

## Case 2

# Piedmont Trailer Manufacturing Company

**Spreadsheet Case****Difficulty Rating:** ★

### Case Overview

The Piedmont Trailer Manufacturing Company case requires students to construct an Economic Feasibility workbook. The Economic Feasibility workbook summarizes and analyzes the benefits and costs associated with a proposed custom order tracking project that is currently underway at the Piedmont Trailer Manufacturing Company. The preparation of the Economic Feasibility workbook requires the student to design five worksheets, use several formulas and functions, apply basic cell and worksheet formatting, and consolidate data from multiple worksheets into a summary worksheet.

The students will create the Economic Feasibility workbook; therefore, there is not an existing data file available for this case. The case scenario provides the students with the information that they need to prepare the Economic Feasibility workbook. The solutions for this case are located in the **PiedmontSolution4** file.

### Teaching Tips

This case requires students to prepare a documentation sheet. Often students have some concerns about the contents of the documentation sheet. When you assign this case, you can mention that the documentation sheet is a worksheet that briefly summarizes the contents of the workbook. At a minimum, the documentation sheet should identify the workbook's creator, specify the date the workbook is created, describe the contents of the workbook, and provide a brief explanation of each worksheet.

Students are asked to determine the internal rate of return for the custom order tracking system project. Microsoft Excel provides an IRR function that is easy to use. Before assigning this case, you may want to briefly discuss discount rates, present value factors, present values, future values, and the internal rate of return. You can work a simple example in class to demonstrate these concepts. Alternatively, have your students research these financial terms and concepts. In particular, have your students use Microsoft Excel's help feature to obtain information about the IRR function.

### Information Specifications Solutions

The Design Specifications section requires the student to prepare documentation, one-time costs, recurring costs, tangible benefit, and economic feasibility summary worksheets. Figures 1 – 5 show the initial documentation, economic feasibility summary, one-time costs, recurring costs, and tangible benefit worksheets.

Figure 1: Documentation Worksheet

Economic Feasibility Workbook		
<b>Created by:</b>	Lisa Miller, Senior Systems Analyst	
<b>Date Created:</b>	January 2, 2008	
<b>Purpose:</b>	The Economic Feasibility Workbook tracks the benefits and costs associated with Piedmont's new custom order tracking system.	
<b>Worksheets:</b>	Documentation	Documents the workbook.
	Economic Feasibility Summary	Summarizes the economic feasibility for the project.
	One-Time Costs	Identifies the one-time costs and their approximate dollar values.
	Recurring Costs	Identifies the recurring costs and their approximate dollar values.
	Tangible Benefit	Identifies the recurring benefits and their approximate dollar values.

Figure 2: Economic Feasibility Summary Worksheet

Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008							
<b>Discount Rate</b>	<b>0.14</b>						
		<b>Year</b>					<b>Totals</b>
<b>Year</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
<b>Benefits</b>							
Recurring Value of Benefits	\$0	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of Benefits	\$0.00	\$380,701.75	\$333,948.91	\$292,937.64	\$256,962.84	\$225,406.00	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$380,701.75</b>	<b>\$714,650.66</b>	<b>\$1,007,588.30</b>	<b>\$1,264,551.14</b>	<b>\$1,489,957.14</b>	<b>\$1,489,957.14</b>
<b>Costs</b>							
One-Time Costs	(370,703.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of Recurring Costs		(278,947.37)	(244,690.67)	(214,640.94)	(188,281.53)	(165,159.24)	
<b>Net Present Value of All Costs</b>	<b>(370,703.00)</b>	<b>(649,650.37)</b>	<b>(894,341.04)</b>	<b>(1,108,981.98)</b>	<b>(1,297,263.51)</b>	<b>(1,462,422.75)</b>	<b>(1,462,422.75)</b>
<b>Overall Net Present Value</b>							<b>\$27,534.39</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(370,703.00)	101,754.39	89,258.23	78,296.70	68,681.31	60,246.77	
Overall NPV Cash Flow	(370,703.00)	(268,948.61)	(179,690.38)	(101,393.68)	(32,712.37)	27,534.39	
<b>IRR:</b>	<b>(370,703.00)</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>17.049417%</b>
<b>Break-even Occurs Between:</b>	Years 4 and 5						
<b>Break-even Fraction:</b>	0.542973						
<b>Actual Break-even Occurs:</b>	4.542973						

