

Insourcing/Outsourcing: The FlexCon Piston Decision

This case addresses many issues that affect insourcing/outsourcing decisions. A complex and important topic facing businesses today is whether to produce a component, assembly, or service internally (insourcing) or purchase that same component, assembly, or service from an external supplier (outsourcing).

Because of the important relationship between insourcing/outsourcing and competitiveness, organizations must consider many variables when considering an insourcing/outsourcing decision. This may include a detailed examination of a firm's competency and costs, along with quality, delivery, technology, responsiveness, and continuous improvement requirements. Because of the critical nature of many insourcing/outsourcing decisions, cross-functional teams often assume responsibility for managing the decisionmaking process. A single functional group usually does not have the data, insight, or knowledge required to make effective strategic insourcing/outsourcing decisions.

FlexCon 's Insourcing/Outsourcing of Pistons

FlexCon, a \$3 billion maker of small industrial engines, is undergoing a major internal review to decide where the company should focus its product development efforts and strategic investment. Executive management is arguing that too much capacity and talent are being committed to producing simple, commodity-type items that provide small differentiation within the marketplace. FlexCon concluded that in its attempts to preserve jobs, it has insourced parts that are easy to manufacture, while outsourcing those that are complex or challenging. Producing commodity-like components with mature technologies is adding little to what FlexCon's customers consider important. The company has become increasingly dependent on suppliers for critical components and subassemblies that make a major difference in the performance and cost of finished products. Part of FlexCon's effort at redefining itself involves creating an understanding of insourcing/outsourcing among managers and employees. The company has sponsored workshops and presentations to convey executive management's vision and goals, including educating those who are directly involved in making detailed insourcing/outsourcing recommendations. One presentation given by an expert in strategic sourcing focused on the changes in the marketplace that are encouraging outsourcing. The expert noted six key trends and changes that influence insourcing/outsourcing decisions:

1. The pressure for cost reduction is severe and will continue to increase. Cost reduction pressures are forcing organizations to use their production resources more efficiently. A recent study found that over 70% of firms surveyed expect stable or increasing purchased material costs through 2010. As a result, executive management will increasingly rely on insourcing/outsourcing decisions as a way to manage costs.
2. Firms are continuing to become more highly specialized in product and process technology. Increased specialization implies focused investment in a process or technology, which contributes to greater cost differentials between firms.
3. Firms will increasingly focus on what they excel at while outsourcing areas of nonexpertise. Some organizations are formally defining their core competencies to help guide the insourcing/outsourcing effort. This has affected decisions concerning what businesses a firm should engage.
4. The need for responsiveness in the marketplace is increasingly affecting insourcing/outsourcing decisions. Shorter cycle times, for example, encourage greater outsourcing with less vertical integration. The time to develop a production capability or capacity may exceed the window available to enter a new market.

5. Wall Street recognizes and rewards firms with higher ROI/ROA. Because insourcing usually requires an assumption of fixed assets (and increased human capital), financial pressures are causing managers to closely examine sourcing decisions. Avoidance of fixed costs and assets is motivating many firms to rely on supplier assets.
6. Improved computer simulation tools and forecasting software enable firms to perform insourcing/outsourcing comparisons with greater precision. These tools allow the user to perform sensitivity analysis (what-if analysis) that permits comparison of different sourcing possibilities.

One topic that interested FlexCon managers was a discussion of how core competencies relate to outsourcing decisions. FlexCon management commonly accepted that a core competency was something the company “was good at.” This view, however, is not correct. A core competency refers to skills, processes, or resources that distinguish a company, are hard to duplicate, and make that firm unique compared to other firms. Core competencies begin to define a firm’s long-run, strategic ability to build a dominant set of technologies or skills that enable it to adapt quickly to changing market opportunities. The presenter argued that three key points relate to the idea of core competence and its relationship to insourcing/outsourcing decisions:

1. A firm should concentrate internally on those components, assemblies, systems, or services that are critical to the finished product and where the firm possesses a distinctive (i.e., unique) advantage valued by the customer.
2. Consider outsourcing components, assemblies, systems, or services when suppliers have an advantage. Supplier advantages may occur because of economies of scale, process-specific investment, higher quality, familiarity with a technology, or a favorable cost structure.
3. Recognize that once a firm outsources an item or service, it usually loses the ability to bring that production capability or technology in-house without committing a significant investment.

