Typical Cost-benefit Considerations in Managerial Decision Making

DTSL |IIM VISAKHAPATNAM

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Introduction

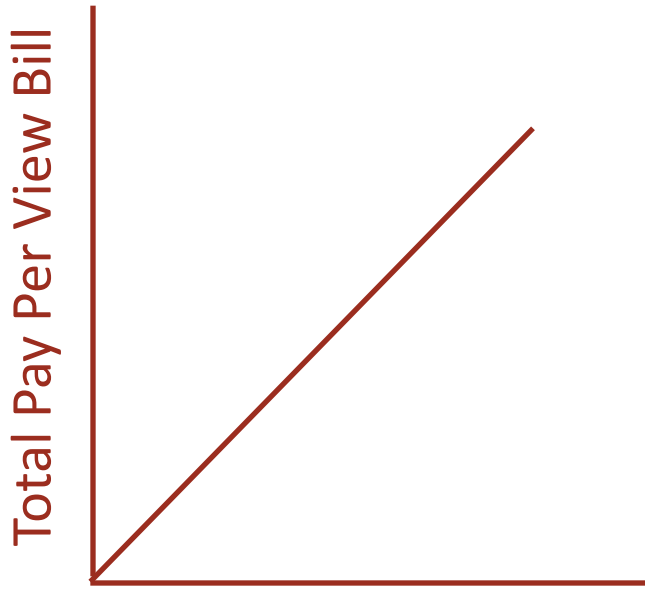
Process of determining cost behavior, often focuses on historical data.

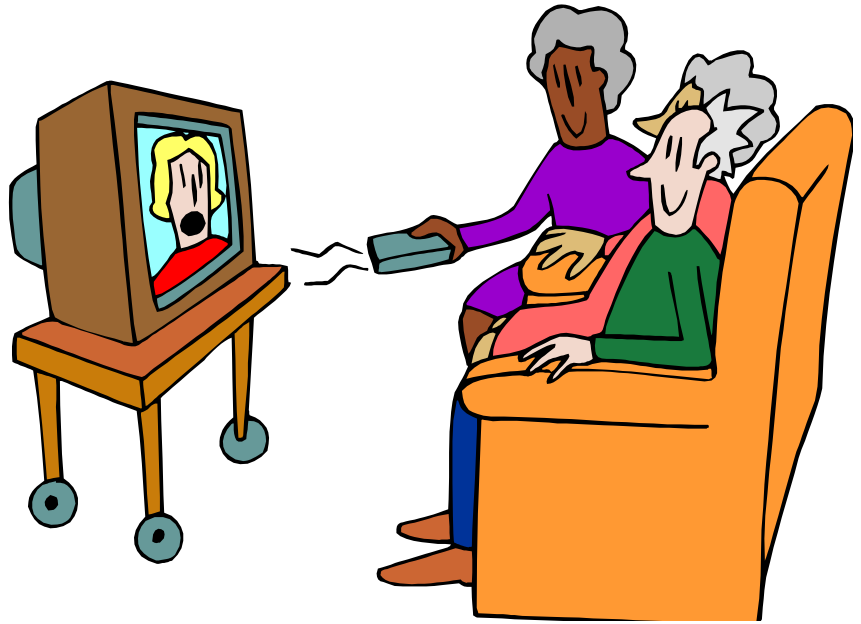
Relationship between cost and activity.

Using knowledge of cost behavior to forecast level of cost at a particular activity. Focus is on the future.

Total Variable Cost Example

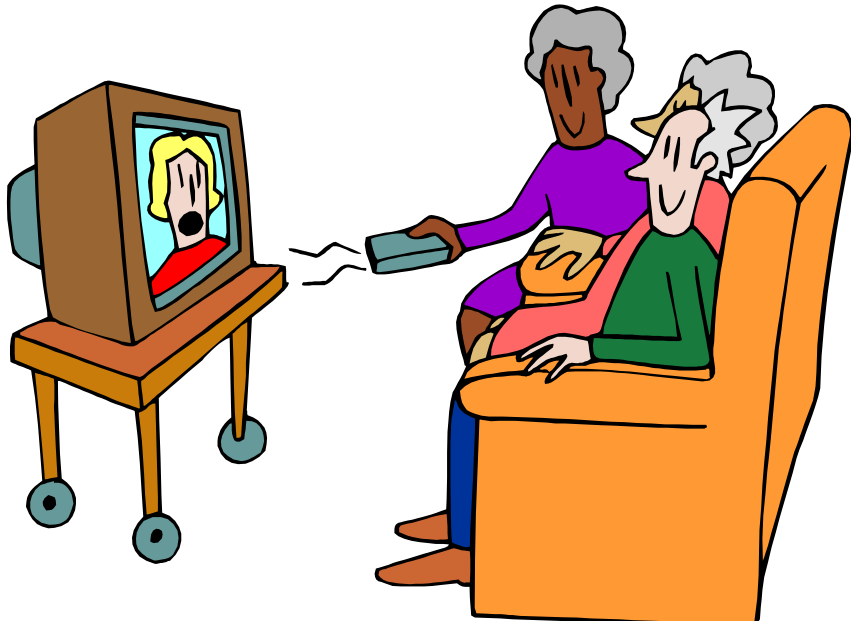
Your total Pay Per View bill is based on how many Pay Per View shows that you watch.

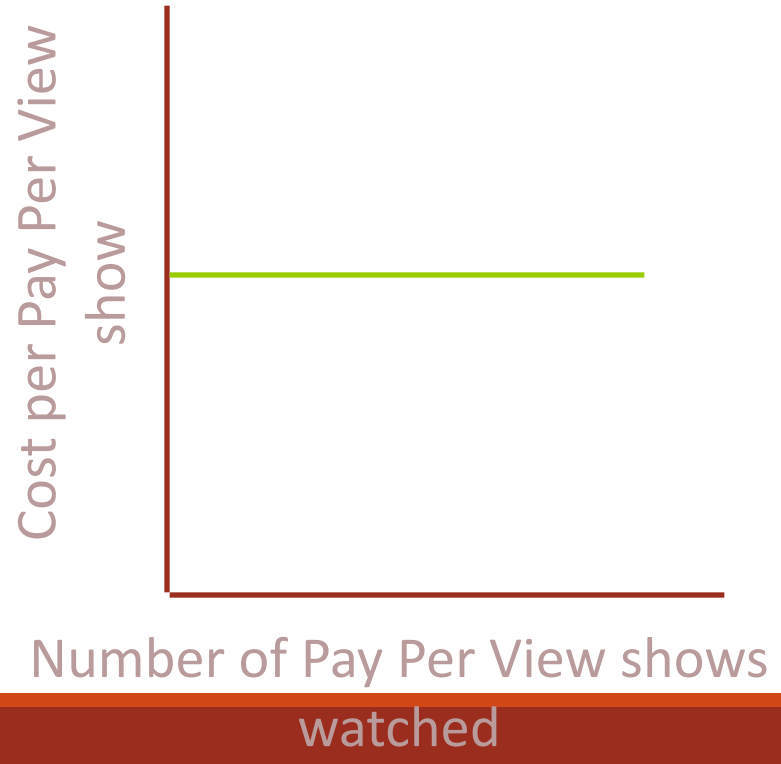




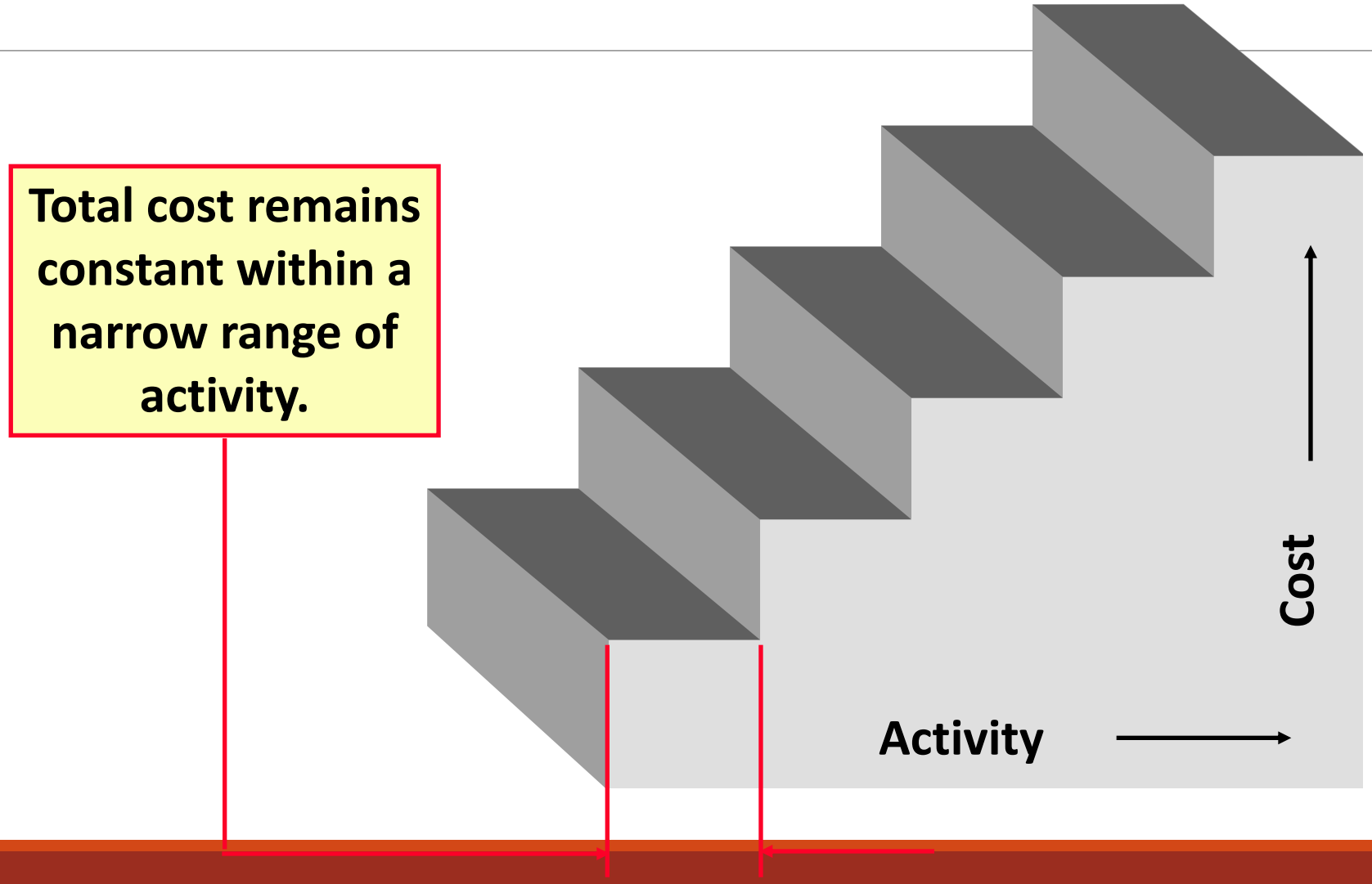
Variable Cost Per Unit Example

The cost per Pay Per View show is constant. For example, $4.95 per show.



