Relevant Costs for Decision Making

Identifying Relevant Costs

A relevant cost is a cost that differs between alternatives.

An avoidable cost can be eliminated, in whole or in part, by choosing one alternative over another. Avoidable costs are relevant costs. Unavoidable costs are irrelevant costs.

Two broad categories of costs are never relevant in any decision. They 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
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4	Maintenance and repairs		0.065
5	Parking fees at school	360	0.036
6	Total average cost		$ 0.569

Some Additional Information

7	Reduction in resale value of car per mile of wear	$ 0.026
8	Round-tip 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 train, the cost would not 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
Total	$ 114.86

Relevant Financial Cost of Taking the Train	
Round-trip ticket	$ 104.00

Total and Differential Cost Approaches

The management of a company is considering a new labor saving machine that rents for $3,000 per year. Data about the company's annual sales and costs with and without the new machine are:

	Current Situation	Situation With New Machine	Differential Costs and Benefits
Sales (5,000 units @ $40 per unit)	$ 200,000	$ 200,000	-
Less variable expenses:			
Direct materials (5,000 units @ $14 per unit)	70,000	70,000	-
Direct labor (5,000 units @ $8 and $5 per unit)	40,000	25,000	15,000
Variable overhead (5,000 units @ $2 per unit)	10,000	10,000	-
Total variable expenses	120,000	105,000	-
Contribution margin	80,000	95,000	15,000
Less fixed expense:			
Other	62,000	62,000	-
Rent on new machine	-	3,000	(3,000)
Total fixed expenses	62,000	65,000	(3,000)
Net operating income	$ 18,000	$ 30,000	12,000

Total and Differential Cost Approaches

As you can see, the only costs that differ between the alternatives are the direct labor costs savings and the increase in fixed rental costs.

	Current Situation	Situation With New Machine	Differential Costs and Benefits
Sales (5,000 units @ $40 per unit)	$ 200,000	$ 200,000	-
Less variable expenses:			
Direct materials (5,000 units @ $14 per unit)	70,000	70,000	-
Direct labor (5,000 units @ $8 and $5 per unit)	40,000	25,000	15,000
Variable overhead (5,000 units @ $2 per unit)	10,000	10,000	-
Total variable expenses	120,000	105,000	-
Contribution margin	80,000	95,000	15,000
		62,000	-
		3,000	(3,000)
		65,000	(3,000)
		$ 30,000	12,000

We can efficiently analyze the decision by looking at the different costs and revenues and arrive at the same solution.

Net Advantage to Renting the New Machine	
Decrease in direct labor costs (5,000 units @ $3 per unit)	$ 15,000
Increase in fixed rental expenses	(3,000)
Net annual cost saving from renting the new machine	$ 12,000

Total and Differential Cost Approaches

Using the differential approach is desirable for two reasons:

1. Only rarely will enough information be available to prepare detailed income statements for both alternatives.
2. Mingling irrelevant costs with relevant costs may cause confusion and distract attention away from the information that is really critical.

Decision 1:

Drop or retain a product line?

Adding/Dropping Segments

Due to the declining popularity of digital watches, Lovell Company's digital watch line has not reported a profit for several years. Lovell is considering dropping this product line.

A Contribution Margin Approach

DECISION RULE

Lovell should drop the digital watch segment only if its profit would increase. This would only happen if the fixed cost savings *exceed* the lost contribution margin.

Adding/Dropping Segments

Segment Income Statement
Digital Watches

Sales		$ 500,000
Less: variable expenses		
Variable manufacturing costs	$ 120,000	
Variable shipping costs	5,000	
Commissions	75,000	200,000
Contribution margin		$ 300,000
Less: fixed expenses		
FMOH	$ 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 operating loss		$ (100,000)

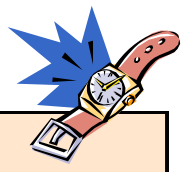
Adding/Dropping Segments

Segment Income Statement
Digital Watches

Sales		$ 500,000
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 operating loss		$ (100,000)

Investigation has revealed that total FMOH and general administrative expenses would not be affected if the digital watch line is dropped. The FMOH and general administrative expenses assigned to this product would be reallocated to other product lines.