The manager or team responsible for making an insourcing/outsourcing decision must develop a true sense of what the core competency of the organization is and whether the product or service under consideration is an integral part of that core competency.

The workshops and presentations have given most participants a greater appreciation of the need to consider factors besides cost when assessing insourcing/outsourcing opportunities. One breakout work session focused exclusively on developing a list of the key factors that may affect the insourcing/outsourcing analysis at FlexCon, which appears in Exhibit 1.

Exhibit 1	Key Factors Supporting Insourcing/Outsourcing Decisions
<p>FACTORS SUPPORT INSOURCING:</p> <ol style="list-style-type: none"> 1. Cost considerations favor the buyer. 2. A need or desire exists to integrate internal plant operations. 3. Excess plant capacity is available that can absorb fixed overhead. 4. A need exists to exert direct control over production and quality. 5. Product design secrecy is an important issue. 6. A lack of reliable suppliers characterizes the supply market. 7. Firm desires to maintain a stable workforce in a declining market. 8. Item or service is directly part of a firm’s core competency, or links directly to the strategic plans of the organization. 9. Item or technology behind making the item is strategic to the firm. The item adds to the qualities customers consider important. 10. Union or other restrictions discourage or even prohibit outsourcing. 11. Outsourcing may create or encourage a new competitor. 	<p>FACTORS SUPPORT OUTSOURCING:</p> <ol style="list-style-type: none"> 1. Cost considerations favor the supplier. 2. Supplier has specialized research and know-how, which creates differentials in cost and quality. 3. Buying firm lacks the technical ability to build an item. 4. Buyer has small volume requirements. 5. Buying firm has capacity constraints while the seller does not. 6. Buyer does not want to add permanent workers. 7. Future volume requirements are uncertain—buyer wants to transfer risk to the supplier. 8. Item or service is routine and available from many competitive sources. 9. Short cycle time requirements discourage new investment by the buyer—using existing supplier assets is logical. 10. Adding capacity at the buyer requires high capital start-up costs. 11. Process technology is mature with minimal likelihood of providing a future competitive advantage to the purchaser.

The Piston Insourcing/Outsourcing Decision

FlexCon is considering outsourcing production of all pistons that are part of the company's "R" series of engines. FlexCon has machined various versions of these pistons for as long as anyone at the company can remember. In fact, the company started fifty years ago as a producer of high-quality pistons. The company grew as customers requested that FlexCon produce a broader line of products. This outsourcing analysis has generated a great deal of interest and emotion among FlexCon engineers, managers, and employees.

FlexCon produces pistons in three separate work cells, which differ according to the type of piston produced. Each cell has six numerically controlled machines in a U-shape layout, with a supervisor, a process engineer, a material handler, and 12 employees assigned across the three cells. Employees, who are cross-trained to perform each job within their cell, work in teams of four. FlexCon experienced a 30% gain in quality and a 20% gain in productivity after shifting from a process layout, where equipment was grouped by similar capabilities, to work cells, where equipment was grouped to support a specific family of products. If FlexCon decides to outsource the pistons, the company will likely dedicate the floor space currently occupied by the work cells to a new product or expansion of an existing product. FlexCon will apply the work cell equipment for other applications, so the outsourcing analysis will not consider equipment write-offs beyond normal depreciation.

Although there are different opinions regarding outsourcing the pistons, FlexCon engineers agreed that the process technology used to produce this family of components is mature. Gaining future competitive advantages from new technology was probably not as great as other process applications within FlexCon's production process. This did not mean, however, that FlexCon could avoid making new investments in process technology if the pistons remained in-house, or that some level of process innovation is not possible.