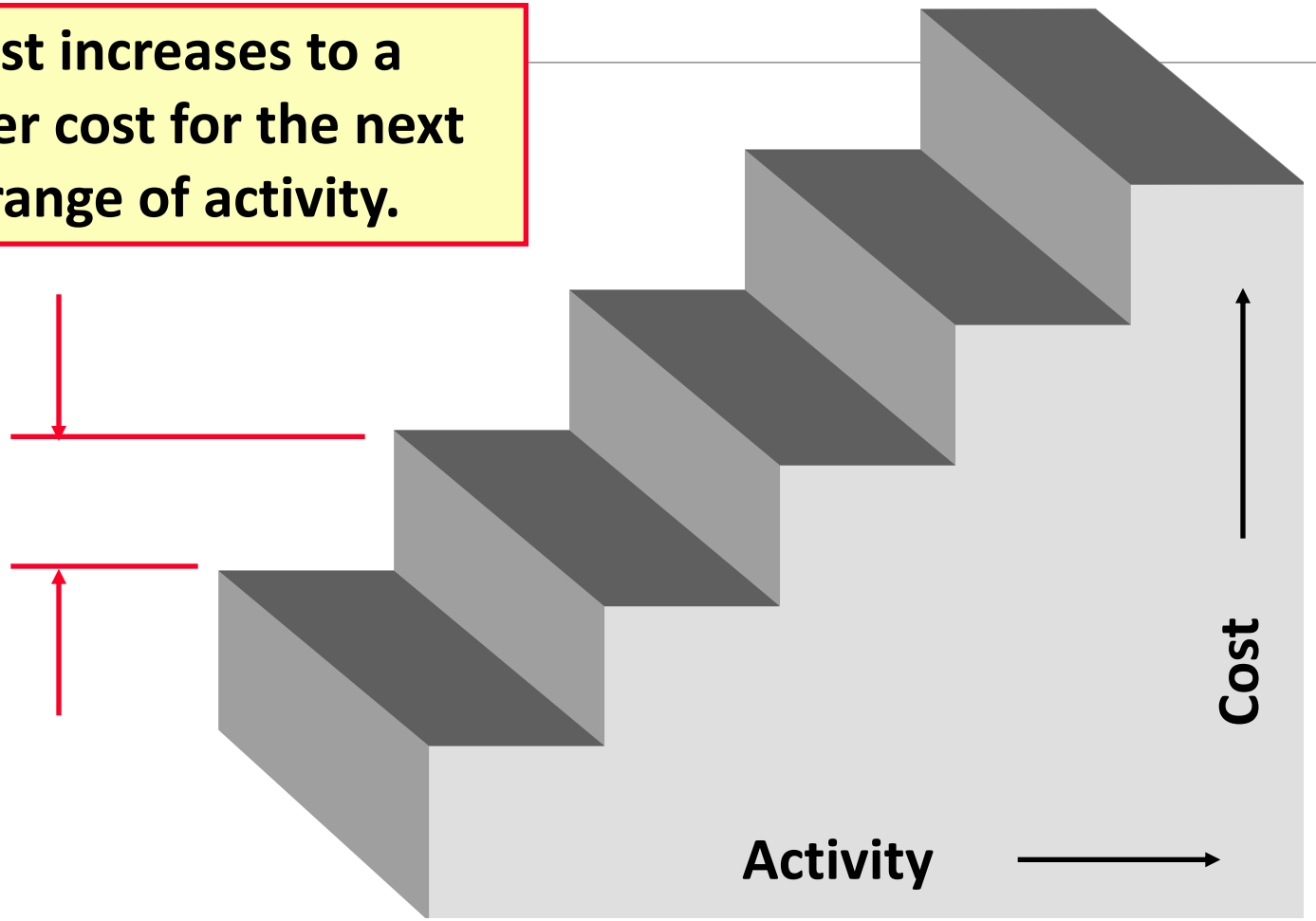


Step-Variable Costs



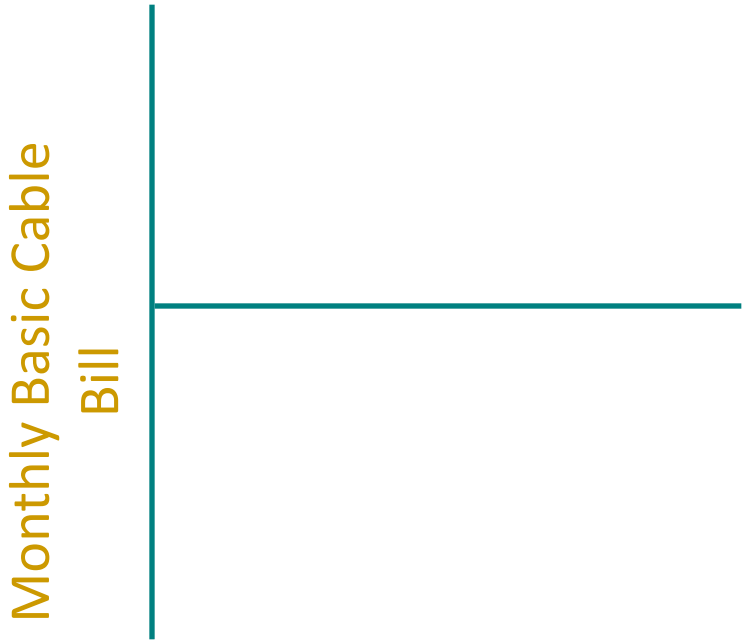
Step-Variable Costs

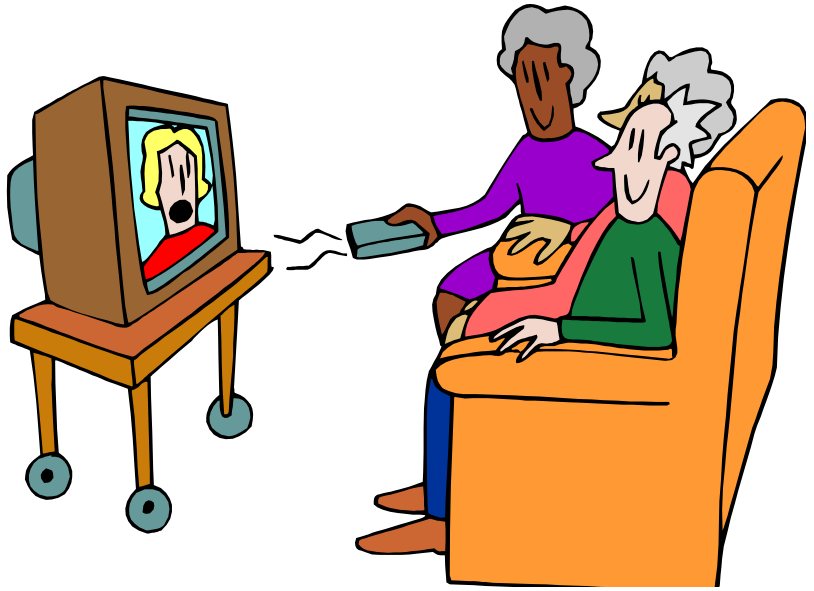
Total cost increases to a new higher cost for the next higher range of activity.



Total Fixed Cost Example

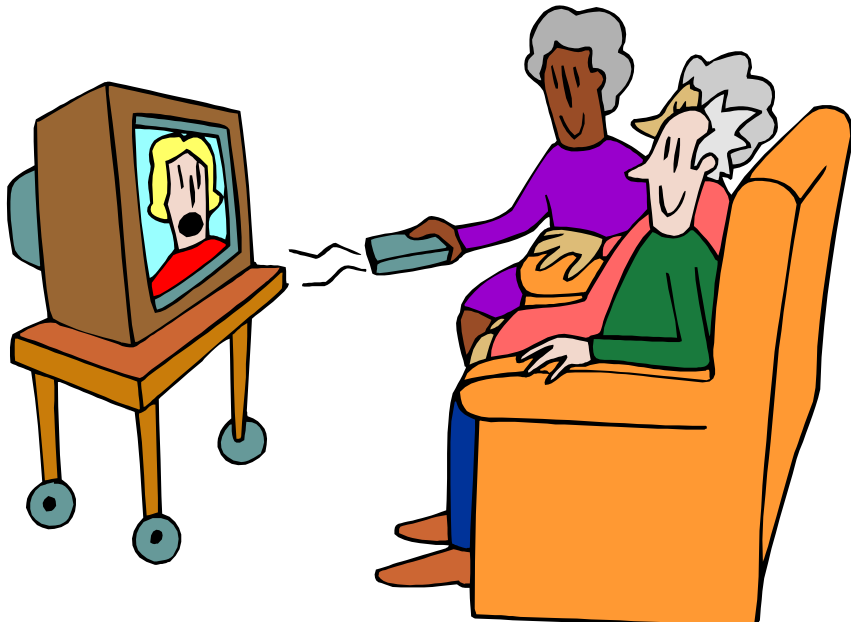
Your monthly basic cable TV bill probably does not change no matter how many hours you watch.

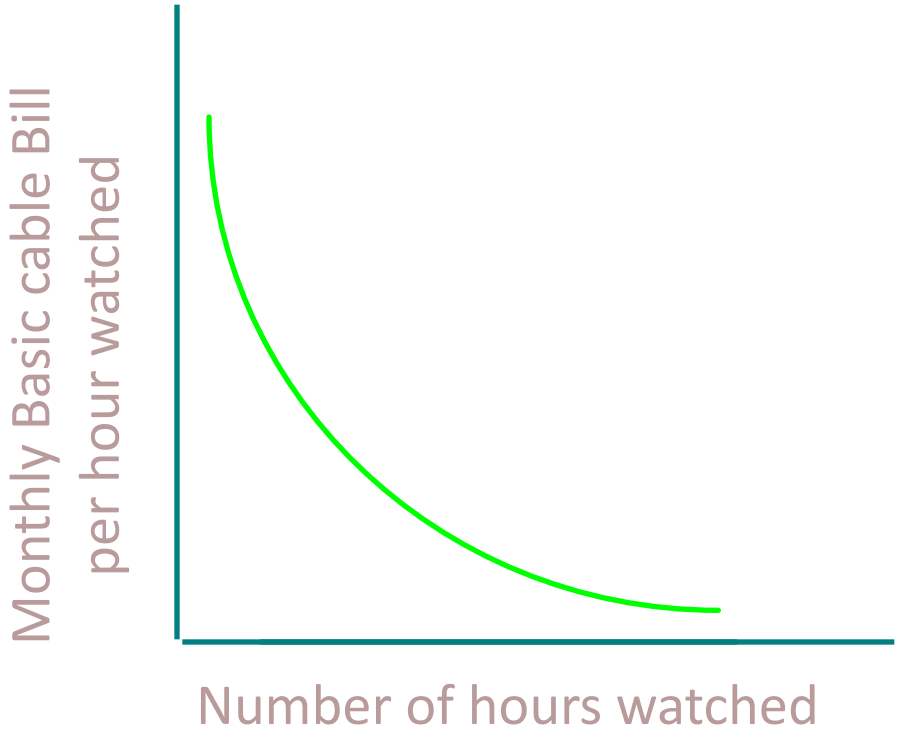




Fixed Cost Per Unit Example

The average cost per hour decreases as more hours are spent watching cable television.





