

# LINKS Tutorial #7: Distribution Alternatives

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In LINKS, you have three distribution options in each region:

0. Have no DC and ship direct from your plant/DC1 in region 1.
1. Subcontract DC services from a third-party vendor.
2. Own and operate your own DC.

Each option offers comparable performance. So which constitutes the *best* option for any given region? There are two factors to consider:

- **If you plan to do postponed production** in the region, then you *must* own a DC there (option 2). And, postponed production costs and benefits must be considered, as well as distribution and transportation costs. The *next* tutorial, Tutorial #8, provides more detail about postponed production costs.
- **If you do not plan to do postponed production**, then the major issue is which of the three distribution options offers the lowest cost.

This tutorial provides a "hands-on" exercise for you to analyze these situations using data from a fictitious LINKS firm. Later, you can apply the approaches from this exercise to make decisions for your own firm using your own data.

This brief tutorial consists of two parts:

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## PART 1: "Hands-On" Exercise

### **NOTE!**

To get the most from this exercise, you should be familiar with P&L statements, inventory tracking, and forecasting. If any of these are unfamiliar, you may wish to work through the appropriate LINKS Tutorial (#1, #2, or #4) before you begin this exercise.

**Question 1 - Relevant Costs:** Select which of the following cost area(s) differ(s) between distribution options 0 (no DC), 1 (third-party DC), and 2 (owned DC) in any region:

- \_\_\_\_\_ Product costs.
- \_\_\_\_\_ Transportation costs.
- \_\_\_\_\_ Administrative overhead.
- \_\_\_\_\_ Fixed costs to open, operate, and close distribution centers.
- \_\_\_\_\_ Inventory carrying cost.

**Question 2 – Is It Worth Switching?** Assume that your firm currently has distribution option 1 (third-party DC) in region 2, and you are considering switching to option 2 (owned DC) because the operating cost is much cheaper.

- a. Your firm currently pays \_\_\_\_\_ per round to have a third-party DC in region 2. (Hint: Look in your LINKS participant's manual!)
- b. How much would you save (if anything) each simulation round in operating costs if you switched from option 1 (third-party DC) to option 2 (owned DC)?
- c. How much would you save (if anything) in inventory holding costs if you switched from option 1 (third-party DC) to option 2 (owned DC)?
- d. Assume that you carried \$500,000 of finished goods inventory at DC2 (third-party DC) at the end of the last simulation round.
  - (1) Calculate how much you spent in inventory charges at DC2 during the last simulation round.
  - (2) Calculate the inventory holding cost savings you would have accrued if you had option 2 (owned DC) during the last simulation round.

- e. You will incur some one-time fixed costs to switch from option 1 (third-party DC) to option 2 (owned DC). Fill-in the appropriate cost in each blank below:
- (1) The cost to close the current DC in region 2: \_\_\_\_\_
  - (2) The cost to open your own DC in region 2: \_\_\_\_\_
- Total One-Time Switching Costs [(1) + (2)] = \_\_\_\_\_
- f. Assuming the inventory charge savings you calculated in question 2d(2) and the operating cost savings you calculated in question 2b, how many simulation rounds would it take to recover the one-time fixed costs you'd spend to switch from option 1 (third-party DC) to option 2 (owned DC)?

**Question 3** follows on the next page...

**Question 3 - Determining the Lowest Cost Distribution Option:** Assume that your firm ships finished goods from your plant/DC in region 1 to customers in region 2. You own your DC in region 1 but you don't have DC in region 2. You expect the following results for region 2 during the next simulation round:

- Total Sales: Channel 1, Product 1 = 5,000
- Total Sales: Channel 2, Product 1 = 6,000
- Total Sales: Channel 1, Product 2 = 4,500
- Total Sales: Channel 2, Product 2 = 5,500
- Product 1 Unit Cost = \$157
- Product 2 Unit Cost = \$200
- A 5% safety stock ordered (and inventoried) for each product.

a. Complete the following table to determine the expected costs in the next simulation round for each possible distribution option in **region 2**:

	<b>Option 0 (no DC)</b> <i>{current scenario}</i>	<b>Option 1</b> <b>(third-party)</b>	<b>Option 2</b> <b>(Own)</b>
Operating Costs Per Simulation Round:			
Transportation from DC1 to DC2 (assume Shipper I):		(Assume all air)	(Assume all air)
Transportation to Customers:			
Inventory Holding Costs:			
<b>Total Expected Cost Per Simulation Round:</b>			

b. In question 3a (above), you found that the on-going operating costs per simulation round of options 1 and 2 were lower than option 0 for this LINKS firm. Given that a firm would also have to pay one-time fixed costs to open the DC, why would any firm ever choose options 1 or 2?

