Call Center Staffing Assignment

Task 1: Minimum cost staffing plans for each of the four call centers

To develop minimum cost staffing plans for each of the call centers, initially the necessary number of staff in each half-hour intervals to have at most 1-minute average waiting time is determined for each call-center using simulation template. The necessary number of staff for each call center is reported in Table 1 at the Appendix.

After these requirements of staff are determined, optimum 8-hour shifts are solved by using Excel solver for each call center. While solving, it is assumed that all employees work 8-hour shifts, and each shift starts only on the hour. The constraints for each half-hour interval are as following: there are at least as many employees as necessary number of staff to meet the company's 60-second average speed of answer (ASA) requirement.

The number of optimum 8-hour shifts for each call-center are supplied below:

Table 1: Optimum 8-hour shifts to satisfy 1-minute ASA

Call Center	Total Shifts	start at 7	start at 8	start at 9	start at 10	start at 11	start at 12
General	23	6	3	5	2	0	7
Card Services	6	2	1	0	1	0	2
Mortgage	5	0	2	0	1	0	2
Collections	6	0	2	1	1	0	2

As expected, general call center requires the greatest number of employees as it gets the highest number of calls. In total, 40 eight-hour shifts are required each day in this design. This is equivalent to 320 hours of work daily and 20x320=6400 hours of work monthly assuming 20 workdays. This corresponds to 6,400x22=140,800 USD monthly cost.

Task 2: Alternative 4-hour shifts

The number of necessary staff to meet ASA requirement does not change with the bank's 4-hour shift policy. However, if the bank considers 4-hour shifts, three changes should be made: i) The employees now work for 8 consecutive half-hours instead of 16 consecutive half-hours, ii) The employees can start to work at 1,2,3, and 4 in addition to 7,8,9,11, and 12, and iii) The number of shifts should be calculated by these additional starting employees.

After reflecting these, the number of optimum shifts for each call center are supplied in the following table. As it can be seen, considering these are 4-hour shifts the number of full-time equivalents has fallen in all call-centers.

In total, 66 four-hour shifts are required each day in this design. This is equivalent to 264 hours of work daily and 20x264=5,280 hours of work monthly assuming 20 workdays. This corresponds to 5,280x22=116,160 USD monthly cost. Considering the cost efficiency compared to 8-hour shifts, 4-hour shift policy can be advised to the bank.

Table 2: Optimum 4-hour shifts to satisfy 1-minute ASA

Call Center	Total Shifts	start at 7	start at 8	start at 9	start at 10	start at 11	start at 12	start at 1	start at 2	start at 3	start at 4
General	38	6	3	5	2	5	3	5	0	8	1
Card Services	10	2	1	0	1	2	0	0	1	2	1
Mortgage	8	0	2	0	1	0	2	0	1	0	2
Collections	10	0	2	1	1	0	2	1	1	0	2

Task 3: The ASA requirement is reduced to 10 seconds for the General Call Center

When the ASA requirement is reduced to 10 seconds for the General Call Center, then the necessary number of staff for half-hour intervals should be recalculated. Using the template and considering ASA times, the necessary number of staff for each half-hour interval for the General Call Center is calculated. These are presented at the Appendix.

Implementing the new staff requirements and solving LP problem again yields the following optimum 8-hour shifts for the General Call Center.

Table 3: Optimum 8-hour shifts to satisfy 10-second ASA

Call Center	Total Shifts	start at 7	start at 8	start at 9	start at 10	start at 11	start at 12
General	28	7	5	4	2	0	10

To satisfy 10-secs of ASA, the bank should employ more shifts compared to 1-minute of ASA. The cost difference is calculated as following:

$$Monthly\ Cost\ Difference$$
$$= Daily\ number\ of\ shifts\ difference\ x\ 8\ hours\ x\ \ 20\ days\ x\ hourly\ wage$$

$$Monthly\ Cost\ Difference = (28 - 23)\ x\ 8\ x\ \ 20\ x\ 22 = 17{,}600\ USD$$

This additional monthly cost should be compared to additional benefits from increasing customer satisfaction. If additional benefits overweigh, then this design can be implemented for the General Call Center.

Task 4: The cross-selling proposal is implemented

When CTI is implemented, service time increases to 5 minutes which is equivalent to μ falling to 1/5=0.2. Using this new value and considering ASA should be at most 1 minute, number of necessary staff is calculated for each half-hour shift for the General Call Center (this is where CTI is implemented). Full-time equivalent jumps tremendously as a result. The new minimum number of staff is presented at the Appendix.

Using these new minimum number of staff numbers and solving LP problem yields the following optimum number of shifts for the General Call Center:

Table 4: Optimum 8-hour shifts with CTI implementation

Call Center	Total Shifts	start at 7	start at 8	start at 9	start at 10	start at 11	start at 12
General	46	11	8	9	4	13	1

As a result, total **monthly** additional cost of implementing CTI and keeping at most 1-minute ASA is as following:

COST ITEM	MONTHLY COST
ADDITIONAL SHIFTS	23x8x20x22=80,960 Extra 23 shifts, 8 hours, 20 days, 22 USD hourly wage
SOFTWARE COST	7500/12=625 7500 annually
AGENT COST	46x675/12=2,587.5 46 FTE worker licensing, 675 annual cost
INTEGRATION COST (ASSUMED ANNUAL)	2500/12=208.33
INSTALLATION COST (ASSUMED ANNUAL)	2500/12=208.33
SAP COST	80x13x20=20,800 80 USD hourly cost, 13 hours a day, 20 days
TOTAL COST	**105,389.16 USD**

