Chapter 12

Lecture Notes

Chapter theme: Making decisions is one of the basic functions of a manager. To be successful in decision making, managers must be able to perform differential analysis, which focuses on identifying the costs and benefits that differ between alternatives. The purpose of this chapter is to develop these skills by illustrating their use in a wide range of decision-making situations.

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1. **Cost concepts for decision making**

*Learning Objective 1: Identify relevant and irrelevant costs and benefits in a decision.*

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* 1. **Identifying relevant costs and** **benefits**
     1. Costs that differ between alternatives are called **relevant costs.** Benefits that differ between alternatives are **relevant benefits.**

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* + - 1. An **avoidable cost** is a cost that can be eliminated in whole or in part by choosing one alternative over another. **Avoidable costs are relevant costs. Unavoidable costs are irrelevant costs**.

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* + 1. **Two broad categories** of costs are **never relevant** in any decision:
       1. A **sunk cost** is a cost that has already been incurred and cannot be avoided regardless of what a manager decides to do.
       2. A future cost that **does not differ** between alternatives is **never** relevant in a decision.

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* + 1. Keys to successful decision-making:
       1. Focus only on relevant costs (also called avoidable costs, differential costs, or incremental costs) and relevant benefits (also called differential benefits or incremental benefits).

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* + - 1. Ignore everything else including sunk costs and future costs and benefits that do not differ between the alternatives.
    1. **Different costs for different purposes**
       1. Costs that are relevant in one decision situation **may not be relevant** in another context. Thus, in each decision situation, the manager must examine the data at hand and isolate the relevant costs.

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#### An example of identifying relevant costs and benefits

* + 1. Assume the following information with respect to Cynthia, a Boston student who is considering visiting her friend in New York. Cynthia is trying to decide whether it would be less expensive to **drive** or take the **train** to New York.

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* + - 1. She has assembled the following information with respect to her automobile.

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* + - 1. She has also gathered the additional information as shown to aid in her decision.

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* + - 1. Which costs are relevant to her decision?
         1. The cost of the car is **irrelevant** to the decision because it is a sunk cost.
         2. The annual cost of auto insurance is **irrelevant** because it does not differ between alternatives.

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* + - * 1. The cost of the gasoline is **relevant** because it is avoidable if she takes the train.
        2. The cost of maintenance and repairs is **relevant** because in the long-run these costs depend upon miles driven.

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* + - * 1. The parking fee at school is **irrelevant** because it is not a differential cost.
        2. The decline in resale value is **relevant** due to the additional miles driven.
        3. The round trip train fare is **relevant** because it is avoidable if she drives her car.

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* + - * 1. Relaxing on the train is **relevant**, but difficult to quantify.
        2. The kennel cost is **irrelevant** because it is not a differential cost.
        3. The cost of parking in New York is **relevant** because it is avoidable if she takes the train.

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* + - * 1. The benefits of having a car in New York and the problem of finding a parking space are both **relevant**, but difficult to quantify.
      1. From a financial standpoint, **Cynthia would be better off taking the train**.

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C. **Reconciling the total and differential approaches**

1. Assume the following information for a company considering a new labor-saving machine that rents for **$3,000 per year**. Notice:
2. The total approach requires constructing **two contribution format income statements** –onefor each alternative.

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1. The difference between the two income statements of **$12,000** equals the differential benefits shown at the bottom of the right-hand column.
2. The most efficient means of analyzing this decision is to use the **differential approach** to isolate the relevant costs and benefits as shown.

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1. 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.

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* + 1. Mingling irrelevant costs with relevant costs may cause confusion and distract attention away from the information that is really critical.

1. **Adding and dropping product lines and other** **segments**

*Learning Objective 2: Prepare an analysis showing whether a product line or other business segment should be added or dropped.*

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#### One of the most important decisions managers make is whether to add or drop a business segment. Ultimately, a decision to drop an old segment or add a new one is going to hinge primarily on the impact the decision will have on net operating income. To assess this impact it is necessary to carefully analyze the costs.

