



# Relevant Costs for Decision Making

At the time of the first walk on the moon, a reporter asked one of the astronauts if he had been nervous when he was strapped into his seat before going into space.

"Well." the astronaut said, "of course I was. Who wouldn't be? There I was. sitting on top of 9,999 parts and bits—each of which had been made by the lowest bidder!"

# Cost Concepts for Decision Making

A **relevant cost** is a cost that differs between alternatives.



# Identifying Relevant Costs

Costs that can be eliminated (in whole or in part) by choosing one alternative over another are **avoidable** costs. Avoidable costs are relevant costs.

**Unavoidable costs are never relevant and include:**

- ① Sunk costs.
- ② Future costs that **do not differ** between the alternatives.

# Identifying Relevant Costs

Cynthia, a Boston student, is considering visiting her friend in New York. She can drive or take the train. By car it is 230 miles to her friend's apartment. She is trying to decide which alternative is less expensive and has gathered the following information:

Automobile Costs (based on 10,000 miles driven per year)		
	Annual Cost of Fixed Items	Cost per Mile
1 Annual straight-line depreciation on car	\$ 2,800	\$ 0.280
2 Cost of gasoline		0.050
3 Annual cost of auto insurance and license	1,380	0.138
4 Maintenance and repairs		0.065
5 Parking fees at school	360	0.036
6 Total average cost		\$ 0.569

\$45 per month × 8 months

\$1.60 per gallon ÷ 32 MPG

\$18,000 cost – \$4,000 salvage value ÷ 5 years

# Identifying Relevant Costs

## Automobile Costs (based on 10,000 miles driven per year)

	Annual Cost of Fixed Items	Cost per Mile
1 Annual straight-line depreciation on car	\$ 2,800	\$ 0.280
2 Cost of gasoline		0.050
3 Annual cost of auto insurance and license	1,380	0.138
4 Maintenance and repairs		0.065
5 Parking fees at school	360	0.036
6 Total average cost		<u>\$ 0.569</u>

## Some Additional Information

7 Reduction in resale value of car per mile of wear	\$ 0.026
8 Round-trip train fare	\$ 104
9 Benefits of relaxing on train trip	????
10 Cost of putting dog in kennel while gone	\$ 40
11 Benefit of having car in New York	????
12 Hassle of parking car in New York	????
13 Per day cost of parking car in New York	\$ 25

# Identifying Relevant Costs

Which costs and benefits are relevant in Cynthia's decision?

The cost of the car is a sunk cost and is not relevant to the current decision.

The annual cost of insurance is not relevant. It will remain the same if she drives or takes the train.

However, the cost of gasoline is clearly relevant if she decides to drive. If she takes the drive the cost would now be incurred, so it varies depending on the decision.

# Identifying Relevant Costs

Which costs and benefits are relevant in Cynthia's decision?

The cost of maintenance and repairs is relevant. In the long-run these costs depend upon miles driven.

The monthly school parking fee is not relevant because it must be paid if Cynthia drives or takes the train.

At this point, we can see that some of the average cost of \$0.569 per mile are relevant and others are not.

# Identifying Relevant Costs

Which costs and benefits are relevant in Cynthia's decision?

The decline in resale value due to additional miles is a relevant cost.

The round-trip train fare is clearly relevant. If she drives the cost can be avoided.

Relaxing on the train is relevant even though it is difficult to assign a dollar value to the benefit.

The kennel cost is not relevant because Cynthia will incur the cost if she drives or takes the train.

# Identifying Relevant Costs

Which costs and benefits are relevant in Cynthia's decision?

The cost of parking is relevant because it can be avoided if she takes the train.

The benefits of having a car in New York and the problems of finding a parking space are both relevant but are difficult to assign a dollar amount.

# Identifying Relevant Costs

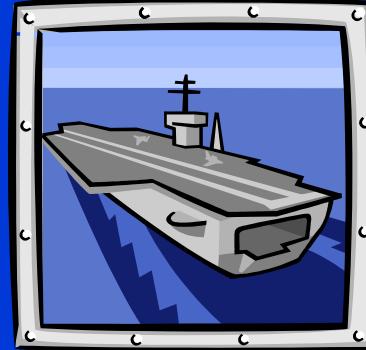
From a financial standpoint, Cynthia would be better off taking the train to visit her friend. Some of the non-financial factors may influence her final decision.

Relevant Financial Cost of Driving	
Gasoline (460 @ \$0.050 per mile)	\$ 23.00
Maintenance (460 @ \$0.065 per mile)	29.90
Reduction in resale (460 @ \$0.026 per mile)	11.96
Parking in New York (2 days @ \$25 per day)	50.00
<b>Total</b>	<b><u>\$ 114.86</u></b>

Relevant Financial Cost of Taking the Train	
Round-trip ticket	<u>\$ 104.00</u>

# Note

- Do not underestimate the importance and power of the relevant cost idea.

