:00: 15	55
Thursday	08:00-17:00: 5, 08:30-17:30: 20, 09:30-18:30: 15, 11:00-20:00: 20	60
Friday	08:00-17:00: 5, 08:30-17:30: 30, 10:00-19:00: 10, 11:00-20:00: 15	60
Saturday	08:00-17:00: 5, 09:00-18:00: 20, 11:00-20:00: 5	30
Sunday	08:00-17:00: 5, 09:30-18:30: 15, 11:00-20:00: 5	25

Figure 3: Sample output of best shifts with least Total FTE

2.6. Weekly rostering, leveraging overtime to optimize headcount

Once the shifts are identified, weekly rosters were built keeping in mind the shift requirements, while optimizing the headcount requirement. Overtime options are leveraged here to ensure that we keep the headcount requirement to the minimum. In the example below, since Group 4 is being used for overtime on Saturday, they have been scheduled for an additional day off. Another option is to use overtime payment instead of offering a complementary off day.

HS Retention								
Weekday	Shift Pattern	Required	Group1	Group2	Group3	Sat Overtime	Balance	Total HC
Monday	08:00-17:00: 5, 09:00-18:00: 245, 10:00-19:00: 125, 11:00-20:00: 245	620	515	130	45		-70	
Tuesday	08:00-17:00: 5, 09:00-18:00: 285, 10:00-19:00: 95, 11:00-20:00: 260	645	515	130			0	
Wednesday	08:00-17:00: 5, 09:00-18:00: 305, 10:00-19:00: 45, 11:00-20:00: 340	695	515	130		60	-10	
Thursday	08:00-17:00: 5, 08:30-17:30: 255, 10:00-19:00: 95, 11:00-20:00: 215	570	515		45	60	-50	
Friday	08:00-17:00: 170, 10:00-19:00: 165, 11:00-20:00: 180	515	515		45		-45	
Saturday	08:00-17:00: 5, 09:00-18:00: 225, 11:00-20:00: 50	280		130	45	60	45	
Sunday	08:00-17:00: 5, 09:00-18:00: 125, 11:00-20:00: 60	190		130	45	60	-45	
			515	**130**	**45**	**60**		**750**

Figure 4: Sample rostering

2.7. Final headcount calculation and identification of headcount savings

The above step provides the absolute headcount requirements; however, the actual requirement would be higher. This is to account for uninformed absenteeism, annual leave and buffer staff (to replace attrition). A standard industry best practice is to use a factoring of 17% which has been implemented here. A simple comparison of the headcount requirements to the current headcount for each skillset provides the headcount savings.

3. Results and Findings

3.1. Initial observations from entire dataset

Parameter	Date	Offered	AHT	Staff
count	38020	38020	38020	38020
mean	29-11-2023	295.99	991.25	274.83
min	**01-05-2023**	1.00	7.00	2.00
25%	15-08-2023	56.00	832.39	67.00
50%	29-11-2023	210.00	990.14	218.00
75%	16-03-2024	510.00	1133.35	451.00
max	**30-06-2024**	4152.00	2338.63	1098.00
std		256.53	213.59	228.26

Table 4: Descriptive Stats

Observation:

- On an average, 296 calls are received in each half hour interval however the range is wide from from 1 to 4,152 calls per interval.
- Similar trend observed in AHT wherein the mean is 991 with a wide range.
- Evidently, the staff requirement follows similar trend since staff requirement is a function of workload (Workload = Calls x AHT).

3.2. Initial observations for individual skillsets

	Offered	AHT	Staff	Offered	AHT	Staff
Parameter	Retention			Care		
count	9545	9545	9545	9525	9525	9525
mean	439.59	1133.67	469.40	564.74	776.07	437.71
min	1.00	43.00	2.00	1.00	7.00	2.00
25%	309.00	1045.07	315.00	406.00	728.99	305.00
50%	458.00	1125.97	466.00	581.00	782.95	434.00
75%	560.00	1238.68	616.00	702.00	837.31	578.00
max	1402.00	2000.00	1050.00	4152.00	1290.00	1098.00
std	162.08	170.05	201.23	221.55	105.91	163.94
	Sales			Complaints		
count	9475	9475	9475	9475	9475	9475
mean	143.11	949.58	155.24	34.04	1105.78	34.68
min	1.00	80.00	3.00	1.00	52.25	2.00
25%	100.00	860.95	110.00	23.00	988.61	8.00
50%	146.00	944.11	155.00	34.00	1102.98	39.51
75%	183.00	1033.43	205.00	44.00	1227.23	57.00
max	294.00	1690.29	301.00	104.00	2338.63	104.00
std	51.91	139.72	61.76	13.66	203.21	25.81

Table 5: Descriptive stats at SkillSet level

Observation:

- The range of calls offered (minimum to maximum) varies significantly across skillsets, indicating the need for further analysis of the distribution of offered calls.
- A similar trend is observed for Average Handling Time (AHT), suggesting a need for detailed examination of AHT variations across skillsets.