Differences over outsourcing a component that is critical to the performance of FlexCon's final product threatens to affect the insourcing/outsourcing decision. One engineer threatened to quit if FlexCon outsourced a component that could "bring down" the entire engine in case of quality failure. He also maintained, "Our pistons are known in the industry as first-rate." Another engineer suggested that FlexCon's supply management group, if given support from the engineers, could adequately manage any risk of poor supplier quality. However, a third engineer noted, "Opportunistic suppliers will exploit FlexCon if given the chance—we've seen it before!" This engineer warned the group about suppliers "buying in" to the piston business only to coercively raise prices. Several experienced engineers voiced the opinion that they could not imagine FlexCon outsourcing a component that was responsible for making FlexCon the company it is today. Several newer members of the engineering group suggested they should wait until the outsourcing cost analysis was complete before rendering final judgment.

Management has created a cross-functional team composed of a process engineer, a cost analyst, a quality engineer, a procurement specialist, a supervisor, and a machine cell employee to conduct the outsourcing analysis. A major issue confronting this team involves determining which internal costs to apply to the analysis. Including total variable costs is straightforward because these costs are readily identifiable and vary directly with production levels. Examples of variable costs include materials, direct labor, and transportation.

The team is struggling with whether (or at what level) to include total factory and administrative costs (i.e., fixed costs and the fixed portion of semivariable costs). Factory and administrative costs include utilities, indirect labor, process engineering support, depreciation, corporate office administration, maintenance, and product design charges. Proper allocation of overhead is a difficult, and sometimes subjective, task. The assumptions the team makes about how to allocate total factory and operating costs can dramatically alter the results of the analysis.

The aggregated volume for pistons over the next several years is critical to this analysis. Exhibit 2 provides a monthly forecast of expected piston volumes over the next two years. Total forecasted volume is 300,000 units in Year 1 and 345,000 units in Year 2. The team arrived at the forecast by determining the forecast for FlexCon "R" series engines, which is an independent demand item. Pistons are a dependent demand item (i.e., dependent on the demand for the final product).

Although this is a long-term decision likely to extend beyond ten years, the team has confidence in its projections (including supplier pricing) only through two years. Although maintaining piston production internally would require some level of process investment in Years 3 through 10, the team believes any projections past Year 2 contain too much uncertainty. (Conducting a net present value for expected savings from out-sourcing, if they exist, is beyond the scope of this assignment.)

Exhibit 2	Aggregated Two-Year Piston Demand	
	YEAR 1 EXPECTED DEMAND	YEAR 2 EXPECTED DEMAND
January	30,000	34,000
February	30,000	34,000
March	30,000	34,000
April	27,000	31,000
May	25,000	28,000
June	25,000	28,000
July	23,000	27,000
August	21,000	25,000
September	22,000	25,000
October	23,000	27,000
November	23,000	27,000
December	21,000	25,000
Total	300,000	345,000

Insourcing Costs

The team has decided that a comprehensive total cost analysis should include all direct and indirect costs incurred to support piston production. FlexCon tracks its materials and labor by completing production worksheets for each job. The team collected data for the previous year, which revealed that the three work cells produced 288,369 pistons.

Direct Materials

FlexCon machines the pistons from a semifinished steel alloy purchased directly from a steel foundry. The foundry ships the alloy to FlexCon in 50 lb. blocks, which cost \$195 per block. Each piston requires, on average, 1.1 lb. of semifinished raw material for each finished piston. This figure includes scrap and waste.

The team expects the semifinished raw material price to remain constant over the next two years. Although FlexCon expects greater piston volumes in Years 1 and 2 compared with current demand, the team does not believe additional material economies are available.

FlexCon spent \$225,000 last year on other miscellaneous direct materials required to produce the pistons. The team expects to use this figure as a basis for calculating expected Year 1 and 2 costs for miscellaneous direct material requirements.

Direct Work Cell Labor

The direct labor in the three work cells worked a total of 27,000 hours last year. Total payroll for direct labor was \$472,500, which includes overtime pay. The average direct labor rate is \$17.50 per hour ($\$472,500 / 27,000$ total hours = \$17.50 per hour). As a rule of thumb, the team expects to add 40% to direct labor costs to account for benefits (health, dental, pension, etc.).