Figure 3: One-Time Costs Worksheet

<b>Piedmont Trailer Manufacturing Company</b> <b>Custom Order Tracking Project</b> <b>One-Time Costs</b> <b>January 2, 2008</b>	
<b>Cost</b>	<b>Approximate Dollar Value</b>
Development Personnel	(142,000.00)
Training	(45,000.00)
Project-Related Technology Purchases	(65,000.00)
Site Preparation	(105,250.00)
<b>Miscellaneous</b>	
Conference-Related	(7,500.00)
Supplies	(2,704.00)
Duplication	(3,249.00)
<b>Total One-Time Costs</b>	<b>(370,703.00)</b>

Figure 4: Recurring Costs Worksheet

<b>Piedmont Trailer Manufacturing Company</b> <b>Custom Order Tracking Project</b> <b>Recurring Costs</b> <b>January 2, 2008</b>	
<b>Cost</b>	<b>Approximate Dollar Value</b>
Software Maintenance	(\$55,000.00)
Hardware	(\$30,000.00)
Supplies	(\$35,000.00)
IT Positions (3 people)	(\$160,000.00)
Site Rental	(\$38,000.00)
<b>Total Recurring Costs</b>	<b>(\$318,000.00)</b>

**Figure 5: Tangible Benefit Worksheet**

<b>Piedmont Trailer Manufacturing Company</b> <b>Custom Order Tracking Project</b> <b>Recurring Benefits</b> <b>January 2, 2008</b>	
<b>Benefit</b>	<b>Approximate Dollar Value</b>
Storage Savings	\$30,000.00
Staff Reduction (2 people)	\$45,000.00
Reduced Order Rework	\$14,000.00
Increased Sales	\$100,000.00
Faster Order Processing	\$40,000.00
Better Data Management	\$125,000.00
Streamline Activities	\$80,000.00
<b>Total Recurring Benefits</b>	<b>\$434,000.00</b>

**1. How will discount rates of 8, 10, 12, 14, and 16 percent affect the project's feasibility?**

Figures 6 – 10 provide suggested answers for this question. The answers for this question assume a useful life of 5 years. Using a discount rate of 8 percent, the net present value of all benefits is \$1,732,836.16; the net present value of all costs is \$1,640,384.79; the overall net present value is \$92,451.36, and the project breaks even in approximately 3.84 years.

Using a 10 percent discount rate, the net present value of all benefits is \$1,645,201.46; the net present value of all costs is \$1,576,173.19; the overall net present value is \$69,028.27, and the project breaks even in approximately 4.04 years.

Using a 12 percent discount rate, the net present value of all benefits is \$1,564,472.87; the overall net present value of all costs is \$1,517,021.83; the overall net present value is \$47,451.04, and the project breaks even in approximately 4.279 years.

Using a 14 percent discount rate, the net present value of all benefits is \$1,489,957.14; the net present value of all costs is \$1,462,422.75; the overall net present value is \$27,534.39, and the project breaks even in approximately 4.54 years.

Using a discount rate of 16 percent, the net present value of all benefits is \$1,421,043.45; the net present value of all costs is \$1,411,928.38, and the overall net present value is \$9,115.06. At a discount rate of 16 percent, the project breaks even in 4.83 years.