3.3. Average calls received for each skillset across time of day

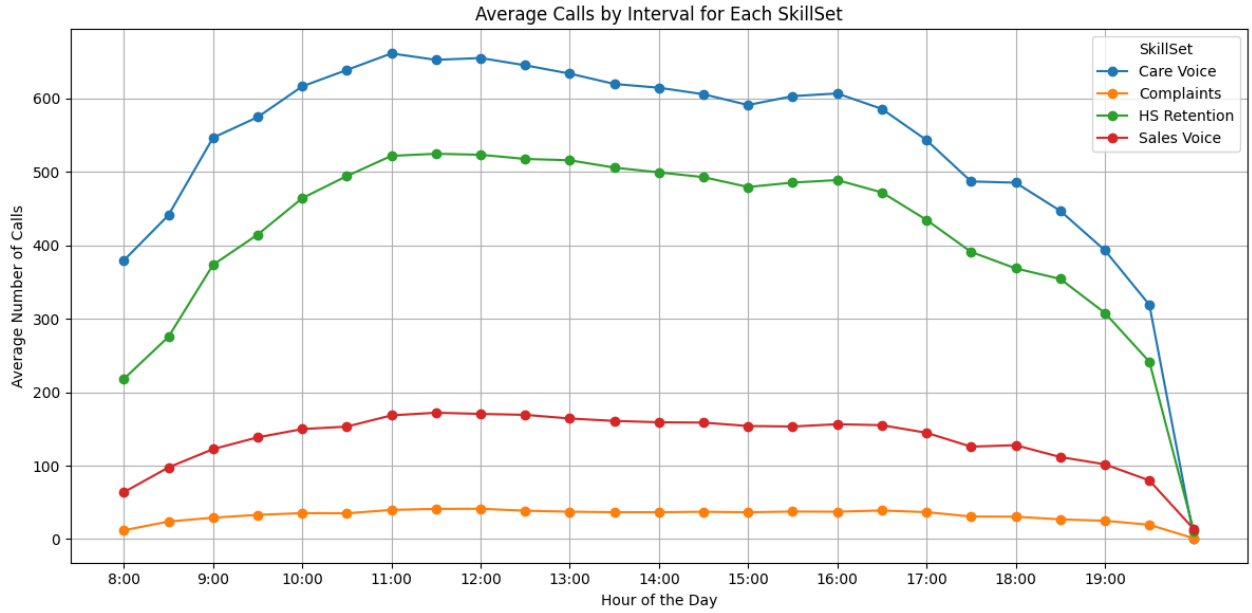

Figure 5: Average calls received per skillset across intervals

The Retention and Care skillsets exhibit more pronounced variability compared to Complaints and Sales, suggesting that they would benefit more from the implementation of multiple shift patterns.

Given that this dataset is time series in nature, and considering the importance of data continuity, a line graph has been selected for visualization. This approach effectively captures the flow and progression of data over time, as supported by Hector Guerrero's Excel Data Analysis: Modelling and Simulation (Second Edition *reference Pg52, #4c*).