Adding/Dropping Segments



Segment Income Statement
Digital Watches

Sales		$ 500,000
Less: variable expenses		200,000
C		$ 300,000
Less: fixed expenses		
General factory overhead	$ 60,000	
Salary of line manager	90,000	
Depreciation of equ		
Advertising - direct		
Rent - factory space		
General admin. expenses	30,000	400,000
Net operating loss		$ (100,000)

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

Should Lovell retain or drop the digital watch segment?

A Contribution Margin Approach

Contribution Margin Solution		
Contribution margin lost if digital watches are dropped		$ (300,000)
Less fixed costs that can be avoided		
Salary of the line manager	$ 90,000	
Advertising - direct	100,000	
Rent - factory space	70,000	260,000
Net disadvantage		$ (40,000)

Decision: Retain

Decision 2:

Make or Buy?
Produce in-house or outsource?

The Make or Buy Decision: An Example

- Essex Company manufactures part 4A that is used in one of its products.
- The unit product cost of this part is:

Direct materials	$ 9
Direct labor	5
Variable overhead	1
Depreciation of special equip.	3
Supervisor's salary	2
General factory overhead	10
Unit product cost	$ 30

The Make or Buy Decision

- The special equipment used to manufacture part 4A has no resale value.
- The total amount of general factory overhead, which is allocated on the basis of direct labor hours, would be unaffected by this decision.
- The $30 unit product cost is based on 20,000 parts produced each year.
- An outside supplier has offered to provide the 20,000 parts at a cost of $25 per part.

Should we accept the supplier's offer?

The Make or Buy Decision

	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	$ 25		$ 500,000
Direct materials	$ 9	180,000	
Direct labor	5	100,000	
Variable overhead	1	20,000	
Depreciation of equip.	3	-	
Supervisor's salary	2	40,000	
General factory overhead	10	-	
Total cost	$ 30	$ 340,000	$ 500,000

20,000 × $9 per unit = $180,000

The Make or Buy Decision

	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	$ 25		$ 500,000
Direct materials	$ 9	180,000	
Direct labor	5	100,000	
Variable overhead	1	20,000	
Depreciation of equip.	3	-	
Supervisor's salary	2	40,000	
General factory overhead	10	-	
Total cost	$ 30	$ 340,000	$ 500,000

The special equipment has no resale value and is a sunk cost.

The Make or Buy Decision

	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	$ 25		$ 500,000
Direct materials	$ 9	180,000	
Direct labor	5	100,000	
Variable overhead	1	20,000	
Depreciation of equip.	3	-	
Supervisor's salary	2	40,000	
General factory overhead	10	-	
Total cost	$ 30	$ 340,000	$ 500,000

Not avoidable; irrelevant. If the product is dropped, it will be reallocated to other products.

The Make or Buy Decision

	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	$ 25		$ 500,000
Direct materials	$ 9	180,000	
Direct labor	5	100,000	
Variable overhead	1	20,000	
Depreciation of equip.	3	-	
Supervisor's salary	2	40,000	
General factory overhead	10	-	
Total cost	$ 30	$ 340,000	$ 500,000

Should we make or buy part 4A?

Opportunity Cost

An opportunity cost is the benefit that is foregone as a result of pursuing some course of action.

Opportunity costs are not actual dollar outlays and are not recorded in the formal accounts of an organization.

How would this concept potentially relate to the Essex Company?

Decision 3:

Accept or reject a special order?

Special Orders

- Jet, Inc. makes a single product whose normal selling price is $20 per unit.
- A foreign distributor offers to purchase 3,000 units for $10 per unit.
- This is a one-time order that would not affect the company's regular business.
- Annual capacity is 10,000 units, but Jet, Inc. is currently producing and selling only 5,000 units.

