Contabilidade de Gestão Avançada

Mestrado CFFE

Aula 4

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Cost Planning for the Product Life Cycle: Target Costing, Theory of Constraints, and Strategic Pricing

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The Product Life Cycle

Four management methods discussed in this chapter:

- Target costing
- Theory of constraints (TOC)
- Life-cycle costing
- Strategic pricing

All involve the entire product life cycle:

- Managers now need to look at costs upstream (before manufacturing) and downstream (after manufacturing)

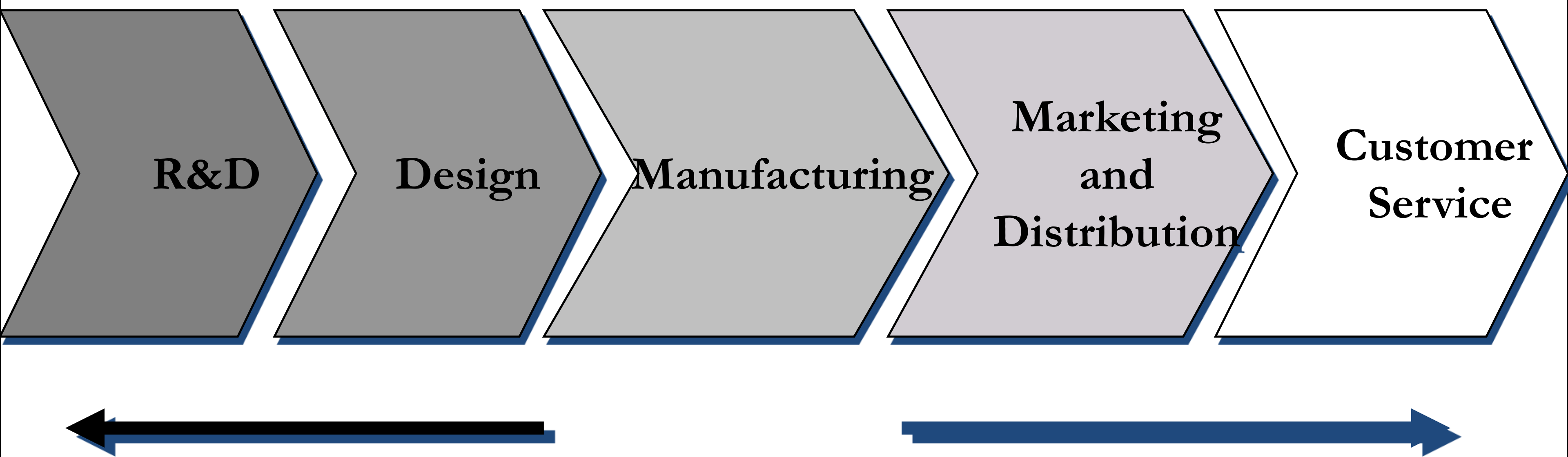
The Cost Life Cycle

"Cost life cycle" refers to the following sequence of activities:

- Research and Development (R&D)
- Design
- Manufacturing (or providing the service)
- Marketing/distribution
- Customer service

It is the life cycle of a product or service from the viewpoint of costs incurred

The Cost Life Cycle (continued)



