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Economic Analysis of a New Business—Doing it Right

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Starting a new business involves many steps. The first is to develop an economic analysis to determine whether there will be a profit or loss before starting production. If there is a projected profit based on the best available information, then a business plan should be developed. There are many plans available that can be used as guides. A good place to obtain assistance is one of the Small Business Development Centers located throughout the state. *Starting a Home-Based Business* is a very useful guide.[1] It discusses ways for the business person to determine where the company is, where it wants to be, and how it plans to get there. A person can also register the business at the "First Stop Clearinghouse" within the Department of Commerce,[2] which can provide answers concerning legal structure, employment, taxes, licensing, and some federal requirements.

Consumption is the only reason for developing any new product. It is important to know if there is a need or desire for the new product. It also is a good idea to determine the price range consumers will pay for the product and how this compares to the average cost to produce the product. The whole production-marketing process should be completely paid for when consumers buy the products. Consumers choose which products they buy based on their needs, customs, income, and knowledge of alternative products and prices of each. Prices for the products, as well as quality, comprise a major part of the consumer's decision to buy any product.

Two major questions have to be asked before starting any project or enterprise: (1). What will it cost to produce a new product, and (2) what will consumers pay for that product?"

First, a cost analysis needs to be developed. The information needed to determine whether or not the product will make a profit over several years is based on average annual production costs and returns. This average cost analysis is referred to as an economic feasibility study. To estimate income potential, each new product should have a technical feasibility examination completed to ensure it can be produced in a form and at a cost acceptable to the consumer. Actual costs or the best available estimates should be used for this estimation. Any cost analysis will be only as good as the information used to estimate average costs per unit.

Break-even cost is the point where cost and revenue per unit are the same, which means there is neither a profit nor a loss. Break-even cost of production is the lowest price that can be charged for a product and still cover all costs of production. Once the market price for the product and average cost per unit is calculated, these data can be used to estimate a cash flow analysis. This information on start-up costs can be used to determine the amount of money needed for each year the business continues to operate. This should be done before talking with financial lending sources.

People invest in a new business or product with the idea of making a profit. It is important to know how much profit will be earned for each product or enterprise over several years. Gross income from sales is the amount of money resulting from the sale of the product or products. Net profit is the money left after all costs are deducted from gross sales and all taxes are paid.

Profits are not estimated from the sale of one unit but are estimated over a given time period, usually one year. The sale of a few units, when the average price per unit is below average cost of production, is not profitable. The level of production should be estimated where the volume generates sufficient gross income to cover fixed costs plus variable costs.

Cash flow and average-costs analysis are two different types of analyses that provide different kinds of management information. Cash flow analysis for a new business includes calculating the money needed for a

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long-term loan to buy equipment and buildings. Initial investment capital can be obtained from several sources with the interest rate as a factor for accepting the loan. Short-term operating loans are used to buy ingredients (inputs), hire workers, and establish a market strategy. The need for operating capital to start production and pay bills before any products are sold is part of a cash flow analysis and will depend on the amount of cash available. These funds are used for the purchase of inputs, labor, etc.

New Business Analysis

Starting a new business or producing a new product will require an estimate of total production costs and total returns received for the product. Without this information, entrepreneurs do not know if there is a profit for each item. Once it is known the product will be profitable, deciding how much to produce is the next major concern.

Greater production levels can lower average fixed costs and sometimes average variable costs if, for example, inputs can be purchased in greater volume at lower costs. The response time to change production will depend on factors such as equipment capacity, availability of raw materials, labor, number of shifts, and management ability.

The uncertainties of future prices cause managers to make "best-price estimates" based on their knowledge of consumer demand for their product or similar products. To remove price uncertainty, different types of forward contracts can be developed that set price or production levels or both. Many products do not have an organized futures market. Forward contracts can be developed for both inputs and products. It is crucial that legal assistance be used for different types of price and delivery contracts.

