

“Project Management Using Earned Value”  
Case Study Solution 22.1

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# Estimating Cost Savings

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**SOLUTION**  
**Estimating Cost Savings**

1. Very few line items are likely to experience learning curves. Labor should benefit from it, but the only other area that will surely benefit is engineering. Use of very similar drawings will obviously be a cost savings for the series of installations. While material costs may also experience cost savings because of a larger order, that is not a learning savings; it is a volume purchase savings.
2. Assume only installation labor and engineering benefit from the stated 90% unit learning curve. Costs are calculated using the following steps:

Step 1: Create a spreadsheet (this example uses MS Excel<sup>®</sup>) to calculate the unit values and lot totals for a 90% unit learning curve. Because the total value of the first 10 miles is known, set the spreadsheet to calculate the first ten units as follows:

Calculation of Unit and Lot Values for 90% Unit Learning Curve		
Slope	1st Unit Value (a)	Exponent Value (b)
90%	100.00	-0.1520
Unit #	Unit Value	Lot Total
1	100.00	799
2	90.00	
3	84.62	
4	81.00	
5	78.30	
6	76.16	
7	74.39	
8	72.90	
9	71.61	
10	70.47	

Where:

- Slope is entered at the desired 90%.
- 1st Unit Value (a) is set to a nominal value of 100.
- Exponent Value (b) is calculated by the formula:  
 $b = \text{LN}(\text{Slope})/\text{LN}(2)$ .
- Unit #'s are entered in order.
- Unit Value is calculated by the formula:  
 $y = ax^b$  where: a is the 1st Unit Value,  
x is the Unit #, and  
b is the Exponent Value.
- Lot Total is the sum of the 10 units.

At this point, it does not matter what value was selected for the first unit value. One hundred is used here to easily check whether the formulas were entered correctly. Note that unit 2's value is 90% of unit 1's value, unit 4's value is 90% of unit 2's value, and unit 8's value is 90% of unit 4's value.

Step 2: Using the Goal Seek option in the Data/What If Analysis menu item of MS Excel<sup>®</sup>, set the Lot Total cell equal to the Labor total dollars for the first ten miles (\$650,000) by changing the 1<sup>st</sup> Unit Value (a). This is an iterative calculation that the spreadsheet will calculate very quickly. The result will look like this:

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Calculation of Unit and Lot Values for 90% Unit Learning Curve		
Slope	1st Unit Value (a)	Exponent Value (b)
90%	81306.12	-0.1520
Unit #	Unit Value	Lot Total
1	81306.12	650,000
2	73175.50	
3	68801.72	
4	65857.95	
5	63661.61	
6	61921.55	
7	60487.51	
8	59272.16	
9	58220.43	
10	57295.45	

Step 3: Extend the spreadsheet from Unit 10 to Unit 80, copying the formulas in the Unit Value and Lot Total columns for each lot of ten miles. The last lot of ten miles will look like this:

71	42533.02	421,429
72	42442.69	
73	42353.80	
74	42266.30	
75	42180.15	
76	42095.31	
77	42011.75	
78	41929.43	
79	41848.32	
80	41768.38	

Total for eight lots: 3,907,074

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The estimated cost for Labor by lot when using a 90% unit learning curve is:

1 <sup>st</sup> lot of ten miles:	\$ 650,000
2 <sup>nd</sup> lot of ten miles:	\$ 537,700
3 <sup>rd</sup> lot of ten miles:	\$ 497,523
4 <sup>th</sup> lot of ten miles:	\$ 472,862
5 <sup>th</sup> lot of ten miles:	\$ 455,253
6 <sup>th</sup> lot of ten miles:	\$ 441,659
7 <sup>th</sup> lot of ten miles:	\$ 430,648
8 <sup>th</sup> ten miles:	<u>\$ 421,429</u>
	\$ 3,907,074

For Engineering, repeat Steps 2 and 3 above except change the Goal Seek value to the Engineering value for the first ten miles (\$40,000).

The estimated cost for Engineering by lot when using a 90% unit learning curve is:

1 <sup>st</sup> lot of ten miles:	\$ 40,000
2 <sup>nd</sup> lot of ten miles:	\$ 33,089
3 <sup>rd</sup> lot of ten miles:	\$ 30,617
4 <sup>th</sup> lot of ten miles:	\$ 29,099
5 <sup>th</sup> lot of ten miles:	\$ 28,016
6 <sup>th</sup> lot of ten miles:	\$ 27,179
7 <sup>th</sup> lot of ten miles:	\$ 26,501
8 <sup>th</sup> lot of ten miles:	<u>\$ 25,934</u>
	\$ 240,435

The cost savings assuming a 90% unit linear learning curve for each of the two activities would be:

LABOR:	No learning:	\$65,000/mile x 80 miles	= \$5,200,000
	90% learning:		= <u>\$3,907,074</u>
	Total Labor savings:		\$1,292,926 or 24.86%
ENGINEERING:	No learning:	\$4,000/mile x 80 miles	= \$ 320,000
	90% learning:		= <u>\$ 240,435</u>
	Total Engineering savings		\$ 79,565 or 24.86%
TOTAL SAVINGS:			<u>\$1,372,491</u>

There would be additional savings because the location adjustment (+10%) would be applied to a smaller total base than if learning curve was ignored.