Scheduling Employees at the Big Town Fire

MGMT 101-Group37

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Overview & Learning Goals

Meet The Analysis Team Members

Team Name

The Strategic Thinkers

Sophia Vo

Business Econ
3rd Year

Arman Ehsami

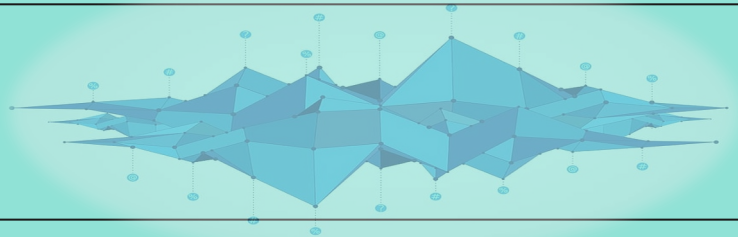
Business Administration
2nd Year

Yingxuan Ma

Economics
3rd Year

Contents & Learning Goals

- Deeper understanding of personal scheduling problem
- Completing all questions in Case 1 with opinions and answers
- Collaborating in analyzing the case scenarios in the Excel workbook
- Successfully performing all of the quantitative analysis through Excel
- Summarizing our findings in the presentation slides
- Reflecting on our learning outcomes findings in this case study.



Presentation Context

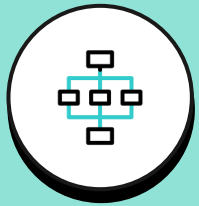
Problem: Scheduling Employees at Big Town Fire

Background Story

- HR Manager contacted us
- Optimal solution to schedule their employers(firefighters)
- Cut the cost

Our Job

- Schedule firefighters in the most effective way while fulfilling all the requirements
- Allocate the firefighter’s time and schedule more efficiently
- Enable Big Town Fire to cut their operating cost



Morning and Night Shifts

Rates

- Day shift hourly rates :39.9 per hour (basic 30 + additional 33% of benefits)
- Night Shift hourly rates: 46.55 per hour. (dayshift rates +5 per hour)

Four days of work was 12 hours per day and followed by three consecutive days off

The weekly firefighter personnel requirements are:

	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
5a-5p	11	11	12	18	19	19	14
5p-5a	16	17	18	20	22	24	20

Part A: Importance of the Scheduling Process

Biggest Challenge

The biggest challenges to make optimal arrangements within minimal expense based on firefighters' work patterns this involves a personal scheduling problem of the fire department if this problem is not well solved the HR department will have a problem, causing the operating expenses be high and lead to a shortage of fire personnel or budget.