Understanding Cost Analysis

Managers should know and understand the process of analyzing total costs, which includes all factors of input for any product sold. Total costs are made up of two basic types of costs, fixed and variable. Costs are variable when they can be changed by managers during any production period, usually because of fluctuations in quantities bought or produced. Conversely, costs are fixed when they cannot be changed by managers during any production period. The most common time period used for dividing fixed and variable costs is one year. This also coincides with an accounting year for tax purposes, and some of the same data can be used for both purposes. Some examples are:

FIXED COSTS

Depreciable:

- Equipment — itemized
- Buildings

Nondepreciable:

- Land
- Building Repairs
- Property Taxes
- Insurance
- Manager Wages
- Storage Costs

VARIABLE COSTS

Labor Wages:

- List per worker

Labor Non-wages:

- Social Security
- Workers' Compensation
- Ingredients
- Packing Materials
- Equipment Repairs
- Utilities
- Interest on Loans

PRODUCTION

- Units per day
- Units per year
- Inventory
  - Units stored

REVENUE

- Price per unit
- Units sold per year
- Shipping Costs

Fundamental formulas for a specific time period, usually one year, are listed here.

NP = TR - TC

Net Profit (NP) = Total Revenues (TR) minus Total Costs (TC) for one year.

TR = Q x P

Total Revenues (TR) = Total number (quantity) of items sold times the price (P) of each item sold throughout the year.

TC = TFC + TVC

TC = Total Fixed Costs (TFC) + Total Variable Costs (TVC).
TFC = Annual costs that do not vary during the year.
TVC = Costs that will vary with production levels.

AVC = TVC/Q

Average Variable Costs (AVC) = Total Variable Costs (TVC) divided by number of items sold (Q).

AFC = TFC/Q

Average Fixed Costs (AFC) = Total Fixed Costs (TFC) divided by number of items sold (Q).

ATC = TC/Q

Average Total Cost (ATC) = Total Cost (TC) divided by number of units sold (Q). Also called average break-even price or average per unit cost of production.

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Before production is started, a cost analysis should be made depending on the type of management decisions needed for control. Consistent, accurate cost information will provide accurate analysis for decisions that need to be made to price products and manage costs to maximize profits. Using the formulas listed below, an estimate can be calculated for an average annual cost that can be compared to the average annual price received for the product. These costs are based on the actual or estimated volume or capacity of production.

A spreadsheet type of analysis can be set up for any type of cost analysis. This can be done using a calculator, with a little organization for each section. Computer spreadsheets simplify the process but are not required. This spreadsheet will help analyze investment costs before actually making the commitment. To estimate profit potential, the manager should complete a cost analysis for each new product before production is started and makes changes continuously after production has started. All analyses should use the latest and best information available at the time. This could be done daily, weekly, monthly or annually, depending on the type of management decisions needed for control. Consistent, accurate cost information will provide reliable analysis for decisions that need to be made to price products and manage costs to maximize profits.

For illustrative purposes here, a sauce manufacturer will be used for estimating costs of production, returns, and profit. This is done for three sizes of containers: pint, quart, and gallon, and with three comparisons: per container, per case, and total net income for the year. Each part of the cost analysis is presented as a guide for individual operators and does not depict a real firm.

Table 1. Total investment, depreciation and annual estimated cost for a sauce processing plant.

Asset and Date	Investment	Years	Total
Refrigerator — 01 — 1996	$158.00	10	$ 15.80
Commercial oven — 01—1996	200.00	10	20.00
Small scales “	406.00	10	40.60
Thermometer “	70.00	10	7.00
Dishwasher	106.00	10	10.60
Kettle 30 gallon	300.00	10	30.00
Kettle	200.00	10	20.00
Can opener	63.00	5	12.60
Smoker	850.00	5	170.00
Shop vacuum	153.00	10	15.30
Computer	2,395.00	3	798.33
Building	20,000.00	20	1,000.00
Pickup (1/2 time)	11,500.00	10	575.00
Van (1/2 time)	8,500.00	10	425.00
Total investment	**$44,901.00**		
Annual depreciation			$3,140.23
Manager salary			20,000.00
Interest -- opportunity costs**		6.00%	2,694.06
Total Annual Fixed			$25,834.29

***Opportunity cost is the income the investor could receive by having the investment in some other security or bank.*

Total Annual Fixed Costs (TFC)

To calculate total fixed costs, a complete list of all equipment and buildings has to be developed. This will include every item that will be used more than one year. The date of purchase and total price paid for each item installed and ready to use should be listed to ensure accurate depreciation schedules. These data are also necessary for tax purposes.