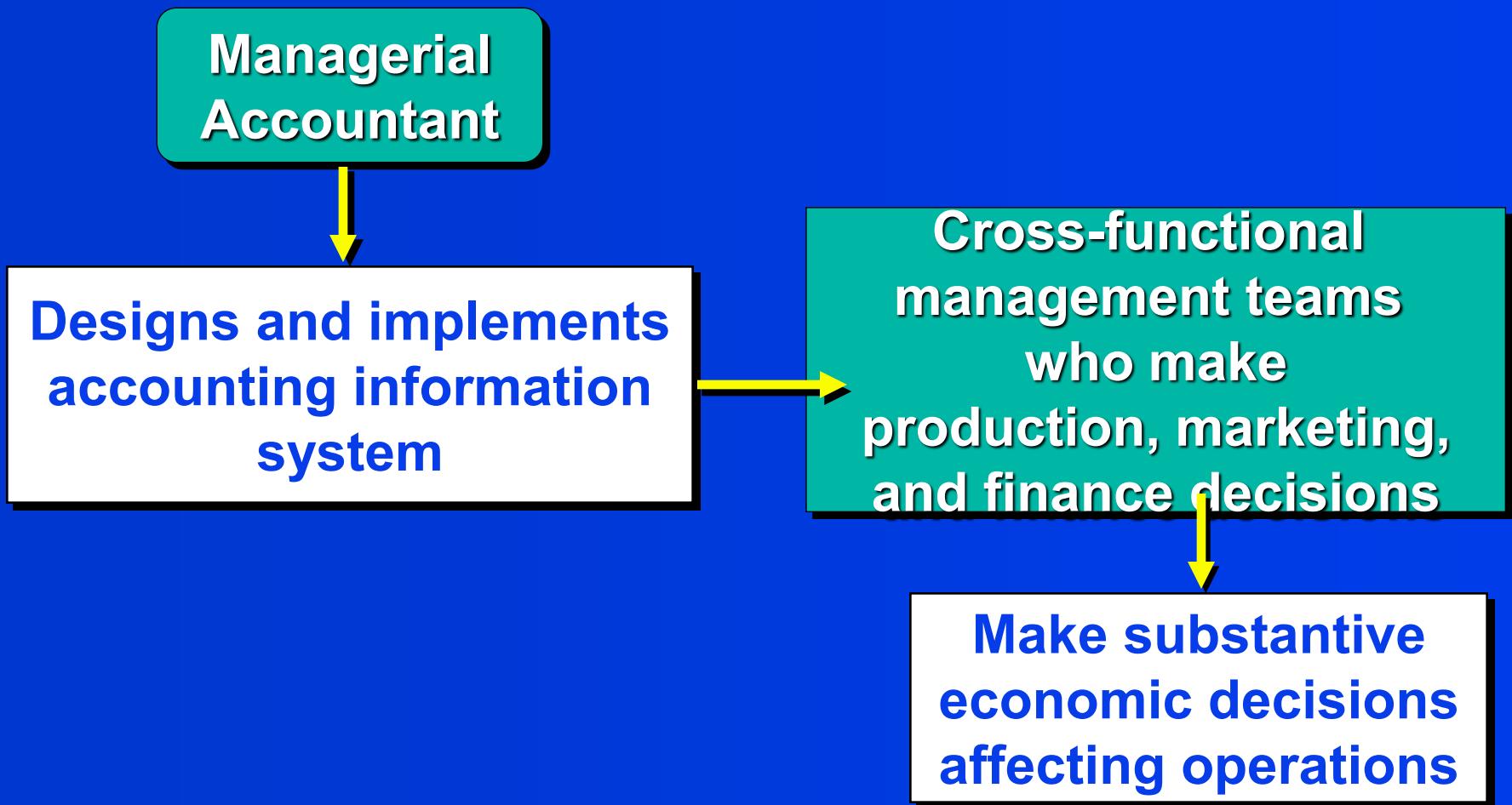


- Most costs (and benefits) do not differ between alternatives. This allows you to focus on the few things that matter.
- This principle also helps avoid mistakes.

# Information and the decision process

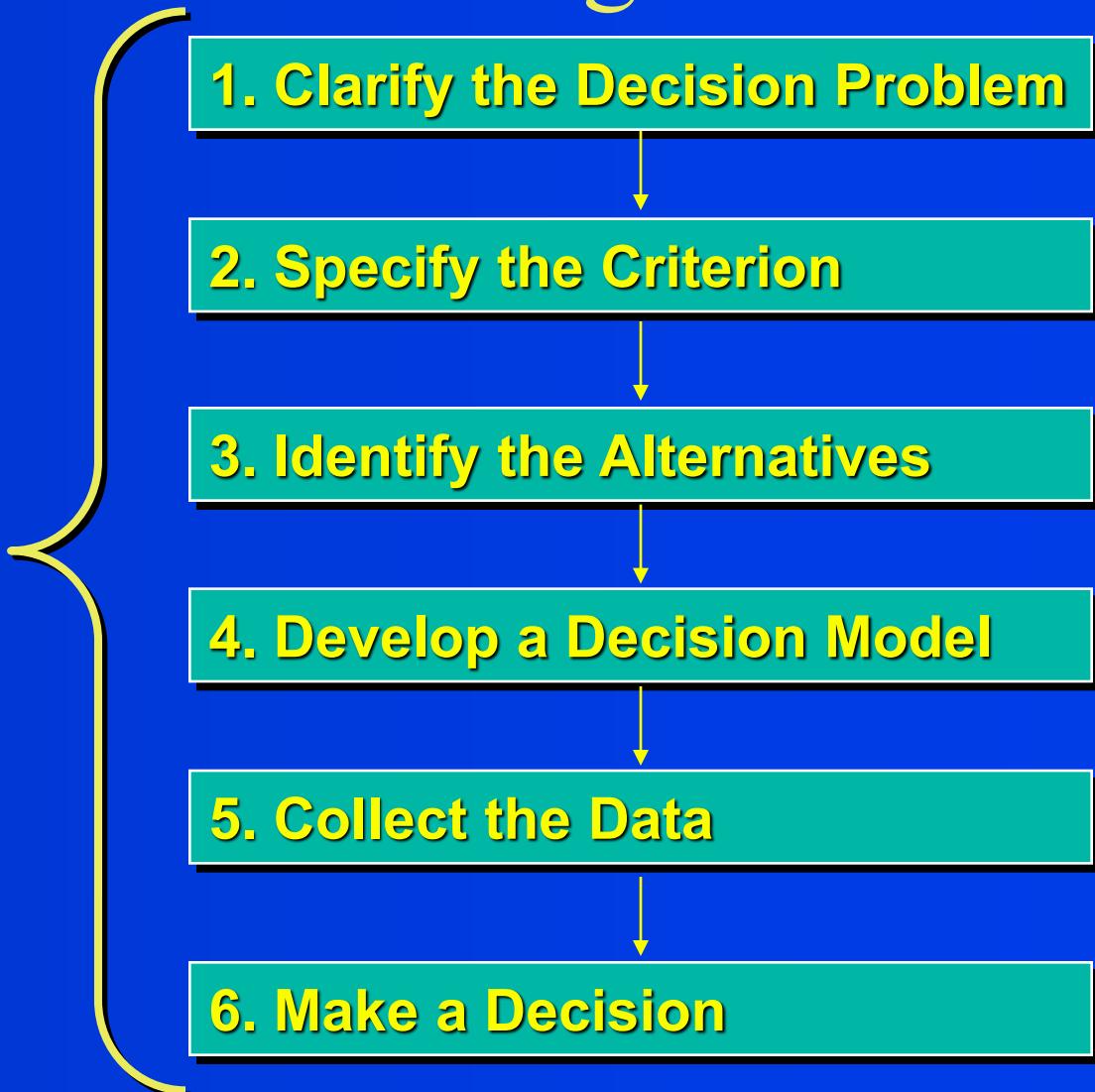
- Managers usually follows a decision model for choosing among different courses of action.
- A decision model is a formal method of making a choice, and it often involves both quantitative and qualitative analyses.
- Managers normally uses the five step decision making process