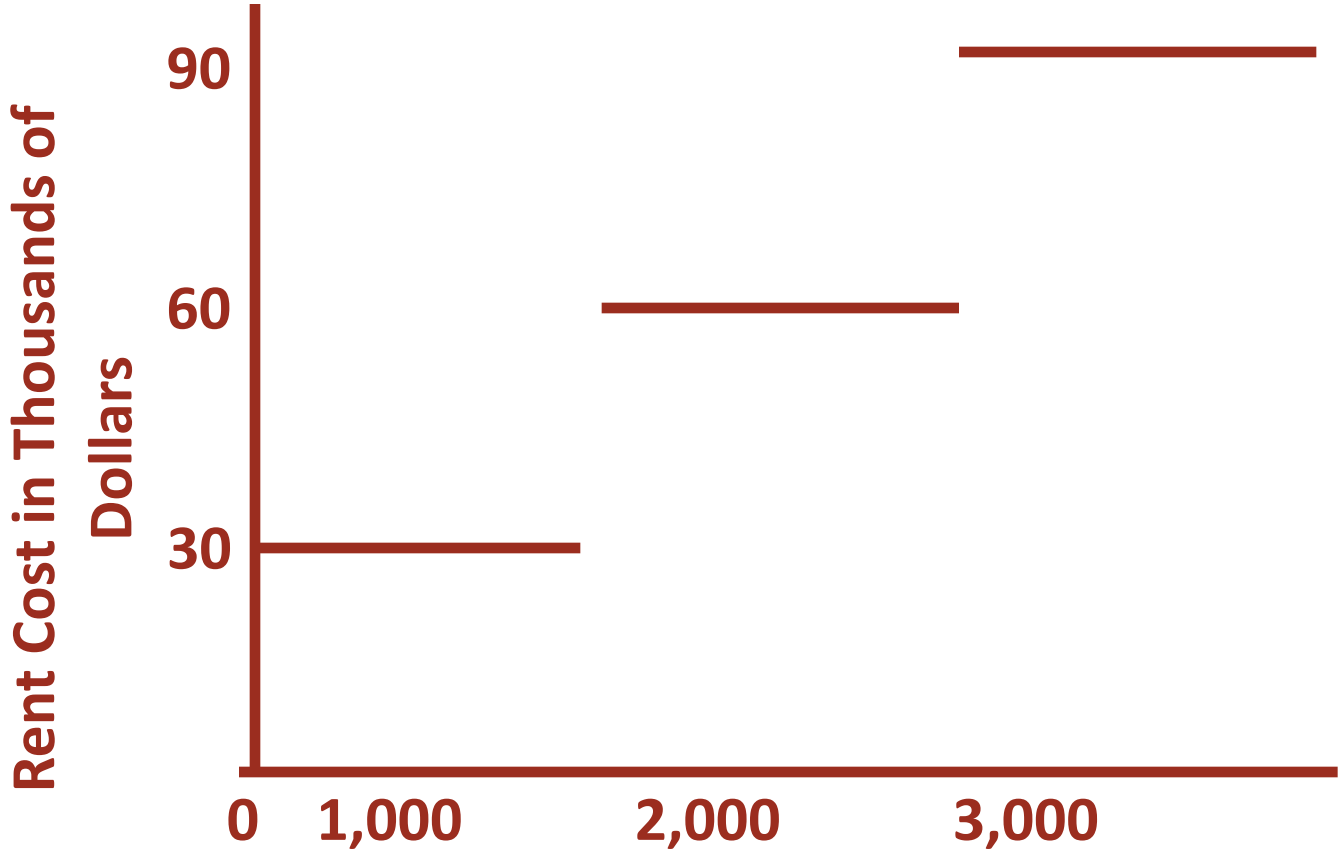
Step-Fixed Costs

Example: Office space is available at a rental rate of $30,000 per year in increments of 1,000 square feet. As the business grows more space is rented, increasing the total cost.

Continue

Step-Fixed Costs

Total cost doesn't change for a wide range of activity, and then jumps to a new higher cost for the next higher range of activity.



Step-Fixed Costs

How does this type of fixed cost differ from a step-variable cost?

Step-variable costs can be adjusted more quickly and . . .

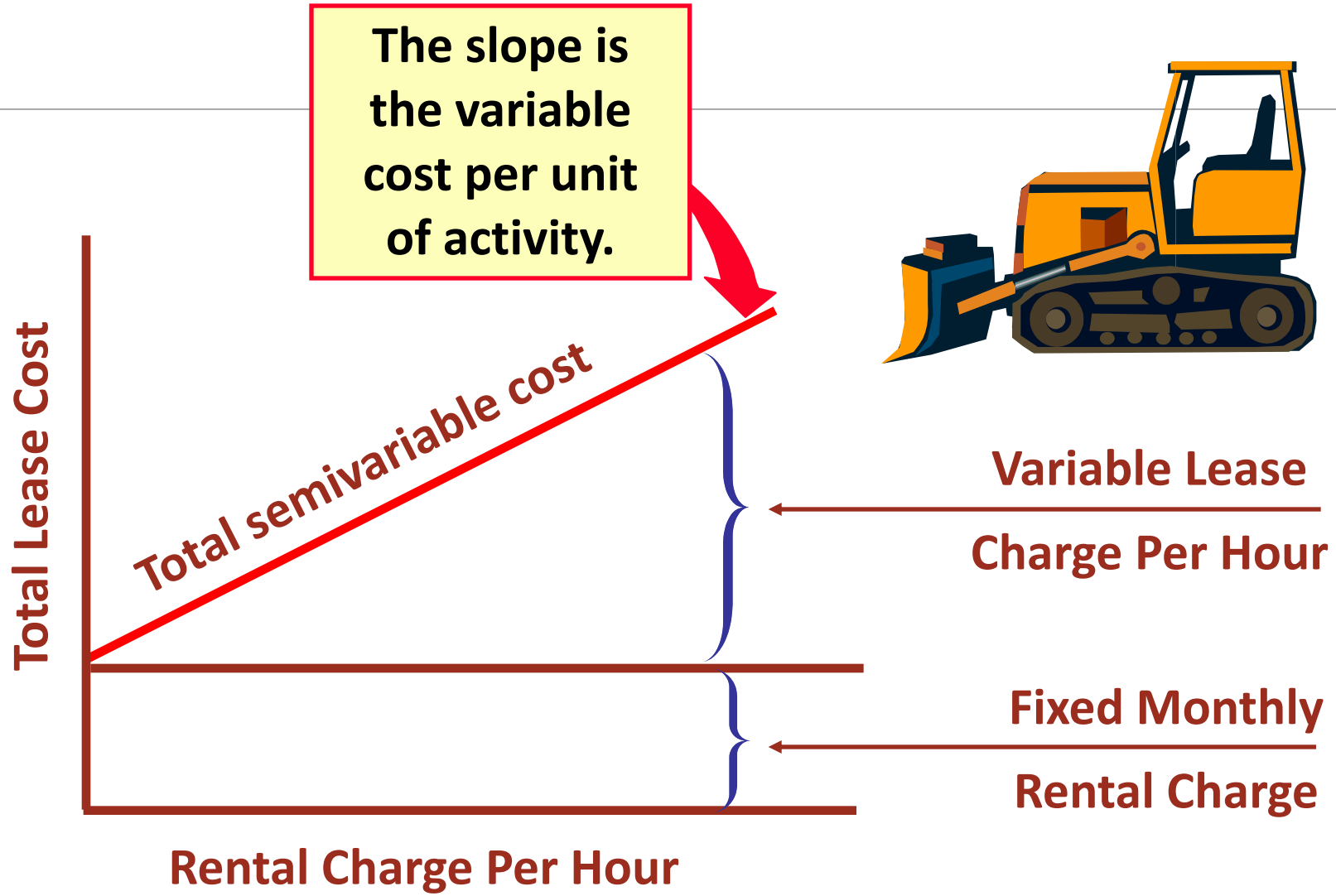
The width of the activity steps is much wider for the step-fixed cost.

Semivariable Cost

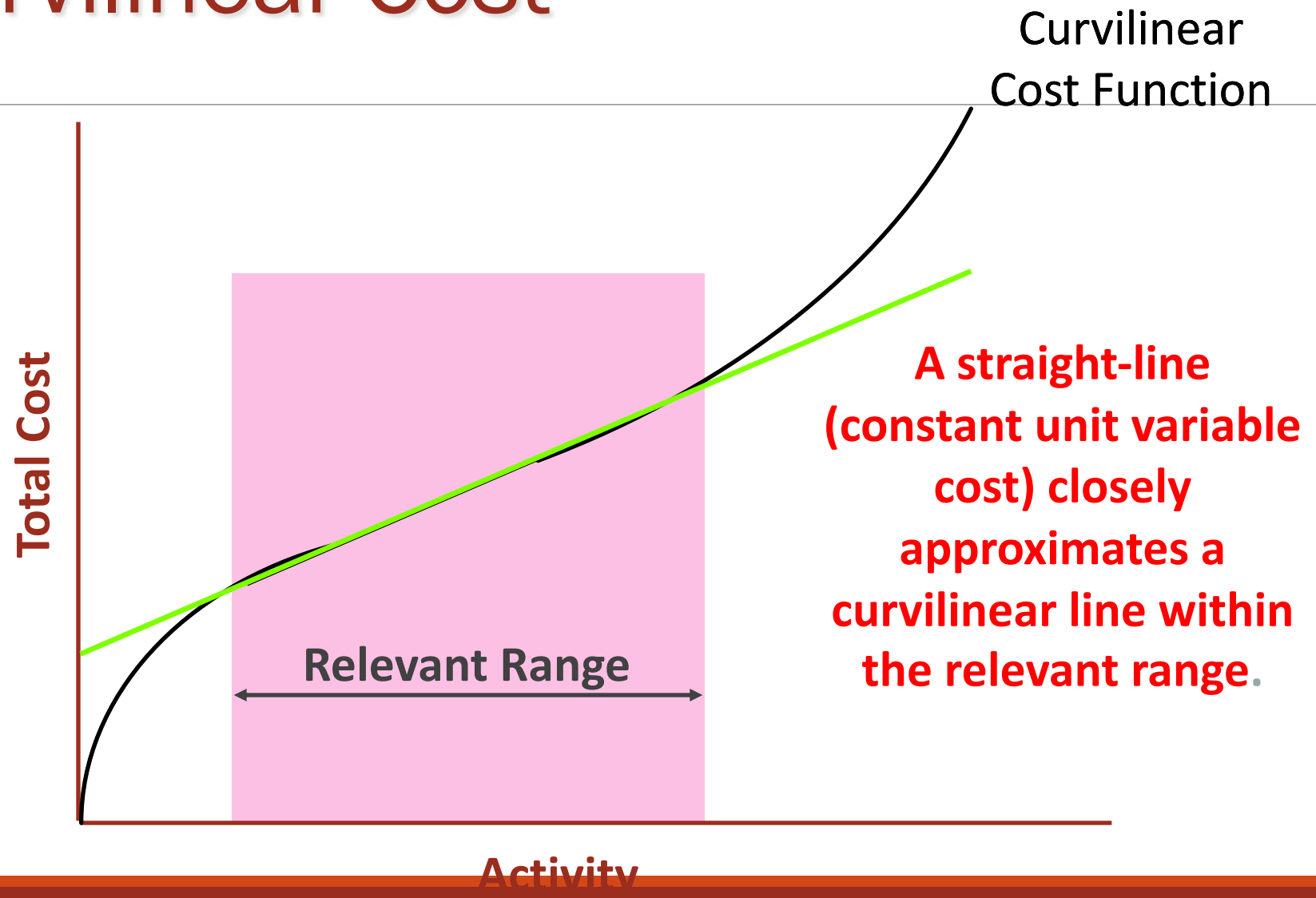
A semivariable cost is partly fixed and partly variable.

