SCM Simulation

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Year 1 - Design Room

- Options picked: **Stylish & Storage Capacity**
- Raises profits by $8 for both models (highest increase in profits out of all combinations of options)
- Standard deviations remains at 4 and 5 (all other options added increase the standard deviation)
    - Lower SD reduces uncertainty in demand forecasts
- Demand decreases by 2, but this is made up for by the increase in profit per unit
    - Initially, 60 units x $70/unit = $4200 (model A) and 30 units x $90/unit = $2700 (model B)
    - With options, 58 units x $78/unit = $4524 (model A) and 28 units x $98/unit = $2744 (model B)

Year 1 - Forecasting Room

- When deciding our demand forecasts, we decided to go with the average values, especially because there are no significant outliers on the team to make us think otherwise. In this case, for model A, we went with 58,000 phones per month and for model B, we went with 28,000 phones per month.

Year 1 - Production Room

- Decided to invest in the $2M CELLDEX opportunity because ideally with better demand forecasts, we wouldn't have to submit many quantity change orders.
- Model B has a much higher salvage value ($110) than Model A, so it is less risky to overproduce Model B
    - It can cost up to 18% more to hold Model B in inventory

Year 1 - Production Room

Style	Retail Price	In-house Cost	Cost	Salvage Value	Cost of Understocking	Cost of Overstocking	Critical Ratio	z-value	Mean	SD	Order
model A	215	147	137	14	78	123	0.39	-0.28	58	4	57
model B	255	167	157	110	98	47	0.68	0.46	28	5	30

- Supplier FarFarAway has capacity of 60k, and supplier PrettyClose has capacity 35k, which should be enough to produce the total of 87k of both models (also minimizes setup costs)
- FarFarAway will produce roughly 66% of everything and PrettyClose will produce 33% of everything (based on intuition of minimizing costs by outsourcing while still having the flexibility of a close supplier if demand changes.)

Year 1 - Production Room

- Initially, FarFarAway produced 37 A and 20 B while PrettyClose produced 21 A and 10 B
- We got updated demand information that Model A would not be performing as well and that Model B would have higher demand than expected. We chose to issue a change order in April for the FarFarAway supplier to produce less A (down to 30) and more B (up to 25). This change wouldn't kick in until August, which was around when the significant changes in demand were predicted.

Year 1 Results

Year 1 Results

REVENUES

	Model A	Model B	Total
Sales	$85,785,000	$61,710,000	$147,495,000
Markdown	$0	$376,800	$376,800
Total Revenue	$85,785,000	$62,086,800	**$147,871,800**

COSTS

	Model A	Model B	Total
Production	$55,853,000	$39,950,000	$95,803,000
Inventory	$154,800	$20,400	$175,200
Total	$56,007,800	$39,970,400	**$95,978,200**

Setups		$2,000,000
Celldex		$2,000,000
Change Orders		$2,000,000
Total Cost		**$101,978,200**

GROSS MARGIN

Gross Margin	**$45,893,600**
Gross Margin %	**31.04**

Year 1 - Board Room

- We didn't realize that we had to remember our reasoning for not selecting certain options
- Carla and Ankit: no vote, "pay more attention to how believable demand predictions are for the product options and demand uncertainty"
- Mattheo: yes vote, "allocated production well between different suppliers"
- Adele: no vote, "think more about when to overproduce and when to underproduce relative to demand"
- Mia: no vote, "think about your choice of suppliers, capacity allocation, and production flexibility"

Year 2 - Design Room

- No historical demand data because new lines have been redesigned -- focus on this year’s new data
- Stylish and storage capacity: low standard deviation (down to 2 for A and 4 for B), $12 increase per unit on profit

Year 2 - Forecasting Room

- We predicted a demand of 55 for model A and 32 for model B, making an estimate based on the committee average

Year 2 - Production Room

- Tried without CELLDEX data to see if it's actually worth the investment. In year 1, we still had to pay for a change order even with CELLDEX, so it may be worth it to just pay for a change order.
- Based on newsvendor using outsource costs, we should order 54 A and 33 B (these numbers stay about the same, e.g. 54 and 34, for in house costs)

Style	Retail Price	In-house Cost	Cost	Salvage Value	Cost of Understocking	Cost of Overstocking	Critical Ratio	z-value	Mean	SD	Order
model A	215	135	145	13	70	132	0.35	-0.39	55	2	54
model B	255	155	165	108	90	57	0.61	0.29	32	5	33

- PrettyClose: 19 A, 8 B
- Year 1 Board seemed happy with our split between far and close suppliers so we used the same logic this time

Year 2 - Production Room

- By May, the demands changed such at A would have very high demand for the rest of the year and B would have very low demand
    - Issued change order (because -11 inventory predicted for A and very high inventory levels predicted for B) for PrettyClose (because these demand changes are occurring immediately) to 30 A and 0 B
- After advancing to Aug, we realized that this decrease in B was not enough. However, it was too late to issue another change order because FarFarAway has a 4mo lead time, and PrettyClose was at capacity.