Upstream Activities **Downstream Activities**

Design decisions account for much of total life-cycle costs

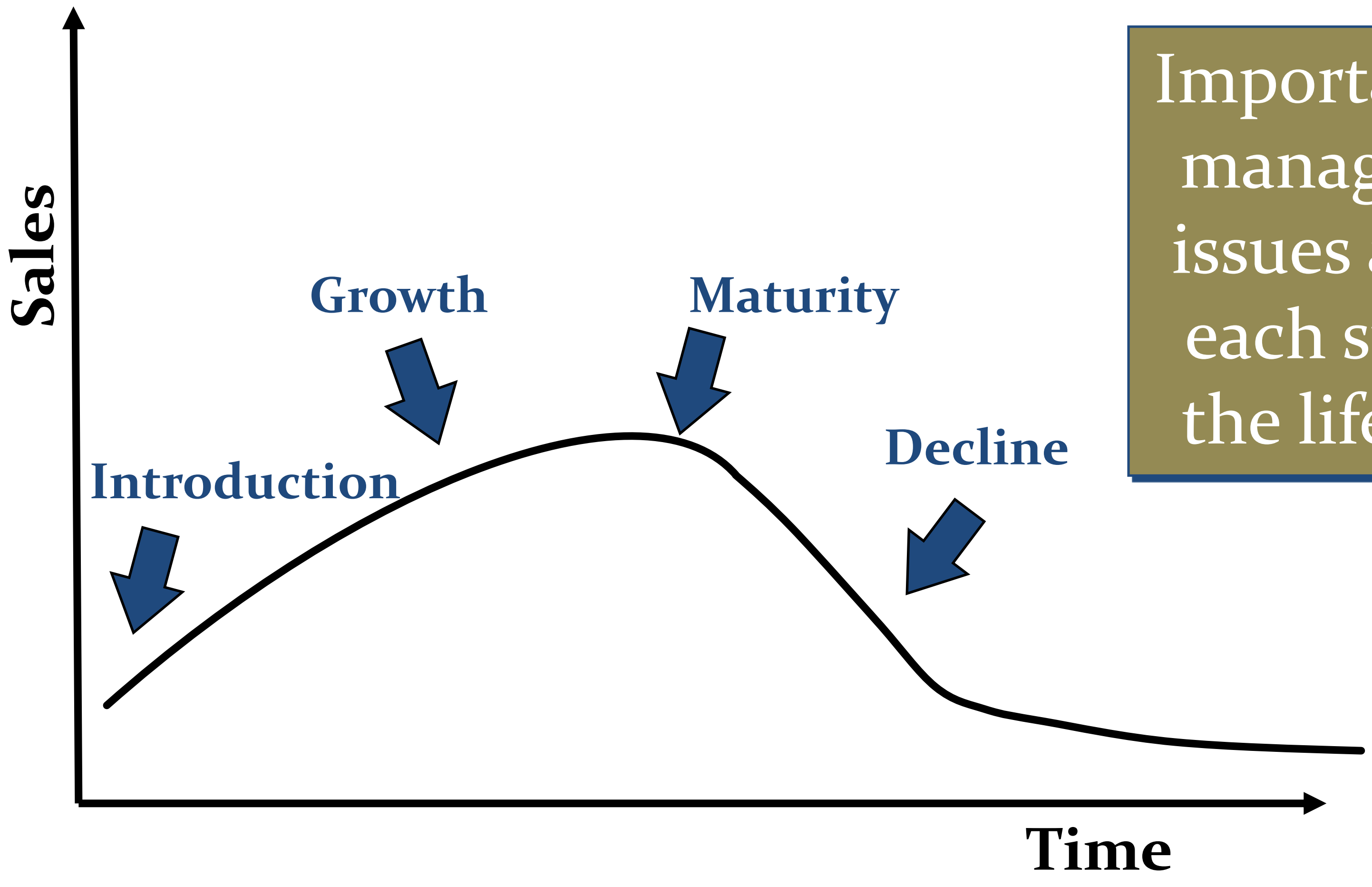
The Sales Life Cycle

The Sales life cycle is the sequence of phases in the product's or service's life:

- Introduction of the product or service to the market
- Growth in sales
- Maturity
- Decline
- Withdrawal from the market

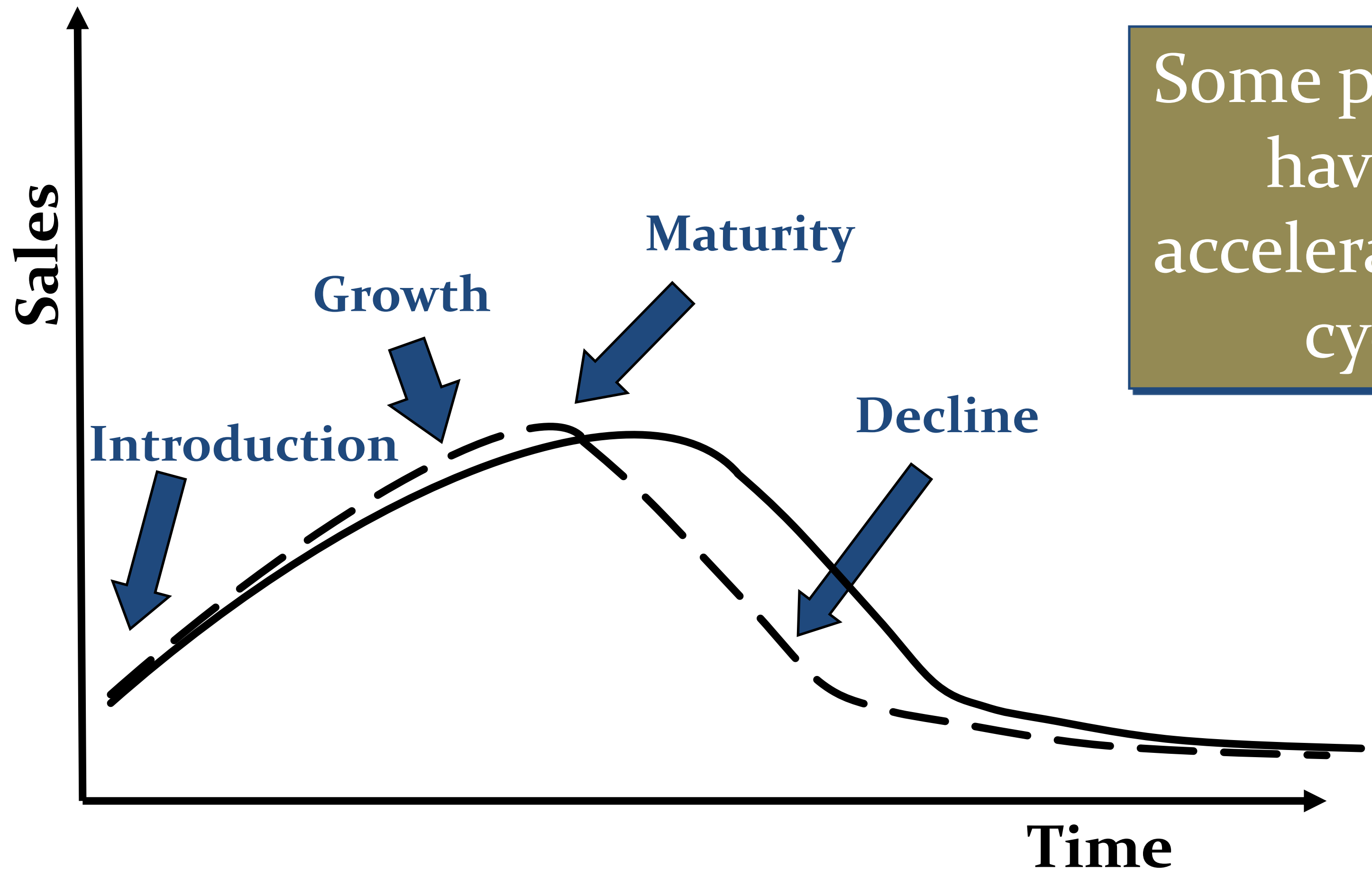
The sales life cycle is the life cycle of a product or service from the viewpoint of sales volume achieved

The Sales Life Cycle



Important cost management issues arise in each stage of the life cycle.