Consider the following example:

Semivariable Cost

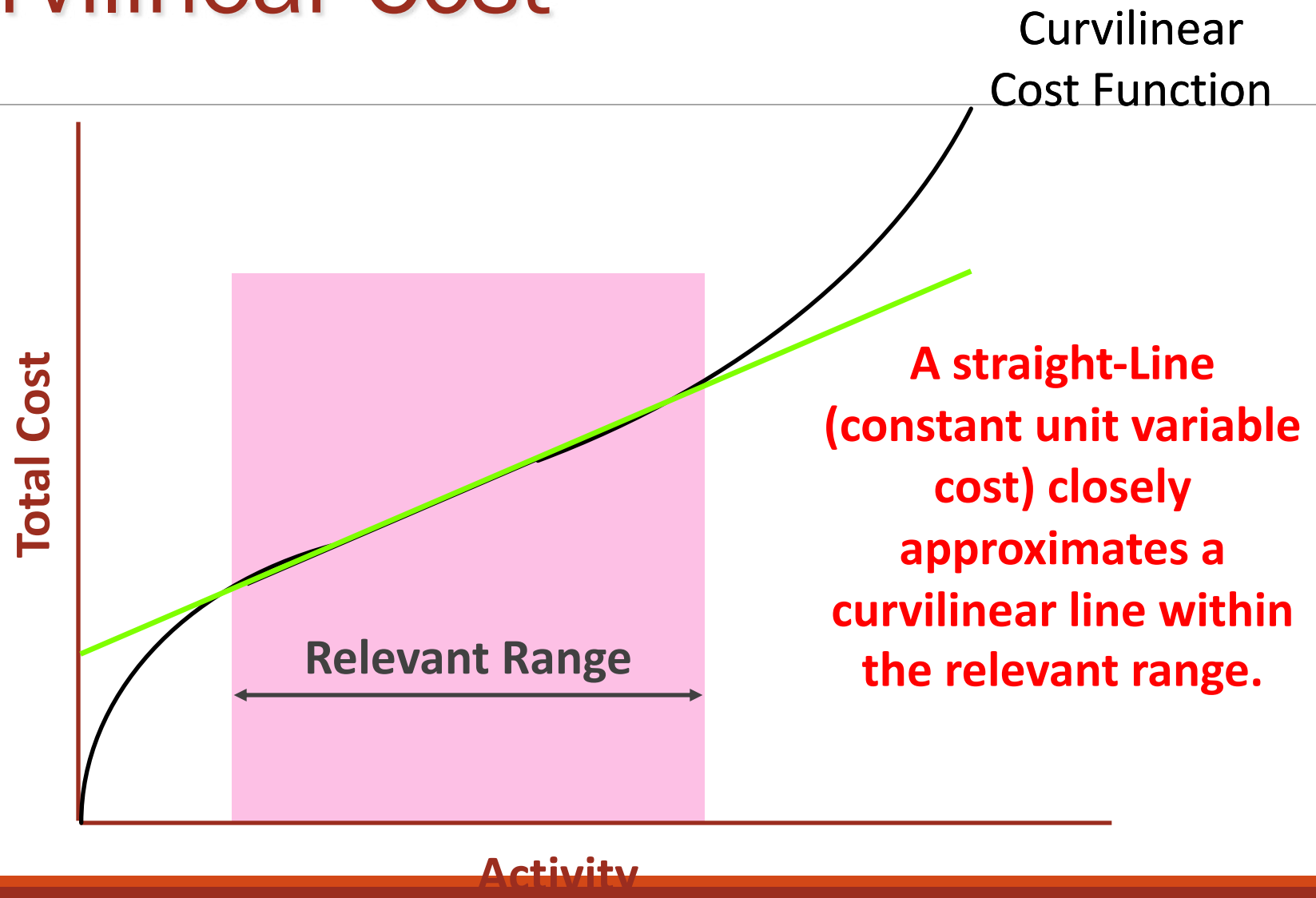


Curvilinear Cost



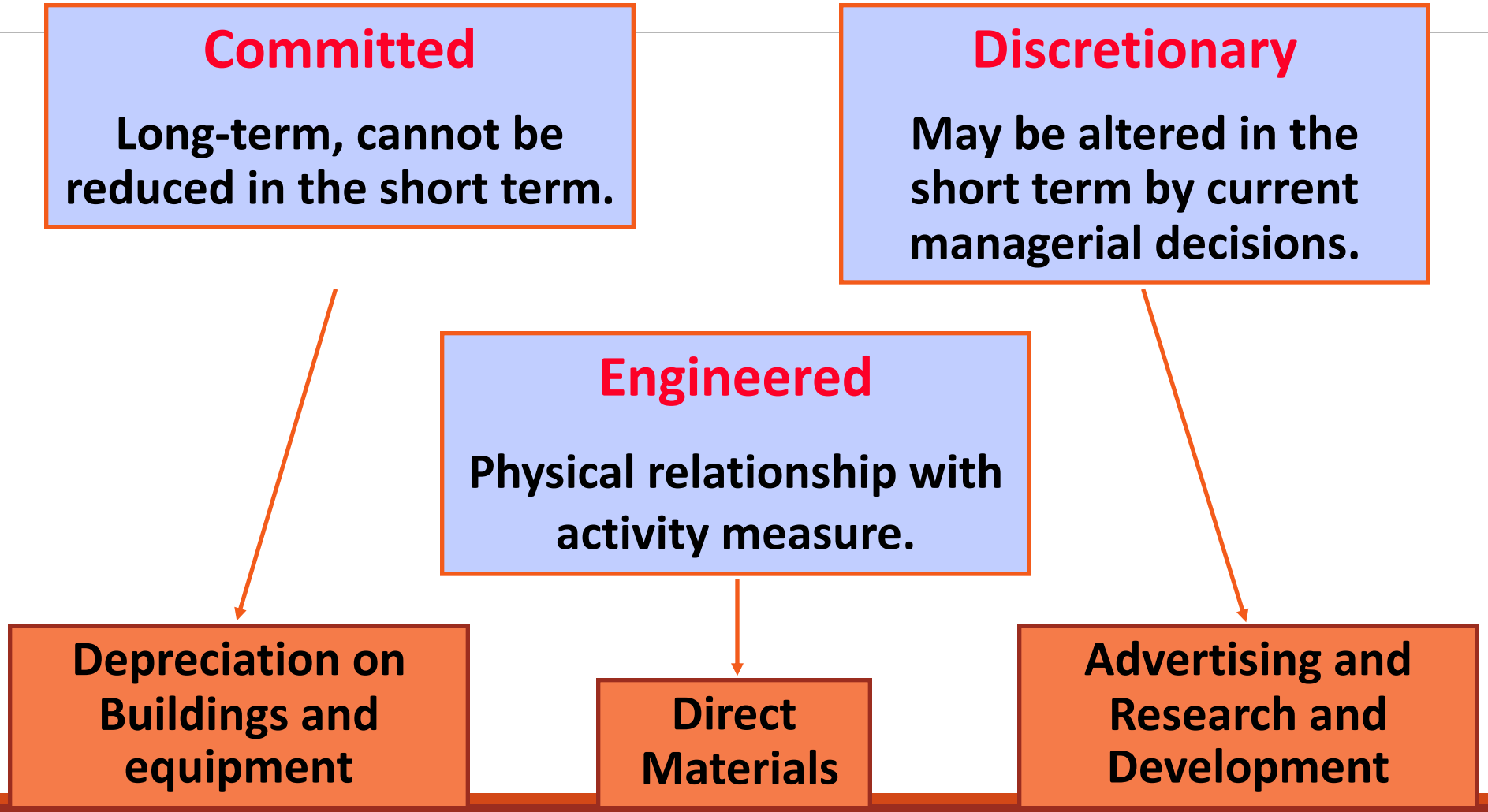
A straight-line (constant unit variable cost) closely approximates a curvilinear line within the relevant range.

Curvilinear Cost



A straight-Line (constant unit variable cost) closely approximates a curvilinear line within the relevant range.

Engineered, Committed, and Discretionary Costs



For each of the following cost items (i through Xiii), choose the graph (a through l) that best represents it.

I. The cost of utilities at a university. For low student enrollments, utility costs increase with enrollment, but at a decreasing rate. For large student enrollments, utility costs increase at an increasing rate.

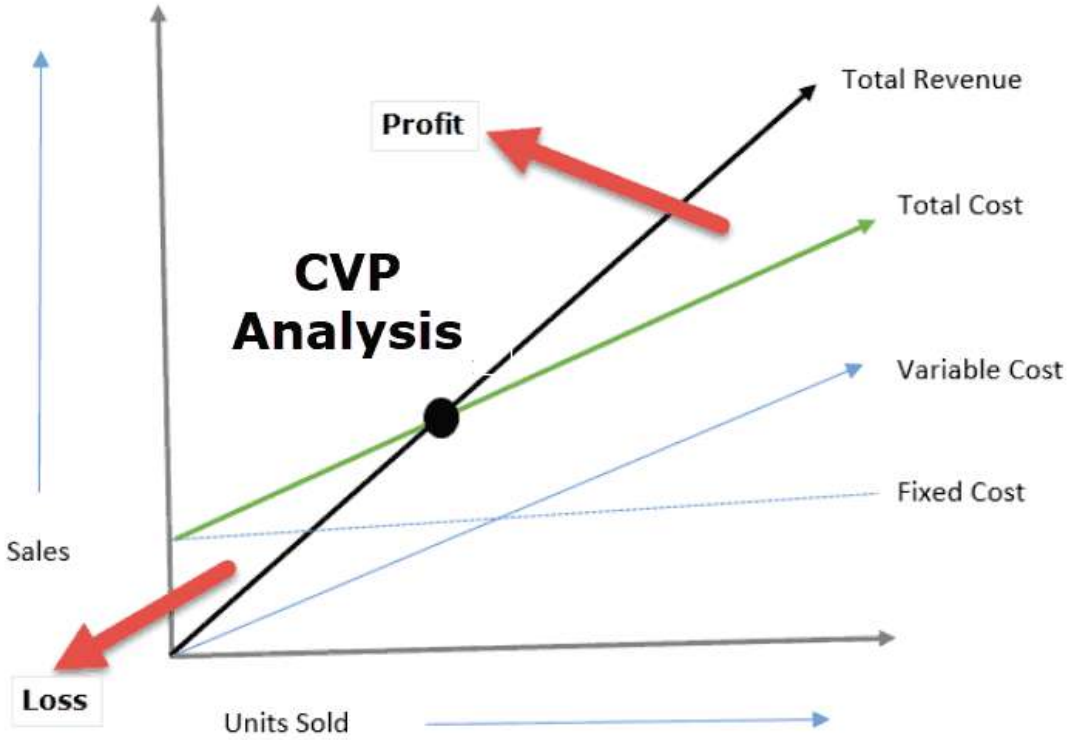
II. The cost of on-line back-up storage at a rate of $2.50 per gigabyte, up to 50 gigabytes, beyond which storage is unlimited.

III. The cost of outsourcing diagnostic blood testing by a hospital. The hospital pays an independent lab a fee of $1,000 per month plus $3 for each test done.

IV. The salary costs of the shift supervisors at a truck depot. Each shift is eight hours. The depot operates with one, two, or three shifts at various times of the year.

- The salaries of the security personnel at a factory. The security guards are on duty around the clock.
- The wages of table-service personnel in a restaurant. The employees are part-time workers, who can be called upon for as little as two hours at a time.
- The cost of electricity during peak-demand periods is based on the following schedule.
  - Up to 10,000 Kilowatt-hours (kWh) $.09 per kWh
  - Above 10,000 Kilowatt-hours (kWh) $.12 per kWh

  The price schedule is designed to discourage overuse of electricity during periods of peak demand.
- The cost of sheet metal used to manufacture automobiles.
- The cost of chartering a private airplane. The cost is $410 per hour for the first three hours of a flight. Then the charge drops to $305 per hour.