3.4.Call volume distribution by weekday

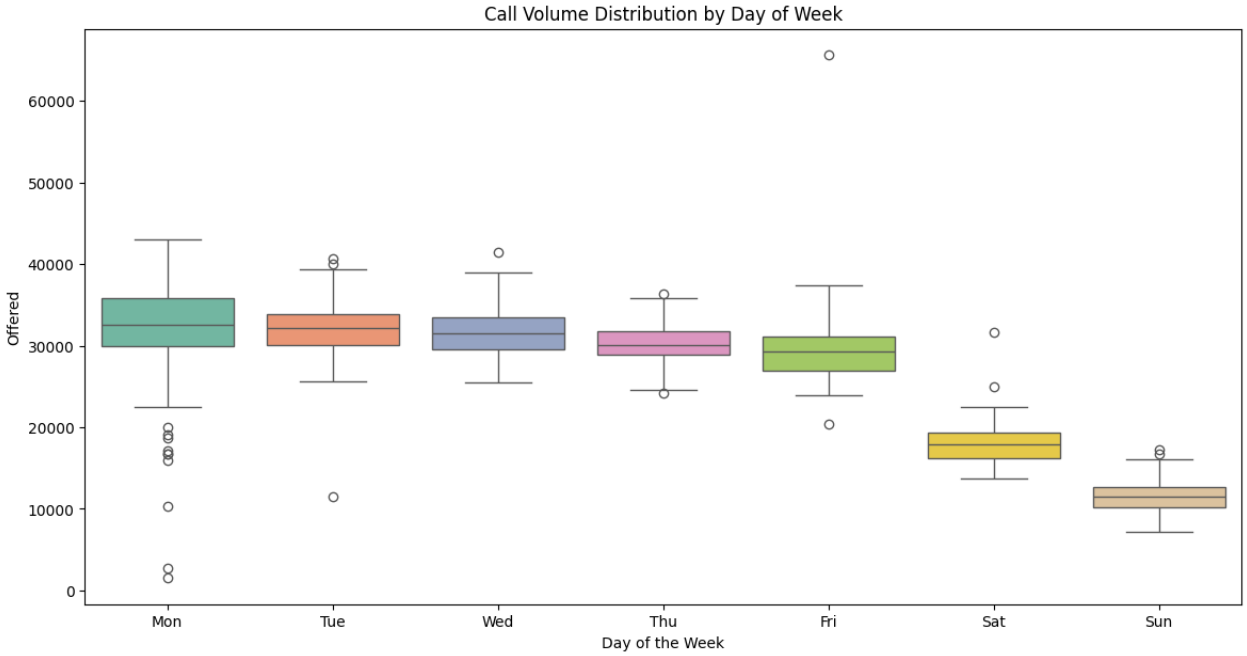

Figure 6: Call volume distribution across weekday

Observation: Mondays exhibit a higher number of outliers, particularly on the lower end, as indicated by data points falling below the lower whisker of the box plot. However, these lower-end outliers are unlikely to adversely affect staffing levels in terms of service level.

There is a discernible pattern of reduced call volumes from weekdays to the weekend (Saturday and Sunday). This trend is consistent across various skillsets, as observed in the box plots for each individual skillset.

3.5. Weighted AHT across skillsets and outlier analysis

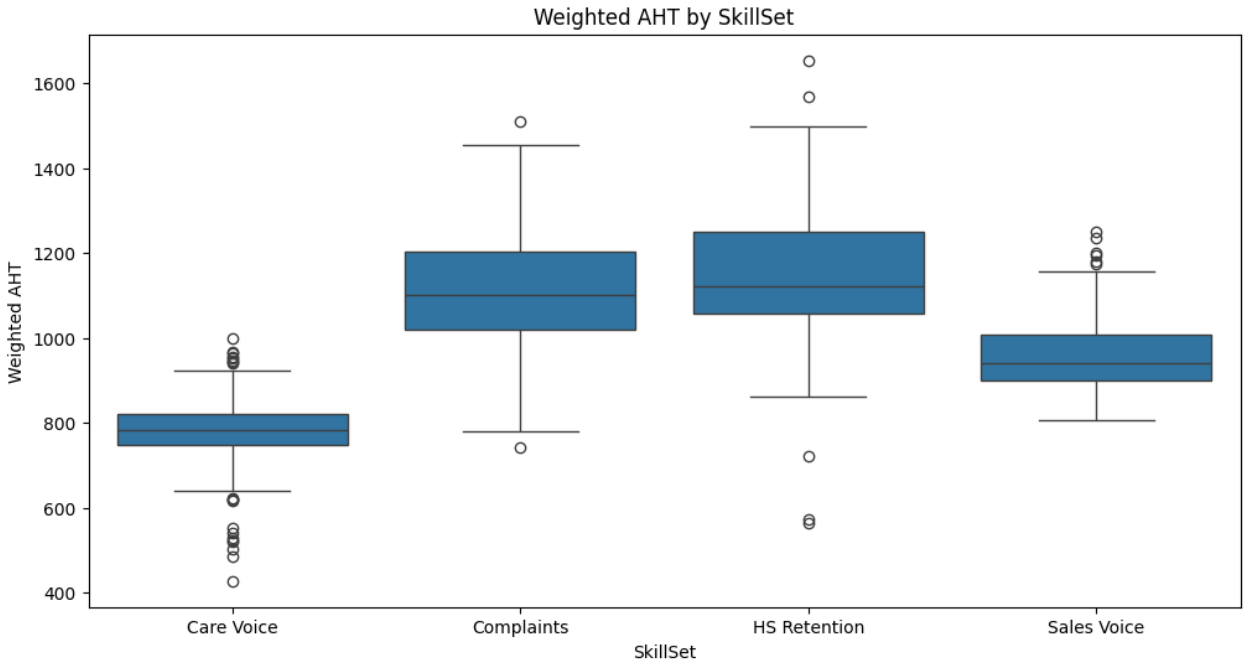

Figure 7: Weighted AHT across skillsets

Observation: A box plot has been utilized to identify outliers in the data.