Additional Benefits of CTI comes from cross-selling which can be calculated with 100% cross-sell capture ratio:

PRODUCT	AVERAGE NET PROFIT	VOLUME	TOTAL PROFIT
DIRECT NEW AUTO LOAN	362	2,960	1,071,520
DIRECT USED AUTO LOAN	284	17,569	4,989,596
VISA CLASSIC	160	746	119,360
VISA GOLD	392	2,078	814,576
MASTER CARD	152	380	57,760
		Total	**7,052,812 USD**

To cover additional costs, the necessary cross-sell capture ratio is calculated as 1.49%. It is highly probable that the implementation of CTI will bring net profits since 1.49% is a highly achievable cross-sale capture ratio.

$$Break\ even\ cross-sale\ rate = \frac{105{,}389}{7{,}052{,}812} = 1.49\%$$

Task 5: Consolidating the four call centers into one

When the call centers are consolidated into a single call-center, then the necessary number of staff for half-hour intervals should be recalculated using total demand for all four services. Using the template and considering ASA times, the necessary number of staff for each half-hour interval for this Consolidated Call Center is calculated. These are presented at the Appendix.

After these requirements of staff are determined, optimum 8-hour shifts are solved by using Excel solver for the consolidated call center. The number of 8-hour shifts falls from 40 to 30 compared to Task 1, corresponding 25% decrease in total costs compared to original case in Task 1. This is equal to 25% x 140,800= 35,200 USD savings in total costs.

Table 5: Optimum 8-hour shifts for the consolidated call center

Call Center	Total Shifts	start at 7	start at 8	start at 9	start at 10	start at 11	start at 12
Consolidated	30	7	5	9	1	0	8

Appendix

Table A.1: Number of minimum staff to comply at most average waiting time = 1 min

Time interval	General	Card Services	Mortgage	Collections
7:00-7:29	1	1	0	0
7:30-7:59	6	2	0	0
8:00-8:29	8	2	1	2
8:30-8:59	9	3	2	2
9:00-9:29	13	3	2	3
9:30-9:59	14	3	2	3
10:00-10:29	15	4	3	3
10:30-10:59	16	4	3	4
11:00-11:29	15	4	3	4
11:30-11:59	15	3	3	4
12:00-12:29	15	3	3	3
12:30-12:59	15	3	3	4
1:00-1:29	14	3	3	3
1:30-1:59	15	3	3	4
2:00-2:29	13	3	3	3
2:30-2:59	13	3	3	4
3:00-3:29	14	3	3	4
3:30-3:59	13	3	3	4
4:00-4:29	14	3	3	3
4:30-4:59	12	3	3	4
5:00-5:29	7	2	1	3
5:30-5:59	6	2	1	3
6:00-6:29	3	2	1	1
6:30-6:59	3	1	1	1
7:00-7:29	1	1	1	1
7:30-8:00	0	1	0	0

Table A.2: Number of minimum staff to comply at most average waiting time = 10 secs

Time interval	General
7:00-7:29	1
7:30-7:59	7
8:00-8:29	10
8:30-8:59	12
9:00-9:29	16
9:30-9:59	16
10:00-10:29	18
10:30-10:59	18
11:00-11:29	18
11:30-11:59	17
12:00-12:29	17
12:30-12:59	17
1:00-1:29	16
1:30-1:59	17
2:00-2:29	15
2:30-2:59	16
3:00-3:29	16
3:30-3:59	16
4:00-4:29	16
4:30-4:59	14
5:00-5:29	9
5:30-5:59	7
6:00-6:29	4
6:30-6:59	4
7:00-7:29	1
7:30-8:00	1

Table A.3: Number of minimum staff for the consolidated call center AS=1 min

Time interval	Consolidated
7:00-7:29	1
7:30-7:59	7
8:00-8:29	9
8:30-8:59	12
9:00-9:29	17
9:30-9:59	18
10:00-10:29	21
10:30-10:59	22
11:00-11:29	21
11:30-11:59	21
12:00-12:29	19
12:30-12:59	20
1:00-1:29	18
1:30-1:59	20
2:00-2:29	18
2:30-2:59	19
3:00-3:29	20
3:30-3:59	18
4:00-4:29	18
4:30-4:59	17
5:00-5:29	9
5:30-5:59	7
6:00-6:29	4
6:30-6:59	3
7:00-7:29	2
7:30-8:00	1

Table A.4: Number of minimum staff to when CTI is implemented

Time interval	General
7:00-7:29	1
7:30-7:59	11
8:00-8:29	16
8:30-8:59	19
9:00-9:29	27
9:30-9:59	28
10:00-10:29	31
10:30-10:59	32
11:00-11:29	31
11:30-11:59	30
12:00-12:29	30
12:30-12:59	30
1:00-1:29	28
1:30-1:59	30
2:00-2:29	26
2:30-2:59	27
3:00-3:29	28
3:30-3:59	27
4:00-4:29	27
4:30-4:59	23
5:00-5:29	14
5:30-5:59	11
6:00-6:29	6
6:30-6:59	4
7:00-7:29	1
7:30-8:00	0