Importance of the Scheduling Process

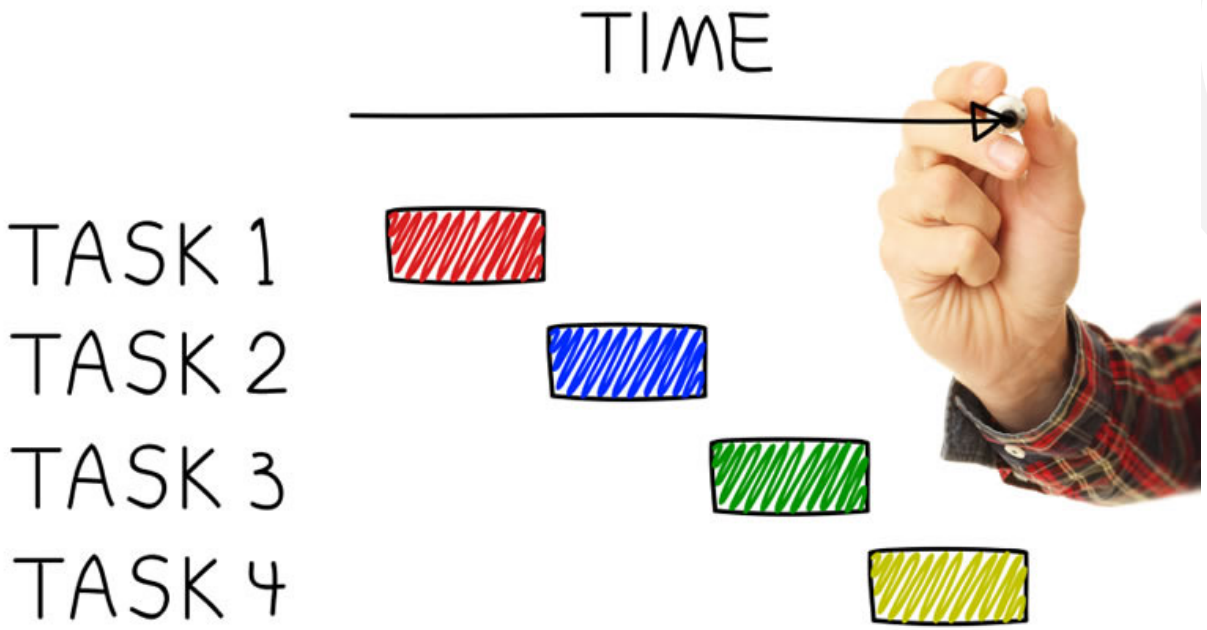
If Failing to Address:

1. jeopardize public safety as there may be insufficient personnel to handle emergencies
2. delayed response times or an inability to effectively manage multiple incidents simultaneously
3. decreased productivity and increased turnover rates.
4. unnecessary costs, such as overtime expenses, due to understaffing or improper allocation of resources.

Assumptions in performing Analysis

Our assumption is that any fire fighter will follow the schedule and there will be no complaints, absentees, accidents, etc. affecting factors

Analyses & Interpretation



Part B: Benchmark Solution

Decision Variables

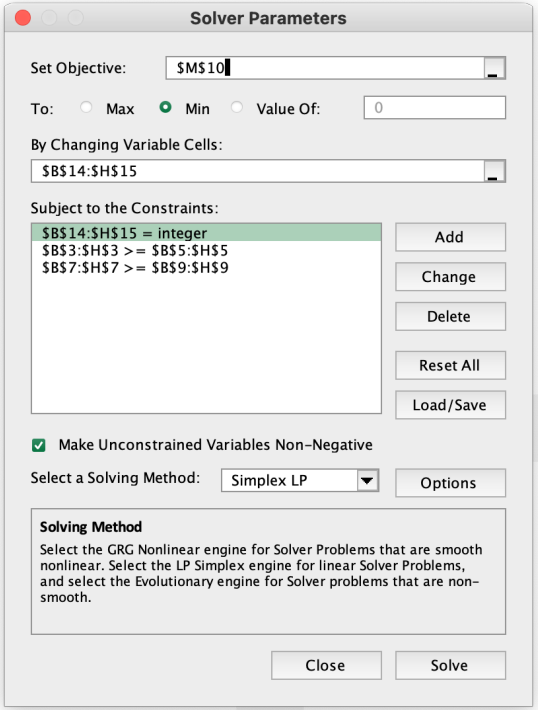
X mon,am, Xtue,am, …,Xsun,am
X mon,pm, Xtue,pm, …,Xsun,pm

Objective Function: Minimize Z

=30*(1+33%) *(X mon,am+Xtue,am+, …,+Xsun,am)*12*4+35*(1+33%)* (X mon,pm+Xtue,pm+, …,+Xsun,pm)

Constraints:

Xmon,am + Xfri, am + X sat, am+Xsun,am >= 11
…
Xi >= 0 for all I = Mon, Tue, Wen…
Xi integer