The Sales Life Cycle



Some products have an accelerated life cycle

Target Costing

- **Target costing: a costing method in which the firm determines the allowable (i.e., “target”) cost for a product or service, given a competitive market price and a targeted profit**

- **Two options for reducing costs to achieve the target-cost level:**
  - By integrating new manufacturing technology using advanced cost management techniques, (such as ABC), and seeking higher productivity
  - By redesigning the product or service

Implementing Target Costing

❶ Determine the market price

❷ Determine the desired profit

- Profit per unit
- Profit as a % of revenue or cost

❸ Calculate the target cost as market price less desired profit

❹ Use "value engineering" to reduce cost

❺ Use kaizen costing and operational control to further reduce costs

Value Engineering

Value engineering (step 4):

- Analyze trade-offs between product functionality (features) and total product cost
- Perform a consumer analysis during the design stage of the new or revised product to identify critical consumer preferences

Value Engineering (continued)

For firm's that can add and delete features easily, *functional analysis* (examining the performance and cost of each major function or feature of the product) can be used

- *Benchmarking* is often used in this step to determine which features give the firm a competitive advantage
- Goal: provide a desired level of performance without exceeding the target cost

Value Engineering (continued)

Design analysis:

- Useful when the **firm cannot add and delete features easily**
- The design team prepares several possible designs of the product, each having similar features with different levels of performance and different costs
- Accountants work with the design team to choose one design that best meets customer preferences while not exceeding the target cost

Kaizen

Kaizen (step five): using continuous improvement & operational control to reduce costs in the *manufacturing stage* of the product life cycle

- Achieved through:
  - Streamlining the supply chain
  - Lean manufacturing
  - Improving manufacturing methods and productivity programs
  - Employing new management techniques
- Used extensively in the time period between product redesigns

Target Costing Example

HPI manufactures a hearing aid, HPI-2, that has 30% of the market. It has a cost of $650 and sells for $750. A competitor has just introduced a new model that incorporates a computer chip that improves quality. Its cost is $1,200. A consumer analysis indicates that cost-conscious consumers will remain loyal to HPI as long as price does not exceed $600. HPI wants to maintain the current rate of profit, $100 per hearing aid.

HPI must therefore reduce its cost to $500 ($600 price - $100 profit) to meet its profit goal

Target Costing Example (continued)

Design analysis options :

- Alternative A: reduce R&D, replace parts, and change inspection procedure – savings = $150
- Alternative B: replace parts and change inspection procedure – savings = $150
- Alternative C: increase R&D to develop a computer chip type hearing aid, replace parts, change inspection procedure, renegotiate new supplier contract – savings = $150

Target Costing Example (continued)

Management chooses alternative C because:

- The increase in R&D will improve the firm's competitive position in the future
- The move is strategically important: the new technology may be dominant in the future

Quality Function Deployment (QFD)

QFD: the integration of value engineering, marketing analysis, and target costing to assist in determining which components of the product should be targeted for redesign or cost reduction

Four steps in QFD:

1. Identify and rank customers' purchasing criteria for the product
2. Identify the components of the product and the cost of each component
3. Determine how the product's components contribute to customer satisfaction
4. Determine the importance index of each component

QFD Example: Step 1

First: Customer Criteria and Ranking

	Importance	Relative Importance	
Safety	95	46.3%	= 95÷205
Performance	60	29.3%	= 60÷205
Economy	50	24.4%	= 50÷205
Total	205	100.0%	

QFD Example: Step 2

Second: Identify Components and Cost of Each

	Cost	Percent of Total	
Motor	$40	53.3%	= 40÷75
Saw	20	26.7%	= 20÷75
Frame	15	20.0%	= 15÷75
Total	$75	100.0%	

QFD Example: Step 3

How Components Contribute to Customer Satisfaction

	Customer Criter:		
	Safety	Performance	Economy
Motor	10%	10%	60%
Saw	30%	50%	10%
Frame	60%	40%	30%
Total	100%	100%	100%

QFD Example: Step 4

Fourth: Determine Importance Index for Each Component

	Safety	Perform.	Economy	Importance Index
Relative importance	46.3%	29.3%	24.4%	
% contribution:				
Motor	10%	10%	60%	22.2%*
Saw	30%	50%	10%	31.0%
Frame	60%	40%	30%	46.8%
Total	100%	100%	100%	100.00%

* (10% × 46.3%) + (10% × 29.3%) + (60% × 24.4%)

QFD Example: Conclusion

	Importance Index	Relative Cost
Motor	22.2%	53.3%
Saw	31.0%	26.7%
Frame	46.8%	20.0%
Total	100.0%	100.0%

The above analysis shows that too much is being spent on the motor component, relative to its value to the customer. In contrast, not enough is being spent on the frame component relative to its value to the customer.

Measuring and Improving Speed

- **Many strategic initiatives undertaken by firms today focus on improving the speed of operations**

- **Manufacturing *cycle time* (*lead time* or *throughput time*) is the amount of time between the receipt of a customer order and the shipment of that order**
  - Note that start and finish time of the cycle can be defined in several ways. Example: the start time could be defined as the time raw materials are ordered, and the finish time as the time production is completed

Measuring and Improving Speed (continued)

- ***Manufacturing cycle efficiency* (MCE) is defined as processing time divided by total cycle time**
  - MCE separates total cycle time into:
    - Processing time
    - Inspection time
    - Materials handling time
    - Waiting time, and so on
  - Most firms would like to see MCE close to one
- ***Constraints* are activities that slow a product's total cycle time**

The Theory of Constraints (TOC)

TOC focuses on improving speed at the constraints, to decrease overall cycle time

Five steps in TOC:

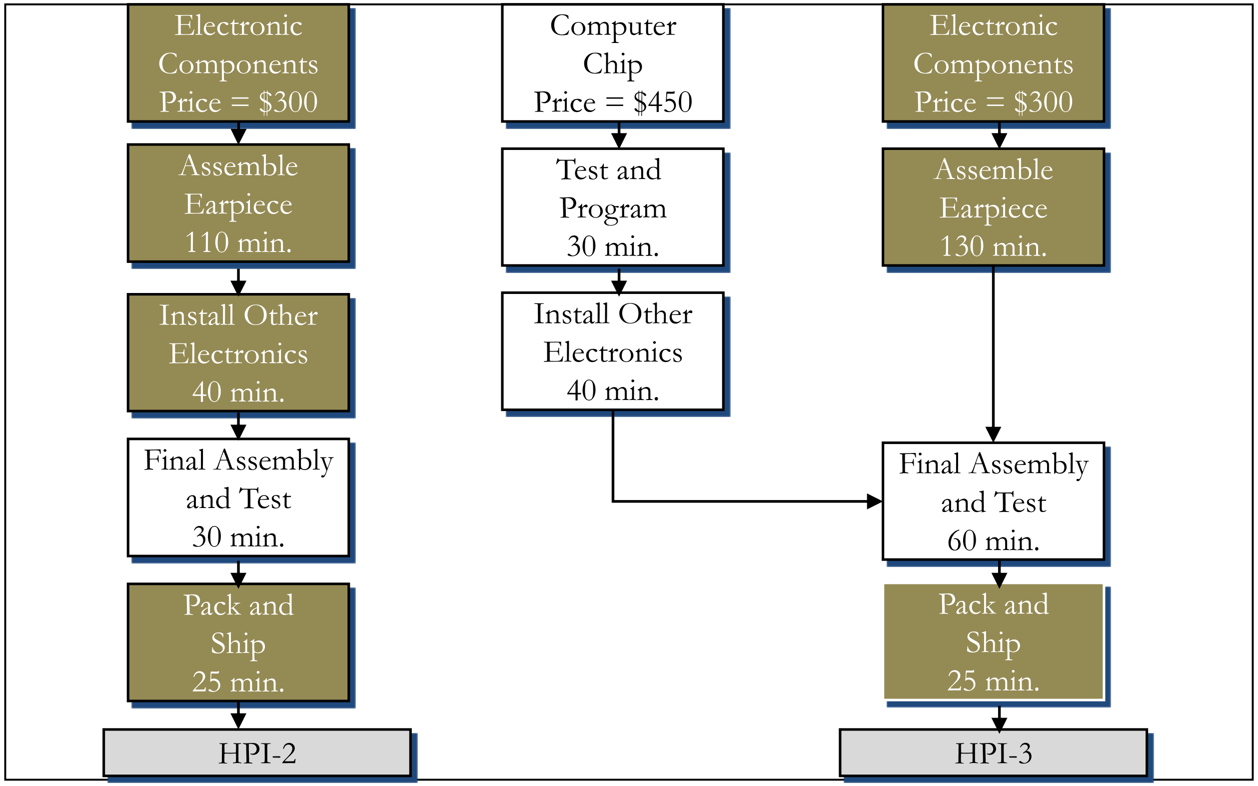
1. Identify the constraint
2. Determine the most profitable product mix given the constraint
3. Maximize the flow through the constraint
4. Add capacity to the constraint
5. Redesign the manufacturing process for flexibility and fast cycle time

TOC Example

HPI manufactures both the second generation (HPI-2) and the third generation (HPI-3) of hearing aids. Prices are competitive at $600 and $1,200, respectively, and are not expected to change. The monthly orders average 3,000 units for HPI-2 and 1,800 units for HPI-3. New customers are told they may have to wait at least three weeks for their orders, and management is concerned about the need to improve speed in the manufacturing process.

TOC Example Step 1: Identify the Constraint

Develop a *flow diagram*, which shows the sequence and time of each process



TOC Example Step 1: Identify the Constraint

Use the flow diagram and additional operational data to identify the constraint for HPI

- There is difficulty maintaining adequate staffing in all process areas except process 5
- Analysis of the process flow, staffing levels, and process time reveals the constraint occurs in process 4, perform final assembly and test; the other four processes have slack time

TOC Example Step 2: Determine the most profitable product mix given the constraint

The most profitable mix provides the maximum total profits for both products

- First, use throughput margin to determine the most profitable product given the constraint
- Throughput margin = selling price less materials cost

In the example, the relevant measure of profitability is *throughput margin per minute in final assembly and testing*

Step 2: (continued)

HPI-3 has a higher throughput margin per unit, but with the time constraint in process 4, HPI-2 is the more profitable product per constraint time minute.

	HPI-2	HPI-3
Price	$600.00	$1,200.00
Materials cost	300.00	750.00
Throughput margin	$300.00	$450.00
Constraint time (for Process 4)	30	60
Throughput per minute	$10.00	$7.50

Step 2: (continued)

HPI will produce all 3,000 units (total demand) for HPI-2 since it is the more profitable, and the remaining capacity will be used to produce HPI-3. HPI-2 will use 1,500 (3,000 units × 0.5 hour per unit) hours of the 2,400-hour capacity. The 900 hours remaining allow for production of 900 units of HPI-3.

	HPI-2	HPI-3
Total demand in units	3,000	1,800
Units of product in optimal mix	3,000	900
Unmet demand	-	900

TOC Example Step 3: Maximize the flow through the constraint

- Look for ways to speed the flow by simplifying the process, improving product design, reducing setup, and reducing other delays

- Objective is to balance the flow of production through the system (processes prior to and including the constraint) by carefully timing and scheduling those activities

Step 3: (continued)

- Another method to use is *Takt time* (total time available to meet expected customer demand)

- Example: after allowing for employee break time, a manufacturing plant operation has 400 minutes of manufacturing time available per day. If average customer demand is 800 units, the Takt time is 30 seconds per unit. The Takt time of 30 seconds is used to balance the flow of product through the processes.

400 minutes ÷ 800 units = 30 seconds per unit *takt time*

TOC Example Steps 4 & 5

Step 4: Add capacity to the constraint

- Adding new machines or additional labor is a long-term measure that can improve flow through the constraint

Step 5: Redesign the manufacturing process for flexibility and fast cycle time

- This step involves the most complete strategic response to the constraint because simply removing one or more minor features of a product might speed up the production process significantly

Life-Cycle Costing

Life-cycle costing provides a more complete perspective of product costs and profitability than pricing based on manufacturing costs alone

- Managers need to be concerned with costs outside the manufacturing process because upstream and downstream costs can account for a significant portion of total life-cycle costs.