**Figure 6: Economic Feasibility Summary with an 8 Percent Discount**

Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008							
Discount Rate	0.08						
	Year						Totals
Year	0	1	2	3	4	5	
<b>Benefits</b>							
Recurring Value of Benefits	\$0	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.925926	0.857339	0.793832	0.735030	0.680583	
Present Value of Benefits	\$0.00	\$401,851.85	\$372,085.05	\$344,523.19	\$319,002.96	\$295,373.11	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$401,851.85</b>	<b>\$773,936.90</b>	<b>\$1,118,460.09</b>	<b>\$1,437,463.05</b>	<b>\$1,732,836.16</b>	<b>\$1,732,836.16</b>
<b>Costs</b>							
One-Time Costs	(370,703.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.925926	0.857339	0.793832	0.735030	0.680583	
Present Value of Recurring Costs		(294,444.44)	(272,633.74)	(252,438.65)	(233,739.49)	(216,425.46)	
<b>Net Present Value of All Costs</b>	<b>(370,703.00)</b>	<b>(665,147.44)</b>	<b>(937,781.19)</b>	<b>(1,190,219.84)</b>	<b>(1,423,959.34)</b>	<b>(1,640,384.79)</b>	<b>(1,640,384.79)</b>
<b>Overall Net Present Value</b>							<b>\$92,451.36</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(370,703.00)	107,407.41	99,451.30	92,084.54	85,263.46	78,947.65	
Overall NPV Cash Flow	(370,703.00)	(263,295.59)	(163,844.29)	(71,759.75)	13,503.71	92,451.36	
<b>IRR:</b>	<b>(370,703.00)</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>17.049417%</b>
<b>Break-even Occurs Between:</b>	<b>Years 3 and 4</b>						
<b>Break-even Fraction:</b>	<b>0.841624</b>						
<b>Actual Break-even Occurs:</b>	<b>3.841624</b>						

**Figure 7: Economic Feasibility Summary with a 10 Percent Discount**

Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008							
Discount Rate	0.10						
	Year						Totals
Year	0	1	2	3	4	5	
<b>Benefits</b>							
Recurring Value of Benefits	\$0	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.909091	0.826446	0.751315	0.683013	0.620921	
Present Value of Benefits	\$0.00	\$394,545.45	\$358,677.69	\$326,070.62	\$296,427.84	\$269,479.85	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$394,545.45</b>	<b>\$753,223.14</b>	<b>\$1,079,293.76</b>	<b>\$1,375,721.60</b>	<b>\$1,645,201.46</b>	<b>\$1,645,201.46</b>
<b>Costs</b>							
One-Time Costs	(370,703.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.909091	0.826446	0.751315	0.683013	0.620921	
Present Value of Recurring Costs		(289,090.91)	(262,809.92)	(238,918.11)	(217,198.28)	(197,452.98)	
<b>Net Present Value of All Costs</b>	<b>(370,703.00)</b>	<b>(659,793.91)</b>	<b>(922,603.83)</b>	<b>(1,161,521.93)</b>	<b>(1,378,720.21)</b>	<b>(1,576,173.19)</b>	<b>(1,576,173.19)</b>
<b>Overall Net Present Value</b>							<b>\$69,028.27</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(370,703.00)	105,454.55	95,867.77	87,152.52	79,229.56	72,026.87	
Overall NPV Cash Flow	(370,703.00)	(265,248.45)	(169,380.69)	(82,228.17)	(2,998.61)	69,028.27	
<b>IRR:</b>	<b>(370,703.00)</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>17.049417%</b>
<b>Break-even Occurs Between:</b>	<b>Years 4 and 5</b>						
<b>Break-even Fraction:</b>	<b>0.041632</b>						
<b>Actual Break-even Occurs:</b>	<b>4.041632</b>						

**Figure 8: Economic Feasibility Summary with a 12 Percent Discount**

Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008							
Discount Rate	0.12						
	Year						Totals
Year	0	1	2	3	4	5	
<b>Benefits</b>							
Recurring Value of Benefits	\$0	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.892857	0.797194	0.711780	0.635518	0.567427	
Present Value of Benefits	\$0.00	\$387,500.00	\$345,982.14	\$308,912.63	\$275,814.85	\$246,263.26	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$387,500.00</b>	<b>\$733,482.14</b>	<b>\$1,042,394.77</b>	<b>\$1,318,209.62</b>	<b>\$1,564,472.87</b>	<b>\$1,564,472.87</b>
<b>Costs</b>							
One-Time Costs	(370,703.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.892857	0.797194	0.711780	0.635518	0.567427	
Present Value of Recurring Costs		(283,928.57)	(253,507.65)	(226,346.12)	(202,094.75)	(180,441.74)	
<b>Net Present Value of All Costs</b>	<b>(370,703.00)</b>	<b>(654,631.57)</b>	<b>(908,139.22)</b>	<b>(1,134,485.34)</b>	<b>(1,336,580.09)</b>	<b>(1,517,021.83)</b>	<b>(1,517,021.83)</b>
<b>Overall Net Present Value</b>							<b>\$47,451.04</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(370,703.00)	103,571.43	92,474.49	82,566.51	73,720.10	65,821.52	
Overall NPV Cash Flow	(370,703.00)	(267,131.57)	(174,657.08)	(92,090.57)	(18,370.48)	47,451.04	
<b>IRR:</b>	<b>(370,703.00)</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>17.049417%</b>
<b>Break-even Occurs Between:</b>	Years 4 and 5						
<b>Break-even Fraction:</b>	0.279095						
<b>Actual Break-even Occurs:</b>	4.279095						