Care shows the highest number of outliers and, while it has the highest call volume, its relatively lower Average Handling Time (AHT) compared to Retention - another skillset with high call volume - should result in lower staffing requirements.

Complaints and Retention exhibit higher AHT and greater variation, with Complaints showing the widest variation, followed by Retention. Sales has a relatively lower and less variable AHT compared to these skillsets.

3.6. Correlation heatmap across AHT, Staff, Weekday, Half Hour and Offered

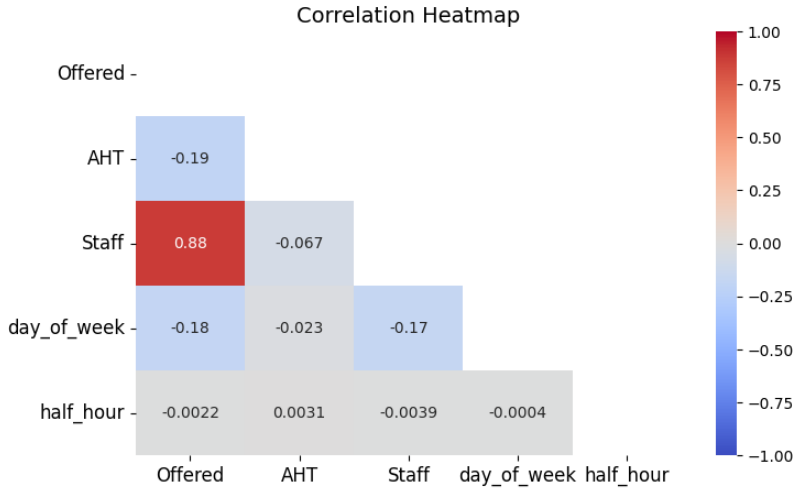

Figure 8: Correlation heatmap

Observation: The correlation between Average Handling Time (AHT) and Offered calls is -0.19. This negative correlation suggests that as the number of calls in the queue increases, there is a tendency for staff to reduce AHT. Further analysis at the skillset level is needed to better understand this relationship and determine if this pattern holds consistently across different skillsets.

3.7.Clustering

	No. of Clusters			
Weekday	**Retentions**	**Care**	**Sales**	**Complaints**
Monday	3	4	3	3
Tuesday	3	3	5	3
Wednesday	3	5	3	4
Thursday	3	4	3	3
Friday	3	2	3	4
Saturday	3	2	2	2
Sunday	3	2	3	4

Figure 9: Clustering Results for SkillSets

Observation: Retention clusters are consistent across the weekdays with 3 clusters each day. Care and Sales, owing to the large variation, span across 2 to 5 clusters whereas complaints varies from 2 to 4 clusters across the weekdays. While running shift optimization logic, it was noted that the shifts do not necessarily follow the clustering logic. This is attributed to the fact that a 9 hour shift across a 12 hour working window is able to cover multiple clusters in one shift. Hence it is not necessary that the number of clusters will be equal to the number of shifts. Consequently, the shift optimization was done using all possible variations in mind: from 2 to 4 shifts in the working window.