# The Managerial Accountant's Role in Decision Making



# The Decision-Making Process

**Quantitative  
Analysis**

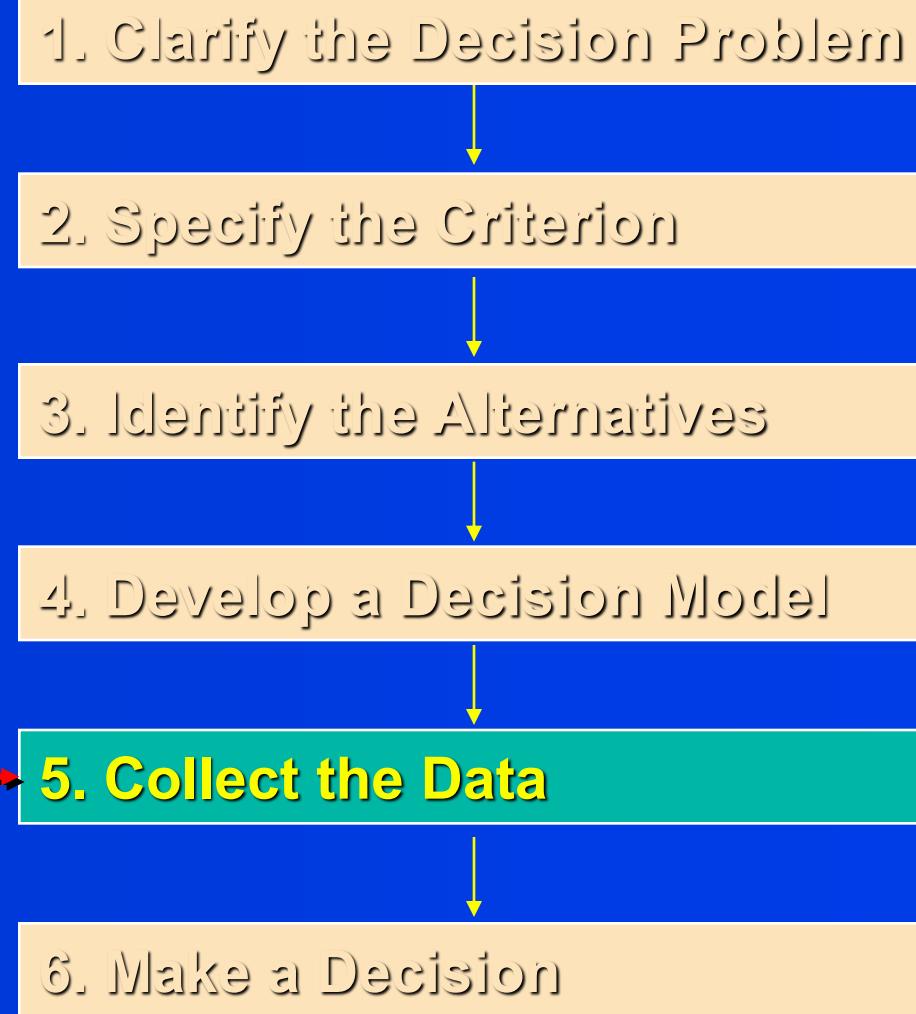


# The Decision-Making Process

Primarily the responsibility of the managerial accountant.

Information should be:

1. Relevant
2. Accurate
3. Timely



# The Decision-Making Process

## Relevant

Pertinent to a decision problem.

## Accurate

Information must be precise.