Year 2 Results

Year 2 Results

REVENUES

	Model A	Model B	Total
Sales	$106,330,000	$44,975,000	$151,305,000
Markdown	$0	$1,162,500	$1,162,500
Total Revenue	$106,330,000	$46,137,500	**$152,467,500**

COSTS

	Model A	Model B	Total
Production	$68,250,000	$31,000,000	$99,250,000
Inventory	$8,680	$339,240	$347,920
Total	$68,258,680	$31,339,240	**$99,597,920**
	Setups		$2,000,000
	Celldex		$0
	Change Orders		$2,000,000
	Total Cost		**$103,597,920**

GROSS MARGIN

	Gross Margin	**$48,869,580**
	Gross Margin %	**32.05**

Year 2 - Boardroom

- Carla - yes vote, “decisions on which options to include were better this year than last”
- Ankit - yes vote, “you seem to understand that the options with high demand uncertainty make accurate demand forecasting difficult”
- Matheo - no vote, “think about how much we need to produce at home, and how much we can produce overseas. Is it the same or different for each model?”
    - Next year, should use a different splitting strategy for each model to determine. Maybe try supplying more of model with higher SD at the close supplier
- Adele - no vote, “look at the trade-off between stocking out of a model and having excess inventory at the end of the year”
    - Should consider how if markdown costs are lower than the stockout costs, then it might be profitable to have a small surplus
- Mia - no vote, “think more about how capacity allocation and production flexibility are connected”

Year 3 - Design Room

- Extended battery: no increase in profit, small increase in SD, decreased demand
- Durability: no change in profit, high increase in SD, no change in demand
- GPS: no change in profit, slight increase in SD for A, decrease in SD for B, decrease in demand
- Audio quality: profit increases by 5, demand increases and SD decreases
- Only option chosen was Audio Quality because it was the only one that increases profit and demand and decreases SD (and other combinations also result in worse outcomes)

Year 3 - Forecasting Room

- Again, used the averages of the demand estimates (65 for A, 29 for B)

Year 3 - Production Room

- We decided not to use celldex because we had better profits in Year 2 without it -- the demand estimates with celldex were not very accurate in Year 1, and in both years we had to pay 2M for a change order anyways.
- Again, the differences in in-house vs outsource costs didn't make a difference in order quantities. Using newsvendor model, we should order 64 A and 31 B each month.

Style	Retail Price	In-house Cost	Cost	Salvage Value	Cost of Understocking	Cost of Overstocking	Critical Ratio	z-value	Mean	SD	Order
model A	215	150	140	14	75	126	0.37	-0.32	65	2	64
model B	255	170	160	112	95	48	0.66	0.42	29	5	31

- Use FarFarAway and PrettyClose again for lower set-up costs
- Based on the Year 2 boardroom results, we want to pay attention to how uncertainty affects how we split between far and close production
    - B has a higher SD, so we want to produce a higher proportion in PrettyClose
    - A has a lower SD, so we used the same split as before (~66% FarFarAway, ~33% PrettyClose)
    - 44 A and 16 B FarFarAway; 20 A and 15 B PrettyClose

Year 3 - Production Room

- By May, we were producing too much B and not enough of A. We issued a change order for PrettyClose to 21 A and 11 B to balance inventory. This was enough to get us significant profits by the end of the year.

Year 3 Results

REVENUES

	Model A	Model B	Total
Sales	$103,845,000	$43,860,000	$147,705,000
Markdown	$2,016,000	$1,248,000	$3,264,000
Total Revenue	$105,861,000	$45,108,000	**$150,969,000**

COSTS

	Model A	Model B	Total
Production	$71,330,000	$32,380,000	$103,710,000
Inventory	$103,200	$163,200	$266,400
Total	$71,433,200	$32,543,200	**$103,976,400**

Setups		$2,000,000
Celldex		$0
Change Orders		$2,000,000
Total Cost		**$107,976,400**

GROSS MARGIN

Gross Margin	**$42,992,600**
Gross Margin %	**28.48**

Year 3 - Board Room

- Carla: yes vote, “you are doing a great job on evaluating options based on more than the consensus data. You seem to understand which forecasting data are most relevant in predicting the future demand and profitability of an option”
- Ankit: yes vote, “choices in regards to which option to choose are consistently well thought out. You seem to understand that the predictability of demand and profitability is negatively influenced by choosing certain risky options”
- Matheo: yes vote, “you understood the difference between the models when it comes to overseas versus domestic production”
- Adele: no vote because we did not look at markdown costs/stockout costs
    - “you decided to produce more of Model A than the forecast said we could sell by the end of the year. You did the opposite for Model B. I think this was a smart decision”
    - “excess inventory costs (or markdown costs) and the costs of stocking out of a model all need to be part of your calculations”
- Mia: no vote, “look for better ways to increase our flexibility to adjust our production schedule once actual demand has been observed.”