Cost-Volume-Profit Analysis

The Break-Even Point

The break-even point is the point in the volume of activity where the organization's revenues and expenses are equal.

Sales	$250,000
Less: variable expenses	150,000
Contribution margin	100,000
Less: fixed expenses	100,000
Net income	$ -

Equation Approach

Sales revenue – Variable expenses – Fixed expenses = Profit

Unit sales price	×	Sales volume in units

Unit variable expense	×	Sales volume in units

($500 × X) – ($300 × X) – $80,000 = $0

($200X) – $80,000 = $0

X = 400 surf boards

Contribution-Margin Approach

Consider the following information developed by the accountant at Curl, Inc.:

For each additional surf board sold, Curl generates $200 in contribution margin.

	Total	Per Unit	Percent
Sales (500 surf boards)	$250,000	$ 500	100%
Less: variable expenses	150,000	300	60%
Contribution margin	$100,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ 20,000		

Contribution-Margin Approach

$$\frac{\text{Fixed expenses}}{\text{Unit contribution margin}} = \text{Break-even point (in units)}$$

	Total	Per Unit	Percent
Sales (500 surf boards)	$250,000	$ 500	100%
Less: variable expenses	150,000	300	60%
Contribution margin	$100,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ 20,000		

$$\frac{\$80{,}000}{\$200} = 400 \text{ surf boards}$$

Contribution-Margin Approach

Here is the proof!

	Total	Per Unit	Percent
Sales (400 surf boards)	$200,000	$ 500	100%
Less: variable expenses	120,000	300	60%
Contribution margin	$ 80,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ -		

400 × $500 = $200,000

400 × $300 = $120,000

Contribution Margin Ratio

Calculate the break-even point in *sales dollars* rather than units by using the contribution margin ratio.

$$\frac{\text{Contribution margin}}{\text{Sales}} = \text{CM Ratio}$$

$$\frac{\text{Fixed expense}}{\text{CM Ratio}} = \text{Break-even point (in sales dollars)}$$

Contribution Margin Ratio

	Total	Per Unit	Percent
Sales (400 surf boards)	$200,000	$ 500	100%
Less: variable expenses	120,000	300	60%
Contribution margin	$ 80,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ -		

$$\frac{\$80,000}{40\%} = \$200,000 \text{ sales}$$

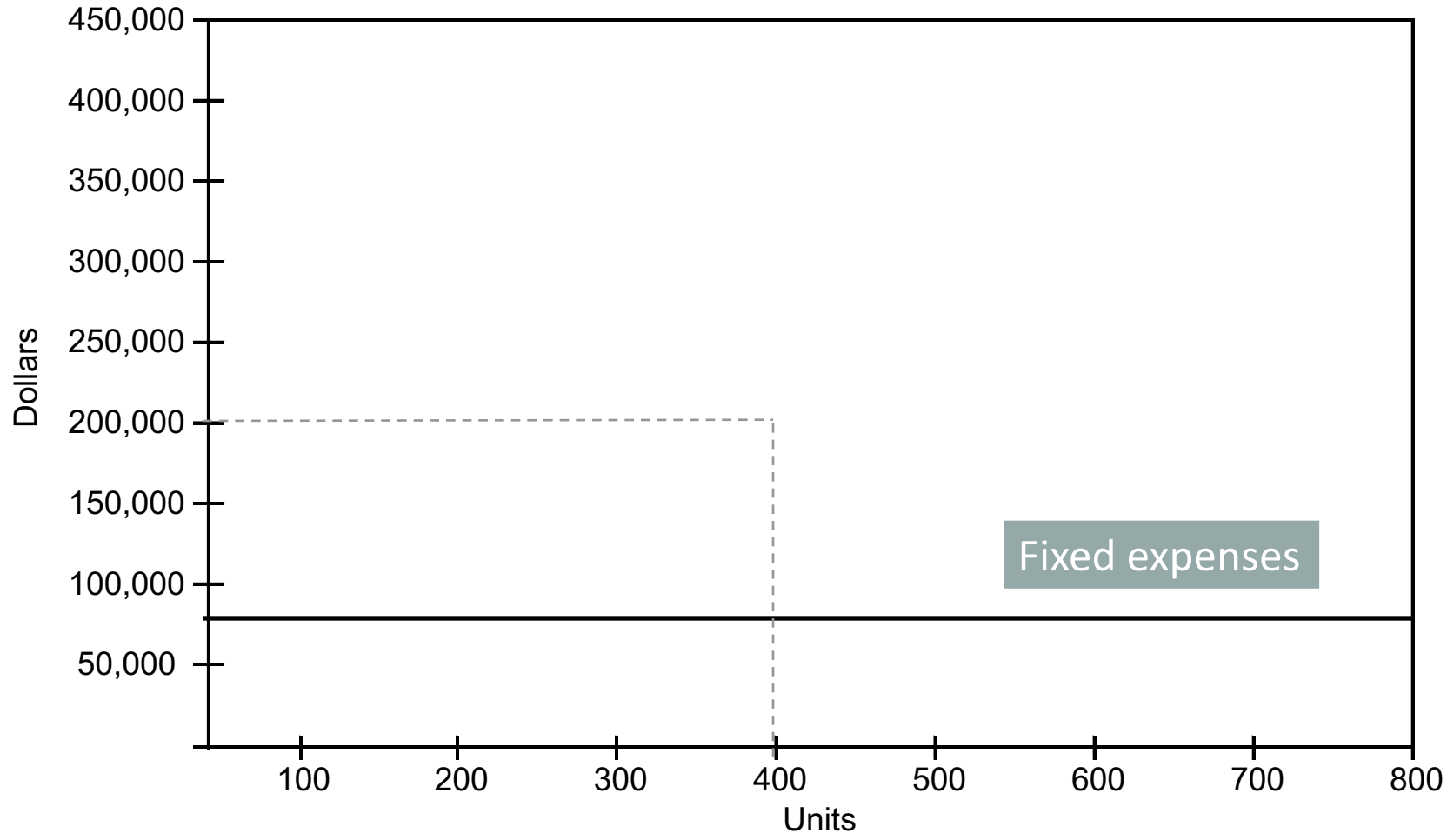
Graphing Cost-Volume-Profit Relationships

Viewing CVP relationships in a graph gives managers a perspective that can be obtained in no other way.

Consider the following information for Curl, Inc.:

	300 units	400 units	500 units
Sales	$ 150,000	$ 200,000	$ 250,000
Less: variable expenses	90,000	120,000	150,000
Contribution margin	$ 60,000	$ 80,000	$ 100,000
Less: fixed expenses	80,000	80,000	80,000
Net income (loss)	$ (20,000)	$ -	$ 20,000

Cost-Volume-Profit Graph



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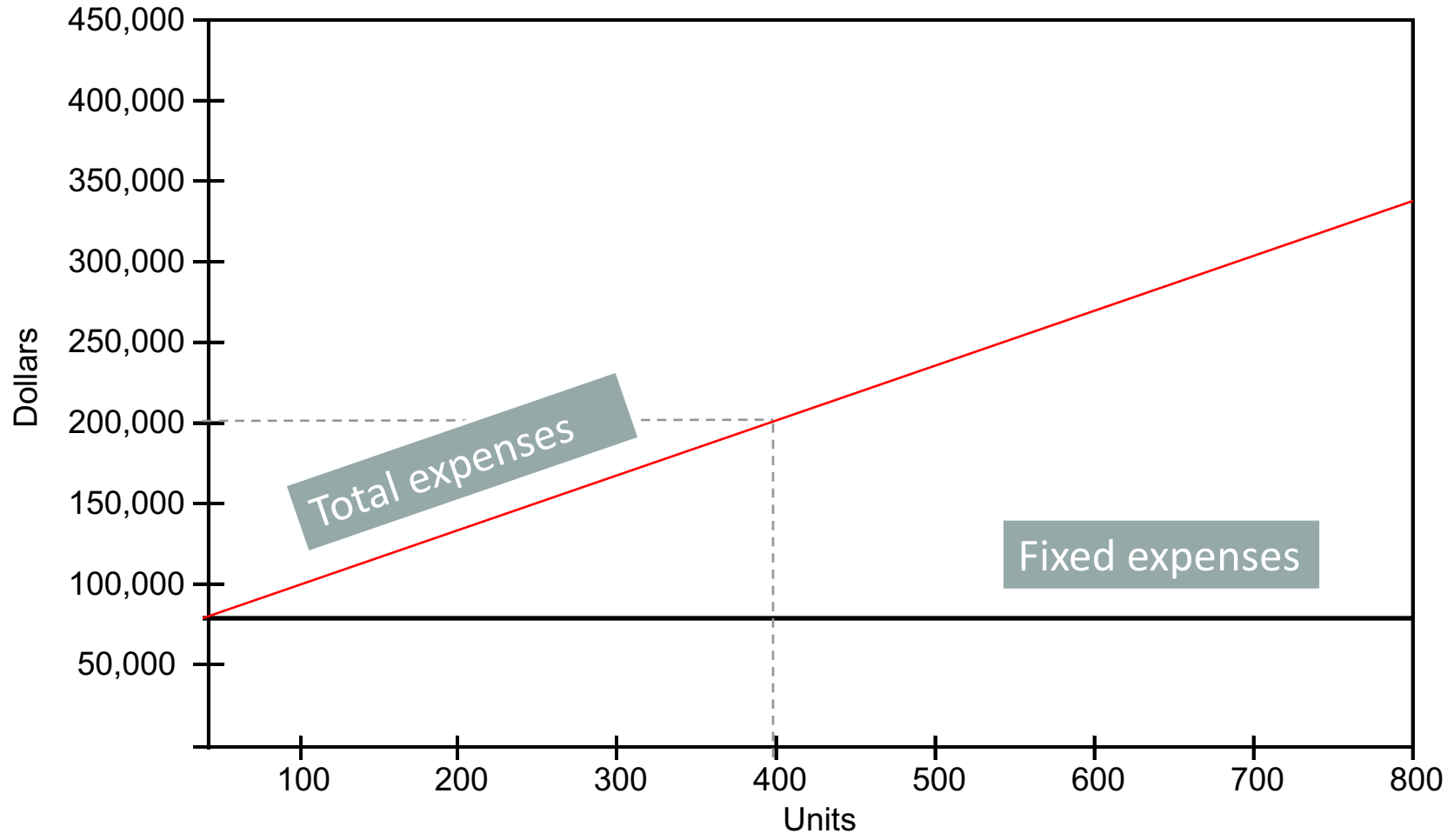