## Timely

Available in time for a decision

1. Clarify the Decision Problem



2. Specify the Criterion



3. Identify the Alternatives



4. Develop a Decision Model

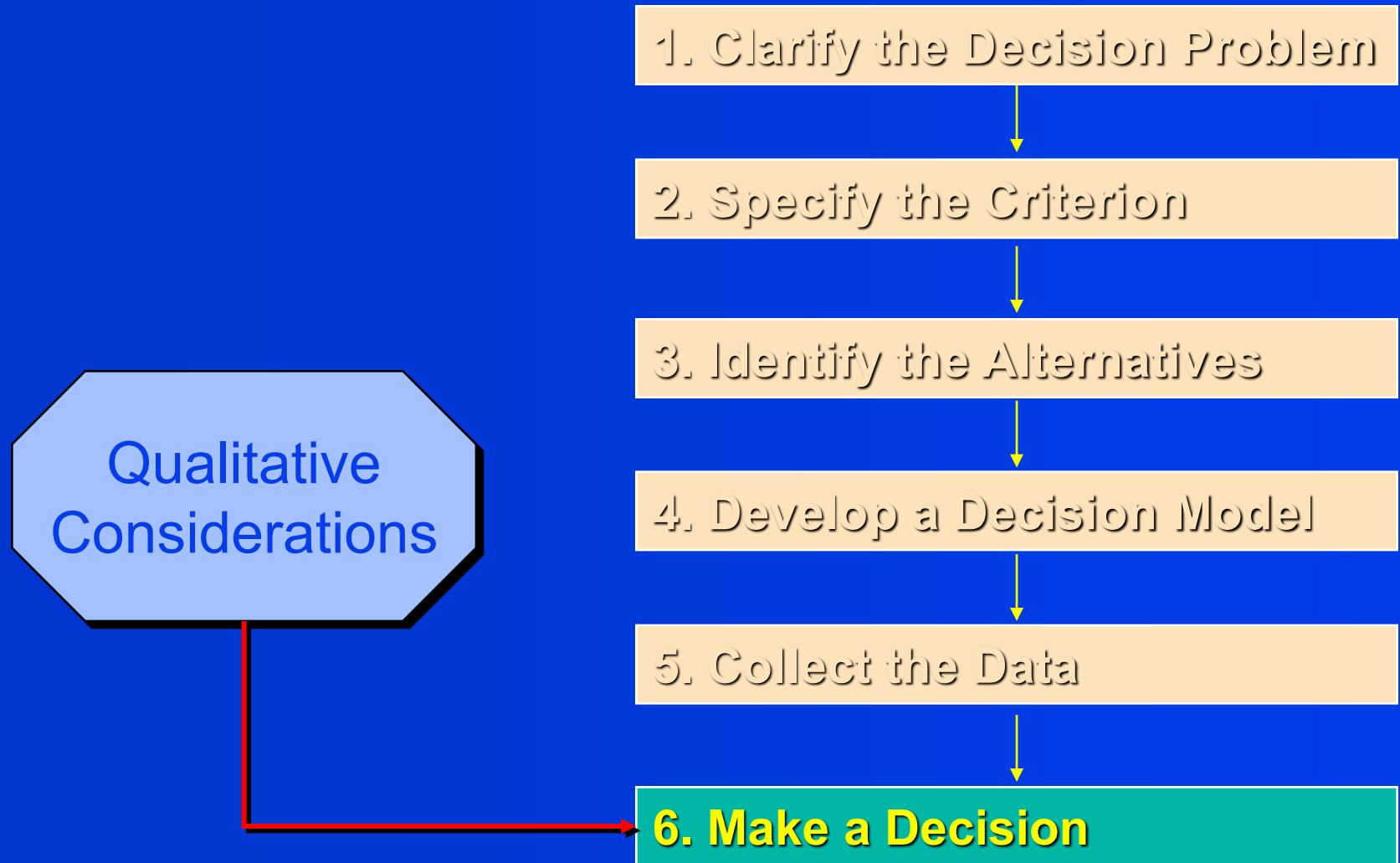


5. Collect the Data



6. Make a Decision

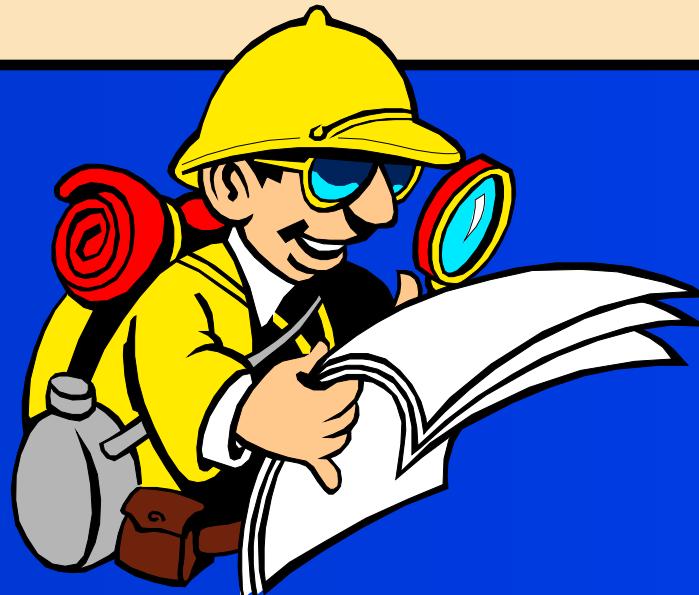
# The Decision-Making Process



# Relevant Information

**Information is relevant to a decision problem when . . .**

- It has a bearing on the future,**
- 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

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

	Keep Old Loader	Replace Old Loader	Differential Cost
Depreciation of old loader	\$ 25,000		
Write-off of old loader		\$ 25,000	\$ -
Proceeds			
Depreciation			
Operating			
Total cost			

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**.

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			
Operating costs			
Total cost			

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

# 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			
Total costs			

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

# 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	<u>\$ 105,000</u>	<u>\$ 80,000</u>	<u>\$ 25,000</u>

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

# Relevant Costs

Here is an analysis that includes only relevant costs:

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

- Consider a strategic decision facing management at precision sporting goods, a manufacturer of golf clubs: Should it recognize its manufacturing operations to reduce manufacturing labour costs? Assume that there are only two alternatives: do not recognize or recognize.
  
- The reorganization will eliminate all manual handling of materials. The current manufacturing labour consists of 20 workers – 15 workers operate machines, and 5 workers handle materials. The 5 materials – handling workers have been hired on contracts that permit layoffs without additional payments. Each worker works 2000 hours annually. The cost of reorganization (consisting mostly of new equipment leases) is predicted to be Rs.9,00,000 each year. The predicted production output of 25,000 units will be unaffected by the decision. Also unaffected will be predicted selling price of rS.2500, the direct material cost per unit of rS.500, manufacturing overhead of Rs.75,00,000 and marketing costs of Rs.2,00,00,000. Labour are paid \$160 per hour

	All Revenues and Costs		Relevant Revenues and Costs	
	Alternative 1: Do Not Reorganize	Alternative 2: Reorganize	Alternative 1: Do Not Reorganize	Alternative 2: Reorganize
Revenues <sup>a</sup>	Rs 6,25,00,000	Rs 6,25,00,000	—	—
Costs:				
Direct materials <sup>b</sup>	Rs 1,25,00,000	Rs 1,25,00,000	—	—
Manufacturing labor	Rs 64,00,000 <sup>c</sup>	Rs 48,00,000 <sup>d</sup>	Rs 64,00,000 <sup>c</sup>	Rs 48,00,000 <sup>d</sup>
Manufacturing overhead	Rs 75,00,000	Rs 75,00,000	—	—
Marketing	Rs 2,00,00,000	Rs 2,00,00,000	—	—
Reorganization costs	—	Rs 9,00,000	—	Rs 9,00,000
Total costs	Rs 4,64,00,000	Rs 4,57,00,000	Rs 64,00,000	Rs 57,00,000
Operating income	Rs 1,61,00,000	Rs 1,68,00,000	Rs (64,00,000)	Rs (57,00,000)
	{ Rs 7,00,000 Difference }		{ Rs 7,00,000 Difference }	

<sup>a</sup>25,000 units × Rs 2,500 per unit = Rs 6,25,00,000

<sup>b</sup>20 workers × 2,000 hours per worker × Rs 160 per hour = Rs 64,00,000

<sup>c</sup>25,000 units × Rs 500 per unit = Rs 1,25,00,000

<sup>d</sup>15 workers × 2,000 hours per worker × Rs 160 per hour = Rs 48,00,000

# Analysis of Special Decisions

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

**We just received  
a special order. Do  
you think we should  
accept it?**



# 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 about \$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	\$ 150,000
Variable cost per flight	\$ 90,000
Reservation cost savings	<u>(5,000)</u>
Variable cost of charter	<u>85,000</u>
Contribution from charter	<u><u>\$ 65,000</u></u>

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

The Bajaj is working at full production capacity producing 10,000 units of a unique product, Rosebo. Manufacturing cost per unit for Rosebo is as follows:

- Direct material ₹20
- Direct manufacturing labor 30
- Manufacturing overhead 50
- Total manufacturing cost 100 (Manufacturing overhead cost per unit is based on variable cost per unit of ₹20 and fixed costs of ₹3,00,000 (at full capacity of 10,000 units).
- Marketing cost, all variable, is ₹40 per unit, and the selling price is ₹200. A customer, the Royal Company, has asked Bajaj to produce 2,000 units of Orangebo, a modification of Rosebo. Orangebo would require the same manufacturing processes as Rosebo. Royal has offered to pay Bajaj ₹150 for a unit of Orangebo and half the marketing cost per unit.
- Required
  1. What is the opportunity Cost to Bajaj of producing the 2,000 units of Orangebo? (Assume that no overtime is worked.)
  2. The Reliable Corporation has offered to produce 2,000 units of Rosebo for Bajaj so that Bajaj may accept the Royal offer. That is, if Bajaj accepts the Reliable offer, Bajaj would manufacture 8,000 units of Rosebo and 2,000 units of Orangebo and purchase 2,000 units of Rosebo from Reliable. Reliable would charge Bajaj ₹140 per unit to manufacture Rosebo. On the basis of financial considerations alone, should Bajaj accept the Reliable offer? Show your calculations.
  3. Suppose Bajaj had been working at less than full capacity, producing 8,000 units of Rosebo at the time the Royal offer was made. Calculate the minimum price Bajaj should accept for Orangebo under these conditions. (Ignore the previous ₹150 selling price.)

# 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**

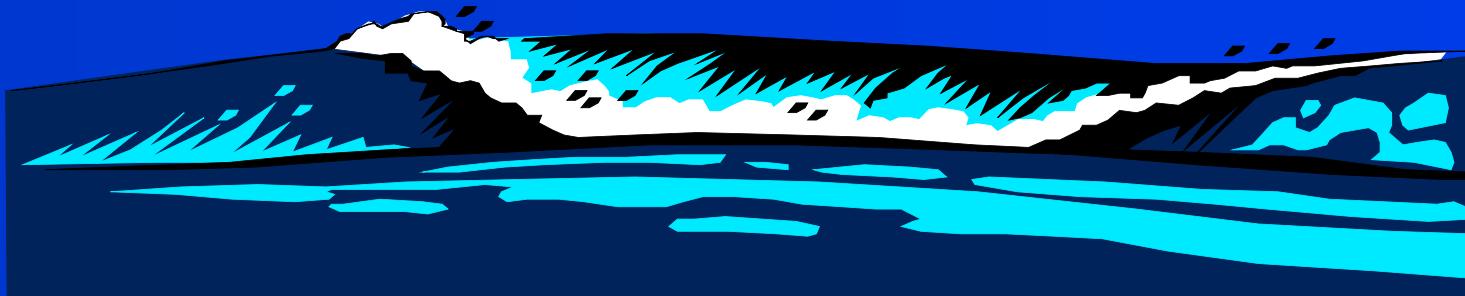
Special price for charter	\$ 150,000
Variable cost per flight	\$ 90,000
Reservation cost savings	<u>(5,000)</u>
Variable cost of charter	85,000
Opportunity cost:	
Lost contribution on route	<u>80,000</u>
Total	<u><u>\$ (15,000)</u></u>

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

# Accept or Reject a Special Order

With excess capacity . . .

- Relevant costs usually will 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
<b>Total cost per dessert</b>	<b>\$ 0.25</b>

# Outsource a Product or Service

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

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

# 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.



# Outsource a Product or Service

## Beware of Unit-Cost Data

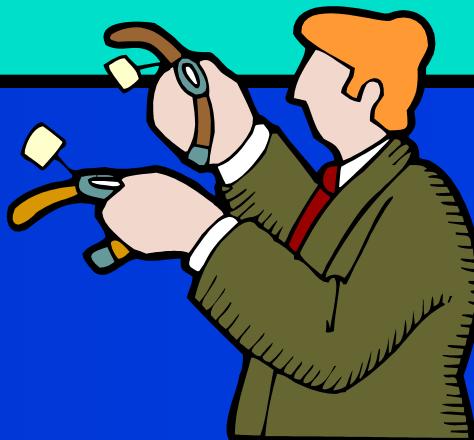
For decision-making purposes, unitized fixed costs can be misleading.



# Add or Drop a Service, Product, or Department

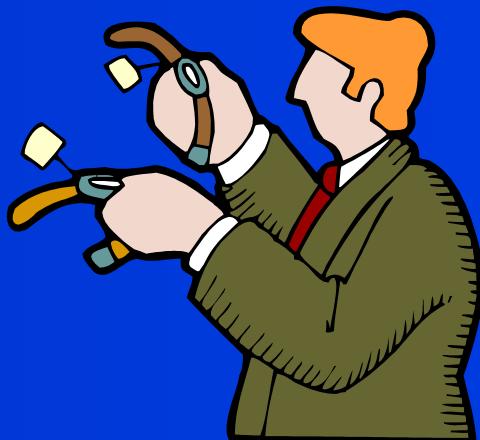
One of the most important decisions managers make is whether to add or drop a product, service or department.

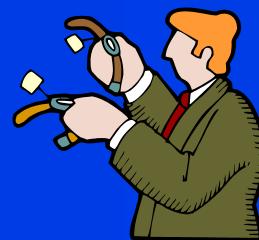
Let's look at how the concept of relevant costs should be used in such a decision.



# Add or Drop a Product

Due to the declining popularity of digital watches, Swick Company's digital watch line has not reported a profit for several years. An income statement for last year is shown on the next screen.

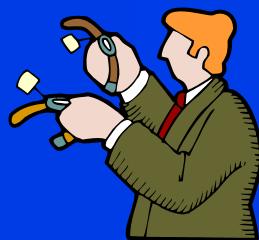




# Add or Drop a Product

## Segment Income Statement Digital Watches

<b>Sales</b>		<b>\$ 500,000</b>
<b>Less: variable expenses</b>		
<b>Variable mfg. costs</b>	<b>\$ 120,000</b>	
<b>Variable shipping costs</b>	<b>5,000</b>	
<b>Commissions</b>	<b>75,000</b>	<b>200,000</b>
<b>Contribution margin</b>		<b>\$ 300,000</b>
<b>Less: fixed expenses</b>		
<b>General factory overhead</b>	<b>\$ 60,000</b>	
<b>Salary of line manager</b>	<b>90,000</b>	
<b>Depreciation of equipment</b>	<b>50,000</b>	
<b>Advertising - direct</b>	<b>100,000</b>	
<b>Rent - factory space</b>	<b>70,000</b>	
<b>General admin. expenses</b>	<b>30,000</b>	<b>400,000</b>
<b>Net loss</b>		<b>\$ (100,000)</b>



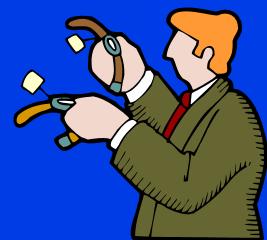
# Add or Drop a Product

## Segment Income Statement Digital Watches

If the digital watch line is dropped, the fixed general factory overhead and general administrative expenses will be allocated to other product lines because they are **not avoidable**.

