Measuring and Analyzing Activity Costs

Numerical Exercises

NE 2.1: Cost–Benefit analysis and Differential Costs *(5 minutes)*

The temporary worker ((4 hours)(£6/hour) or £24)) is cheaper to use than the owner ((3 hours)(£10/hour) or £30)). The transportation and machinery costs are irrelevant because they are the same for both solutions.

NE 2.2: Opportunity Costs and Sunk Costs *(5 minutes)*

a. If the raw materials won't be replaced, the opportunity cost is £5/pound.

b. If the raw materials must be replaced for use in another product, the opportunity cost is £6/pound.

NE 2.3: Opportunity Costs *(5 minutes)*

The opportunity cost of using the employee's time is £12 + £4 or £16. If the other project could be done by another employee, the opportunity cost is £12/hour.

NE 2.4: Opportunity Costs and Varying Rates of Output *(15 minutes)*

Number of units	Total costs	Marginal costs	Average costs
1	£ 25	£ 25	£ 25.00
2	40	15	20.00
3	52	12	17.33
4	62	10	15.50
5	72	10	14.40
6	82	10	13.67
7	100	18	14.28
8	130	30	16.25

Start-up costs are in evidence in the making of the first three units and capacity constraints are in evidence in the making of the 7th and 8th units.

NE 2.5: Activity Costs *(5 minutes)*

Estimated total costs = fixed costs + (variable cost/kilometre)(number of kilometres (£0.50/kilometre)(500 kilometres) = £300

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NE 2.6: Fixed and Variable Costs *(10 minutes)*

a. The expected cost of making 20,000 pairs of skis is €1,000,000 + (20,000 pairs of skis)(€100 per pair of skis) = €3,000,000.

b. The expected cost of making 30,000 pairs of skis is €1,000,000 + (30,000 pairs of skis)(€100 per pair of skis) = €4,000,000.

c. The manufacture of 30,000 pairs of skis may be beyond the capacity of the company. Therefore, fixed and variable costs may not be representative of the opportunity cost of making skis in that range.

NE 2.7: Fixed, Variable, and Average Costs *(15 minutes)*

a. The vice-chancellor of Midlands University has calculated the average cost of each student. If the decision is to add more students, the vice-chancellor should be looking at the marginal cost of another student. The marginal cost can be approximated by the variable cost as long as the university is below capacity.

b. The cost of adding 100 students is £300,000. Therefore, the variable cost per unit is £300,000/100 or £3,000/student. The total variable costs of 4,000 students is (4,000 students)(£3,000/student), or £12,000,000. The remaining cost of 4,000 students is £30,000,000 – £12,000,000, or £18,000,000, which is equal to the fixed costs.

NE 2.8: Fixed and Variable Costs *(10 minutes)*

Costs under the CAM approach:

£1,000,000 + (10,000 chips)(£20/chip) = £1,200,000

Costs under the more manual approach:

£500,000 + (10,000 chips)(£50/chip) = £1,000,000

The manual approach is less costly in making 10,000 chips per month.

NE 2.9: Opportunity Costs *(5 minutes)*

Opportunity cost for Emily for making the fence herself:

Cost of materials	£100
Cost of labour (£10/hour)(15 hours)	150
Total	£250

The opportunity cost of building the fence herself is less than the cost of paying someone else to build the fence (£300). Therefore, Emily should make the fence herself.