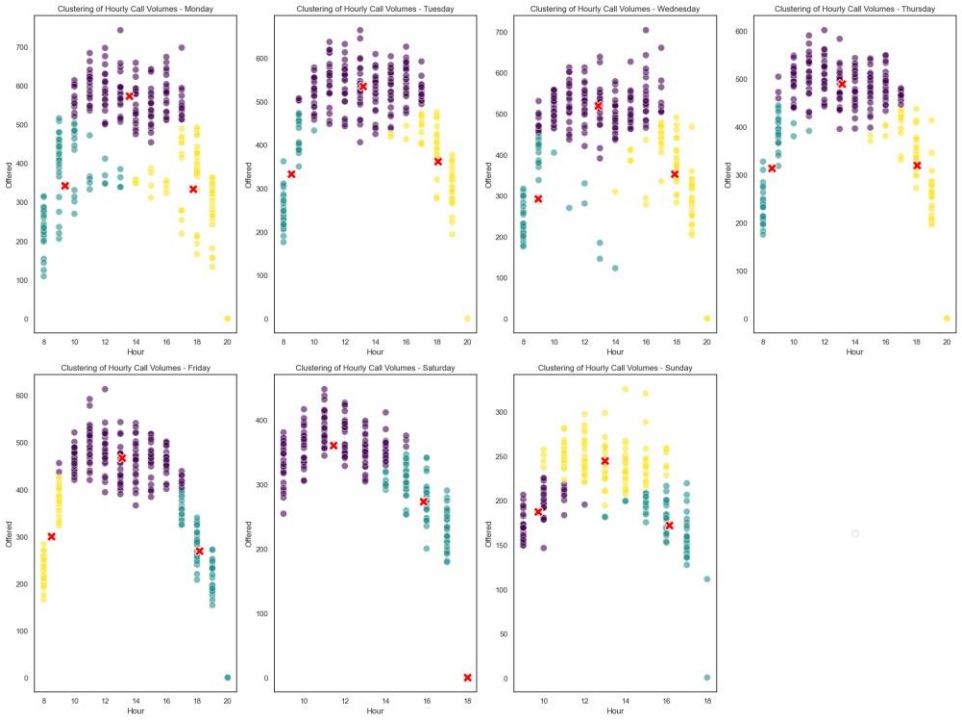

Figure 10: Sample clustering for Retentions

3.8.Shift Optimization

Retentions: Shifts with minimum FTE requirements

Weekday	Shift Pattern (Shift: FTE)	Total FTE
Monday	08:00-17:00: 5, 09:00-18:00: 245, 10:00-19:00: 125, 11:00-20:00: 245	620
Tuesday	08:00-17:00: 5, 09:00-18:00: 335, 11:00-20:00: 305	645
Tuesday	08:00-17:00: 210, 10:00-19:00: 155, 11:00-20:00: 280	645
Tuesday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 330, 11:00-20:00: 305	645
Tuesday	08:00-17:00: 5, 09:00-18:00: 285, 10:00-19:00: 95, 11:00-20:00: 260	645
Tuesday	08:00-17:00: 5, 09:00-18:00: 305, 10:30-19:30: 40, 11:00-20:00: 295	645
Tuesday	08:00-17:00: 210, 10:00-19:00: 155, 10:30-19:30: 5, 11:00-20:00: 275	645
Wednesday	08:00-17:00: 5, 09:00-18:00: 305, 10:00-19:00: 45, 11:00-20:00: 340	695
Thursday	08:00-17:00: 5, 08:30-17:30: 255, 10:00-19:00: 95, 11:00-20:00: 215	570
Friday	08:00-17:00: 170, 10:00-19:00: 165, 11:00-20:00: 180	515
Friday	08:00-17:00: 170, 10:00-19:00: 165, 10:30-19:30: 5, 11:00-20:00: 175	515
Saturday	08:00-17:00: 5, 09:00-18:00: 225, 11:00-20:00: 50	280
Saturday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 220, 11:00-20:00: 50	280
Sunday	08:00-17:00: 5, 09:00-18:00: 125, 11:00-20:00: 60	190
Sunday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 120, 11:00-20:00: 60	190
Sunday	08:00-17:00: 5, 09:00-18:00: 120, 10:00-19:00: 10, 11:00-20:00: 55	190
Sunday	08:00-17:00: 5, 09:00-18:00: 120, 10:30-19:30: 10, 11:00-20:00: 55	190

Care: Shifts with minimum FTE requirements

Weekday	Shift Pattern (Shift: FTE)	Total FTE
Monday	08:00-17:00: 190, 09:30-18:30: 150, 11:00-20:00: 220	560
Monday	08:00-17:00: 190, 09:30-18:30: 145, 10:30-19:30: 10, 11:00-20:00: 215	560
Tuesday	08:00-17:00: 190, 10:00-19:00: 190, 10:30-19:30: 10, 11:00-20:00: 215	605
Wednesday	08:00-17:00: 5, 08:30-17:30: 175, 09:30-18:30: 155, 11:00-20:00: 250	585
Thursday	08:00-17:00: 5, 09:00-18:00: 310, 10:00-19:00: 65, 11:00-20:00: 215	595
Friday	08:00-17:00: 220, 10:00-19:00: 90, 10:30-19:30: 35, 11:00-20:00: 185	530
Saturday	08:00-17:00: 5, 09:00-18:00: 220, 11:00-20:00: 10	235
Saturday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 215, 11:00-20:00: 10	235
Sunday	08:00-17:00: 5, 09:30-18:30: 115, 11:00-20:00: 35	155
Sunday	08:00-17:00: 5, 08:30-17:30: 5, 09:30-18:30: 110, 11:00-20:00: 35	155
Sunday	08:00-17:00: 5, 09:00-18:00: 5, 09:30-18:30: 110, 11:00-20:00: 35	155
Sunday	08:00-17:00: 5, 09:30-18:30: 110, 10:30-19:30: 5, 11:00-20:00: 35	155