To start the process of estimating total fixed costs, set up a table with at least four columns (Table 1). In the first column, list the building and each piece of equipment that will be used longer than one year, regardless of the size and number needed, and the date purchased. In a second column, list the price paid for each item, including shipping and installation. The third column contains the number of years each item will be used until replaced or discarded. In the fourth column, an annual cost of using each piece of equipment (depreciation) is calculated by dividing the total purchase price, which includes shipping and installation, by the expected number of years of use. This is the most common depreciation schedule for this type of analysis. There are many different ways to estimate depreciation primarily for tax purposes. Use the one that makes the most sense for each situation.

These estimated depreciation figures are annual costs of machinery, equipment, and buildings. Machines will be used for different time periods based on their function and durability. Buildings are often depreciated over a 20- to 30-year period. This allocates the cost of each piece of equipment or building to a one-year period. The salvage value can be subtracted from the purchase price. However, this is not used because old or discarded equipment is often not worth much when it is to be replaced by a new piece of equipment.

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Table 2. Example of annual variable costs for a sauce manufacturer.

Expense	Number	No. Hrs./batch	Rate per hour	Total annual
Hired labor**	3	5.5	$5.00	$33,000.00
Accountant				540.00
Advertisement				1,020.00
Bank Charges				90.00
Clothing				180.00
Dues				72.00
Entertainment				300.00
Fees				900.00
Freight				960.00
Insurance				1,380.00
Maintenance				120.00
Miscellaneous				240.00
Office				144.00
Packaging				360.00
Supplies				1,020.00
Taxes				385.00
Trademark				25.00
Travel				360.00
Utilities				600.00
Other expenses				900.00
Total expenses - Variable costs				**$42,596.00**

**Based on two batches per day for 200 days or 400 batches per year.

This is a permanent inventory record that changes only when new items are purchased or old ones discarded or sold. New equipment or buildings should be added to the inventory list. Proposed equipment or expansion ideas can be estimated by temporarily adding them to the base inventory list and calculating increased investment, annual depreciation, and changes in production levels. The results of these estimates will quickly show the effect on the profit figures for the firm if all other costs and returns remain the same.

Fixed costs such as property taxes and insurance on buildings and equipment have to be added when they are known. Once the operation begins, these costs will not fluctuate within a one-year period as a result of changes in production levels.

The total investment in this example is $44,901 while the annual depreciation cost for equipment and buildings is $3,140. Remember, the annual costs for equipment and buildings are the same amount as the annual depreciation costs. Annual depreciation costs plus other annual fixed costs for this firm (manager's salary of $20,000 and opportunity costs of $2,694) total $25,834.

Total Variable Costs (TVC)

Total variable costs will vary with the volume of production within one year. This includes such costs as hired labor, raw product inputs, containers, labels, fuel, electricity, utilities, cleaning costs, and shipping. All variable costs should be listed as separate items with the best estimate for the initial analysis (Table 2). A general list of charges should be consistent with each specific operation. Once production starts, actual expenditures for every item should be recorded to ensure accurate costs.

Create a table that will list the basic ingredients in each recipe or parts for a product with the cost and amount of each. Each product could require a number of different ingredients with different prices. A table should be created for each product. Determine the production capacity you anticipate for each product and analyze the cost. In this example, the capacity is two batches of sauce per day for 200 days, or 400 batches. Each batch is 30 gallons (3,840 ounces) or a total of. 1,536,000 ounces per year. This results in an annual production of 96,000 pints, 48,000 quarts, or 12,000 gallons per year. Only one estimate for one year's production for each size container will be done for purposes of this analysis. Various sized containers are used in other estimates to determine the cost of each size of container.

Table 3. Cost of all purchased ingredients converted to price per ounce and 30 gallon batch for sauce.

Ingredients	Price/ case	Price/ ounce	Ounces/ batch	Cost/ 30 gal. batch
Tomato Sauce	$21.00	$0.0228	920.00	$20.98
Paste	31.40	0.2617	120.00	31.40
White sugar	24.00	0.0300	768.00	23.04
Salt	7.80	0.0195	69.60	1.36
Black pepper	5.24	0.3275	2.88	0.94
Orange juice	10.60	0.0589	15.00	0.88
Vinegar	15.99	0.0208	160.00	3.33
A-1 sauce	14.00	0.0273	160.00	4.37
Liquid smoke	18.00	0.0352	96.00	3.38
Dehydrated bacon bits	30.40	0.1267	96.00	12.16
Molasses	9.69	0.0757	32.00	2.42
Paprika	4.39	0.2744	1.92	0.53
Water			1,398.60	0.00
Total 30 gal. batch			3,840.00	$104.81
400 batches - Variable costs				$41,924.00

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Table 4. Cost of various sized jars, lids and cases.