Year 4 - Design Room

- GPS: does not impact the profit, demand decreases, and standard deviation increases
- Audio Quality: profit increases, demand increased slightly, and standard deviation for A is decreasing slightly and standard deviation for B is increasing slightly.
- Super-Slim: Profit doesn't change, demand decreases, and standard deviation increases significantly
- Camera Quality: Profit doesn't change, standard deviation increases, and demand decreases
- We chose just Audio Quality because it was the only option that increased profit and demand and didn't have much of an impact on SD

Year 4 - Forecasting Room

- Again, we used the average of all the demand estimates (63 A, 26 B)

Year 4 - Production Room

- Again, did not use CELLDEX because we have found it more useful to just issue change orders given that the CELLDEX demand is not always accurate.
- Used FarFarAway and PrettyClose again for lower setup costs
- Again, the differences in in-house vs outsource costs didn't make a difference in order quantities. Using newsvendor model, we should order 63 A and 30 B each month.

Style	Retail Price	In-house Cost	Cost	Salvage Value	Cost of Understocking	Cost of Overstocking	Critical Ratio	z-value	Mean	SD	Order
model A	212	147	137	14	75	123	0.38	-0.31	63	1	63
model B	252	167	157	110	95	47	0.67	0.44	26	9	30

- For A, we produce 46 (~75%) FarFarAway and 17 in Pretty Close
- For B, 14 in FarFarAway and 16 in PrettyClose

Year 4 - Production Room

- In May, demand estimates changed such that A would have much less demand and B would have much greater demand, so we changed PrettyClose to 9 A and 21 B

Year 4 Results

Year 4 Results

REVENUES

	Model A	Model B	Total
Sales	$90,100,000	$65,268,000	$155,368,000
Markdown	$739,800	$0	$739,800
Total Revenue	$90,839,800	$65,268,000	**$156,107,800**

COSTS

	Model A	Model B	Total
Production	$59,677,000	$42,133,000	$101,810,000
Inventory	$135,680	$30,240	$165,920
Total	$59,812,680	$42,163,240	**$101,975,920**
		Setups	$2,000,000
		Celldex	$0
		Change Orders	$2,000,000
		Total Cost	**$105,975,920**

GROSS MARGIN

	Gross Margin	**$50,131,880**

Year 4 - Board Room

- Carla - yes vote, “you understand that the average forecasting data are often more relevant in predicting the future demand and profitability of an option than the consensus forecasts”
- Ankit - yes vote, “you understand that a high degree of variance among the different forecasters is a good indication of demand uncertainty.”
- Matheo - yes vote, “you understood the difference between Model A and B when it comes to overseas versus domestic production”
- Adele - yes vote, “you understand now that if stockout costs are bigger than the markdown costs, then it is profitable to plan for a small surplus over expected demand, and vice versa”
- Mia - no vote, “There are still things you could have done better to increase flexibility to change your production as demand changes. It is important to take the lead times of domestic and overseas suppliers into account.”

Summary

CUMULATIVE TOTALS

	Model A	Model B	Total
Revenue	$388,815,800	$218,936,300	$607,752,100
Costs	$255,512,360	$147,313,180	$402,825,540
Administrative Costs			$18,000,000
		Gross Margin	**$186,926,560**
		Gross Margin %	**30.76**

Summary by Year

Year 1

	Model A	Model B	Total
Revenue	$85,785,000	$62,086,800	$147,871,800
Costs	$56,007,800	$39,970,400	$95,978,200
Administrative Costs			$6,000,000
		Gross Margin	**$45,893,600**
		Gross Margin %	**31.04**

Year 2

	Model A	Model B	Total
Revenue	$106,330,000	$46,137,500	$152,467,500
Costs	$68,258,680	$31,339,240	$99,597,920
Administrative Costs			$4,000,000
		Gross Margin	**$48,869,580**
		Gross Margin %	**32.05**

Year 3

	Model A	Model B	Total
Revenue	$105,861,000	$45,444,000	$151,305,000
Costs	$71,433,200	$33,840,300	$105,273,500
Administrative Costs			$4,000,000
		Gross Margin	**$42,031,500**
		Gross Margin %	**27.78**

Year 4

	Model A	Model B	Total
Revenue	$90,839,800	$65,268,000	$156,107,800
Costs	$59,812,680	$42,163,240	$101,975,920
Administrative Costs			$4,000,000
		Gross Margin	**$50,131,880**
		Gross Margin %	**32.11**