MGMT 323 - Supply Chain Management

Assignment 01

Ali Muhammad Asad - aa07190

Make or Buy Decision

1. Your are given the following information:

COSTS	MAKE OPTION	BUY OPTION
Fixed Cost	$125,000	$5,000
Variable Cost	$15	$17

    a. Find the break-even quantity and the total cost at the break-even point.

    b. If the requirement is 150,000 units, is it more cost-effective for the firm to buy or make the components? What is the cost savings for choosing the cheaper option?

Solution:

a. $Q_{BE} = \dfrac{F_M - F_B}{V_B - V_M} = \dfrac{125000 - 5000}{17 - 15} = \dfrac{120000}{2} = 60000$

The breakeven quantity is 60,000 units.

Total Cost $= 125000 + 15(60000) = \$1025000$

b. For a requirement of 150000 units, the breakeven quantity is less than the requirement. Therefore, it is more cost-effective for the firm to make the components.

Cost if firm makes the components $= 125000 + 15(150000) = \$2375000$

Cost if firm buys the components $= 5000 + 17(150000) = \$2555000$

Cost savings $= 2555000 - 2375000 = \$180000$

The firm saves $180,000 by making the components.

---

2. Ms. Jane Kim, Purchasing Manager of Kuantan ATV, Inc., is negotiating a contract to buy 20,000 units of a common component part from a supplier. Ms. Kim has done a preliminary cost analysis on manufacturing the part in-house and concluded that she would need to invest $50,000 in capital equipment and incur a variable cost of $25 per unit to manufacture the part in-house. Assuming the total fixed cost to draft a contract with her supplier is $1,000, what is the maximum purchase price that she should negotiate with her supplier? What other factors should she negotiate with the suppliers?

> **Solution:** For the given scenario, we can construct the following table:
>
> | Costs | Make Option | Buy Option |
> |---|---|---|
> | Fixed | 50000 | 1000 |
> | Variable | 25 | x |
>
> Now we have 20,000 units.
>
> Cost for Make $= 50000 + 25(20000) = 50000 + 500000 = 550000$
>
> Cost for Buy $= 1000 + 20000x$
>
> Then we can find the maximum purchase price for her to negotiate as so:
> $1000 + 20000x < 550000 \implies x < 27.45$.
>
> Then the maximum purchase price she should negotiate with her supplier is $27.45 as after $27.45, it would be more cost-effective for her to make the components in-house as after that price the cost of buying the components would exceed the cost of making them in-house. Some other factors to consider while negotiating can include payment terms, delivery times, quality of the components, etc.

3. A Las Vegas, Nevada, manufacturer has the option to make or buy one of its component parts. The annual requirement is 20,000 units. A supplier is able to supply the parts for $10 per piece. The firm estimates that it costs $600 to prepare the contract with the supplier. To make the parts in-house, the firm must invest $50,000 in capital equipment and estimates that the parts cost $8 per piece.

    a. Assuming that cost is the only criterion, use break-even analysis to determine whether the firm should make or buy the item. What is the break-even quantity and what is the total cost at the break-even point?

    b. Calculate the total costs for both options at 20,000 units. What is the cost savings for choosing the cheaper option?

Solution: For the given scenario, we can construct the following table:

Costs	Make Option	Buy Option
Fixed	50000	600
Variable	8	10

  a. $Q_{BE} = \dfrac{F_M - F_B}{V_B - V_M} = \dfrac{50000 - 600}{10 - 8} = \dfrac{49400}{2} = 24700$

     Total Cost $= 50000 + 8(24700) = 50000 + 197600 = 247600$

     The breakeven quantity is 24,700 units, and the total cost at this quantity is $247,600.

     Since the breakeven quantity is greater than the requirement, the firm should buy the components.

  b. Cost if firm makes the components $= 50000 + 8(20000) = 50000 + 160000 = 210000$

     Cost if firm buys the components $= 600 + 10(20000) = 600 + 200000 = 200600$

     Cost savings $= 210000 - 200600 = 9400$

     The firm saves $9,400 by buying the components.

Total Cost of Ownership

1. Given the following information, use total cost analysis to determine which supplier is more cost-effective. Late delivery of raw material results in 60 percent lost sales and 40 percent back orders of finished goods.

Order lot size	1,000
Requirements (annual forecast)	120,000 units
Weight per engine	22 pounds
Order processing cost	$125/order
Inventory carrying rate	20% per year
Cost of working capital	10% per year
Profit margin	15%
Price of finished goods	$4,500
Back order cost	$15 per unit

ORDER SIZE	SUPPLIER 1	SUPPLIER 2
1 to 999 units/order	$50.00 per unit	$49.50 per unit
1000 to 2,999 units/order	$49.00 per unit	$48.50 per unit
3,000 + units/order	$48.00 per unit	$48.00 per unit
Tooling cost	$12,000	$10,000
Terms	2/10, net 30	1/10, net 30
Distance	125 miles	100 miles
Supplier Quality Rating	2%	2%
Supplier Delivery Rating	1%	2%

Truckload (TL $\geq$ 40,000 lbs):	$0.85 per ton-mile
Less-than-truckload (LTL):	$1.10 per ton-mile
Note: per ton-mile = 2,000 lbs per mile	

