SECTION 1 – COST

Chapter 1 – Cost Elements

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Introduction/Learning Objectives

Cost is one of the three fundamental attributes associated with performing an activity or the acquisition of an asset. These are: price (cost), features (performance), and availability (schedule). The key learning objectives are:

- Understand what makes up cost – i.e., the basic resources (material, labor, etc.) that are needed to perform an activity or create an asset.
- Understand the distinction between cost elements that are directly applied to an asset and those that are indirectly applied.
- Relate the cost elements to the life cycle of the asset: acquisition, use and disposal.
- Use the understanding of cost elements to further understand how cost is measured, applied, and recorded to arrive at the total activity and/or asset cost.
- Apply the knowledge gained to solve problems related to cost element source and definition.

Terms to Know

- Activity
- Asset
- Cost
- Cost categories
- Cost elements
- Cost objectives
- Direct costs
- Fixed costs
- Indirect costs
- Project
- Resources
- Variable costs
- Work breakdown structure (WBS)

Key Points for Review

- **Concepts**
  - Cost engineering is the application of scientific principles and techniques.
  - What are the key activities that generate cost when they are performed or that define plans and processes that cause (or influence) cost to be generated in other activities and/or assets?
  - What are the elements that make up cost?
  - How are these cost elements categorized and how do they relate to one another?
  - Why is it important to collect and account for costs as they relate to specific activities and assets?

- How to apply these cost elements and categories to the insight for managing activities and assets?

❖ **Cost Definition**
- Cost is the value of an activity or asset.
- Resources used are categorized as material, labor, and "other."
- The value of the asset may also include the cost elements of scrap material or manufacturing spares, construction form-work and expendable safety items, as well as the cost of transporting the material to the work site.

❖ **Material**
- Material is the physical composition of the asset. However, the value of the asset may also include the cost elements of scrap material or manufacturing spares, construction form work and expendable safety items, and the cost of transporting the material to the work site.

❖ **Labor**
- Labor as the value of the work needed to complete the activity or asset.

❖ **Other**
- The "other" cost category is resources that are needed to support the activity and/or asset.

❖ **Cost Category and Value of Asset**
- Another important aspect of cost relates to whether one is the producer or consumer of an activity or asset.
- The value of an asset or activity may also be related to intangible costs.

Category	**Cost Element Examples**
Material	Pen, desk, lumber, etc.
Labor	Draw plans, order materials, receive materials, installation, etc.
Other	Permit fees, gas, truck, etc.

❖ **Cost Structure**
- It is important to further structure the cost elements within the material, labor, and other resource categories in order to understand how they influence the total cost of the activity or asset and to get a better understanding of how they can be controlled.

❖ **Grouping**

The cost elements can be grouped into direct costs, indirect costs, fixed costs, and variable costs.

- **Direct costs** are those resources that are expended solely to complete the activity or an asset. In other words, any cost that is specifically identified with a particular final cost objective, but not necessarily limited to items that are incorporated in the end product as material or labor is considered direct cost.
- **Indirect costs** are those resources that need to be expended to support the activity or asset, but are also associated with other activities and assets. In other words, any cost not directly

identified with a single final cost objective, but identified with two or more final cost objectives. Indirect costs may also be referred to as "overhead costs" or "burden costs." Indirect costs are general administrative activities associated with operating the business, costs for providing and maintaining field equipment or a manufacturing facility, and expenses for utilities, taxes, legal services, etc.

- **Fixed costs** are those cost elements that must be provided independent of the volume of work activity or asset production that they support. These can be either direct or indirect costs.
- **Variable costs** are those cost elements that must be provided and are dependent on the volume of work activity or asset production that they support. Again, these can be either direct or indirect costs.
- Grouping examples can be found in Chapter 1, *Skills and Knowledge of Cost Engineering*, 6th Edition, Tables 1.2 and 1.4.

❖ **Cost Accounting Definition:**

- Cost accounting is defined as the historical reporting of disbursements, costs and expenditures on a project.
- Recording of cost information is nothing more than the mechanical gathering of data in a routine manner.
- Become familiar with the code of accounts structure.
- Activity based costing assigns resources to activities.
- Work breakdown structure (WBS) can be used with code of accounts. Be familiar with the structure.