Should Jet accept the offer?

Special Orders

Jet, Inc.
Contribution Income Statement

Revenue (5,000 × $20)		$ 100,000
Variable costs:		
Direct materials	$ 20,000	
Direct labor	5,000	
Manufacturing overhead	10,000	
Marketing costs	5,000	
Total variable costs		40,000
Contribution margin		60,000
Fixed costs:		
Manufacturing overhead	$ 28,000	
Marketing costs	20,000	
Total fixed costs		48,000
Net operating income		$ 12,000

$8 variable cost

Special Orders

If Jet accepts the offer, net operating income will increase by $6,000.

Increase in revenue (3,000 × $10)	$30,000
Increase in costs (3,000 × $8 variable cost)	24,000
Increase in net income	$ 6,000

Note: This answer assumes that fixed costs are unaffected by the order and that variable marketing costs must be incurred on the special order.

Decision 4:

Knowing that we have a bottleneck, should we be emphasizing Product 1 or Product 2?

Utilization of a Constrained Resource

- When a constraint exists, a company should select a product mix that maximizes the total contribution margin earned since fixed costs usually remain unchanged.
- A company should not necessarily promote those products that have the highest unit contribution margin.
- Rather, it should promote those products that earn the highest contribution margin in relation to the constraining resource.

Utilization of a Constrained Resource: An Example

Ensign Company produces two products and selected data are shown below:

	Product 1	Product 2
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 machine A1 per unit	1.00 min.	0.50 min.

Utilization of a Constrained Resource

- Machine A1 is the constrained resource and is being used at 100% of its capacity.
- There is excess capacity on all other machines.
- Machine A1 has a capacity of 2,400 minutes per week.

Should Ensign focus its efforts on Product 1 or Product 2?

Utilization of a Constrained Resource

The key is the contribution margin per unit of the constrained resource.

		Product 1		Product 2	
Contribution margin per unit		$ 24		$ 15	
Time required to produce one unit	÷	1.00	min. ÷	0.50	min.
Contribution margin per minute		$ 24		$ 30	

Product 2 should be emphasized. Provides more valuable use of the constrained resource machine A1, yielding a contribution margin of $30 per minute as opposed to $24 for Product 1.

Utilization of a Constrained Resource

The key is the contribution margin per unit of the constrained resource.

		Product 1			Product 2	
Contribution margin per unit		$ 24			$ 15	
Time required to produce one unit	÷	1.00	min.	÷	0.50	min.
Contribution margin per minute		$ 24			$ 30	

If there are no other considerations, the best plan would be to produce to meet current demand for Product 2 and then use remaining capacity to make Product 1.

Utilization of a Constrained Resource

Let's see how this plan would work.

Alloting Our Constrained Resource (Machine A1)

Weekly demand for Product 2		2,200	units
Time required per unit	×	0.50	min.
Total time required to make Product 2		1,100	min.

Utilization of a Constrained Resource

Let's see how this plan would work.

Alloting Our Constrained Resource (Machine A1)

Weekly demand for Product 2		2,200	units
Time required per unit	×	0.50	min.
Total time required to make Product 2		1,100	min.
Total time available		2,400	min.
Time used to make Product 2		1,100	min.
Time available for Product 1		1,300	min.

Utilization of a Constrained Resource

Alloting Our Constrained Resource (Machine A1)