- Decision-making at the design stage is critical because decisions at this point commit a firm to a given production, marketing, and service plan, and lock in most of the product's total life cycle costs. most crucial way to manage these costs is at the design stage of the product and the manufacturing process.

Life-Cycle Costing Example

According to the "traditional" product-line statements below, ADI-1 appears to be the more profitable product

Product Line Income Statements Analytical Decisions, Inc.			
	ADI-1	ADI-2	Total
Sales	$ 4,500,000	$ 2,500,000	$ 7,000,000
Cost of sales	1,240,000	1,005,000	2,245,000
Gross margin	$ 3,260,000	$ 1,495,000	$ 4,755,000
R & D			2,150,000
Selling and service			1,850,000
Income before taxes			$ 755,000

Life-Cycle Costing Example (continued)

However, when upstream and downstream costs are considered, ADI-2 is actually more profitable

Life-Cycle Costing Analytical Decisions, Inc.			
	ADI-1	ADI-2	Total
Sales	$ 4,500,000	$ 2,500,000	$ 7,000,000
Cost of sales	1,240,000	1,005,000	2,245,000
Gross margin	$ 3,260,000	$ 1,495,000	$ 4,755,000
R & D	1,550,000	600,000	2,150,000
Selling and service	1,450,000	400,000	1,850,000
Income before taxes	$ 260,000	$ 495,000	$ 755,000

Strategic Pricing

- **Strategic pricing decisions require information from:**
  - The cost life cycle
  - The sales life cycle

Strategic Pricing (continued)

Strategic pricing depends on the position of the product or service in the *sales life cycle*

Phase 1 Introduce	Pricing is set relatively high to recover development costs and take advantage of new-product demand
Phase 2 Growth	Pricing is likely to stay relatively high as the firm attempts to build profitability
Phase 3 Maturity	The firm becomes more of a price taker than a price setter and attempts to reduce upstream and downstream costs
Phase 4 Decline	Volume and prices decline and the firm increases emphasis on controlling upstream and downstream costs

Peak Load Pricing

- Designed to capitalize on or modify consumer behavior, examples include:
  - Charging different rates for peak and off-peak cell phone minutes used
  - Charging more per kilowatt of electricity in the afternoon than in the middle of the night

Short-Term Profit Planning: Cost-Volume-Profit (CVP) Analysis

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CVP Analysis

- CVP analysis is a planning tool for analyzing how operating decisions and marketing decisions affect short-term operating profit

- CVP relies on an understanding of the relationship between variable costs, fixed costs, unit selling price, and output level (volume)

CVP Analysis (continued)

CVP analysis can be used in:

- Setting prices for products and services
- Determining whether to introduce a new product or service
- Replacing a piece of equipment
- Determining breakeven point
- Making “Make-or-buy” (i.e., sourcing) decisions
- Determining the best product mix
- Performing strategic “what-if” (sensitivity) analysis

CVP Analysis (continued)

The CVP model is as follows:

Operating profit = Sales − Total costs

or

Sales = Fixed costs + Variable costs + Operating profit

or

Operating profit = (Units sold × selling price/unit) − (Units sold × variable cost/unit) − Fixed costs

CVP Analysis (continued)

For convenience, the (single-product) model is commonly shown in symbolic form:

$$\pi_B = (p \times Q) - (v \times Q) - F$$

Where:

Q = units sold (i.e., sales volume)

p = selling price per unit

F = total fixed cost

v = variable cost per unit

π_B = operating profit (before tax)

CVP Analysis (continued)

Three additional concepts regarding the CVP model:

1. Contribution margin:

- *Unit contribution margin* (cm) = Unit sales price (p) – Unit variable cost (v)
- Unit contribution margin (cm) = the increase in operating profit for a unit increase in sales = (p – v)
- *Total contribution margin* (CM) = Unit contribution margin (cm) × Units sold (Q)

CVP Analysis (continued)

– *Contribution margin ratio* = Unit contribution margin (cm)÷ unit sales price (p)

$$= (p - v) \div p \quad = \quad cm/p$$

– The *contribution income statement*:

- A useful way to show information developed in CVP analysis
- Classifies costs based on cost *behavior* (fixed versus variable) rather than cost type (product versus period)
- Provides an easy and accurate prediction of the effect of a change in sales on operating profit

Strategic Role of CVP Analysis (continued)

CVP analysis is also important in life-cycle costing and target costing

– CVP analysis can assist in *life-cycle costing* by helping to determine whether a product is likely to achieve its desired profitability, the most cost-effective manufacturing process, the best marketing and distribution channels, the best compensation plan, whether to offer discounts, etc.

– CVP analysis can assist in *target costing* by showing the effect on profit of alternative product designs that have different target costs

Breakeven (B/E) Planning

Determining the "breakeven point" is the starting point of many business plans:

- *Breakeven* is the point at which revenues equal total costs and profit is zero

- The breakeven (B/E) point can be determined in either of two ways:

  - Based on Units Sold (Q)

  - Based on Sales Dollars (Y)

B/E Planning (continued)

Breakeven in Units, Q (@ B/E, π_B = $0)

$$\$0 = (p \times Q) - (v \times Q) - F$$

$$\$0 = (p - v)Q - F$$

$$F = (p - v)Q$$

$$Q = F/(p - v)$$

That is, Q = Fixed costs ÷ contribution margin per unit

B/E Planning (continued)

Breakeven in Sales Dollars, Y (@ B/E, π_B = \$0)