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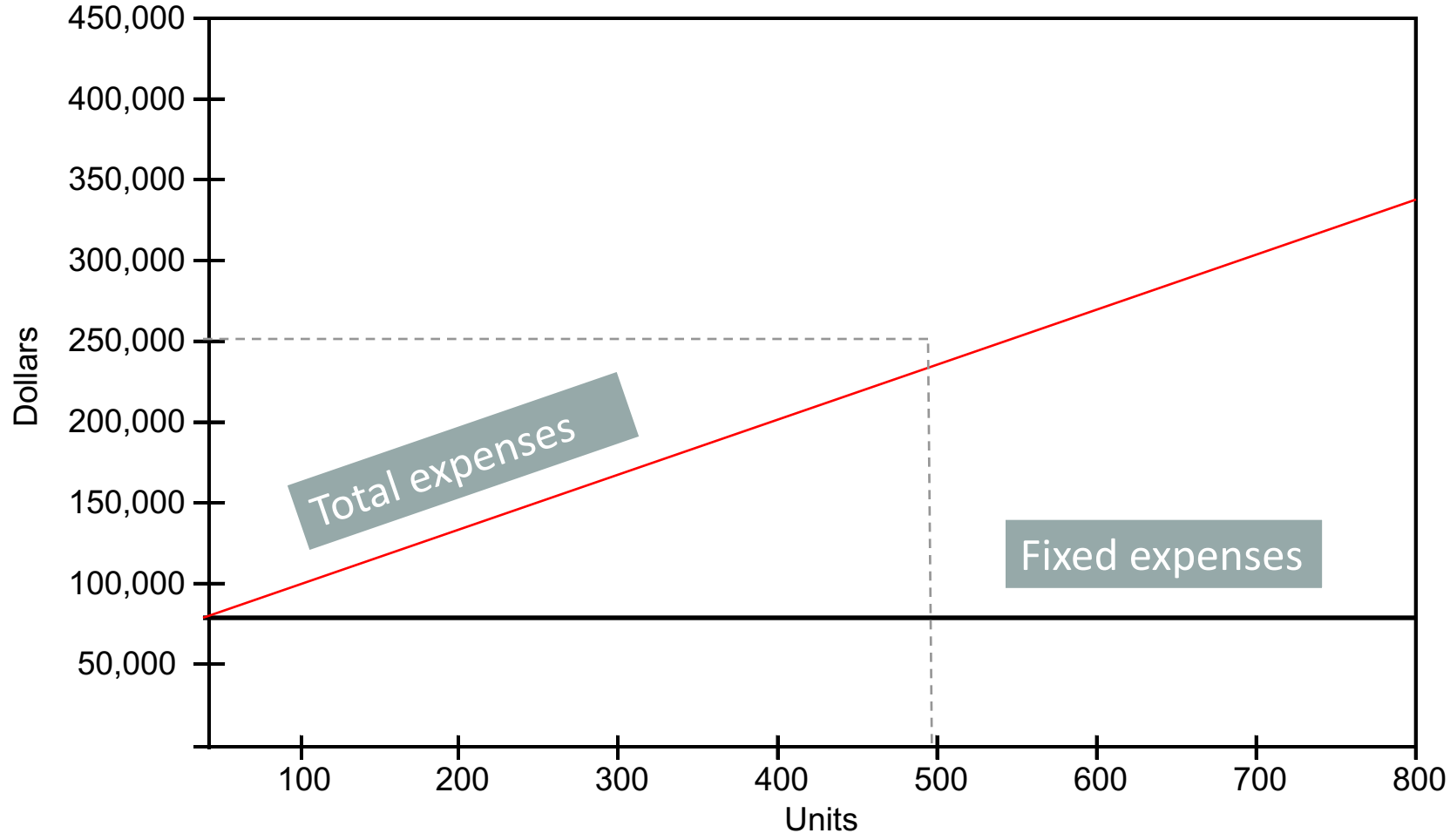

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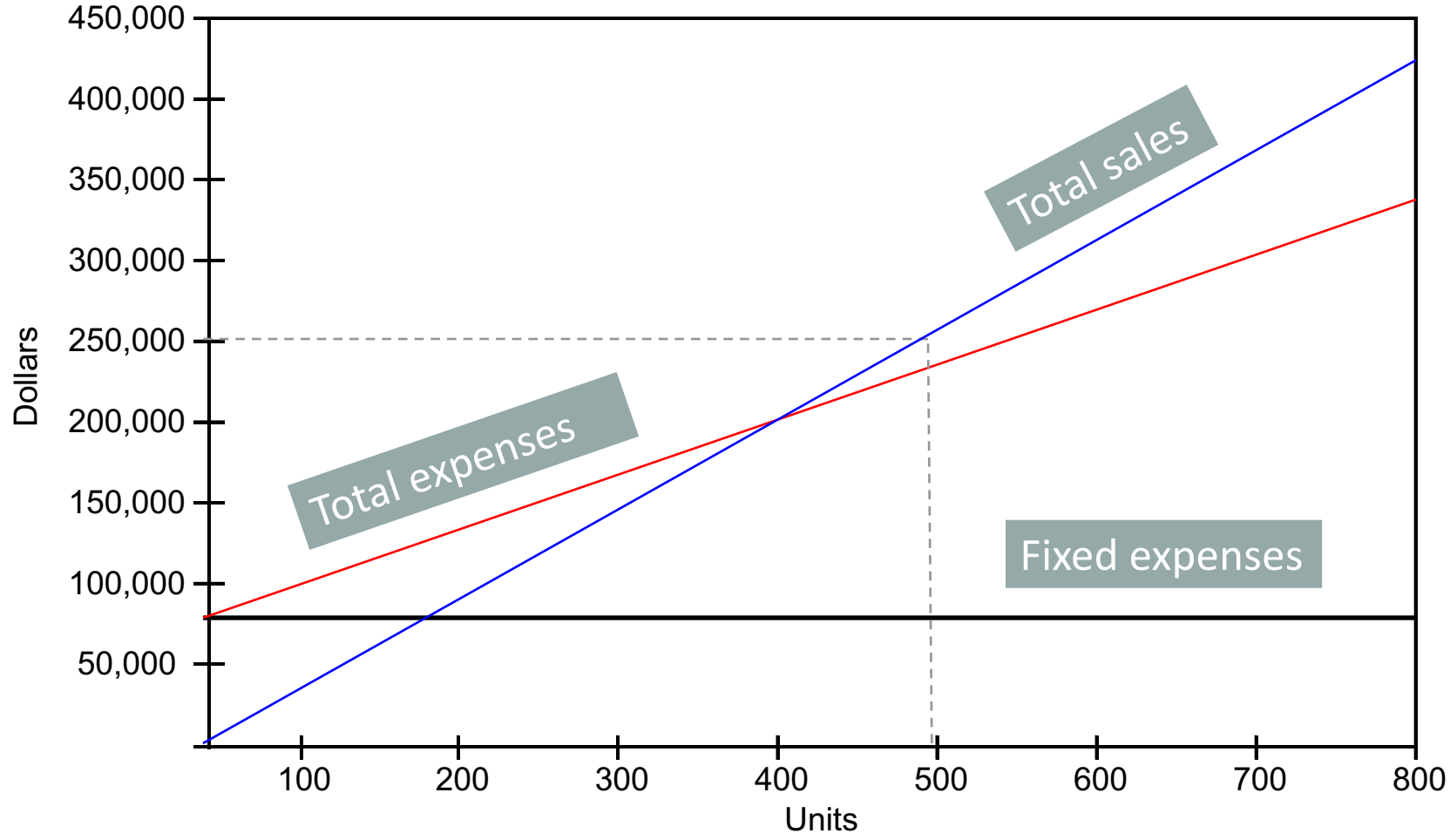