### Less: fixed expenses

General factory overhead	\$ 60,000
Salary of line manager	90,000
Depreciation of equipment	50,000
Advertising - direct	100,000
Rent - factory space	70,000
General admin. expenses	30,000
	400,000
Net loss	\$ (100,000)



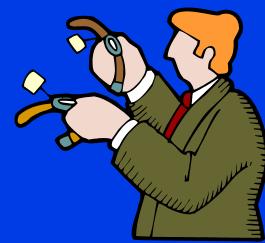
# Add or Drop a Product

## Segment Income Statement Digital Watches

Sales \$ 500,000

The equipment used to manufacture digital watches has no resale value or alternative use.

Variable shipping costs	\$ 3,000	
Commissions	75,000	200,000
Contribution margin		\$ 300,000
Less: fixed expenses		
General factory overhead	\$ 60,000	
Salary of line manager	90,000	
Depreciation of equipment	50,000	
Advertising - direct	100,000	
Rent - factory space	70,000	
General admin. expenses	30,000	400,000
Net loss		\$ (100,000)



# Add or Drop a Product

## Segment Income Statement Digital Watches

Sales	\$ 500,000
Less: variable costs	
Variable manufacturing	
Variable selling	
Commission	\$ 200,000
Contribution margin	\$ 300,000
Less: fixed expenses	
General factory	
Salary of manager	
Depreciation	
Advertising	
Rent - factory	
General admin. expenses	\$ 400,000
Net loss	\$ (100,000)

**Should Swick retain or drop  
the digital watch segment?**



# Add or Drop a Product

	Keep Watch	Drop Watch	Difference
<b>Sales</b>	<u>\$ 500,000</u>	_____	_____
<b>Less variable expenses:</b>			
Mfg. expenses	120,000	_____	_____
Freight out	5,000	_____	_____
Commissions	75,000	_____	_____
<b>Total variable expenses</b>	<u>200,000</u>	_____	_____
<b>Contribution margin</b>	<u>300,000</u>	_____	_____
<b>Less fixed expenses:</b>			
General factory overhead	60,000	_____	_____
Salary of line manager	90,000	_____	_____
Depreciation	50,000	_____	_____
Advertising - direct	100,000	_____	_____
Rent - factory space	70,000	_____	_____
General admin. expenses	<u>30,000</u>	_____	_____
<b>Total fixed expenses</b>	<u>400,000</u>	_____	_____
<b>Net loss</b>	<u><u>\$(100,000)</u></u>	_____	_____

# Add or Drop a Product

	Keep Watch	Drop Watch	Difference
<b>Sales</b>	<b>\$ 500,000</b>	<b>\$ -</b>	<b>\$ (500,000)</b>
<b>Less variable expenses:</b>			
Mfg. expenses	120,000	-	120,000
Freight out	5,000	-	5,000
Commissions	75,000	-	75,000
<b>Total variable expenses</b>	<b>200,000</b>	<b>-</b>	<b>200,000</b>
<b>Contribution margin</b>	<b>300,000</b>	<b>-</b>	<b>(300,000)</b>
<b>Less fixed expenses:</b>			
General factory overhead	60,000	60,000	-
Salary of line manager	90,000	-	90,000
Depreciation	50,000	50,000	-
Advertising - direct	100,000	-	100,000
Rent - factory space	70,000	-	70,000
General admin. expenses	30,000	30,000	-
<b>Total fixed expenses</b>	<b>400,000</b>	<b>140,000</b>	<b>260,000</b>
<b>Net loss</b>	<b><u><u>\$ (100,000)</u></u></b>	<b><u><u>\$ (140,000)</u></u></b>	<b><u><u>\$ (40,000)</u></u></b>

# Summary

## Summary

<b>Contribution margin lost if digital watches are dropped</b>	<b>\$ (300,000)</b>
<b>Less fixed costs that can be avoided</b>	
Salary of the line manager	\$ 90,000
Advertising - direct	100,000
Rent - factory space	<u>70,000</u>
<b>Net disadvantage</b>	<b><u>\$ (40,000)</u></b>