The team also expects direct labor rates to increase 3% a year for the next two years. The team does not expect per-hour production rates to change significantly. The process is well established, and FlexCon has already captured any learning curve benefits.

Work cell employees are responsible for machine setup, so the team decided not to include machine setup as a separate cost category.

Indirect Work Cell Labor

FlexCon assigns a supervisor, material handler, and engineer full-time to the three work cells. Last year, the supervisor earned \$52,000, the material handler earned \$37,000, and the engineer earned \$63,000 in salary. Again, the team expects to apply an additional 40% to these figures to reflect fringe benefits. The team expects these salaries to increase 3% each year.

Factory Overhead and Administrative Costs

This category of costs is, without doubt, the most difficult category of cost to allocate. For example, should the team prorate part of the plant manager's salary to the piston work cells? One team member argued that these costs are present with or without piston production and, therefore, should not be part of the insourcing calculation. Another member maintained that factory overhead supports the factory, and the three work cells are a major part of the factory. Not including these costs would distort the insourcing calculation. She noted that the supplier is most assuredly considering these costs when quoting the piston contract. Another member suggested performing two analyses of insourcing costs. One would include factory overhead and administrative costs, and the other would exclude these costs.

The team divided the factory into six "zones" based on the functions performed throughout the plant. The piston work cells account for 25% of the factory's floor space, 28% of total direct labor hours, and 23% of plant volume. From this analysis, the team has decided to allocate 25% of the factory's overhead and administrative costs to the piston work cells for the analysis that includes these costs. Exhibit 3 presents relevant cost data for the previous year. The team expects these costs to increase 3% each year.

Preventive Maintenance Costs

FlexCon spent \$40,250 on preventive maintenance activities on the 18 machines in the three cells last year and expects this to increase by 10% in each of the next two years (due to the increasing age of the equipment).

Machine Repair Costs

An examination of maintenance work orders reveals that the 18 work cell machines, which are each five to seven years old, required total unplanned repair expenses of \$37,000 last year. The maintenance supervisor expects this figure to increase by 8% in Year 1 and 12% in Year 2 of the analysis due to increasing age and volumes.

Ordering Costs

Although FlexCon produces pistons in-house, the company still incurs ordering costs for direct materials. The team estimates that each monthly order to the foundry and other suppliers costs FlexCon \$1,500 in direct and transaction-related costs.

Semifinished Raw Material Inventory Carrying Costs

FlexCon typically maintains one month of semifinished raw material inventory as safety and buffer stock. The carrying charge assigned to this inventory is 18% annually.

Exhibit 3	Total Factory Overhead and Administrative Costs	
COST CATEGORY	PREVIOUS YEAR EXPENSE/COST	
Administrative staff	\$1,200,000	
Staff engineering	\$ 900,000	
Taxes	\$ 120,000	
Utilities	\$1,500,000	
Insurance	\$ 500,000	
Plant Maintenance	\$ 800,000	
Total	\$5,020,000	

Inbound Transportation

FlexCon receives a monthly shipment of semifinished alloy that the work cells use to machine the pistons. Total transportation costs for the previous year amounted to \$31,500 (which resulted in 288,369 pistons produced).

The team expects transportation charges for other direct materials used in production to be \$0.01 per unit in Years 1 and 2 of the analysis.

Consumable Tooling Costs

The machines in the work cell are notorious for “going through tooling.” Given the consumable tooling costs realized during the previous year, the team estimates additional tooling expenses of \$56,000 in Year 1, and \$65,000 in Year 2.

Depreciation

The team has decided to include in its cost calculation normal depreciation expenses for the 18 work cell machines. The depreciation expense for the equipment is \$150,000 per year.

Finished Piston Carrying Costs

Because FlexCon coordinates the production of pistons with the production of “R” series engines, any inventory carrying charges for finished pistons are part of the cost of the finished engine and are not considered relevant to this calculation.