**Figure 9: Economic Feasibility Summary with a 14 Percent Discount**

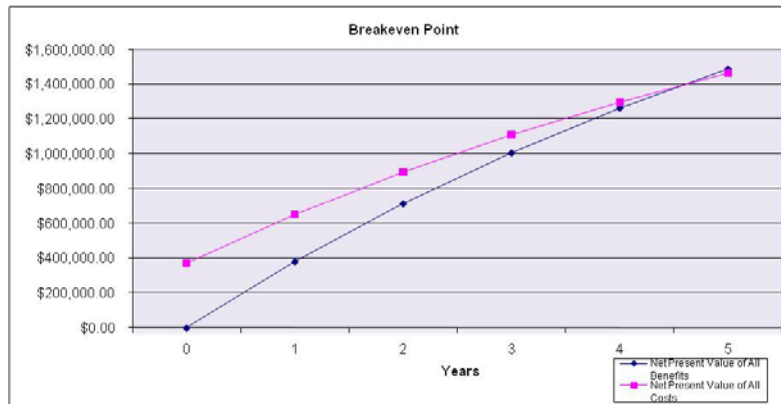
Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008							
Discount Rate	0.14						
	Year						Totals
Year	0	1	2	3	4	5	
<b>Benefits</b>							
Recurring Value of Benefits	\$0	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of Benefits	\$0.00	\$380,701.75	\$333,948.91	\$292,937.64	\$256,962.84	\$225,406.00	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$380,701.75</b>	<b>\$714,650.66</b>	<b>\$1,007,588.30</b>	<b>\$1,264,551.14</b>	<b>\$1,489,957.14</b>	<b>\$1,489,957.14</b>
<b>Costs</b>							
One-Time Costs	(370,703.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of Recurring Costs		(278,947.37)	(244,690.67)	(214,640.94)	(188,281.53)	(165,159.24)	
<b>Net Present Value of All Costs</b>	<b>(370,703.00)</b>	<b>(649,650.37)</b>	<b>(894,341.04)</b>	<b>(1,108,981.98)</b>	<b>(1,297,263.51)</b>	<b>(1,462,422.75)</b>	<b>(1,462,422.75)</b>
<b>Overall Net Present Value</b>							<b>\$27,534.39</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(370,703.00)	101,754.39	89,258.23	78,296.70	68,681.31	60,246.77	
Overall NPV Cash Flow	(370,703.00)	(268,948.61)	(179,690.38)	(101,393.68)	(32,712.37)	27,534.39	
<b>IRR:</b>	<b>(370,703.00)</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>17.049417%</b>
<b>Break-even Occurs Between:</b>	Years 4 and 5						
<b>Break-even Fraction:</b>	0.542973						
<b>Actual Break-even Occurs:</b>	4.542973						

**Figure 10: Economic Feasibility Summary with a 16 Percent Discount**

<b>Piedmont Trailer Manufacturing Company</b> <b>Custom Order Tracking Project</b> <b>Economic Feasibility Summary</b> <b>January 2, 2008</b>							
Discount Rate	0.16						
Year	0	1	2	3	4	5	Totals
<b>Benefits</b>							
Recurring Value of Benefits	\$0	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.862069	0.743163	0.640658	0.552291	0.476113	
Present Value of Benefits	\$0.00	\$374,137.93	\$322,532.70	\$278,045.43	\$239,694.34	\$206,633.05	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$374,137.93</b>	<b>\$696,670.63</b>	<b>\$974,716.06</b>	<b>\$1,214,410.40</b>	<b>\$1,421,043.45</b>	<b>\$1,421,043.45</b>
<b>Costs</b>							
One-Time Costs	(370,703.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.862069	0.743163	0.640658	0.552291	0.476113	
Present Value of Recurring Costs		(274,137.93)	(236,325.80)	(203,729.14)	(175,628.57)	(151,403.94)	
<b>Net Present Value of All Costs</b>	<b>(370,703.00)</b>	<b>(644,840.93)</b>	<b>(881,166.73)</b>	<b>(1,084,895.87)</b>	<b>(1,260,524.44)</b>	<b>(1,411,928.38)</b>	<b>(1,411,928.38)</b>
<b>Overall Net Present Value</b>							<b>\$9,115.06</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(370,703.00)	100,000.00	86,206.90	74,316.29	64,065.77	55,229.11	
Overall NPV Cash Flow	(370,703.00)	(270,703.00)	(184,496.10)	(110,179.81)	(46,114.05)	9,115.06	
<b>IRR:</b>	<b>(370,703.00)</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>116,000.00</b>	<b>17.049417%</b>
<b>Break-even Occurs Between:</b>	<b>Years 4 and 5</b>						
<b>Break-even Fraction:</b>	<b>0.834959</b>						
<b>Actual Break-even Occurs:</b>	<b>4.834959</b>						

