

# Littlefield Simulation

Presented by Group 4

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# Simulation 1

- Strategy for game one was to maintain moderate utilization rates
  - Our team made sure to check the utilization rates frequently in order to ensure they did not get too low
  - This allowed us to ensure bottleneck resources were addressed and fixed as quickly as possible
  - We collaborated often to make decisions, ensuring that we did not overreact to minor fluctuations
  - In the end station 1 had 4 machines, station 2 had 2 machines, and station 3 had 3 machines
  - This strategy brought great success
- Our biggest flaw with this strategy was indecision
  - We could not predict the precise number of consumers or when the number would change
  - This meant we did not act immediately when there was an opportunity to buy or sell more machines
  - This led to minor losses due to delayed reaction time

## Overall Team Standings

Rank	Team	Cash Balance (\$)
▲	⚡	⚡
1	group2	1,321,557
2	group4	1,313,785
3	tritoneers	1,309,501
4	group1	960,508
5	group9	953,471
6	group7	540,061
6	jungle7	540,061
6	donothing	540,061
6	doobas	540,061
6	group10	540,061
6	tritontwotimers	540,061
6	sungods	540,061
7	jellyfish	431,982
8	group6	347,268
9	group8	345,572
10	group11	314,020
11	rockstar	94,569
12	thebest5	59,835

# Simulation 2

- Data on the spreadsheet indicates that our operation was on track
  - But placement was not strong → why?
- Estimate based on spreadsheet
- Machine was costly
  - Perhaps we bought too much in the beginning and that affected our overall revenue
- Timing of decisions
  - Contract 3: lose out on time and potential.
  - Contract 2: maximize the potential profit.
- Frequency of updating data → less frequent compared to simulation 1
  - Reflected on our overall performance and placement
  - Operational point of view: shows the importance of knowing what is currently happening with the facilities so decisions can be made on demand.

## Overall Team Standings

Rank	Team	Cash Balance (\$)
▲	↕	↕
1	doobas	2,286,284
2	thebest5	2,122,242
3	group9	2,100,119
4	group2	2,081,725
5	jellyfish	2,040,433
6	tritoneers	1,994,727
7	group1	1,834,447
8	sungods	1,624,731
9	group6	1,608,658
10	donothing	1,597,883
10	tritontwotimers	1,597,883
11	group4	1,553,750
12	group7	1,422,718
13	group10	1,306,676

## Transaction History



Day	Parameter	Value
▲	↕	▼
53.25	station 1 machine count	5
53.26	station 2 machine count	2
53.27	station 3 machine count	3
53.27	Contract number	2
164.00	station 1 machine count	6
164.01	station 3 machine count	4
180.49	Reorder quantity (kits)	300
180.49	Reorder point (kits)	100
180.51	Contract number	3

# Utilization Rate

- Our decisions in both games relied on the concept of utilization rates
- The bottleneck is the resource with the highest utilization rate
- Everytime we saw a new bottleneck start to form we made adjustments accordingly and as quickly as possible

# Utilization Rate :

## Simulation 1 Example

- **Observing and Assessing the issue**
  - Station 1 peaking utilization rates
  - Backing up the entire process
  - Increasing average lead times
  - Purchased another machine on Day 53
- **Outcome Analysis**
  - Utilization rates for station 1 decreased
  - Less orders in the Queue
  - Lower average lead times = maximizing profit

**Station 1  
Utilization Rates**

Day	Data
50	0.93
51	1.00
52	1.00
53	1.00
54	1.00
55	0.67
56	0.43
57	0.46
58	0.59
59	0.22
60	0.66
61	0.49
62	0.86

**Lead Times**

Day	Contract 1
50	0.51
51	0.46
52	0.75
53	1.38
54	1.24
55	1.99
56	1.47
57	0.87
58	0.38
59	0.42
60	0.36
61	0.42
62	0.43

# Utilization Rate : Simulation 2 Example

- **Observing and Assessing the issue**
  - Station 1 utilization rates peaking and fluctuating
  - Queue backup every 10 days
  - Causing average lead times to increase
  - Purchased another machine on Day 164
- **Outcome Analysis**
  - Utilization rates decreased with less fluctuation
  - Queue buildup less often
  - Lead times under quoted amount of 1 day leading to maximized revenue under contract

**Station 1 Utilization Rates**

Day	Data
155	0.98
156	1.00
157	0.95
158	0.32
159	0.25
160	0.60
161	0.55
162	0.04
163	0.00
164	0.66
165	0.91
166	0.46
167	0.27

**Station 1 Queue**

Day	Data
155	22.92
156	9.37
157	1.92
158	0.00
159	0.00
160	0.03
161	0.03
162	0.00
163	0.00
164	13.91
165	5.47
166	0.00
167	0.00

**Lead Times**

Day	<u>Contract 2</u>
155	2.33
156	2.03
157	1.36
158	0.72
159	0.50
160	0.37
161	0.36
162	0.63
163	0.00
164	2.41
165	1.66
166	0.65
167	0.36

# Simulation 2 - Spreadsheet

Day	Input	Output_contract1	Output_contract2	Output_contract3	Inventory	U1	U2	U3
1	15	7	0	0	8	0.76	0.47	0.66
2	15	14	0	0	9	0.98	0.85	0.62
3	12	13	0	0	8	0.73	0.72	0.92
4	16	14	0	0	10	1	0.81	0.52
5	20	15	0	0	15	1	0.87	0.72
6	11	12	0	0	14	1	0.79	1
7	16	17	0	0	13	1	0.94	0.96
8	14	17	0	0	18	1	0.84	1
9	15	17	0	0	17	1	0.85	0.65
10	15	17	0	0	17	1	0.85	0.65
95	8	0	9	0	4	0.35	0.26	0.61
96	17	0	7	0	14	0.15	0.17	0.31
97	10	0	0	0	24	0	0	0
98	14	0	5	0	33	0.78	0.23	0.56
99	13	0	30	0	16	1	0.86	1
100	9	0	19	0	6	0.54	0.53	1
	Input	Output1	Output2	Output3	Inventory	U1	U2	U3
Mean	13	7.12	5.82	0	21.56	0.685	0.572	0.701
StdDev	3.39	7.26	8.41	0.00	16.10			
CV	0.26	1.02	1.45	#DIV/0!	0.75			
Median	13	6.5	0	0	16.5			
Max	21	24	32	0	55			
Min	6	0	0	0	1			
Range	15	24	32	0	54			
Ran/Med	1.153846154	3.692307692	#DIV/0!	#DIV/0!	3.272727273	Station 1	Station 2	Station 3
Count	100	100	100	100	100	2	1	1
95%CM	0.66	1.42	1.65	#NUM!	3.16			
Lower Limit 95% C	12.34	5.70	4.17	#NUM!	18.40			
Upper Limit 95% C	13.66	8.54	7.47	#NUM!	24.72	Capacity_1	Capacity_2	Capacity_3
	Output sum	12.94				18.9	22.6	18.5

R*T=l	T=l/R			max capacity	18.5	
R	12.94	since throughput < capacity all the time		throughput	18	
I	21.56			inventory	6	
T	1.666 days	39.98763524	hours	flow time	0.3248531685	7.796476043
					days	h
Aside:						
Each order contains 60 kits						
Maximum WIP Limit: 100 jobs						
safety stock      z*std of demand over review and leadtime						