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

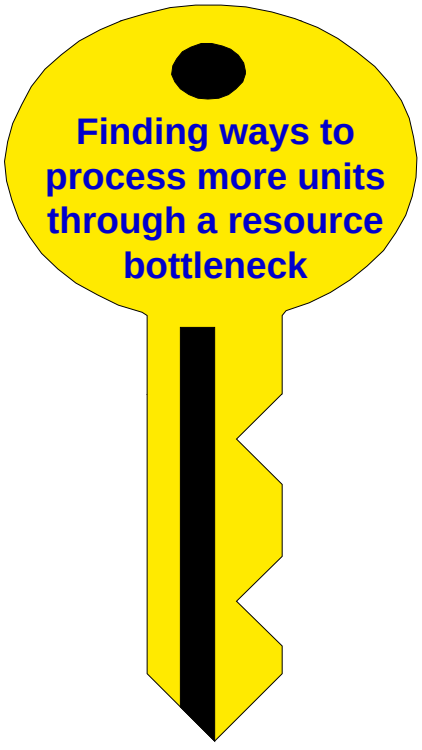
Utilization of a Constrained Resource

According to the plan, we will produce 2,200 units of Product 2 and 1,300 of Product 1. Our contribution margin looks like this.

	Product 1	Product 2
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 Ensign is $64,200.

Managing Constraints



At the bottleneck itself:

- Improve the process
- Add overtime or another shift
- Hire new workers or acquire more machines
- Subcontract production
- Reduce amount of defective units produced
- Add workers transferred from non-bottleneck departments

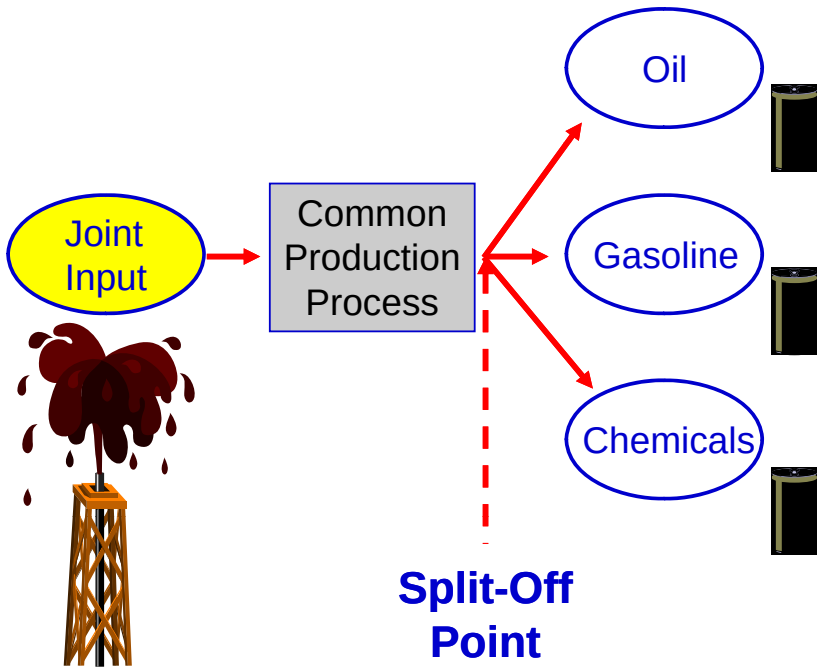
Decision 5:

Should a joint product be sold at the split-off point or processed further?