2. Reset the discount rate to 14 percent. Prepare a breakeven chart that compares the net present value of all benefits to the net present value of all costs.

Figure 11 provides a suggested answer. The solution is also provided in the solution file's ISQ2 BEP Chart worksheet.

**Figure 11: Breakeven Chart**

3. If management stipulates that the internal rate of return must be equal to or greater than the discount rate, is this project still justifiable?

Using the results shown in Figure 10 as a guide, it appears that the internal rate of return is approximately 17.049 percent. As long as the discount rate is equal to or less than the internal rate of return, the project is justifiable.

**4. Assuming the discount rate is 14 percent, how will eliminating an additional staff position of \$32,500 affect the economic feasibility assessment?**

Figure 12 shows the Economic Feasibility Summary worksheet. The elimination of a staff position is a recurring benefit and causes the recurring benefits to increase \$32,500 for each year. The recurring benefits for years 1 through 5 increase from \$434,000 to \$466,500. The overall net present value is \$139,109.52; the IRR increases to approximately 28.72 percent, and the project breaks even in approximately 3.295 years. The solution file's ISQ4 EFS worksheet also shows the results.

**Figure 12: Economic Feasibility Summary Reflecting Staff Position Reduction**

Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008							
Discount Rate	0.14						
		Year					Totals
	0	1	2	3	4	5	
<b>Benefits</b>							
Recurring Value of Benefits	\$0.00	\$466,500.00	\$466,500.00	\$466,500.00	\$466,500.00	\$466,500.00	
Present Value Factor	1	0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of Benefits	\$0.00	\$409,210.53	\$358,956.60	\$314,874.21	\$276,205.45	\$242,285.48	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$409,210.53</b>	<b>\$768,167.13</b>	<b>\$1,083,041.34</b>	<b>\$1,359,246.79</b>	<b>\$1,601,532.27</b>	<b>\$1,601,532.27</b>
<b>Costs</b>							
One-Time Costs	(\$370,703.00)						
Recurring Costs		(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	
Present Value Factor		0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of the Recurring Costs		(\$278,947.37)	(\$244,690.67)	(\$214,640.94)	(\$188,281.53)	(\$165,159.24)	
<b>Net Present Value of All Costs</b>	<b>(\$370,703.00)</b>	<b>(\$649,650.37)</b>	<b>(\$894,341.04)</b>	<b>(\$1,108,981.98)</b>	<b>(\$1,297,263.51)</b>	<b>(\$1,462,422.75)</b>	<b>(\$1,462,422.75)</b>
<b>Overall Net Present Value</b>							<b>\$139,109.52</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(\$370,703.00)	\$130,263.16	\$114,265.93	\$100,233.27	\$87,923.92	\$77,126.25	
Overall NPV Cash Flow	(\$370,703.00)	(\$240,439.84)	(\$126,173.91)	(\$25,940.64)	\$61,983.28	\$139,109.52	
<b>IRR:</b>	<b>(\$370,703.00)</b>	<b>\$148,500.00</b>	<b>\$148,500.00</b>	<b>\$148,500.00</b>	<b>\$148,500.00</b>	<b>\$148,500.00</b>	<b>28.724918%</b>
<b>Break-even Occurs Between:</b>	Years 3 and 4						
<b>Break-even Fraction:</b>	0.295035112						
<b>Actual Break-even Occurs:</b>	3.295						