Sales: Shifts with minimum FTE requirements

Weekday	Shift Pattern	Total FTE
Monday	08:00-17:00: 5, 09:00-18:00: 75, 10:30-19:30: 30, 11:00-20:00: 60	170
Monday	08:00-17:00: 5, 09:30-18:30: 85, 10:30-19:30: 15, 11:00-20:00: 65	170
Tuesday	08:00-17:00: 65, 10:00-19:00: 25, 11:00-20:00: 80	170
Tuesday	08:00-17:00: 5, 08:30-17:30: 65, 10:00-19:00: 20, 11:00-20:00: 80	170
Tuesday	08:00-17:00: 65, 10:00-19:00: 25, 10:30-19:30: 5, 11:00-20:00: 75	170
Wednesday	08:00-17:00: 60, 10:00-19:00: 40, 11:00-20:00: 80	180
Wednesday	08:00-17:00: 5, 08:30-17:30: 65, 10:00-19:00: 25, 11:00-20:00: 85	180
Wednesday	08:00-17:00: 60, 10:00-19:00: 35, 10:30-19:30: 5, 11:00-20:00: 80	180
Thursday	08:00-17:00: 55, 10:00-19:00: 40, 11:00-20:00: 65	160
Thursday	08:00-17:00: 55, 10:00-19:00: 35, 10:30-19:30: 5, 11:00-20:00: 65	160
Friday	08:00-17:00: 35, 09:30-18:30: 50, 10:30-19:30: 15, 11:00-20:00: 50	150
Saturday	08:00-17:00: 5, 09:30-18:30: 80, 11:00-20:00: 5	90

Saturday	08:00-17:00: 5, 08:30-17:30: 5, 09:30-18:30: 75, 11:00-20:00: 5	90
Saturday	08:00-17:00: 5, 09:00-18:00: 5, 09:30-18:30: 75, 11:00-20:00: 5	90
Saturday	08:00-17:00: 5, 09:30-18:30: 60, 10:00-19:00: 20, 11:00-20:00: 5	90
Sunday	08:00-17:00: 5, 09:30-18:30: 40, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 08:30-17:30: 5, 09:30-18:30: 35, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 08:30-17:30: 30, 10:00-19:00: 10, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 08:30-17:30: 35, 10:30-19:30: 5, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 09:00-18:00: 5, 09:30-18:30: 35, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 09:00-18:00: 30, 10:00-19:00: 10, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 09:00-18:00: 35, 10:30-19:30: 5, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 09:30-18:30: 35, 10:00-19:00: 5, 11:00-20:00: 25	70
Sunday	08:00-17:00: 5, 09:30-18:30: 35, 10:30-19:30: 5, 11:00-20:00: 25	70