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#### Lovell Company – an example

#### Assume that Lovell Company’s digital watch line has not reported a profit for several years; accordingly, Lovell is considering discontinuing this product line.

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* + - 1. To determine how dropping this line will affect the profits of the company, Lovell will compare **the contribution margin that would be lost to the costs that would be avoided** if the line was to be dropped.

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#### ii. Assume a segmented income statement for the digital watches line is as shown. Also, assume the following:

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1. An investigation has revealed that the fixed general factory overhead and fixed general administrative expenses **will not be affected** by dropping the digital watch line.

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

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1. A contribution margin approach reveals that the contribution margin lost (**$300,000**) exceeds the fixed costs avoided (**$260,000**) by **$40,000**. Therefore, Lovell should **retain** the digital watch segment.

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1. Comparative income statements can also be prepared to help make the decision.

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1. These income statements show that if the digital watch line is dropped, the company loses **$300,000** in contribution margin.

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1. The general factory overhead (**$60,000**) would be the same under both alternatives, so it is **irrelevant**.

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1. The salary of the product line manager (**$90,000**) would disappear, so it is **relevant** to the decision.

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1. The depreciation (**$50,000**) is a sunk cost. Also, remember that the equipment has no resale value or alternative use, so the equipment and the depreciation expense associated with it are **irrelevant** to the decision.

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1. The complete comparative income statements reveal that Lovell would earn **$40,000** of additional profit by retaining the digital watch line.

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1. Lovell’s allocated fixed costs can **distort** the keep/drop decision.

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1. Lovell’s managers may ask “why keep the digital watch segment when its segmented income statement shows a **$100,000 loss**?”
2. The answer lies in the way **common fixed costs** are allocated to products.

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* + - * 1. Including unavoidable common fixed costs in the segmented income statement makes the digital watch product line **appear** to be unprofitable, when in fact dropping the product line would **decrease** the company’s overall net operating income.

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## **The make or buy decision**

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*Learning Objective 3: Prepare a make or buy analysis.*

#### Key terms and strategic aspects

* + 1. When a company is involved in more than one activity in the entire **value chain**, it is vertically integrated.

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* + - 1. A decision to carry out one of the activities in the value chain **internally**, rather than to buy **externally** from a supplier, is called a **make or buy decision**.

*Helpful Hint: Some critics charge that managers have habitually based make or buy decisions on per unit data without determining which costs are relevant and which are not. Since the per unit costs typically include allocated common fixed costs, they overstate the costs of producing internally. This creates a bias in favor of outsourcing production.*

* + 1. **Vertical integration** provides certain **advantages**:
       1. An integrated company may be able to ensure a **smoother flow of parts and materials** for production than a nonintegrated company.

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* + - 1. Some companies feel that they can **control quality better** by producing their own parts and materials.
      2. Integrated companies **realize profits** from the parts and materials that they choose to make instead of buy.
    1. The primary **disadvantage** of vertical integration is that a company may fail to take advantage of suppliers who can create an **economies of scale advantage** by pooling demand from numerous companies.

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* + - 1. While the economies of scale factor can be appealing, a company must be careful to retain control over activities that are **essential to maintaining its competitive position**.

#### Essex Company – an example

* + 1. Assume that Essex Company manufactures part 4A with a unit product cost as shown.

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* + - 1. Also, assume the following information as shown with respect to part 4A. Given these additional assumptions, **should Essex make or buy part 4A**?

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* + 1. The avoidable costs associated with making part 4A include direct materials (**$180,000**), direct labor (**$100,000**), variable overhead (**$20,000**), and the supervisor’s salary (**$40,000**). Notice:

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* + - 1. The **depreciation** of special equipment represents a sunk cost. Furthermore, the equipment has no resale value, thus the special equipment and its associated depreciation expense are **irrelevant** to the decision.

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* + - 1. The **general factory overhead** represents future costs that will be incurred regardless of whether Essex makes or buys part 4A; hence, it is also **irrelevant** to the decision.