Opportunity Costs

The team recognizes that opportunities may exist for achieving a better return on the space and equipment committed to piston production. Unfortunately, the team does not know with any certainty what management’s plans may be for the floor space or equipment if FlexCon outsources piston production. The team is confident, however, that management will find a use

for the space. If the facility no longer engages in piston production, then FlexCon must allocate fixed factory and overhead costs across a lower base of production. This will increase the average costs of the remaining items produced in the plant, possibly making them uncompetitive compared with external suppliers.

Outsourcing Costs

The following provides relevant information collected by the team as it relates to outsourcing the family of pistons to an external supplier. Although it is beyond the scope of this case, the team has already performed a rigorous assessment of the supply market and has reached consensus on the external supplier in the event the team recommends outsourcing. This was necessary to obtain reliable outsourcing cost data.

Unit Price

The most obvious cost in an outsourcing analysis is the unit price quoted by the supplier. In many respects, outsourcing is an exercise in supplier evaluation and selection. Insourcing/outsourcing requires the evaluation of several suppliers in depth—the internal supplier (FlexCon) and external suppliers (in the marketplace). The supplier that the team favors if FlexCon outsources the pistons quoted an average unit price of \$12.20 per piston (recall that this outsourcing decision involves different piston part numbers). The team believes that negotiation will occur if FlexCon elects to outsource, perhaps resulting in a lower quoted price. Because the team does not yet know the final negotiated price, some members argued that several outsourcing analyses are required to reflect different possible unit prices. Quoted terms are 2/10, net 30. The supplier says it will maintain the negotiated price over the next two years.

Safety Stock Requirements

If the team decides to outsource, FlexCon will hold physical stock from the supplier equivalent to one month's average demand. This results in an inventory carrying charge, which the team must calculate and include in the total cost analysis. Although FlexCon likely will rely on or draw down safety stock levels during the next two years, for purposes of costing the inventory the team has decided not to estimate when this might occur. Inventory carrying charges include working capital committed to financing the inventory, plus charges for material handling, warehousing, insurance and taxes, and risk of obsolescence and damage. FlexCon's inventory carrying charge is 18% annually.

Administrative Support Costs

FlexCon expects to commit the equivalent of one third of a buyer's total time to supporting the commercial issues related to the outsourced family of pistons. The team estimates the buyer's salary at \$54,000, with 40% for fringe benefits. The team expects the buyer's compensation to increase by 3% each year.

Ordering Costs

The team expects that FlexCon will order monthly, or twelve material releases a year. Unfortunately, suppliers in this industry have not been responsive to shipping on a just-in-time basis or using electronic data interchange. Although FlexCon would like to pursue a JIT purchasing model, the team feels that assuming lower volume shipments on a frequently

scheduled basis is not appropriate. The company expects the supplier to deliver one month of inventory at the beginning of each month. The team estimates the cost to release and receive an order to be \$1,500 per order.

Quality-Related Costs

The team has decided to include quality-related costs in its outsourcing calculations. During the investigation of the supplier, a team member collected data on the process that would likely produce FlexCon's pistons. The team estimates that the supplier's defect level, based on process measurement data, will be 1,500 ppm. FlexCon's quality assurance department estimates that each supplier defect will cost the company an average of \$250 in nonconformance costs.

Inventory Carrying Charges

FlexCon must assume inventory carrying charges for pistons received at the start of each month and then consumed at a steady rate during the month. For purposes of calculating inventory-carrying costs for finished pistons provided by the supplier, the team expects to use the average inventory method. The formula for determining the average number of units in inventory each month is the following:

$$\left(\frac{\text{Beginning Inventory at the Start of Each Month} + \text{Ending Inventory at the End of Each Month}}{2} \right) \times \text{Carrying Cost per Month}$$

For calculation purposes, the team assumes that ending inventory each month is zero units (excluding safety stock, which requires a separate calculation). The team expects production to use all the pistons received at the beginning of each month. The carrying charge applied to inventory on an annual basis is 14% of the unit value of the inventory.¹ Appendices 1 and 2 on pp. 823 and 824 will help in the calculation of monthly carrying charges associated with holding supplier-provided piston inventory.