**5. Assume that the staff position mentioned in Step 4 is eliminated, the site preparation cost increases to \$120,000, and the discount rate is 14 percent. What impact will these changes have on the project's feasibility?**

Figure 13 provides a suggested answer. The increase in the site preparation cost requires the student to change this cost in his one-time cost worksheet. The recurring value of benefits is \$466,500, and the one-time costs increase to \$385,453.00 per year. The net present value of all benefits is \$1,601,532.27; the net present value of all costs is \$1,477,172.75, and the overall net present value is \$124,359.52. The project breaks even in 3.86 years, and the IRR is approximately 26.75 percent. The solution file's ISQ5 EFS worksheet also provides the answer.



**Figure 13: Economic Feasibility Summary Reflecting  
Staff Position Reduction and Increased Cost**

<b>Piedmont Trailer Manufacturing Company</b> <b>Custom Order Tracking Project</b> <b>Economic Feasibility Summary</b> <b>January 2, 2008</b>							
<b>Discount Rate</b>	<b>0.14</b>						
		<b>Year</b>					<b>Totals</b>
	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
<b>Benefits</b>							
Recurring Value of Benefits	\$0.00	\$466,500.00	\$466,500.00	\$466,500.00	\$466,500.00	\$466,500.00	
Present Value Factor	1.000000	0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of Benefits	0.00	409,210.53	358,956.60	314,874.21	276,205.45	242,285.48	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$409,210.53</b>	<b>\$768,167.13</b>	<b>\$1,083,041.34</b>	<b>\$1,359,246.79</b>	<b>\$1,601,532.27</b>	<b>\$1,601,532.27</b>
<b>Costs</b>							
One-Time Costs	(385,453.00)						
Recurring Costs		(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	(318,000.00)	
Present Value Factor		0.877193	0.769468	0.674972	0.592080	0.519369	
Present Value of the Recurring Costs		(278,947.37)	(244,690.67)	(214,640.94)	(188,281.53)	(165,159.24)	
<b>Net Present Value of All Costs</b>	<b>(385,453.00)</b>	<b>(664,400.37)</b>	<b>(909,091.04)</b>	<b>(1,123,731.98)</b>	<b>(1,312,013.51)</b>	<b>(1,477,172.75)</b>	<b>(1,477,172.75)</b>
<b>Overall Net Present Value</b>							<b>\$124,359.52</b>
<b>Cash Flow Analysis</b>							
Yearly NPV Cash Flow	(385,453.00)	130,263.16	114,265.93	100,233.27	87,923.92	77,126.25	
Overall NPV Cash Flow	(385,453.00)	(255,189.84)	(140,923.91)	(40,690.64)	47,233.28	124,359.52	
<b>IRR:</b>	<b>(385,453.00)</b>	<b>148,500.00</b>	<b>148,500.00</b>	<b>148,500.00</b>	<b>148,500.00</b>	<b>148,500.00</b>	<b>26.749302%</b>
<b>Break-even Occurs Between:</b>	Years 3 and 4						
<b>Break-even Fraction:</b>	0.861483						
<b>Actual Break-even Occurs:</b>	3.86						

6. Assume that management has enough money to fund two development projects. After you determine this project's internal rate of return, compare its internal rate of return to the internal rate of returns for the proposed development projects listed in the following table. Based on the projects' internal rate of returns, do you think management will fund the custom order tracking system?

Student answers to this question should vary. Many factors will (or should) influence management's ultimate decision about which projects to fund. Hopefully, your students will suggest that additional factors should be considered. These factors include scheduling, strategic alignment, operational objectives, government regulations, and potential benefits. If we base our decision solely on the information from the table, it appears that the custom order tracking system has the second highest IRR. (See Figure 13 for the IRR value.)

## Test Your Design Solutions

The Test Your Design section requires students to modify their worksheet design and then use the modified worksheet to provide Ms. Pablo with answers. Suggested answers for the Test Your Design questions are provided below.

1. What recommendations would you make if the useful life of the project is three years instead of five years? Six years? (Use the original case values and assume a discount rate of 14 percent.)