Complaints: Shifts with minimum FTE requirements

Weekday	Shift Pattern	Total FTE
Monday	08:00-17:00: 5, 09:00-18:00: 35, 11:00-20:00: 20	60
Monday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 30, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 35, 11:00-20:00: 25	60
Tuesday	08:00-17:00: 5, 08:30-17:30: 30, 11:00-20:00: 25	60
Tuesday	08:00-17:00: 15, 09:30-18:30: 25, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 30, 10:00-19:00: 10, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 5, 08:30-17:30: 15, 09:30-18:30: 20, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 5, 08:30-17:30: 25, 10:00-19:00: 10, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 5, 08:30-17:30: 30, 10:30-19:30: 5, 11:00-20:00: 20	60
Tuesday	08:00-17:00: 5, 09:00-18:00: 20, 09:30-18:30: 15, 11:00-20:00: 20	60
Wednesday	08:00-17:00: 25, 10:00-19:00: 15, 11:00-20:00: 15	55
Wednesday	08:00-17:00: 5, 09:00-18:00: 25, 10:00-19:00: 10, 11:00-20:00: 15	55
Wednesday	08:00-17:00: 15, 09:30-18:30: 15, 10:00-19:00: 5, 11:00-20:00: 20	55
Wednesday	08:00-17:00: 25, 10:00-19:00: 10, 10:30-19:30: 5, 11:00-20:00: 15	55
Thursday	08:00-17:00: 35, 11:00-20:00: 25	60
Thursday	08:00-17:00: 5, 08:30-17:30: 30, 11:00-20:00: 25	60
Thursday	08:00-17:00: 30, 10:00-19:00: 10, 11:00-20:00: 20	60
Thursday	08:00-17:00: 5, 08:30-17:30: 20, 09:30-18:30: 15, 11:00-20:00: 20	60
Thursday	08:00-17:00: 5, 08:30-17:30: 25, 10:00-19:00: 10, 11:00-20:00: 20	60
Thursday	08:00-17:00: 5, 08:30-17:30: 30, 10:30-19:30: 5, 11:00-20:00: 20	60
Thursday	08:00-17:00: 5, 09:00-18:00: 25, 09:30-18:30: 10, 11:00-20:00: 20	60
Thursday	08:00-17:00: 5, 09:00-18:00: 30, 10:00-19:00: 5, 11:00-20:00: 20	60
Thursday	08:00-17:00: 30, 10:00-19:00: 5, 10:30-19:30: 5, 11:00-20:00: 20	60
Friday	08:00-17:00: 5, 08:30-17:30: 30, 10:00-19:00: 10, 11:00-20:00: 15	60
Saturday	08:00-17:00: 5, 09:00-18:00: 20, 11:00-20:00: 5	30
Saturday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 15, 11:00-20:00: 5	30
Sunday	08:00-17:00: 5, 09:00-18:00: 15, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 09:30-18:30: 15, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 08:30-17:30: 5, 09:00-18:00: 10, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 08:30-17:30: 5, 09:30-18:30: 10, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 08:30-17:30: 5, 10:00-19:00: 10, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 09:00-18:00: 5, 09:30-18:30: 10, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 09:00-18:00: 5, 10:00-19:00: 10, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 09:00-18:00: 10, 10:30-19:30: 5, 11:00-20:00: 5	25
Sunday	08:00-17:00: 5, 09:30-18:30: 10, 10:00-19:00: 5, 11:00-20:00: 5	25

3.9. Weekly rostering optimizing headcount

3.9.1. Retentions

Weekday	Required	Group1	Group2	Group3	Sat Overtime (OT)	Balance
Monday	620	515	130	45		-70
Tuesday	645	515	130			0
Wednesday	695	515	130		60	-10
Thursday	570	515		45	60	-50
Friday	515	515		45		-45
Saturday	280		130	45	60	45
Sunday	190		130	45	60	-45
		515	**130**	**45**	**60**	
Total HC Requirement	**750**					
Adjusted @ 17%	**878**					
Current HC	**974**					
Savings	**97**					

3.9.2. Care

Weekday	Required	Group1	Group2	Mon OT	Sun OT	Balance
Monday	560	400		75	70	15
Tuesday	605	400	130	75		0
Wednesday	585	400	130		70	-15
Thursday	595	400	130		70	-5
Friday	530	400	130	75		-75
Saturday	235		130	75	70	-40
Sunday	155			75	70	10
		400	**130**	**75**	**70**	
Total HC Requirement	**675**					
Adjusted @ 17%	**790**					
Current HC	**812**					
Savings	**22**					

3.9.3. Sales

Weekday	Required	Group1	Group2	Mon OT	Sun OT	Balance
Monday	170			120	30	20
Tuesday	170	50		120	30	-30
Wednesday	180	50	30	120		-20
Thursday	160	50	30	120		-40
Friday	150	50	30	120		-50
Saturday	90	50	30		30	-20
Sunday	70		30		30	10
		50	**30**	**120**	**30**	
Total HC Requirement	**230**					
Adjusted @ 17%	**269**					
Current HC	**341**					
Savings	**72**					

3.9.4. Complaints

Weekday	Required	Group1	Group2	Sun OT	Balance

Monday	60	40		20	0
Tuesday	60	40	20	20	-20
Wednesday	55	40	20	20	-25
Thursday	60	40	20		0
Friday	60	40	20		0
Saturday	30		20	20	-10
Sunday	25			20	5
		40	**20**	**20**	

Total HC Requirement	**20**
Adjusted @ 17%	**23**
Current HC	**18**
Savings	**-5**