Transportation Charges

Although it is FlexCon's policy to have suppliers ship goods F.O.B. shipping point, the company does not accept title or ownership of goods until receipt at the buyer's dock. However, the company assumes all transportation-related charges. The team estimates that transportation charges for pistons will average \$2,100 per truckload, with fourteen truckloads expected in Year 1 and sixteen truckloads expected in Year 2. The outsourcing supplier is in the United States, which means the team does not have to consider additional costs related to international purchasing.

Tooling Charges

The supplier said that new tooling charges to satisfy FlexCon's production requirements would be \$300,000. The team has decided to depreciate tooling charges over two years, or \$150,000 per year.

Appendix 1**Year1 Inventory Carrying Charges Outsourcing Option**

	BEGINNING INVENTORY	ENDING INVENTORY	AVERAGE INVENTORY	INVENTORY CARRYING COSTS
January	30,000	0		\$
February	30,000	0		\$
March	30,000	0		\$
April	27,000	0		\$
May	25,000	0		\$
June	25,000	0		\$
July	23,000	0		\$
August	21,000	0		\$
September	22,000	0		\$
October	23,000	0		\$
November	23,000	0		\$
December	21,000	0		\$
			Total Inventory Carrying Costs	

Appendix 2**Year 2 Inventory Carrying Charges Outsourcing Option**

	BEGINNING INVENTORY	ENDING INVENTORY	AVERAGE INVENTORY	INVENTORY CARRYING COSTS
January	34,000	0		\$
February	34,000	0		\$
March	34,000	0		\$
April	31,000	0		\$
May	28,000	0		\$
June	28,000	0		\$
July	27,000	0		\$
August	25,000	0		\$
September	25,000	0		\$
October	27,000	0		\$
November	27,000	0		\$
December	25,000	0		\$
			Total Inventory Carrying Costs	

Appendix 3**Insourcing/Outsourcing Cost Factors Worksheet****INSOURCING COSTS
PER UNIT****YEAR 1 YEAR 2****OUTSOURCING COSTS
PER UNIT****YEAR 1 YEAR 2**

Direct materials

Semifinished

Other

Direct labor

Indirect labor

Factory overhead and
administrative

Preventive maintenance

Machine repair

Ordering

Depreciation

Inventory carrying

Inbound transportation

Consumable tooling

Other costs

**Total Insourcing Cost
per Unit**

Purchase cost

Transportation

New tooling

Administrative support

Inventory carrying

Safety stock

Quality-related costs

Ordering

Other costs

Total Outsourcing Costs per Unit

Total savings (1)

Less: Taxes on savings (40%)

Net Outsourcing Savings

Total Savings = (Total Insourcing Costs – Total Outsourcing Costs) × (Total Volume).

Note that the total savings could be negative if the analysis shows that outsourcing costs are greater than insourcing costs.

Supplier Capacity

The team has concluded that the supplier has available capacity to satisfy FlexCon's total piston requirements.

Appendix 3 provides a worksheet to help in the insourcing/outsourcing cost analysis.

ASSIGNMENT

1. Perform a quantitative insourcing/outsourcing analysis using the data provided. What qualitative issues might affect your final decision? Identify any costs or issues that are not part of your analysis that might affect your decision. What is your recommendation regarding what FlexCon should do with its family of pistons? Support your arguments with evidence gathered during your analysis.
2. Assume your group decided to outsource the pistons to the external supplier. Identify a plan that would enable FlexCon to carry out this recommendation. Be as thorough as possible.
3. Discuss the primary reasons when and why insourcing/outsourcing decisions occur.
4. A major challenge with an insourcing/outsourcing analysis involves gathering reliable data. Discuss the various groups that should be involved when conducting an insourcing/outsourcing analysis such as the one presented in this case. What information can each of these groups provide?
5. Discuss the major issues associated with an insourcing/outsourcing analysis and decision.