Figure 14 shows the modified Economic Feasibility Summary worksheet. Using a 14 percent discount rate, it appears that the project breaks even in approximately 4.54 years. At first glance, the students may recommend that the project is not feasible, if its useful life is only three years. As the project is in its planning phase, the project team has not identified all benefits and costs. Arguably, this project is still viable, especially if the team emphasizes the custom order tracking system's intangible benefits, such as customer service and employee morale.

In terms of six years, the net present value of all benefits is \$1,687,681.70; the net present value of all costs is \$1,607,299.27; the overall net present value is \$80,382.43, and the IRR is approximately 21.62 percent. The solution file's TYD1 EFS worksheet also provides the answer.

**Figure 14: Economic Feasibility Summary Reflecting Six-Year Useful Life**

Piedmont Trailer Manufacturing Company Custom Order Tracking Project Economic Feasibility Summary January 2, 2008								
Discount Rate	0.14							
		Year						Totals
	0	1	2	3	4	5	6	
<b>Benefits</b>								
Recurring Value of Benefits	\$0.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	\$434,000.00	
Present Value Factor	1.000000	0.877193	0.769468	0.674972	0.592080	0.519369	0.455587	
Present Value of Benefits	\$0.00	\$380,701.75	\$333,948.91	\$292,937.64	\$256,962.84	\$225,406.00	\$197,724.56	
<b>Net Present Value of All Benefits</b>	<b>\$0.00</b>	<b>\$380,701.75</b>	<b>\$714,650.66</b>	<b>\$1,007,588.30</b>	<b>\$1,264,551.14</b>	<b>\$1,489,957.14</b>	<b>\$1,687,681.70</b>	<b>\$1,687,681.70</b>
<b>Costs</b>								
One-Time Costs	(\$370,703.00)							
Recurring Costs		(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	(\$318,000.00)	
Present Value Factor		0.877193	0.769468	0.674972	0.592080	0.519369	0.455587	
Present Value of the Recurring Costs		(\$278,947.37)	(\$244,690.67)	(\$214,640.94)	(\$188,281.53)	(\$165,159.24)	(\$144,876.52)	
<b>Net Present Value of All Costs</b>	<b>(\$370,703.00)</b>	<b>(\$649,650.37)</b>	<b>(\$894,341.04)</b>	<b>(\$1,108,981.98)</b>	<b>(\$1,297,263.51)</b>	<b>(\$1,462,422.75)</b>	<b>(\$1,607,299.27)</b>	<b>(\$1,607,299.27)</b>
<b>Overall Net Present Value</b>								<b>\$80,382.43</b>
<b>Cash Flow Analysis</b>								
Yearly NPV Cash Flow	(\$370,703.00)	\$101,754.39	\$89,258.23	\$78,296.70	\$68,681.31	\$60,246.77	\$52,848.04	
Overall NPV Cash Flow	(\$370,703.00)	(\$268,948.61)	(\$179,690.38)	(\$101,393.68)	(\$32,712.37)	\$27,534.39	\$80,382.43	
<b>IRR:</b>	<b>(\$370,703.00)</b>	<b>\$116,000.00</b>	<b>\$116,000.00</b>	<b>\$116,000.00</b>	<b>\$116,000.00</b>	<b>\$116,000.00</b>	<b>\$116,000.00</b>	<b>21.624673%</b>
<b>Break-even Occurs Between:</b>	<b>Years 4 and 5</b>							
<b>Break-even Fraction:</b>	<b>0.542973098</b>							
<b>Actual Break-even Occurs:</b>	<b>4.54</b>							

2. Identify at least three additional benefits that might be derived from this project. Estimate their value and include the values in your analysis. What impact do these new benefits have on your economic feasibility?

Your students should identify several additional benefits that the new system will provide. Once your students have identified the additional benefits, these new benefits should be added to the recurring benefits worksheet. Better inventory management, reduced expenses, and error reduction are three additional benefits. The new benefits should strengthen the economic feasibility analysis.

- 3. Identify at least one additional one-time cost and at least three additional recurring costs. Estimate their values and include these values in your analysis. What impact do these new costs have on your economic feasibility? Is the project still justifiable? Why or why not?**

Your students should easily identify additional one-time and recurring costs for the new system. While their answers will vary, new hardware and software purchases are examples of one-time costs. Prorated overhead, maintenance, and computer usage are three examples of recurring costs.