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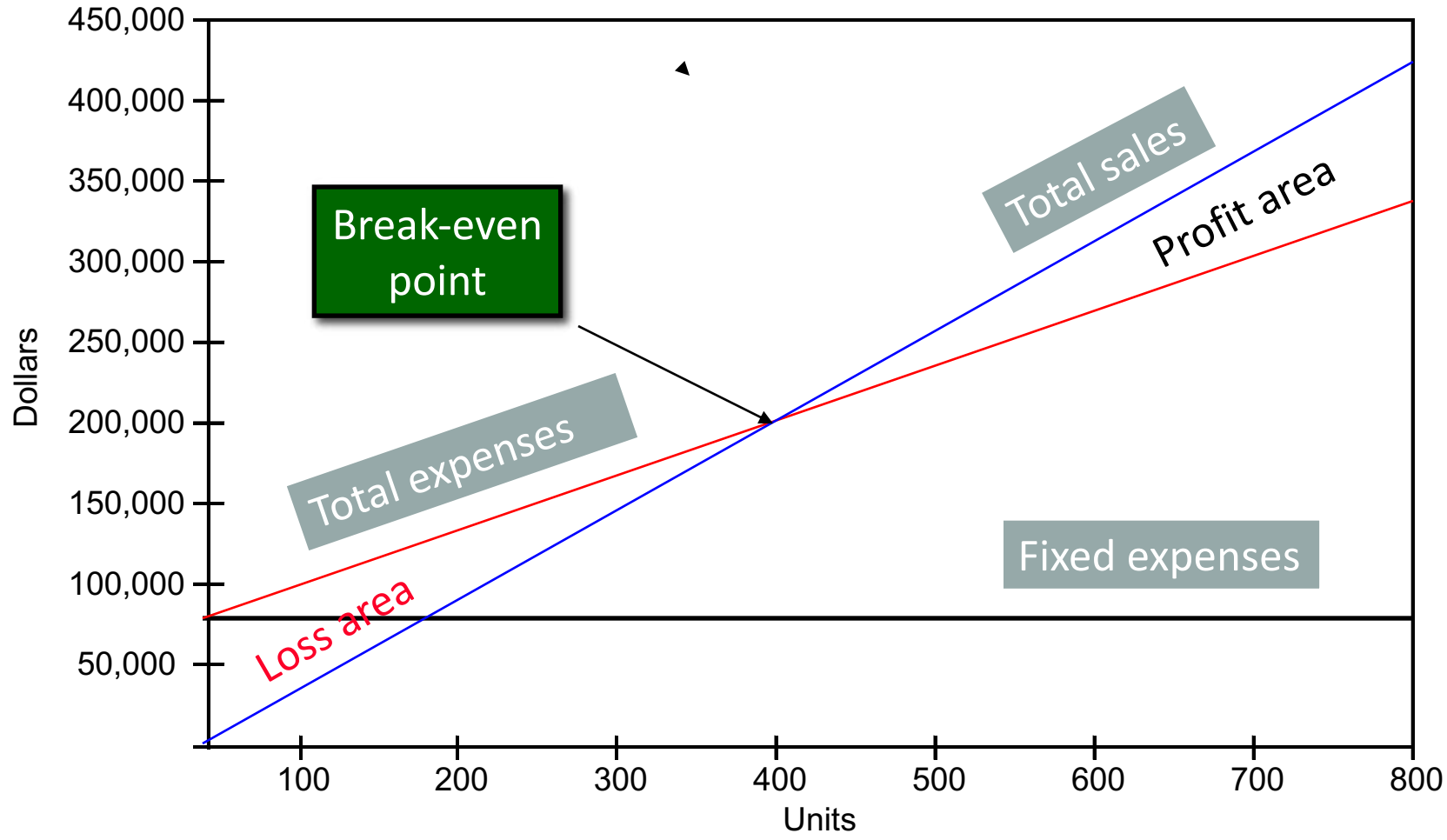
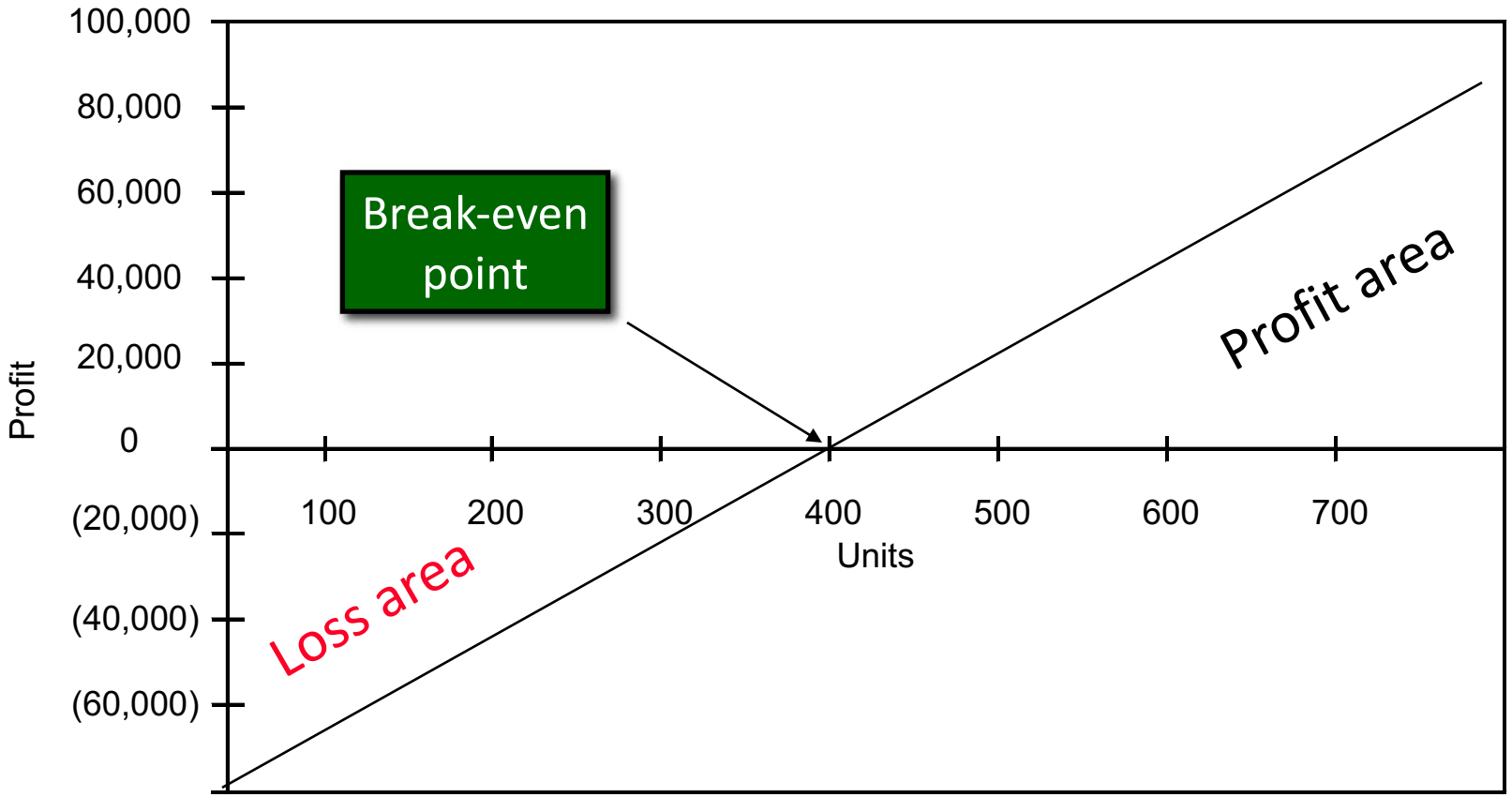
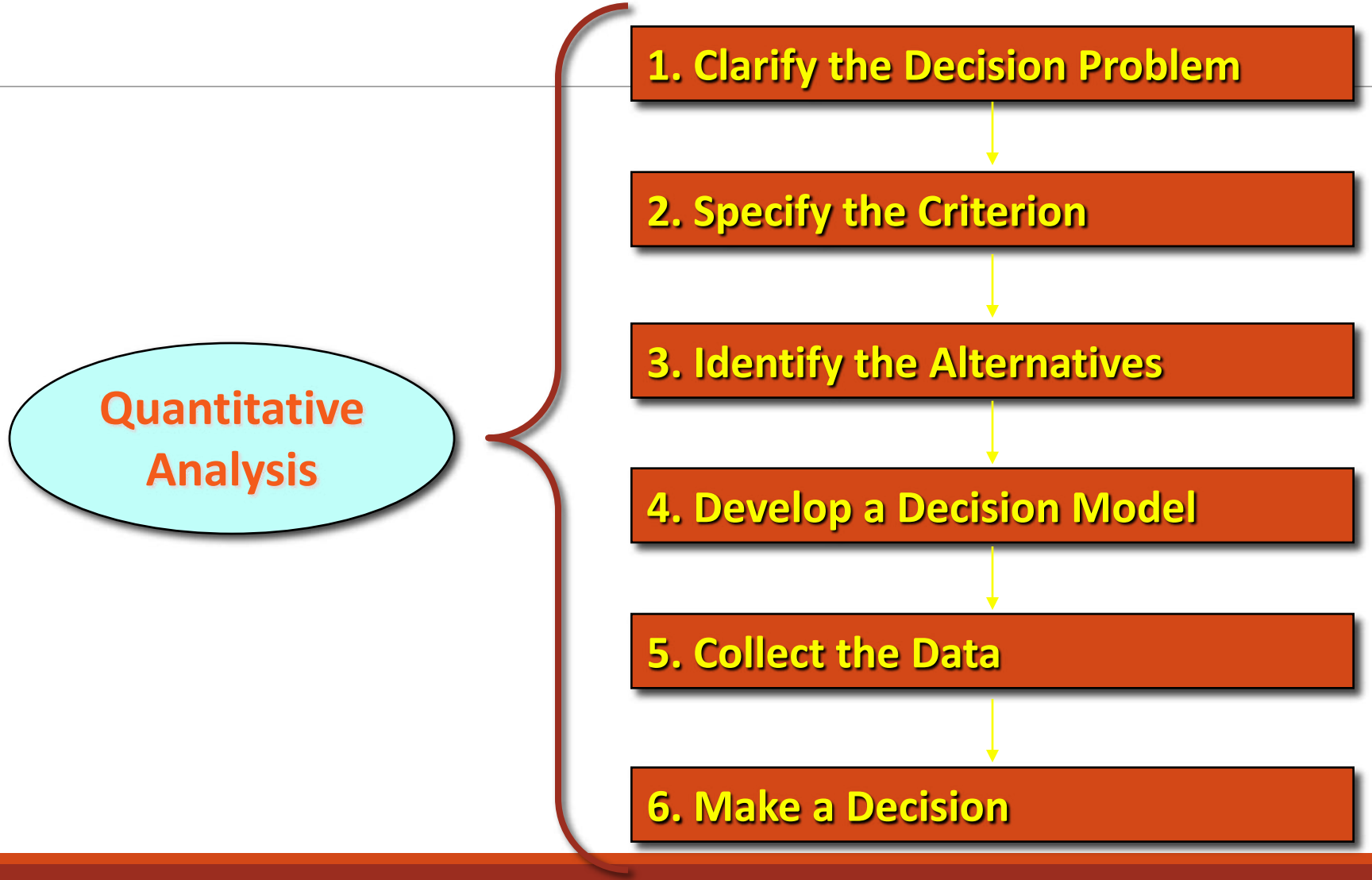


Profit-Volume Graph

Some managers like the profit-volume graph because it focuses on profits and volume.



The Decision-Making Process



Relevant Information

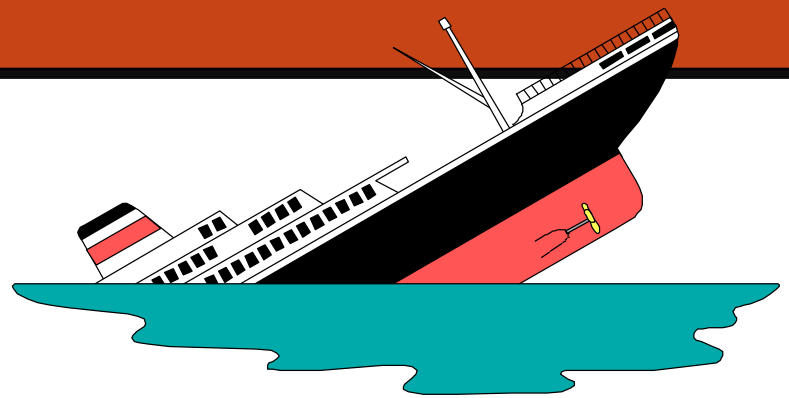
Information is relevant to a decision problem when . . .

1. It has a bearing on the future,
2. It differs among competing alternatives.

Identifying Relevant Costs and Benefits

Sunk costs

Costs that have already been incurred. They do not affect any future cost and cannot be changed by any current or future action.



Sunk costs are irrelevant to decisions.

Relevant Costs - Example

Worldwide Airways is thinking about replacing a three year old loader with a new, more efficient loader.

New loader	
List price	$ 15,000
Annual operating expenses	45,000
Expected life in years	1
Old loader	
Original cost	$100,000
Remaining book value	25,000
Disposal value now	5,000
Annual variable expenses	80,000
Remaining life in years	1

Relevant Costs

If we keep the old loader, we will have depreciation costs of $25,000. If we replace the old loader, we will write-off the $25,000 when sold. There is no difference in the cost, so it is **not relevant**.

We will only have depreciation on the new loader if we replace the old loader. This cost is **relevant**.

The $5,000 proceeds will only be realized if we replace the old loader. This amount is **relevant**.

The new loader will be depreciated in one year.

Relevant Costs

	Keep Old Loader	Replace Old Loader	Differential Cost
Depreciation of old loader	$ 25,000		
Write-off of old loader		$ 25,000	$ -
Proceeds from sale of old loader		(5,000)	5,000
Depreciation of new loader		15,000	(15,000)
Operating costs	80,000	45,000	35,000
Total costs	$105,000	$ 80,000	$ 25,000

The difference in operating costs is relevant to the immediate decision.

Relevant Costs

Here is an analysis that includes only relevant costs:

Relevant Cost Analysis	
Savings in variable expenses provided by the new loader	$35,000
Cost of the new loader	(15,000)
Disposal value of old loader	5,000
Net effect	$25,000

Analysis of Special Decisions

Let's take a close look at some special decisions faced by many businesses.

Accept or Reject a Special Order

A travel agency offers Worldwide Airways $150,000 for a round-trip flight from Hawaii to Japan on a jumbo jet.

Worldwide usually gets $250,000 in revenue from this flight.

The airline is not currently planning to add any new routes and has two planes that are idle and could be used to meet the needs of the agency.

The next screen shows cost data developed by managerial accountants at Worldwide.

Accept or Reject a Special Order

Typical Flight Between Japan and Hawaii		
Revenue:		
Passenger	$ 250,000	
Cargo	30,000	
Total		$ 280,000
Expenses:		
Variable expenses	90,000	
Allocated fixed expenses	100,000	
Total		190,000
Profit		$ 90,000

Worldwide will save $5,000 in reservation and ticketing costs if the charter is accepted.

Accept or Reject a Special Order

Assumes excess capacity

Special price for charter		$ 1,50,000
Variable cost per flight	$ 90,000	
Reservation cost savings	(5,000)	
Variable cost of charter		85,000
Contribution from charter		$ 65,000

Since the charter will contribute to fixed costs and Worldwide has idle capacity, the company should accept the flight.

Accept or Reject a Special Order

What if Worldwide had no excess capacity?

If Worldwide adds the charter, it will have to cut its least profitable route that currently contributes $80,000 to fixed costs and profits. Should Worldwide still accept the charter?