Solution: Based on the provided information, we can construct the following table for ordering and managing the total costs:

Costs	Supplier 1		Supplier 2	
Engine Costs	120000 * 49	5880000	120000 * 48.5	5820000
Cash Discount				
n/30	5880000 * 10% * 30/360	49000	5820000 * 10% * 30/360	48500
1/10	NA	-	5820000 * (10% * 30/360 + 1%)	74366.66667
2/10	5880000 * (10% * 10/360 + 2%)	133933.3333	NA	-
Largest Discount		-133933.3333		-74366.66667
Tooling Cost		12000		10000
Transportation Cost	125 miles * 120000 * 22lbs * 1.1/2000	181500	100 miles * 120000 * 22lbs * 1.1/2000	145200
Ordering Costs	120000/1000 * 125 order cost	15000	120000/1000 * 125 order cost	15000
Carrying Costs	(1000/2) * 49 * 20%	4900	(1000/2) * 48.5 * 20%	4850
Quality Costs	5880000 * 2% Quality Rating	117600	5820000 * 2% Quality Rating	116400
Delivery Rating				
Backorder (40%)	120000 * 1% Delivery Rating * 40% BackOrder * 15 Backorder Cost	7200	120000 * 2% Delivery Rating * 40% BackOrder * 15 Backorder Cost	14400
Lost Sales (60%)	120000 * 1% * 60% Lost Sales * 4500 price of finished goods * 15% profit margin	486000	120000 * 2% * 60% Lost Sales * 4500 price of finished goods * 15% profit margin	972000
Total Cost		6570266.667		7023483.333

Via Total Cost Analysis, we can clearly see that Supplier 1 is more cost-effective as the total cost of ownership is \$6,570,266.67 compared to \$7,023,483.33 for Supplier 2.

2. A buyer received bids and other relevant information from three suppliers for a vital component part for its latest product. Given the following information, use total cost analysis to determine which supplier should be chosen. Late delivery of the component results in 70 percent lost sales and 30 percent back orders of finished goods.

Order lot size	2,000
Requirements (annual forecast)	240,000 units
Weight per engine	40 pounds
Order processing cost	$200/order
Inventory carrying rate	20% per year
Cost of working capital	10% per year
Profit margin	15%
Price of finished goods	$10,500
Back order cost	$120 per unit

ORDER SIZE	SUPPLIER 1	SUPPLIER 2	SUPPLIER 3
1 to 999 units/order	$200.00 per unit	$205.00 per unit	$198.00 per unit
1,000 to 2,999 units/order	$195.00 per unit	$190.00 per unit	$192.00 per unit
3,000 + units/order	$190.00 per unit	$185.00 per unit	$190.00 per unit
Tooling Cost	$12,000	$10,000	$15,000
Terms	2/10, net 30	1/15, net 30	1/10, net 20
Distance	120 miles	100 miles	150 miles
Supplier Quality Rating	2%	1%	2%
Supplier Delivery Rating	1%	1%	2%

Truckload (TL ≥ 40,000 lbs):	$0.95 per ton-mile
Less-than-truckload (LTL):	$1.20 per ton-mile
Note: per ton-mile = 2,000 lbs per mile	

Solution: We use the same methodology as in the previous question to construct a table for the three suppliers as follows:

Costs	Supplier 1		Supplier 2		Supplier 3	
Engine Costs	240000 * 195	46800000	240000 * 190	45600000	240000 * 192	46080000
Cash Discount						
n/30	46800000 * 10% * 30/360	390000	45600000 * 10% * 30/360	380000	46080000 * 10% * 20/360	256000
1/10	NA		45600000 * (10% * 15/360 + 1%)	646000	46080000 * (10% * 20/360 + 1%)	588800
2/10	46800000 * (10% * 10/360 + 2%)	1066000	NA		NA	
Largest Discount		-1066000		-646000		-588800
Tooling Cost		12000		10000		15000
Transportation Cost	120 * 240000 * 40 * 0.95/2000	547200	100 * 240000 * 40 * 0.95/2000	456000	150 * 240000 * 40 * 0.95/2000	684000
Ordering Costs	240000/2000 * 200	24000	240000/2000 * 200	24000	240000/2000 * 200	24000
Carrying Costs	(2000/2) * 195 * 20%	39000	(2000/2) * 190 * 20%	38000	(2000/2) * 192 * 20%	38400
Quality Costs	46800000 * 2% Quality Rating	936000	45600000 * 1% Quality Rating	456000	46080000 * 2% Quality Rating	921600
Delivery Rating						
Backorder (30%)	240000 * 1% * 30% * 120	86400	240000 * 1% * 30% * 120	86400	240000 * 2% * 30% * 120	172800
Lost Sales (70%)	240000 * 1% * 70% * 10500 * 15%	2646000	240000 * 1% * 70% * 10500 * 15%	2646000	240000 * 2% * 70% * 10500 * 15%	5292000
Total Cost		50024600		48670400		52639000

From the table above, we can see that Supplier 2 is the most cost-effective option with a total cost of $48,670,400 compared to $50,024,600 for Supplier 1 and $52,639,000 for Supplier 3.