Operating profit = Sales − total variable costs − Fixed costs

$$\$0 = (p \times Q) - (v \times Q) - F$$

$$\$0 = [p \times (Y/p)] - [v \times (Y/p)] - F$$

$$p \times (Y/p) = [v \times (Y/p)] + F$$

$$Y = [(v/p) \times Y] + F$$

$$Y = F \div (p - v)/p$$

= fixed costs ÷ contribution margin ratio

Example: Breakeven Planning

Household Furnishings, Inc. (HFI) wants to perform a B/E analysis given the following expected results for 2013 and 2014:

	Per Unit	2013	2014
Fixed cost (per year)		$60,000	$60,000
Selling price	$75		
Variable cost	35		
Planned production		2,400 units	2,600 units
Planned sales volume		2,400 units	2,600 units

	2013		2014			
	Amount	Percent	Amount	Percent	Change	Notes
Sales	$180,000	100.00%	$195,000	100.00%	$15,000	
Variable costs	84,000	46.67	91,000	46.67	7,000	
Total contribution margin	$ 96,000	53.33%	$104,000	53.33%	$ 8,000	53.33% is the contribution margin ratio
Fixed costs	60,000		60,000		0	
Operating profit	$ 36,000		$ 44,000		$ 8,000	$8,000 = 0.5333 × $15,000

Breakeven Example (continued)

Breakeven in units, Q :

Operating profit = Sales − Total variable costs − Fixed cost

$$\pi_B = (p \times Q) - (v \times Q) - F$$

$$= (\$75 \times Q) - (\$35 \times Q) - \$5{,}000/\text{month}$$

$$0 = [(\$75 - \$35) \times Q] - \$5{,}000/\text{month}$$

$$\$40 \times Q = \$5{,}000/\text{month}$$

$$Q = \$5{,}000/\text{month}/\$40 \text{ per unit}$$

$$Q = 125 \text{ units/month}$$

Breakeven Example (continued)

Breakeven in dollars, Y:

1. Breakeven in units, Q, times selling price per unit, p
   = 125 units/month × \$75/unit = \$9,375/month

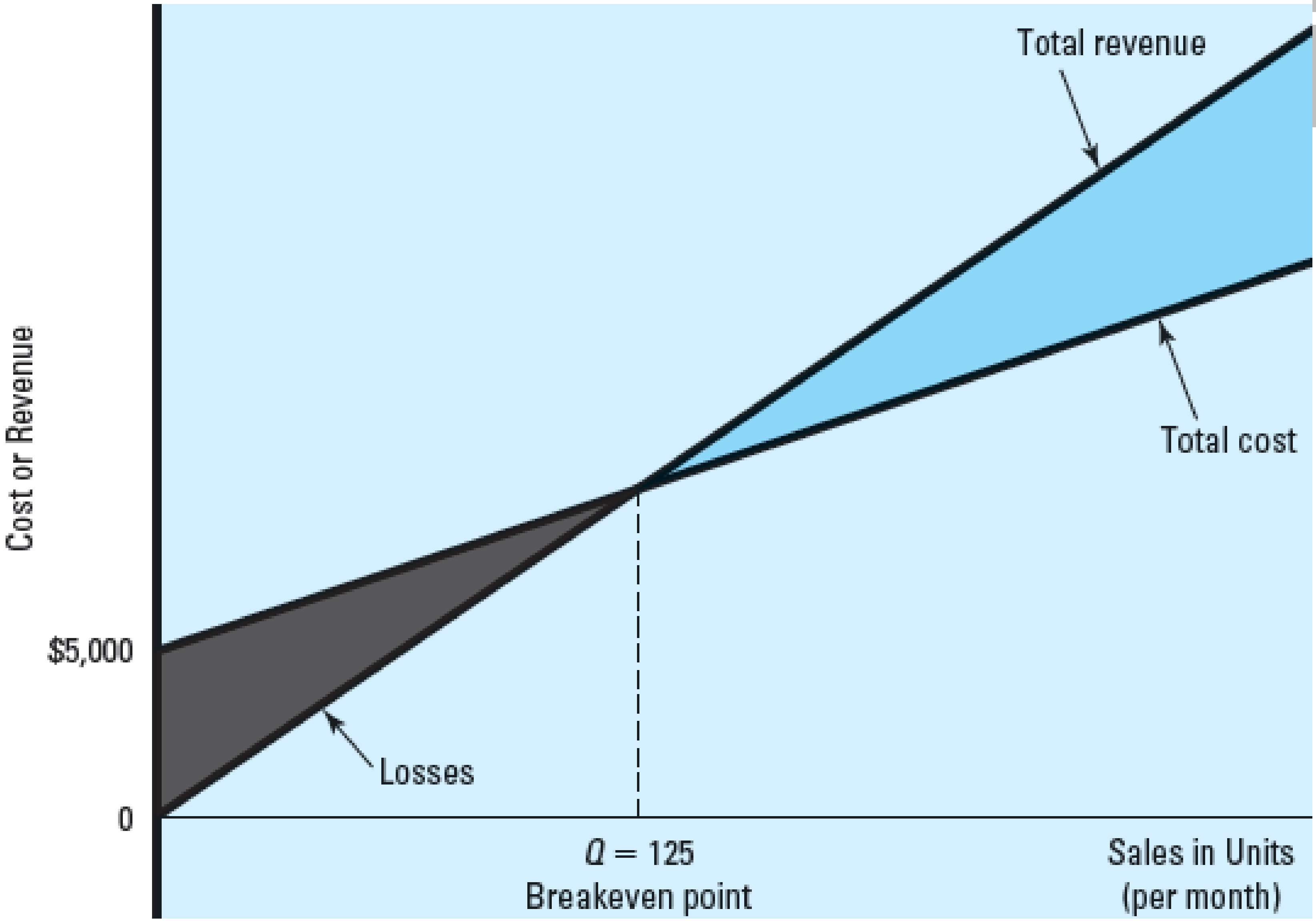
2. Alternatively, breakeven point in sales dollars, Y
   = Fixed cost/month ÷ contribution margin ratio
   = \$5,000/month ÷ (\$75 – \$35)/\$75
   = \$5,000/month ÷ 0.5333333= \$9,375/month