**EXERCISE ANSWERS** follow...

## PART 2: Exercise Answers

**Question 1:** The following cost areas differ between distribution options 0, 1, and 2 in any one region:

- Product costs.
- Transportation costs.
- Administrative overhead.
- Fixed costs to open, operate, and close distribution centers.
- Inventory carrying cost.

**Question 2:**

- a. **\$50,000**
- b. **\$25,000** = \$50,000 - \$25,000
- c. **Cost-savings equal to 2% of the DC's inventory value in each simulation round**  
= 5% - 3%
- d. (1)  $0.05 \times \$500,000 = \mathbf{\$25,000}$  (2)  $(0.05 - 0.03) \times \$500,000 = \mathbf{\$10,000}$
- e. (1) The cost to close the current DC in Region 2: **\$ 50,000**  
(2) The cost to open your own DC in Region 2: **250,000**  
Total One-Time Switching Costs [(1) + (2)] = **\$300,000**
- f.  $\$300,000 / (\$35,000 \text{ per simulation round}) \approx \mathbf{8.6 \text{ simulation rounds}}$

**Question 3:**

a. Preliminary calculations:

- Total expected sales, Product 1 = 5,000 + 6,000 = 11,000 units
- Total expected sales, Product 2 = 4,500 + 5,500 = 10,000 units
- Total Safety Stock = (11,000 + 10,000) x 5% = 1,050 units
- Total Production Order = 11,000 + 10,000 + 1,050 = 22,050 units
- Total Channel 1 Sales = 5,000 + 4,500 = 9,500 units
- Total Channel 2 Sales = 6,000 + 5,500 = 11,500 units

	<b>Option 0 (current scenario)</b>	<b>Option 1 (3<sup>rd</sup> party)</b>	<b>Option 2 (Own)</b>
Operating Costs Per Simulation Round:	<b>0</b>	<b>\$50,000</b>	<b>\$25,000</b>
Transportation from DC1 to DC2:	<b>0</b>	$\$8 \times 22,050 = \mathbf{\$176,400}$	$\$8 \times 22,050 = \mathbf{\$176,400}$
Transportation to Customers:	Channel 1: $\$18 \times 9,500 = \mathbf{\$171,000}$ Channel 2: $\$28 \times 11,500 = \mathbf{\$322,000}$	Channel 1: $\$6 \times 9,500 = \mathbf{\$57,000}$ Channel 2: $\$12 \times 11,500 = \mathbf{\$138,000}$	Channel 1: $\mathbf{\$57,000}$ Channel 2: $\mathbf{\$138,000}$
Inventory Holding Costs (assuming a 0.05 inventory level):	Product 1: $\$157 \times (0.05 \times 11,000) \times 0.03 = \mathbf{\$2,590.50}$ Product 2: $\$200 \times (0.05 \times 10,000) \times 0.03 = \mathbf{\$3,000}$	Product 1: $\$157 \times (0.05 \times 11,000) \times 0.05 = \mathbf{\$4,317.50}$ Product 2: $\$200 \times (0.05 \times 10,000) \times 0.05 = \mathbf{\$5,000}$	Product 1: $\mathbf{\$2,590.50}$ Product 2: $\mathbf{\$3,000}$
<b>Total Cost Per Simulation Round:</b>	<b>\$498,590.50</b>	<b>\$430,717.50</b>	<b>\$401,990.50</b>

Note that this example assumed all air shipping for options 1 and 2, guaranteeing 100% on-time delivery of products shipped from your plant to the regional DC. This does come at an added cost. If you choose to ship surface in your analysis for your own firm, you'll pay lower transportation costs, but some of the shipment may not arrive in time, ending up in "ending inventory" (for which you must pay an inventory charge).

b. Opening costs would need to be viewed beyond a window of just one simulation round since these options may be cost-effective in the long run. Also, if you want to do postponed production, you must own a DC in the region (option 2). Postponed production may offer financial advantages to your firm that make opening your own DC a profitable decision.