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NE 2.10: Opportunity Costs *(5 minutes)*

The opportunity cost of playing video games for an hour:

Cost of playing video games	£5
Forgone revenue from job opportunities	200
Total	£205

NE 2.11: Variable and Fixed Costs *(10 minutes)*

a. Expected cost of 3,000 copies of the school newspaper:

£5,000 + (£0.03/copy)(3,000 copies) = £5,090

b. Expected cost of 5,000 copies of the school newspaper:

£5,000 + (£0.03/copy)(5,000 copies) = £5,150

Numerical Problems

NP 2.1: Differential Costs and Revenues *(10 minutes)*

Costs and revenues of leasing a freezer and selling ice cream treats:	
Revenues from ice cream treats	£10,000
Lost revenues from other ice cream sales	(2,000)
Leasing costs	(1,000)
Cost of ice cream treats	(5,000)
Differential revenues greater than costs	£2,000
Costs and revenues of selling artisan bakery items:	
Revenues from artisan bakery items	£7,000
Cost of bakery items	(3,000)
Rental cost of shelving	(500)
Differential revenues greater than costs	£3,500

Selling artisan bakery items is the preferred choice because the differential revenues over costs are greater.

NP 2.2: Differential, Variable, and Fixed Costs *(10 minutes)*

Currently, the monthly profit for Darien from its cafeteria is as follows:

Sales	£12,000
Variable costs (0.40)(£12,000)	(4,800)
Fixed costs	(4,700)
Profit	£2,500

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With vending machines the profit would be (0.16)(1.40)(£12,000) or £2,688.

The profit is greater with the vending machines by £2,688 – £2,500 or £188 per month.

NP 2.3: Differential Costs and Revenues *(15 minutes)*

a. Profit of Sunday opening if no effect on other sales:

Revenues	£10,000	
	Cost of goods sold (£10,000/1.2)	(8,333)
	Other costs	(1,000)
	Profit	£ 667

It is profitable to operate on Sundays if other sales are not affected.

b. Profit if 60% of sales would have occurred on other days:

Revenues	£10,000
Cost of goods sold (£10,000/1.2)	(8,333)
Other costs	(1,000)
Forgone profit from lost sales (£6,000 – £6,000/1.2)	(1,000)
Profit	(£ 333)

Do not operate on Sundays because the forgone profits on lost sales from other days are larger than the profits from sales on Sundays.

NP 2.4: Opportunity Cost of Space *(15 minutes)*

	Home furnishings	Electronics
Profits	£64,000	£82,000
Lease payments	72,000	79,200
Forgone profits	(£ 8,000)	£ 2,800

JP Max should rent out the home furnishings as lease rental receipts are more than the profits in the Home Furnishings Department. Alternatively, profits generated by the Electronics Department are more than the lease rentals if leased out, so we continue running the Electronics Department. However, neither is being charged inventory holding costs, which could easily change the decision.

Also, one should examine externalities. What kind of merchandise is being sold in the leased store and will this increase or decrease overall traffic and hence sales in the other departments?

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NP 2.5: Opportunity Cost of Using Materials *(15 minutes)*

Opportunity costs are usually positive. In this case, opportunity costs are negative (opportunity benefits) because the firm can avoid disposal costs if it accepts the rush job.

The original £1,000 price paid for GX-100 is a sunk cost. The opportunity cost of GX-100 is –£400. That is, Emrich will increase its cash flows by £400 by accepting the rush order because it will avoid having to dispose of the remaining GX-100 by paying Environ the £400 disposal fee.

How to price the special order is another question. Just because the £400 disposal fee was built into the previous job does not mean it is irrelevant in pricing this job. Clearly, one factor to consider in pricing this job is the reservation price of the customer proposing the rush order. The £400 disposal fee enters the pricing decision in the following way: Emrich should be prepared to pay up to £399 less in any out-of-pocket costs to get this contract.

NP 2.6: Opportunity Cost of Using Display Space *(20 minutes)*

a. The question involves computing the opportunity cost of replacing one of the special promotions being considered with Armadillo car wax. If the car wax is substituted, what is the forgone profit from the dropped promotion? Also, which special promotion is dropped? Answering this question involves calculating the opportunity cost of each planned promotion. The opportunity cost of dropping a planned promotion is its forgone profit: (retail price less unit cost) × volume. The table below calculates the expected profit of each of the three planned promotions.