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* + 1. The total avoidable costs of **$340,000** are less than the **$500,000** cost of buying the part, thereby suggesting that Essex should **continue to make the part**.

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#### Opportunity cost

* + 1. An opportunity cost is the benefit that is **foregone** as a result of pursuing a course of action. These costs **do not represent actual cash outlays** and they are not recorded in the formal accounts of an organization.

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* + 1. In the Essex Company example that we just completed, if Essex had an alternative use for the capacity that it used to make part 4A, there would have been an opportunity cost to factor into the analysis.

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* + - 1. The opportunity cost would have been equal to the **segment margin that could have been derived from the best alternative use of the space**.

1. **Special** **orders**

*Learning objective 4: Prepare an analysis showing whether a special order should be accepted.*

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#### Key terms and concepts

* + 1. A **special order** is a one-time order that is not considered part of the company’s normal ongoing business.

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* + 1. When analyzing a special order, only the **incremental costs** **and benefits** are relevant. Since the existing fixed manufacturing overhead costs would not be affected by the order, they are not relevant.

*Helpful Hint: Emphasize the incremental concept in the decision-making process. If a company accepts a special order to produce an item without carefully determining existing capacity, it might have to cut into regular production. The effects of lost sales from ongoing products might be devastating.*

#### Jet Inc. – an example

* + 1. Assume the following information with respect to a special order opportunity for Jet Inc. **Should Jet accept the offer**?

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* + 1. A contribution format income statement for Jet Inc.’s normal sales of **5,000 units** is as shown.

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* + 1. If Jet accepts the special order, the incremental revenue of **$30,000** will exceed the incremental costs of **$24,000** by **$6,000**. This suggests that Jet should **accept** the order. Notice:

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* + - 1. This answer assumes that the fixed costs are **unavoidable** and that variable marketing costs **must be incurred** on the special order.

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*Quick Check – special order decision making*

1. **Utilization of a constrained resource**

*Learning Objective 5: Determine the most profitable use of a constrained resource.*

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#### Key terms and concepts

* + 1. When a limited resource of some type restricts the company’s ability to satisfy demand, the company is said to have a **constraint**. The machine or process that is limiting overall output is called the **bottleneck—**it is the constraint.

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*Helpful Hint: A production process can be thought of as a chain; each link in the chain represents a step in the process. A chain is only as strong as its weakest link. Likewise, the capacity of a production process is determined by its weakest link, which is the constraint. To increase the strength of a chain, its weakest link must be strengthened. To increase the output of the entire process, the output of the constraint must be increased. Strengthening the stronger links has no effect on the strength of the entire chain. The moral is to identify the constraint and concentrate management attention on effectively increasing its capacity.*

* + 1. Fixed costs are usually unaffected in these situations, so the product mix that maximizes the company’s **total contribution margin** should ordinarily be selected.
    2. A company should not necessarily promote those products that have the highest **unit** contribution margins. Rather, total contribution margin will be maximized by promoting those products or accepting those orders that provide **the highest contribution margin in relation to the constraining resource**.

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#### Ensign Company – an example

* + 1. Assume that Ensign Company produces **two products** and selected data are as shown. In addition assume that:

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* + - 1. **Machine** **A1 is the constraint**.
      2. There is **excess capacity** on all other machines.

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* + - 1. Machine A1 has a capacity of **2,400 minutes per week**.
      2. Ensign is trying to decide if it should focus its efforts on product 1 or 2.

*Quick Check – constrained resource calculations*

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* + 1. As suggested by the answer to the Quick Check question, Ensign should emphasize **product 2** because it generates **a** **contribution margin of $30 per minute of the constrained resource** relative to **$24** **per minute** for **product 1.**

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* + 1. Ensign can maximize its contribution margin by **first producing product 2** to meet customer demand and then using **any remaining capacity to produce product 1**. The calculations would be performed as follows:

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* + - 1. Satisfying the weekly demand of **2,200 units** for product 2 would consume **1,100 minutes** of available capacity on machine A1.