Jar size	16 oz	32 oz	128 oz
Ounces per year	1,536,000	1,536,000	1,536,000
Jars per case	12	12	4
Number of jars & lids	96,000	48,000	12,000
Cost of jar	$0.155	$0.245	$0.375
Cost of lid	$0.075	$0.062	$0.049
Costs for jars/lids	$22,080.00	$14,736.00	$5,088.00
Cases–number produced	8,000	4,000	3,000
Cost per box	$1.00	$1.25	$1.50
Total cost jars, lids, boxes - Variable costs	$30,080.00	$19,736.00	$9,588.00

Table 5. Fixed costs plus variable costs equal total costs based on size of jars.

Size of jars	16 ounces	32 ounces	128 ounces
Total fixed costs	$25,834.29	$25,834.29	$25,834.29
+ Total variable costs	$114,601.71	$104,257.71	$94,108.00
= Total costs (TC)	$140,436.01	$130,092.01	$119,942.29
Revenue per case	$21.00	$39.00	$48.00
x Number of cases	8,000	4,000	3,000
Total returns (TR)	$168,000.00	$156,000.00	$144,000.00
Profit	**$27,563.99**	**$25,907.99**	**$24,057.71**

*Note figures are rounded and may not calculate as shown.

For this example, a list of all ingredients for one 30-gallon batch is converted to the amount and cost of each ingredient. Using the recipe, determine the number of ounces of each item needed per batch and multiply that number by the price per ounce to get the cost per batch. The total weight of all ingredients per batch is 3,840 ounces, which equals 30 gallons. Each product will be unique in this aspect of estimating costs. Use figures that are easy to work with and are meaningful for management purposes. In a spreadsheet analysis, any change in the cost of an ingredient will affect the overall cost of the final product (Table 3). Ingredient prices can be purchased with forward contracts, which will reduce the price variation and will make this part of the analysis easier during the year.

For some products, the containers, jars, or wrapping are major input expenses. A separate table can be set up to consider different prices for different containers (Table 4). In this example, there are three different jar sizes used: a 16-ounce or pint jar, 32-ounce or quart jar, and a 128-ounce or gallon jar. The product unit chosen for analysis should provide the most information for management decisions. If the product is sold by the pound, then everything is converted to a pound unit of product. In this example, it is based on ingredient units, and the final price analysis is in cases because that is the way the product is sold. If there are some sales by the jar, the costs per jar size can be estimated.

Table 6. Cost comparison by different sized jars by case and profit per case and jar.

Size of jars	16 ounces	32 ounces	128 ounces
Average Fixed Cost/case	$3.23	$6.46	$8.61
+ Average Variable Cost/case	$14.32	$26.06	$31.37
= Total Costs/case	$17.55	$32.52	$39.98
Selling Price/case	$21.00	$39.00	$48.00
- Total Costs/case	$17.55	$32.52	$39.98
= Profit/case (P = TR - TC)	$3.45	$6.48	$8.02
Average Fixed Cost/jar (AFC = FC/No. jars)	$.0269	$0.5383	$2.1525
Average Variable Cost/jar (AVC = VC/No. Jars)	1.1933	2.1717	7.8425
Average Total Cost/jar (ATC = TC/No. Jars)	1.4625	2.7100	9.9950
Selling Price/jar	$1.75	$3.25	$12.00
Profit per jar (P = TR - TC)	$0.2875	$0.5400	$2.0050
x Number of jars	96,000	48,000	12,000
Total profit	**$27,564**	**$25,908**	**$24,060**

*Note figures are rounded and may not calculate exactly as shown.

Total Annual Costs (TC)

Total costs of production are estimated by adding the total annual fixed costs to the total annual variable costs. Variable costs include labor, utilities, dues, accountant fees, advertising, freight, insurance, etc. (Table 2), all costs of ingredients (Table 3), and containers (Table 4). Average break-even costs can be estimated by dividing total costs by number of items sold for the year. This average break-even cost can be compared to the average price received for the product. This average break-even cost must be less or at least equaled by the income produced by selling the product(s) in order to continue production. If income is higher, a profit will be realized. If income is lower, there will be a loss on the product.