Accept or Reject a Special Order

Assumes no excess capacity		
Special price for charter		$ 150,000
Variable cost per flight	$ 90,000	
Reservation cost savings	(5,000)	
Variable cost of charter	85,000	
Opportunity cost:		
Lost contribution on route	80,000	165,000
Total		$ (15,000)

Worldwide has no excess capacity, so it should reject the special charter.

Accept or Reject a Special Order

With excess capacity . . .

- Relevant costs will usually be the variable costs associated with the special order.

Without excess capacity . . .

- Same as above but opportunity cost of using the firm's facilities for the special order are also relevant.

Outsource a Product or Service

A decision concerning whether an item should be produced internally or purchased from an outside supplier is often called a "make or buy" decision.

Let's look at another decision faced by the management of Worldwide Airways.

Outsource a Product or Service

An Atlanta bakery has offered to supply the in-flight desserts for 21¢ each.

Here are Worldwide's current cost for desserts:

Variable costs:		
Direct material	$	0.06
Direct labor		0.04
Variable overhead		0.04
Fixed costs:		
Supervisory salaries		0.04
Depreciation of equipment		0.07
Total cost per dessert	$	0.25

Outsource a Product or Service

Not all of the allocated fixed costs will be saved if Worldwide purchases from the outside bakery.

	Cost per Dessert	Savings from Outsourcing
Variable costs:		
Direct material	$ 0.06	$ 0.06
Direct labor	0.04	0.04
Variable overhead	0.04	0.04
Fixed costs:		
Supervisory salaries	0.04	0.01
Equipment depreciation	0.07	-
Total cost per dessert	$ 0.25	$ 0.15

Outsource a Product or Service

If Worldwide purchases the dessert for 21¢, it will only save 15¢ so Worldwide will have a loss of 6¢ per dessert purchased.

Add or Drop a Service, Product, or Department

One of the most important decisions managers make is whether to add or drop a product, service, or department.

Let's look at how the concept of relevant costs should be used in such a decision.

Add or Drop a Product

Worldwide Airways offers its passengers the opportunity to join its World Express Club.

Club membership entitles a traveler to use the club facilities at the airport in Atlanta.

Club privileges include a private lounge and restaurant, discounts on meals and beverages, and use of a small health spa.

Add or Drop a Product

Sales	$200,000
Less: Variable Costs:	
Food/Beverage	$70,000
Personnel	40,000
Variable overhead	25,000
	(135,000)
Contribution Margin	65,000
Less: Fixed Costs:	
Depreciation	$30,000
Supervisor salary	20,000
Insurance	10,000
Airport fees	5,000
Allocated overhead	10,000
	(75,000)
Loss	$ (10,000)

Add or Drop a Product

	KEEP CLUB	ELIMINATE	DIFFERENTIAL
Sales	$200,000	0	$200,000
Food/Beverage	(70,000)	0	(70,000)
Personnel	(40,000)	0	(40,000)
Variable overhead	(25,000)	0	(25,000)
Contribution Margin	**65,000**	**0**	**65,000**
Depreciation	**(30,000)**	**(30,000)**	**0**
Supervisor salary	(20,000)	0	(20,000)
Insurance	**(10,000)**	**(10,000)**	**0**
Airport fees	(5,000)	0	(5,000)
Allocated overhead	**(10,000)**	**(10,000)**	**0**
Loss	$ (10,000)	$(50,000)	$ 40,000

Conclusion

KEEP THE CLUB OPEN!

Contribution margin from general airline operations that will be forgone if club is eliminated	$ 60,000	–0–	$ 60,000
Profit/Loss	$ 40,000	–0–	$ 40,000
Monthly profit of KEEPING the club open			**$100,000**

The Opportunity Cost of lost contribution margin is $60,000.

Worldwide is better off by $100,000 per month by keeping its club open.

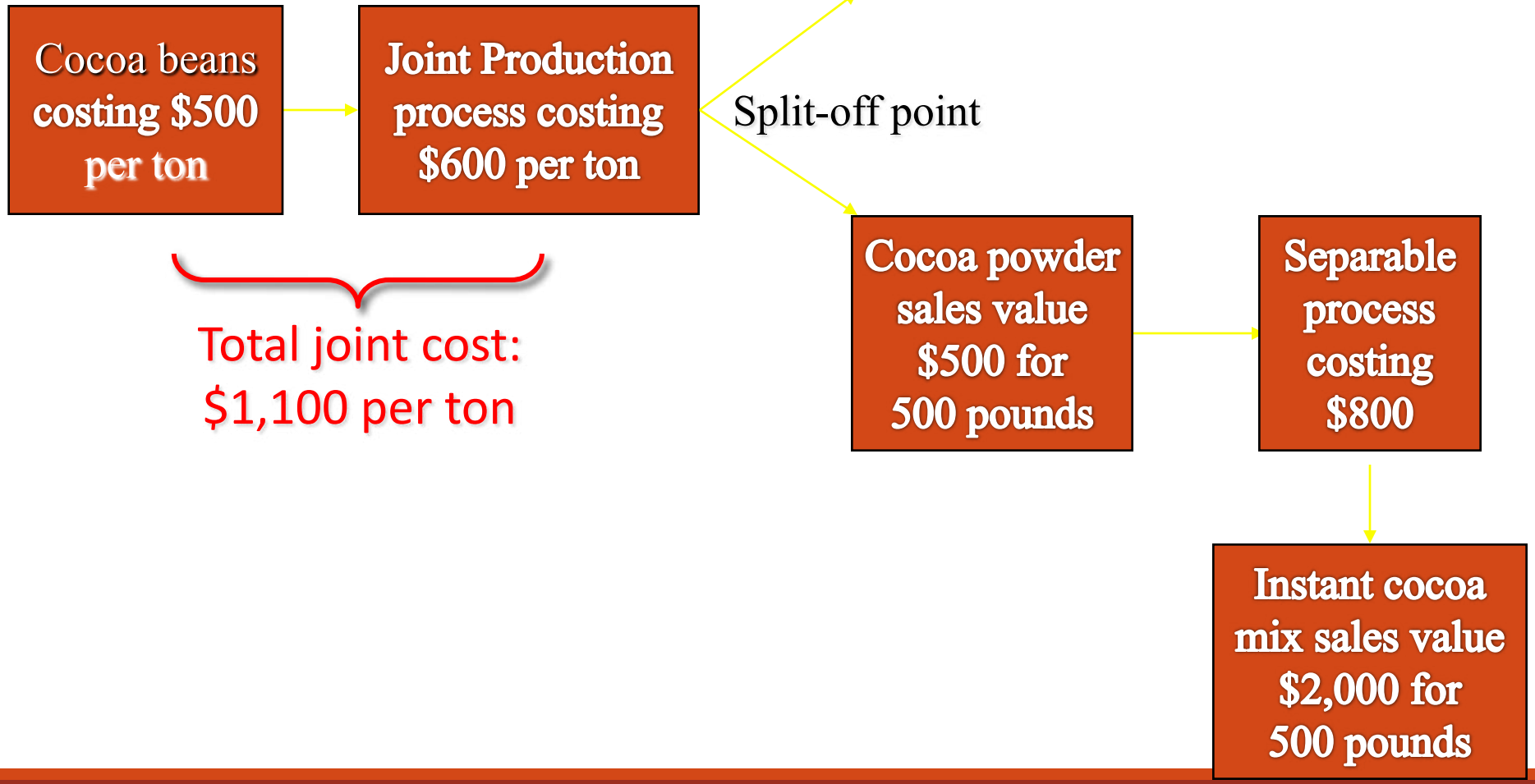
Special Decisions in Manufacturing Firms

Joint Products:

Sell or Process Further

A joint production process resulting in two or more products. The point in the production process where the joint products are identifiable as separate products is called the split-off point.

Joint Processing of Cocoa Bean



Joint Products

Relative Sales Value Method

Joint Costs	Joint Products	Sales Value at Split-Off	Relative Proportion	Allocation of Joint Costs
$ 1,100	Cocoa Butter	$ 750	60%	$ 660
	Cocoa Powder	500	40%	440
		$ 1,250	100%	$ 1,100

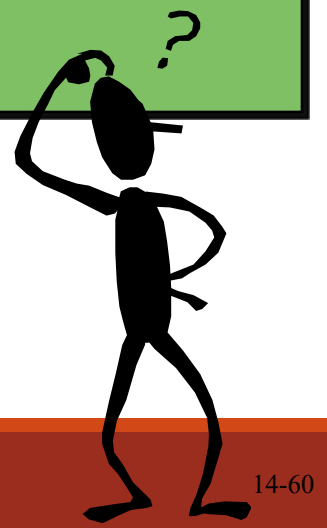
$750 ÷ $1,250 = 60%

60% × $1,100 = $660

Joint Products

Cocoa butter is sold at the end of the joint processing.

Cocoa powder may be sold now or processed into instant cocoa mix. Further processing costs of $800 will be incurred if the company elects to make instant cocoa mix.



Joint Products

Process Further		
Sales value of instant cocoa mix	$	2,000
Sales value of cocoa powder		(500)
Incremental revenue	$	1,500
Less: separable processing costs		(800)
Net benefit of further processing	$	700

The cocoa powder should be processed into instant cocoa mix.

Decisions Involving Limited Resources

Firms often face the problem of deciding how limited resources are going to be used.

Usually, fixed costs are not affected by this decision, so management can focus on maximizing total contribution margin.

Let's look at the Martin, Inc. example.

Limited Resources

Martin, Inc. produces two products and selected data are shown below:

	Products			
	Webs		Highs	
Selling price per unit	$ 60		$ 50	
Less: variable expenses per unit	36		35	
Contribution margin per unit	$ 24		$ 15	
Current demand per week (units)	2,000		2,200	
Contribution margin ratio	40%		30%	
Processing time required on the lathe per unit	1.00	min.	0.50	min.

Limited Resources

The lathe is the scarce resource because there is excess capacity on other machines. The lathe is being used at 100% of its capacity.

The lathe capacity is 2,400 minutes per week.

Should Martin focus its efforts on Webs or Highs?

Limited Resources

Let's calculate the contribution margin per unit of the scarce resource, the lathe.

		Products			
		Webs		Highs	
Contribution margin per unit		$ 24		$ 15	
Time required to produce one unit	÷	1.00	min.	0.50	min.
Contribution margin per minute		$ 24	min.	$ 30	min.

Highs should be emphasized. It is the more valuable use of the scarce resource, the lathe, yielding a contribution margin of $30 per minute as opposed to $24 per minute for the Webs.

If there are no other considerations, the best plan would be to produce to meet current demand for Highs and then use remaining capacity to make Webs.

Limited Resources

Let's see how this plan would work.

Allotting the Scarce Resource – The Lathe

Weekly demand for Highs	2,200 units
Time required per unit	x .50 minutes
Time required to make Highs	1,100 minutes
Total lathe time available	2,400 minutes
Time used to produce Highs	1,100 minutes
Time available for Webs	1,300 minutes
Time required per unit	x 1.00 minute
Production of Webs	1,300 units

Limited Resources

According to the plan, Martin will produce 2,200 Highs and 1,300 Webs. Martin's contribution margin looks like this.

	Webs	Highs
Production and sales (units)	1,300	2,200
Contribution margin per unit	$ 24	$ 15
Total contribution margin	$ 31,200	$ 33,000

The total contribution margin for Martin, Inc. is $64,200. Any other combination would result in less contribution.

Wish you BEST for all your future endeavors!!!