Benchmark Solution Results

Part: A and B

	Mon	Tues	Weds	Thurs	Fri	Sat	Sun	Total # of Day Shifts	Total Hours	Cost for Day Shifts (no benefits)	Cost for Day Shifts (with benefits)	**Benchmark Solution**	
	11.00	**11.00**	**12.00**	**18.00**	**19.00**	**19.00**	**14.00**	104.00	1248.00	$37,440.00	$49,795.20		
Requirements:	>=	>=	>=	>=	>=	>=	>=					Total # Firefighters Required	61
5:00a-5:00p	11	11	12	18	19	19	14					Total Cost	$127,999.20

	Mon	Tues	Weds	Thurs	Fri	Sat	Sun	Total # of Night Shifts	Total Hours	Cost for Night Shifts (no benefits)	Cost for Night Shifts (with benefits)
	16.00	**17.00**	**18.00**	**23.00**	**22.00**	**24.00**	**20.00**	140.00	1680.00	$58,800.00	$78,204.00
Requirements:	>=	>=	>=	>=	>=	>=	>=	Percentage Increase (C)			
5:00p-5:00a	16	17	18	20	22	24	20	100%			
	Original Values (Requirements)				22	24	20				

# Employees Starting	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Personel Required**
5:00a-5:00p	3	4	5	6	4	4	0	26
5:00p-5:00a	4	4	7	8	3	6	3	35
								61

	Compensation		With Benefits	
Day Shift	$30	Per Hour	$39.90	Per Hour
Night Shift	$35	Per Hour	$46.55	Per Hour
Total Cost (no benefits)	$96,240.00			
Total Cost (with benefits)	$127,999.20			

Total Employees 61 Firefighters **Total Cost** $127,999.20

Part C. Increase in Firefighters

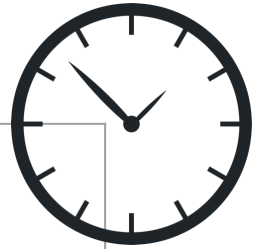
Percentage Increase	Total Cost	FF Required
0%	$127,999.20	61
5%	$130,233.60	62
10%	$132,468.00	63
20%	$136,936.80	65

Part D. Part-Time Employees

- We recommend Big Town Fire employ the firefighters, part-time, which would help minimize costs.
- It makes sense for BTF to have both full time, and part time firefighters

	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
5a-5p	7	4	8	10	9	10	4
5p-5a	9	8	10	10	12	12	8

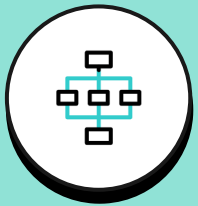
Part E: Limits of Total Hours Worked

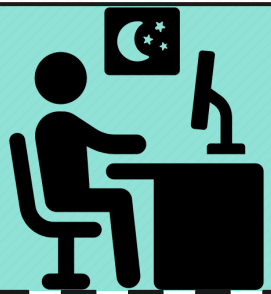


Part-Time Worker Constraint	# of Part-Time Personnel	# of Full-Time Personnel	Total Cost
0%	0	61	$127,999.20
10%	11	55	$123,832.40
20%	23	49	$120,506.40
30%	35	43	$117,180.00
40%	47	37	$113,852.60

Part F: Implications in terms of Cost

Limit Total # by	# of Full-Time Employees	# of Shifts Overtime	Total cost of Full-time shifts	Total cost of Overtime shifts	Total Cost
0	61	0	$127,999.20	$0	$127,999.20
1	60	1	$125,764.80	$837.90	$126,602.70
2	59	5	$123,849.60	$3,710.70	$127,560.30
3	58	9	$121,934.40	$6,583.50	$128,517.90
10	51	37	$108,528.00	$26,693.10	$135,221.10





Conclusion

Part G: Summary

- goal: create an optimal work schedule to compensate firefighters while staying within budget Big Town Fire
- assumed that every firefighter will follow the schedule without any complaints or absences
- results: benchmark solution requires 61 firefighters which costs $127,999.20
- fewer firefighters → more double shifts needed → higher total costs
- part time employees are a cost-effective option for scheduling

THANK YOU!