Planned promotion displays for next week			
	End-of-aisle	Front door	Cash register
Item	Ensea oil	Wiper blades	Floor mats
Projected volume (week)	5,000	200	70
Sales price	69p	£9.99	£22.99
Unit cost	62p	7.99	17.49
Profit per unit	7p	£2.00	£5.50
Total profit (margin × volume)	£350	£400	£385

Ensea oil is the promotion yielding the lowest contribution and therefore is the one Armadillo must beat out. The contribution of Armadillo car wax is:

Selling price	£2.90
less Unit cost	2.50
Contribution margin	0.40
× Expected volume	800
Contribution	£320

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Clearly, since the Armadillo car wax yields a lower contribution margin than all three of the existing planned promotions, management should not change their planned promotions and should reject the Armadillo offer.

b. With 50 free units of car wax, Armadillo's contribution is as follows:

Profit from 50 free units (50 × £2.90)		£145
Profit from remaining 750 units:		
Selling price	£2.90	
less Unit cost	£2.50	
Contribution margin	0.40	
× Expected volume	750	300
Contribution		£445

With 50 free units of car wax, it is now profitable to replace the oil display area with the car wax. The opportunity cost of replacing the oil display is its forgone profit (£350), whereas the benefits provided by the car wax are £445.

Additional discussion point to consider:

(i) This problem introduces the concept of the opportunity cost of retail shelf space. With the proliferation of consumer products, the supermarkets' valuable scarce commodity is shelf space. Consumers often learn about a product for the first time by seeing it on the grocery shelf. To induce the store to stock an item, food companies often give the store a number of free cases. Such a giveaway compensates the store for allocating scarce shelf space to the item.

(ii) This problem also illustrates that retail stores track profit margins and volumes very closely in deciding which items to stock and where to display them.

(iii) One of the simplifying assumptions made early in the problem was that the sale of the special display items did not affect the unit sales of competitive items in the store. Suppose that some of the Ensea oil sales came at the expense of other oil sales in the store. Discuss how this would alter the analysis.

NP 2.7: Opportunity Cost of Time *(20 minutes)*

Airfare per person	€500		
Operating cost Lx-0100/day	€5100	Capacity of Lx-0100	10
Operating cost Lx-0200/day	€5200	Capacity of Lx-0200	7
Wage of managers	€200,000		
Hours per year	2,500		
Cost per hour	€80		
Time on commercial flight	7 hours		
Time on Lx-0100	6 hours		
Time on Lx-0200	4 hours		

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	Commercial	Lx-0100	Lx-0200
Airfare (€500 × 10)	€5,000		
(€500 × 3)			1,500
Opportunity cost of managers' time on the jet (€80 × 10 × 7 × 2)	11,200		
(€80 × 10 × 6 × 2)		9,600	
(€80 × 7 × 4 × 2)			4,480
Opportunity cost of time of managers forced to take commercial jet (€80 × 3 × 7 × 2)			3,360
Operating cost		5,100	5,200
Total	€16,200	€14,700	€14,540

The firm should lease the Lx-0200.

NP 2.8: Marginal and Average Costs *(15 minutes)*

a. The marginal cost is the additional cost of making one more unit.

Number	Calculation	Marginal cost
1	£100,000 – 0	£100,000
2	£150,000 – £100,000	50,000
3	£190,000 – £150,000	40,000
4	£220,000 – £190,000	30,000
5	£250,000 – £220,000	30,000
6	£280,000 – £250,000	30,000
7	£340,000 – £280,000	60,000
8	£400,000 – £340,000	60,000
9	£500,000 – £400,000	100,000

b. The marginal cost probably increases after 6 units due to limited capacity.

c. The average cost of making 5 sorting machines is (£250,000 ÷ 5), or £50,000

d. Sorting machines should be manufactured and sold as long as the marginal revenue (£70,000) is greater than the marginal cost. This occurs at 8 units. If the company made a ninth unit the marginal cost is £100,000, but the marginal revenue is only £70,000.

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