CVP Graph and Profit-Volume (PV) Graph

- The *CVP graph* illustrates how the levels of revenues and total costs change as output (sales volume) changes

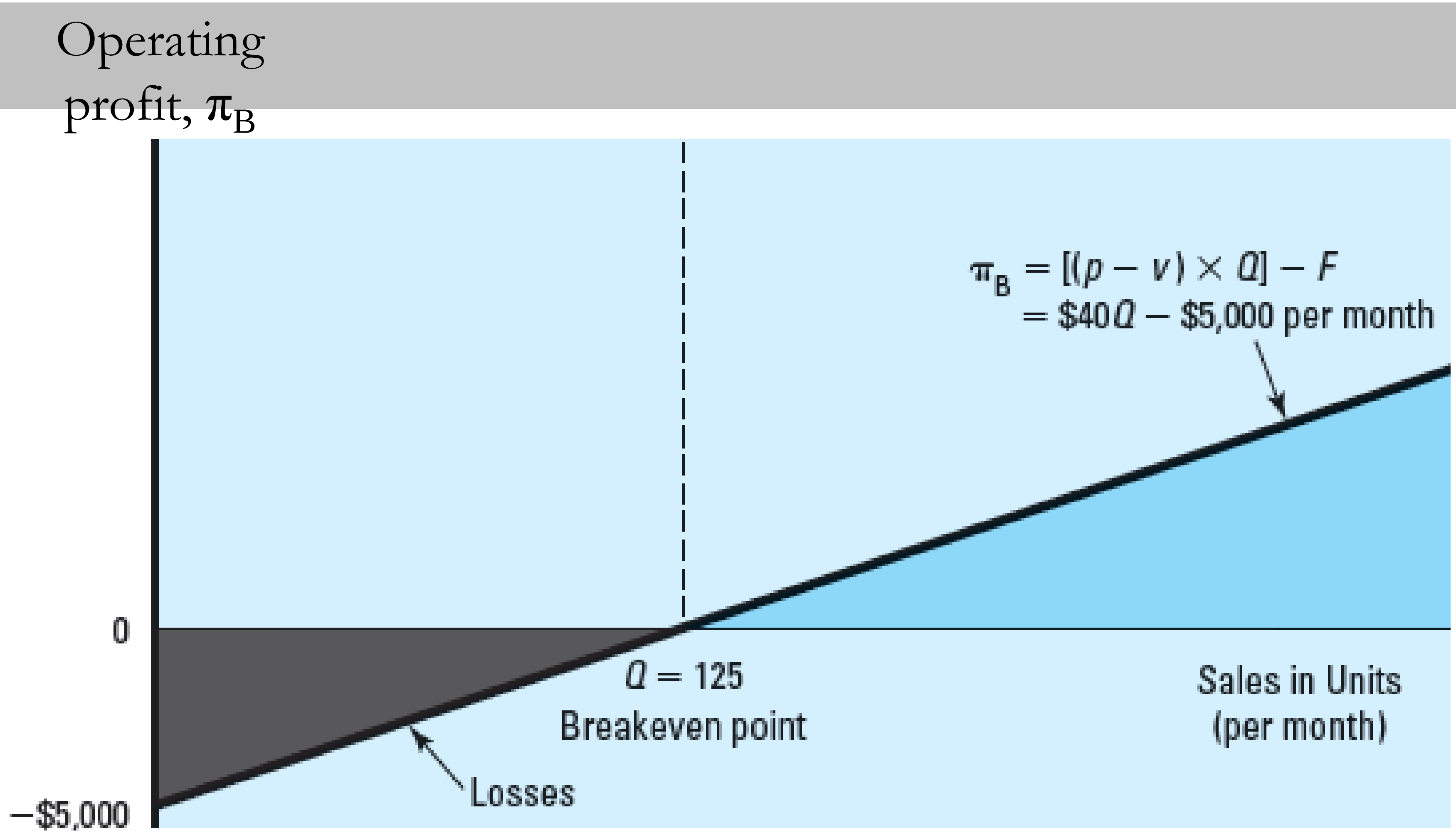
- A *profit-volume (PV) graph* illustrates how the level of operating profit changes as output (sales volume) changes
  - This graph allows a person to clearly see how total contribution margin, and therefore profit, changes as the output level (i.e., volume) changes

CVP Graph



Total revenue
Total cost
Cost or Revenue
$5,000
0
Losses
Q = 125
Breakeven point
Sales in Units
(per month)

PV Graph



Operating profit, π_B
$\pi_B = [(p - v) \times Q] - F$
$= \$40Q - \$5,000$ per month
0
−$5,000
$Q = 125$
Breakeven point
Losses
Sales in Units
(per month)

CVP Analysis in Profit Planning

CVP analysis can be used to determine the sales volume needed to achieve a desired level of before tax profit:

$$Q = \frac{F + \pi_B}{p - v}$$

$$Q = \frac{\$60{,}000 + \$48{,}000}{(\$75 - \$35)/\text{unit}}$$

$$Q = 2{,}700 \text{ units per year}$$

CVP and Profit Planning (continued)

Assume that HFI has the option to choose between two machines that will complete the same operation with the same quality, but with different variable costs per unit (v) and different total fixed costs (F). B/E analysis can help HFI find the level of sales (called the "indifference point"), such that having sales > that this level will favor the option with the higher fixed costs, and having sales < this level will favor the low fixed cost option.