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Fixed costs will not change unless new equipment is needed for a different production level. Variable costs will change directly with the different production levels. A general summary for this product in three sizes of containers indicates the pint size is the most profitable with the largest total costs (Table 5).

Fixed costs will not change for each size of jar. Variable costs are the sum of operating costs from Table 2 plus ingredient costs from Table 3 plus the total cost of jars, lids, and cases for each size of jar from Table 4. The 16-ounce jar costs total $140,436 compared to the 128-ounce jar of $119,942. Total returns are obtained by multiplying the price received for each size by assuming only one size is produced in one time period. Total returns are obtained by multiplying the selling price by the quantity sold for each shipment when the price varies throughout the year. Net returns are estimated by subtracting the total costs from total returns.

Looking at only the total costs for this product would not provide enough information to maximize net returns. Total returns for pint jars at $21 per case will provide more dollar income ($27,564) but has the highest total costs. Gallon cases had a total cost of $119,942, which was the lowest, but the net return was $24,058 at $48 per case. The 32-ounce jars at $39 per case had a total cost of $130,092, and a $156,000 total return yielding a net return of $25,908. These analyses are based on 400 30-gallon batches of production capacity per year. Any changes from this assumption will provide different results. Different receipts or equipment can be analyzed for any type of change.

Total Quantity Sold

Considering these estimates from Table 6, the average cost for each size is $17.55 per case of 16-ounce jars compared to the selling price of $21. Costs for a case of 32-ounce jars average $32.52 compared to $39 per case received on average. For the gallon jars, 128 ounces, the average annual cost was $39.98 per case compared to the average price received of $48 per case. These figures are averaged as if all the production is used to produce one size of jar for one year. Any combination of jar sizes can be estimated by accounting for the volume with each size and the returns for each size.

If more than one product is being produced, different costs will have to be divided between the different products. The more accurately the division of various costs, the more accurate will be the average cost of production for each product. There may be some machines used only for one product that should be allocated only to that product. Management and other costs have to be divided between products based on quantity produced, value produced, or other methods that make the most sense for management decisions.

Summary

Daily management, based on accurate cost and price information, is a key to any operation and provides day-by-day and long-term decisions that guide the whole economic process. Management decisions should be based on the most complete and accurate costs and marketing price information available. The best management tool is a set of accurate records. Launching a new product requires a detailed cost analysis and an understanding of consumer acceptance of the product and prices charged for the product.

The 16-ounce jar produces the most net returns even though the total costs are the greatest. The price received per ounce is greater than the other two sizes. Looking at just total costs as an indication of the size of jars to produce will not reveal the different net returns, given these prices. Considering these prices and costs, this is a profitable operation. If any of the input prices change, the same analysis can be done with no changes in the other inputs to see what effect they would have.

The basic profit formula for managers to use is. NP = TR - TC. Total returns are estimated by using the total number of items sold times the price received for each item and summed for the year. Total costs are estimated by adding all the variable costs throughout the year to fixed costs, which do not change with levels of production. Any of the figures can be changed for projecting alternative investment strategies. Estimating, costs per case or per jar can be done with the information available. The average cost per case for each size of jar can be estimated and compared to the price received per case. If individual jars are sold, the average break-even cost and price per jar can be compared.

In order to produce a product, entrepreneurs must have sufficient knowledge of costs so comparisons can be made with the selling price of the final product. The decision to continue will have to be reexamined when the average total cost per unit is greater than the selling price per unit. If the retail price per unit is greater than average cost of production and marketing, there will be a return on investment, and a decision can be made to continue with the project. Consumers make the final decision to buy any product produced regardless of the costs. Their decisions are based on wanting the product and what they are willing to pay for it. Accurate record keeping and continuous analysis of consumer data will ensure timely management decisions.

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[1]Frederick H. Rice, S*tarting a Home-Based Business*, Kansas Rural Enterprise Institute, Kansas State University, 204 Calvin Hall, Manhattan, KS 66506.

[2] *Steps to Success: A Guide to Starting a Business in Kansas*, The Department of Commerce, Division of Existing Industry Development, First Stop Clearinghouse, 400 SW 8th Street, 5th Floor, Topeka, KS 66603-3957. Phone 913-296-5298.

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