## DECISION RULE

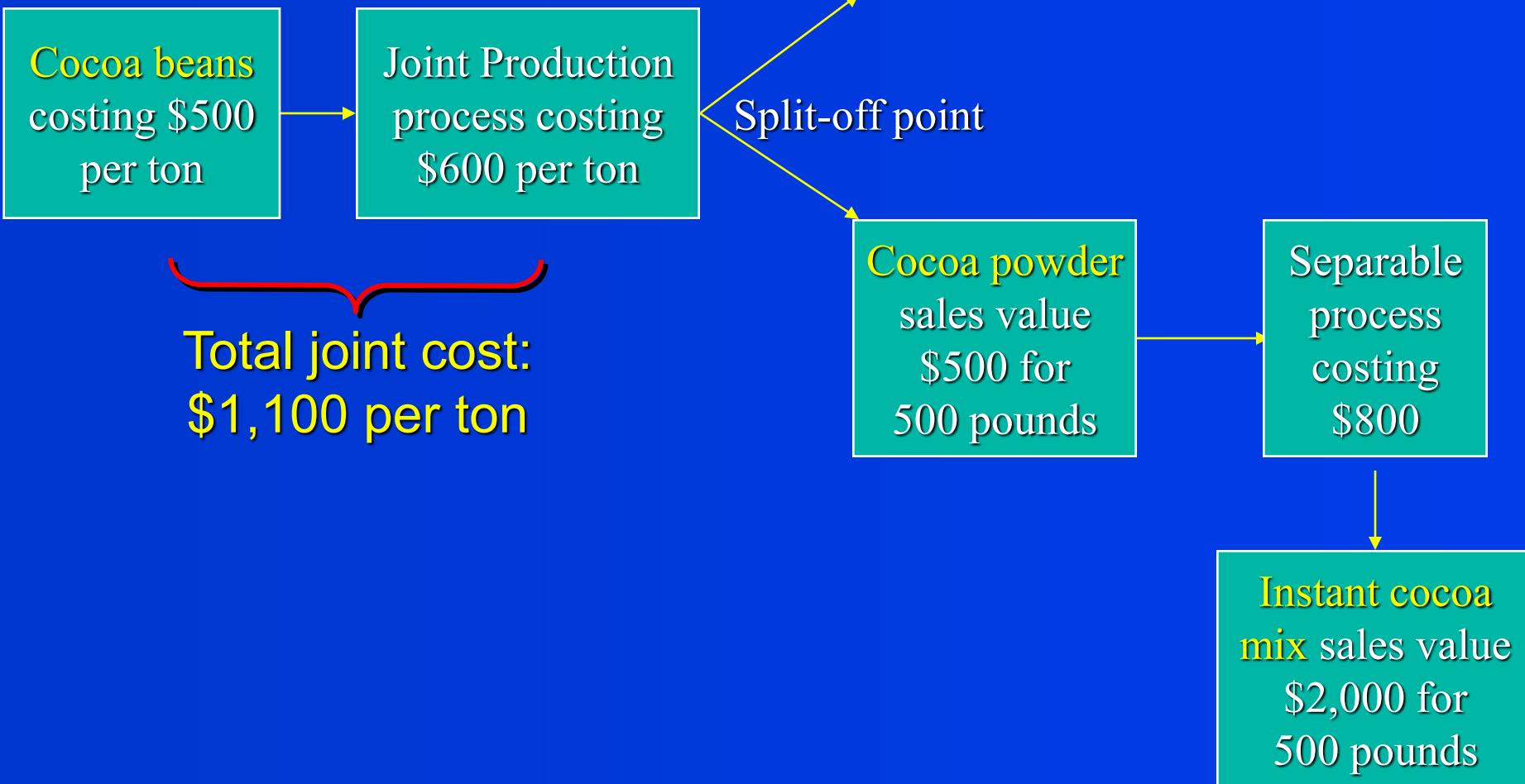
Swick should drop the digital watch segment only if its fixed cost savings exceed lost contribution margin.

# 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		
	Cocoa Powder	500		
		<hr/>	<hr/>	<hr/>
		\$ 1,250		

# 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%	
	Cocoa Powder			

$$\$750 \div \$1,250 = 60\%$$

# 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			

$$60\% \times \$1,100 = \$660$$

# 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

# 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

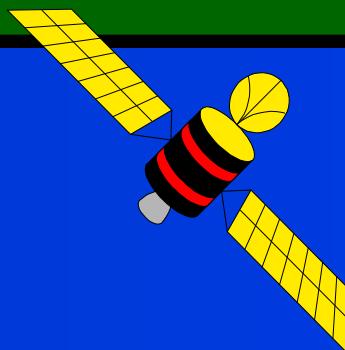
Process Further	
Sales value of instant cocoa mix	\$ 2,000
Sales value of cocoa powder	500
Incremental revenue	\$ 1,500
Less: separable processing costs	(800)
Net benefit of further processing	\$ 700

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 is shown below:

	Products	
	Webs	Higns
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.	half min min.

Only 2400 minutes are available on the lathe machine

**11-34 Relevant costs, contribution margin, product emphasis.** The Rainbows is a take-out food store, at a popular beach resort. Sudhir, owner of the Rainbows, is deciding how much refrigerator space to devote to four different drinks. Pertinent data on these four drinks are as follows:

	Cola	Lemonade	Punch	Natural Orange Juice
Selling price per case	₹180	₹192	₹264	₹384
Variable cost per case	135	152	201	302
Cases sold per foot of shelf space per day	25	24	4	5

Sudhir has a maximum front shelf-space of 12 feet to devote to the four drinks. He wants a minimum of 1 foot and a maximum of 6 feet of front shelf-space for each drink.

*Required*

1. Compute the contribution margin per case of each type of drink?
2. A co-worker of Sudhir's recommends that he maximize the shelf space devoted to those drinks with the highest contribution margin per case. Evaluate this recommendation.
3. What shelf-space allocation for the four drinks would you recommend for the Rainbows? Show your calculations.

Body-Builders, Inc., produces two basic types of weightlifting equipment, Model 19 and Model 14. The weight-lifting craze is such that enough of either Model 19 or Model 14 can be sold to keep the plant operating at full capacity. Both products are processed through the same production departments.

	A	B	C
1		Per Unit	
2		Model 19	Model 14
3	Selling Price	\$100.00	\$70.00
4	Costs		
5	Direct material	28.00	13.00
6	Direct manufacturing labor	15.00	25.00
7	Variable manufacturing overhead*	25.00	12.50
8	Fixed manufacturing overhead*	10.00	5.00
9	Marketing (all variable)	14.00	10.00
10	Total cost	92.00	65.50
11	Operating income	\$ 8.00	\$ 4.50
12			
13	*Allocated on the basis of machine-hours		

Which products should be produced?

Rainbows is a take-out food store, at a popular beach resort. Sudhir, owner of the Rainbows, is deciding how much refrigerator space to devote to four different drinks. Pertinent data on these four drinks are as follows:

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*Required*

# 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	Higns
Contribution margin per unit	\$ 24	?
Time required to produce one unit	÷ 1.00 min.	?
Contribution margin per minute	<u><u>\$ 24</u></u> min.	<u><u>?</u></u>

# 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	<u><u>\$ 24 min.</u></u>	<u><u>\$ 30 min.</u></u>

# 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	<u>\$ 24</u> min.	<u>\$ 30</u> 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.

# 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	<u>\$ 24</u> min.	<u>\$ 30</u> min.

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

# Limited Resources

Let's see how this plan would work.

## Alloting the Scarce Resource - The Lathe

<b>Weekly demand for Highs</b>	<b>2,200</b>	<b>units</b>
<b>Time required per unit</b>	<b>× 0.50</b>	<b>min.</b>
<b>Time required to make Highs</b>	<b>1,100</b>	<b>min.</b>
<b>Total time available</b>	<b>2,400</b>	<b>min.</b>
<b>Time used to make Highs</b>	<b>1,100</b>	<b>min.</b>
<b>Time available for Webs</b>	<b>1,300</b>	<b>min.</b>
<b>Time required per unit</b>	<b>÷ 1.00</b>	<b>min.</b>
<b>Production of Webs</b>	<b>1,300</b>	<b>units</b>

# 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.

# Theory of Constraints

Binding constraints can limit a company's profitability.