***Which alternative should be chosen*?**

CVP and Profit Planning (continued)

Cost of Machine A	=	Cost of Machine B
$\$5,000 + (\$10 \times Q)$	=	$\$15,000 + (\$5 \times Q)$
Q	=	$\$10,000 \div \$5/\text{unit}$
Q	=	2,000 units

CVP and Profit Planning (continued)

Management decisions about costs and prices usually must include *income taxes* because taxes affect the amount of net profit at a given level of sales

In the HFI example, if we assume that the average income tax rate is 20 percent, to achieve the desired annual *after-tax* profit of $48,000, HFI must generate before-tax profits of ....

$$\text{Before-tax profit, } \pi_B = \text{After-tax profit, } \pi_A/(1 - \text{Tax Rate})$$

$$\pi_B = \pi_A \div (1 - t)$$

$$\pi_B = \$48{,}000 \div (1 - 0.2)$$

$$\pi_B = \$60{,}000$$

CVP and Profit Planning (continued)

Thus, when taxes are considered, the CVP model is as follows, with t = average tax rate

$$Q = \frac{F + \dfrac{\text{After-Tax Profit}}{(1 - t)}}{(p - v)}$$

$$Q = \frac{\$60{,}000 + [\$48{,}000 \div (1 - 0.20)]}{(\$75 - \$35)/\text{unit}}$$

$$Q = 3{,}000 \text{ units}$$

The conventional approach to CVP analysis is to use a volume-based measure to forecast costs, but an ABC approach is also possible:

- If the assumption is made that total batch-level costs are fixed relative to the number of batches, both approaches will produce the same result

- On the other hand, if the activity cost pool is a mixed cost, the ABC approach will provide a more accurate estimate of cost because the volume-based approach treats all activity costs that do not vary with output volume, such as machine setup, materials handling, inspection, and engineering, as fixed

CVP Analysis and ABC (continued)

In the ABC approach, additional terms are needed to define the fixed cost element (HFI's results are in parentheses below):

- F^{VB} = the level of *volume-based fixed costs*, or the portion of fixed costs that do not vary with the activity cost driver, $50,000 ($60,000 – $10,000)
- F^{AB} = the portion of fixed costs that *does* vary with the activity cost driver ($10,000)
- v^{AB} = the cost per batch for the ABC driver ($100/batch)
- *b* = the number of units in a batch (30)
- v^{AB}/b = the cost per unit for batch-related costs when the batch is size *b*, $3.333 ($100/batch ÷ 30 units/batch)

CVP Analysis and ABC (continued)

The CVP model under ABC (for batch-related costs):

$$Q = \frac{F^{VB} + \pi_B}{p - v - (v^{AB}/b)}$$

Therefore, output quantity for HFI is:

$$Q = \frac{\$50{,}000 + \$48{,}000}{\$75 - \$35 - (\$100/30)} = 2{,}673 \text{ units } (2{,}673/30 = 89.1 \text{ batches})$$

There are no partial batches so $9,000 (90 batches × $100 per batch) must be figured into the equation

$$Q = \frac{\$50{,}000 + \$9{,}000 + \$48{,}000}{\$75 - \$35} = 2{,}675 \text{ units in 90 batches}$$

Risk and Uncertainty: Some Useful Metrics

Margin of safety (MOS) is the dollar amount of sales above the B/E point (i.e., forecasted (or actual) sales level minus the B/E sales level):

MOS = planned (or actual) sales − breakeven sales
(in units or in dollars)

Margin of safety ratio (MOS%) = MOS ÷ planned (or actual) sales volume = the percentage that sales could fall (from planned or actual levels) before losses occur

Handling Risk and Uncertainty: Degree of Operating Leverage

- Operating leverage refers to the extent of fixed costs in the cost structure of an organization. The greater the operating leverage, the greater the operating risk (i.e., not being able to cover fixed costs via operations).

- Degree of operating leverage (DOL), at any sales volume level, represents the sensitivity of operating income to changes in sales volume.

$$DOL = CM \div \text{operating profit}$$

Multi-Product (or Service) CVP Analysis

- If all fixed costs are traceable to individual products, then the organization can develop a separate CVP model for each product
- Alternatively, the multi-product firm can make an assumption regarding a standard sales mix in which its products are sold
- Sales mix can be determined on the basis of sales dollars or unit sales
- The assumption of sales mix allows the firm to calculate and use a weighted-average contribution margin (cm) *per unit* and weighted average cm *ratio* to complete the multi-product CVP analysis

Example: Multi-Product CVP Analysis

Windbreakers, Inc. sells light-weight sports/recreational jackets and currently has three products: Calm, Windy, and Gale. Total (joint) fixed costs for the period are expected to be $168,000, and we assume the windbreakers' sales mix, measured by sales ***dollars***, will remain constant. Additional information is provided below. (Since sales mix is constant in $, we will use the contribution margin ratio in the analysis. See next slide…)

	Calm	Windy	Gale	Total
Last period's sales	$ 750,000	$ 600,000	$ 150,000	$ 1,500,000
Percent of sales	50%	40%	10%	100%
Price	$ 30	$ 32	$ 40	
Unit variable cost	24	24	36	
Contribution margin	$ 6	$ 8	$ 4	
Contribution margin ratio	0.20	0.25	0.10	

Example: Multi-Product CVP (continued)

From this information, we can calculate the wtd. avg. cm ratio:

Weighted-average CMR = 0.5(0.2) + 0.4(0.25) + 0.1(0.1) = 0.21

The breakeven point for all three products can be calculated as follows:

Y = $168,000 ÷ 0.21

Y = $800,000

This means that for Windbreakers to break even, $800,000 of all three products must be sold in the same proportion as last year's sales mix. The sales for each product need to be as follows:

For Calm	0.5($800,000) =	$400,000	(13,334 units)
For Windy	0.4($800,000) =	320,000	(10,000 units)
For Gale	0.1($800,000) =	80,000	(2,000 units)
		$800,000	

Assumptions of CVP Analysis

- The CVP model assumes revenues and costs are *linear* over a "relevant range" (even though the actual cost behavior may not be linear)
- Outside the *relevant range*, these calculations may not be accurate
- *Step costs* also make approximation via the relevant range unworkable; CVP analysis becomes much more cumbersome
- The basic model is *deterministic*.