4. Interpretation of Results and Recommendation

4.1. Findings from EDA

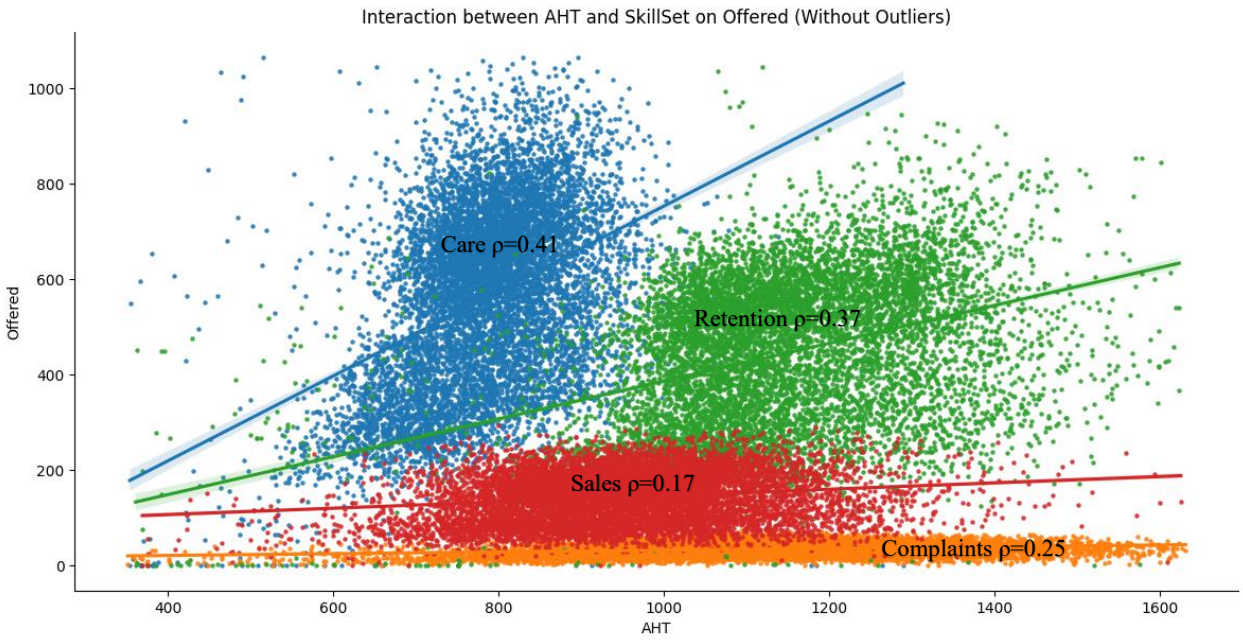

Figure 11: AHT vs Skillset on Offered

Observation: The correlation analysis previously indicated a slight negative correlation between Average Handling Time (AHT) and Calls Offered, suggesting that advisors may attempt to shorten call durations when there is a high volume of calls. However, upon examining individual skillsets, an atypical pattern emerged. For the Care and Retention skillsets, AHT increases as the number of calls in the queue rises, contrary to expected advisor behaviour. This deviation suggests a need for behavioural coaching.

Recommendation: A more detailed project has been proposed to run a behavioural analysis for Retentions and Care skillsets. It has been suggested that the project cover other parameters which

constitute AHT (Talk time, hold time, ACW – After call work and time not ready). This will provide conclusive evidence around whether the issue is systemic or behavioural and thereby help address it.

4.2. Findings from Forecasting

The forecasting models revealed that, for this analysis, forecasting proved redundant. Given that historical call volumes are simply being extrapolated into future intervals, the additional step of running forecasting models before conducting staffing analysis does not contribute effectively to the project's objectives. Consequently, it was determined that forecasting should be excluded from further analysis. The initial plan to incorporate advanced time series forecasting models, such as SARIMA, would not provide additional benefit to achieving the analysis goals.

Recommendation: Forecasting would be useful to predict future staffing needs however that will require data across last few years since it needs to look at annual trends as well.

4.3. Findings from Clustering

Observation: It is observed that the clustering of FTE requirement does not impact the shift patterns since each shift of 9 hours in a 12-hour working window can cover multiple clusters. This approach would be more relevant in scenario involving a 24-hour work window and if a split shift approach is used.

Recommendation: A split shift approach has been recommended to the operations as the next long-term staff-optimization lever to further reduce the headcount requirement beyond the results of this anlaysis.

4.4. Findings from Shift Optimization

The overall benefit that this analysis has identified across the skill sets is:

Skillset	Current HC	Optimized HC	Savings
Retentions	878	974	97
Care	790	812	22
Sales	269	341	72
Complaints	23	18	-5
Total			**185**

At a rate of INR 3 lac annual per headcount this would translate to a potential direct cost **saving of INR 5.5Cr annually**. This saving does not factor the indirect costs of facility, IT, training and other related expenses.

5. Attachments

Raw Data Link

Cleaned Data Link

Colab Notebook link

Copy of Email requesting for a meeting: Additional proof of originality (mid-term feedback).

Meeting invite link: Additional proof of originality (mid-term feedback).