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* + - 1. This implies that **1,300 constraint minutes would still be available** to satisfy demand for product 1.

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* + - 1. Since each unit of product 1 requires one minute of A1 machine time, Ensign could produce **1,300 units of product 1** with its remaining capacity.

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* + - 1. This mix of production (e.g., 2,200 units of product 2 and 1,300 units of product 1) would yield **a total contribution margin of $64,200**.

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*Learning Objective 6: Determine the value of obtaining more of the constrained resource.*

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iv. How much should Ensign be willing to pay for an additional minute of A1 machine time?

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1. Because the additional machine time would be used to make more units of Product 1, Ensign should be willing to pay up to $24 per minute. This amount equals the contribution margin per minute of machine time that would be earned producing more units of Product 1.

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*Quick Check – constrained resource calculations*

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#### Managing constraints

* + 1. It is often possible for a manager to increase the capacity of a bottleneck, which is called **relaxing (or elevating) the constraint**, in numerous ways such as:

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* + - 1. Working **overtime** on the bottleneck.
      2. **Subcontracting** some of the processing that would be done at the bottleneck.
      3. **Investing in additional machines** at the bottleneck.
      4. **Shifting workers** from non-bottleneck processes to the bottleneck.
      5. **Focusing business process improvement efforts** on the bottleneck.
      6. **Reducing defective units** processed through the bottleneck.
    1. These methods and ideas are all consistent with the **Theory of Constraints**, which was introduced in Chapter 1.

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* + 1. If a company has more than one potential constraint, the proper “mix” of products can be found using a quantitative method known as **linear programming**, which is covered in quantitative methods and operations management courses.

1. **Joint product costs and the contribution** **approach**

*Learning Objective 7: Prepare an analysis showing whether joint products should be sold at the split-off point or processed further.*

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#### Key terms/concepts

* + 1. In some industries, a number of end products are produced from a single raw material input. When two or more products are produced from a common input these products are known as **joint products**. The **split-off point** is the point in the manufacturing process at which the joint products can be recognized as separate products.

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* + - 1. For example, in the **petroleum refining industry** a large number of products are extracted from crude oil, including gasoline, jet fuel, home heating oil, lubricants, asphalt, and various organic chemicals.

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* + 1. The term **joint cost** is used to describe costs incurred up to the split-off point. Joint costs are common costs incurred to simultaneously produce a variety of end products.

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* + - 1. Joint costs are traditionally allocated among different products at the split-off point. A typical approach is to allocate joint costs according to the **relative sales value** of the end products.

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* + - 1. 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 decisions

* + 1. Joint costs are **irrelevant** in decisions regarding what to do with a product from the split-off point forward. Therefore, these costs should **not be allocated** to end products for decision-making purposes.

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* + 1. With respect to sell or process further decisions, it is profitable to continue processing a joint product after the split-off point **so long as the incremental revenue from such processing exceeds the incremental processing costs incurred after the split-off point**.

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#### Sell or process further decisions – an example

* + 1. Assume the facts as shown with respect to Sawmill, Inc.

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* + - 1. Sawmill has two joint products – **lumber and sawdust**. Selected financial information is shown for each joint product.

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* + - 1. The **incremental revenue** from further processing of the lumber and sawdust is **$130** and **$10**, respectively.

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* + - 1. The **profit (loss)** from further processing is **$80** for the lumber and **($10)** for the sawdust.

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* + - 1. The lumber **should be processed further** and the sawdust **should be sold at the split-off point**.

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#### Activity-based costing and relevant costs

* + - 1. Activity-based costing can be used to help identify **potentially** relevant costs for decision-making purposes. However, managers should exercise caution against reading more into this “traceability” than really exists. People often assume that if a cost is traceable to a segment, then the cost is automatically avoidable, which is **untrue**. Before making a decision, managers must decide which of the potentially relevant costs are **actually** avoidable.

89