To relax constraints management can . . .

Outsource

Work overtime

Retrain employees

Reduce non-value-added activities

# Uncertainty

One common technique for addressing the impact of uncertainty is **sensitivity analysis** - a way to determine what would happen in a decision analysis if a key prediction or assumption proved to be wrong.



# Expected Values

From the last example, recall the contribution margin for Webs was \$24 and \$15 for Highs.

Due to uncertainty, assume Martin has the following probable contribution margins for the two products.

Webs

Possible value of contribution margin	Probability	Expected Value
\$ 23.00	30%	\$ 6.90
24.00	50%	12.00
25.00	20%	5.00
		<u><u>\$ 23.90</u></u>

Highs

Possible value of contribution margin	Probability	Expected Value
\$ 14.00	10%	\$ 1.40
15.00	40%	6.00
16.00	50%	8.00
		<u><u>\$ 15.40</u></u>

# Expected Values

Martin would use the expected value contribution margins in its decision about utilizing its limited resource - the lathe.

Webs

Possible value of contribution margin	Probability	Expected Value
\$ 23.00	30%	\$ 6.90
24.00	50%	12.00
25.00	20%	5.00
		<u><u>\$ 23.90</u></u>

Highs

Possible value of contribution margin	Probability	Expected Value
\$ 14.00	10%	\$ 1.40
15.00	40%	6.00
16.00	50%	8.00
		<u><u>\$ 15.40</u></u>

**Explain how conflicts can arise  
between the decision model  
used by a manager and the  
performance evaluation model  
used to evaluate the manager.**

Toledo company is considering replacing a metal cutting machine with a newer model. The new machine is more efficient than the old, but it has a shorter life. Revenues from aircraft parts (1,10,00,000 per year) will be unaffected by the replacement decision. Here are the data

	<b>Old machine</b>	<b>New machine</b>
Original cost	1,00,00,000	60,00,000
Useful life	5 years	2 years
Current age	3 years	0 years
Remaining useful life	2 years	2 years
Accumulated depreciation	60,00,000	Not acq. Yet
Book value	40,00,000	Not acq. Yet
Current disposal value (in cash)	4,00,000	Not acq. Yet
Terminal disposal value in cash 2 years from now	0	Rs.0
Annual operating costs (maintenance, energy, repairs, coolants and so on)	80,00,000	46,00,000

# Equipment-Replacement Decisions

	Two Years Together		
	Keep (1)	Replace (2)	Difference (3) = (1) – (2)
Revenues	\$2,200,000	\$2,200,000	—
Operating costs			
Cash operating costs (\$800,000/yr. × 2 years; \$460,000/yr. × 2 years)	1,600,000	920,000	\$ 680,000
Book value of old machine			
Periodic write-off as depreciation or Lump-sum write-off	400,000	—	—
Current disposal value of old machine	—	(40,000) <sup>a</sup>	40,000
New machine cost, written off periodically as depreciation	—	600,000	(600,000)
Total operating costs	2,000,000	1,880,000	120,000
Operating income	\$ 200,000	\$ 320,000	\$(120,000)

<sup>a</sup>In a formal income statement, these two items would be combined as "loss on disposal of machine" of \$360,000.

# Equipment-Replacement Decisions, (Relevant Costs Only)

	Two Years Together		
	Keep (1)	Replace (2)	Difference (3) = (1) – (2)
Cash operating costs	\$1,600,000	\$ 920,000	\$680,000
Current disposal value of old machine	—	(40,000)	40,000
New machine, written off periodically as depreciation	—	600,000	(600,000)
Total relevant costs	<u>\$1,600,000</u>	<u>\$1,480,000</u>	<u>\$120,000</u>

# Decisions and Performance Evaluation

In the real world would the manager  
replace the machine?

An important factor in replacement decisions  
is the manager's perceptions of whether the  
decision model is consistent with how the  
manager's performance is judged.

# Decisions and Performance Evaluation

Top management faces a challenge – that is, making sure that the performance-evaluation model of subordinate managers is consistent with the decision model.

# Behavioral Implications

- Despite the quantitative nature of some aspects of decision making, not all managers will choose the best alternative for the firm
- Managers could engage in self-serving behavior such as delaying needed equipment maintenance in order to meet their personal profitability quotas for bonus consideration

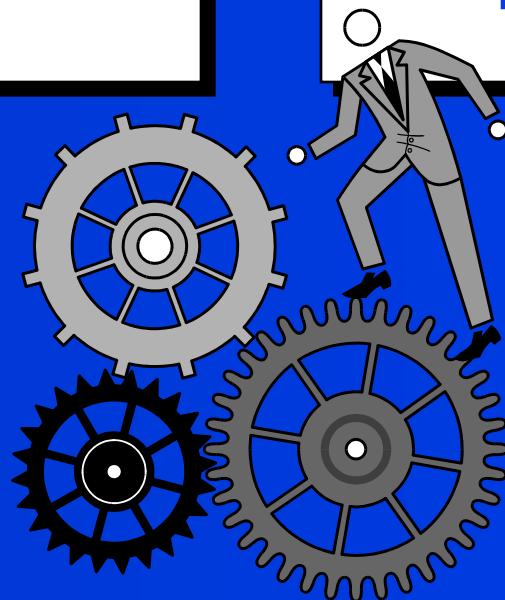
# First year results accrual accounting

	KEEP	REPLACE
Revenues	1,10,00,000	1,10,00,000
Operating costs		
Cash operating costs	80,00,000	46,00,00,000
Depreciation	20,00,000	30,00,00,000
Loss on Disposal	<u>-</u>	<u>36,00,00,000</u>
Total Operating costs	1,00,00,000	1,12,00,000
Operating income /loss	10,00,000	(2,00,000)

# Other Issues in Decision Making

Incentives for  
Decision Makers

Short-Run  
Versus  
Long-Run  
Decisions



# Other Issues in Decision Making

## Pitfalls to Avoid

Sunk  
costs.

Allocated  
fixed costs.

Unitized  
fixed costs.

Opportunity  
costs.