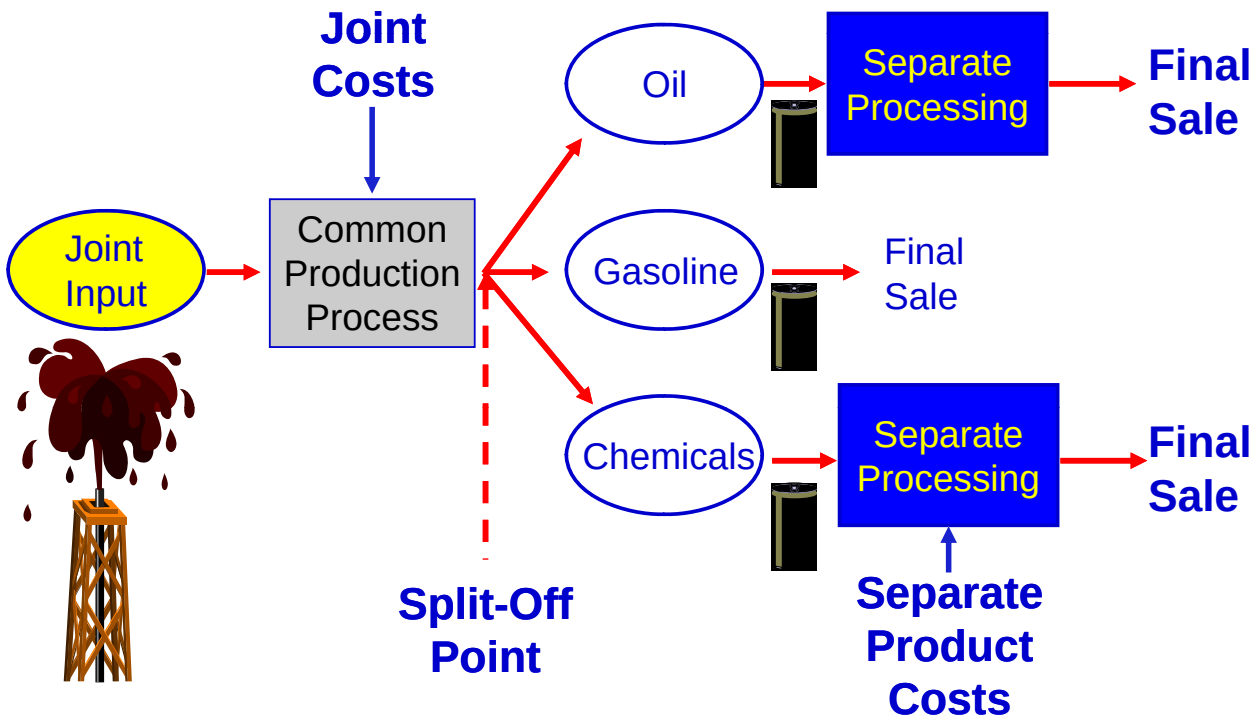
Joint Costs

- In some industries, a number of end products are produced from a single raw material input.
- Two or more products produced from a common input are called joint products.
- The point in the manufacturing process where each joint product can be recognized as a separate product is called the split-off point.

Joint Products



Joint Products



The Pitfalls of Allocation

Joint costs are often allocated to end products on the basis of the relative sales value of each product or on some other basis.

Although allocation is needed for some purposes such as balance sheet inventory valuation, allocations of this kind are very dangerous for decision making.

Sell or Process Further

- Joint costs are irrelevant in decisions regarding what to do with a product from the split-off point forward.
- It will always be profitable to continue processing a joint product after the split-off point so long as the incremental revenue exceeds the incremental processing costs incurred after the split-off point.

Sell or Process Further: An Example

- Sawmill, Inc. cuts logs from which unfinished lumber and sawdust are the immediate joint products.
- Unfinished lumber is sold "as is" or processed further into finished lumber.
- Sawdust can also be sold "as is" to gardening wholesalers or processed further into "presto-logs."

Sell or Process Further

Data about Sawmill's joint products includes:

	Per Log	
	Lumber	Sawdust
Sales value at the split-off point	$ 140	$ 40
Sales value after further processing	270	50
Allocated joint product costs	176	24
Cost of further processing	50	20

Sell or Process Further

Analysis of Sell or Process Further		
	Per Log	
	Lumber	Sawdust
Sales value after further processing	$ 270	$ 50
Sales value at the split-off point	140	40
Incremental revenue	130	10

Sell or Process Further

Analysis of Sell or Process Further		
	Per Log	
	Lumber	Sawdust
Sales value after further processing	$ 270	$ 50
Sales value at the split-off point	140	40
Incremental revenue	130	10
Cost of further processing	50	20
Profit (loss) from further processing	$ 80	$ (10)

Sell or Process Further

Analysis of Sell or Process Further

	Per Log	
	Lumber	Sawdust
Sales value after further processing	$ 270	$ 50
Sales value at the split-off point	140	40
Incremental revenue	130	10
Cost of further processing	50	20
Profit (loss) from further processing	$ 80	$ (10)

We should process the lumber further and sell the sawdust “as is.”