❖ **Cost Management**

The four common methods for providing cost information as they apply to cost management are as follows:

- **Cost Estimating**: This is the prediction of the quantity and cost of resources needed to accomplish an activity or create an asset.
- **Cost Trending**: Cost trends are established from historical cost accounting information. Cost management questions may focus on how expenditures are trending relative to physical accomplishments.
- **Cost Forecasting**: Forecasts are much like estimates. Whereas an estimate is always for future activities and assets, forecasts are prediction of the cost at completion for cost elements that are in progress.
- **Life-Cycle Costing**: Life-cycle costs (LCC) are associated with an asset and extend the cost management information beyond the acquisition (creation) of the asset to the use and disposal of the asset.

Check on Learning

1. _____ are those cost elements that must be provided and dependent on the volume of work activity or asset production that they support.

    A. Direct Costs
    B. Indirect Costs
    C. Fixed Costs
    D. Variable Costs

2. _____ is a method of cost element classification where resources are assigned to activities that are required to accomplish a cost objective.

    A. Code of Accounts
    B. Summary Level Accounts
    C. Activity Based Costing
    D. Work Breakdown Structure

3. _____ are those cost elements that must be provided independent of the volume of work activity or asset production that they support.

    A. Direct Costs
    B. Indirect Costs
    C. Fixed Costs
    D. Variable Costs

4. _____ are those resources that are expended solely to complete the activity or asset.

    A. Direct Costs
    B. Indirect Costs
    C. Fixed Costs
    D. Variable Costs

5. _____ are associated with an asset and extend the cost management information beyond the acquisition (creation) of the asset to the use and disposal of the asset.

    A. Life-Cycle Costs (LCC)
    B. Indirect Costs
    C. Fixed Costs
    D. Variable Costs

6. _____ are those cost elements that must be provided and difficult to appropriate as a direct cost on specific assets that they support.

    A. Direct Costs
    B. Indirect Costs
    C. Fixed Costs
    D. Variable Costs

7. The work breakdown structure (WBS) can be an effective aid for which type of communications?

    A. Team
    B. Company
    C. Customer
    D. All of the above

8. Which of the following is a key reason to use a work breakdown structure (WBS)?

    A. Organize the work
    B. Prevent work from slipping through the cracks
    C. Provide a basis for estimating the project
    D. All of the above

9. Which of the following is not an example of a variable?

    A. Size
    B. Shape
    C. Stamping tool
    D. Weight

10. Procurement planning involves:

    A. A make or buy decision
    B. Answering supplier's questions
    C. Creating the contract
    D. Creating the RFP

Solutions

1. D Variable Costs
   Refer to Chapter 1, “Cost Structuring” topic

2. C Activity Based Costing
   Refer to Chapter 1, “Cost Structuring” topic

3. C Fixed Cost
   Refer to Chapter 1, “Cost Structuring” topic

4. A Direct Cost
   Refer to Chapter 1, “Cost Structuring” topic

5. A Life-Cycle Costs (LCC)
   Refer to Chapter 1, “Cost Management” topic

6. B Indirect Cost
   Refer to Chapter 1, “Cost Structuring” topic

7. D All of the above
   Refer to Chapter 1, “Cost Structuring” topic

8. D All the above
   Refer to Chapter 1, “Cost Structuring” topic

9. C Stamping tool
   Refer to Chapter 1, “Cost Structuring” topic

10. A A make or buy decision
    Refer to Chapter 1, “Cost Management” topic

Chapter 2 – Pricing and Costing

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Introduction/Learning Objectives

This chapter highlights the difference between pricing and costing. It is very important to distinguish between the terms "price" and "cost." There is a very fine difference between them, which is why people often tend to use them interchangeably. This chapter discusses the concepts of pricing and costing of a project, illustrates the differences and helps the reader to identify the inputs, transforming mechanisms and outputs related to the costing and pricing process. The key learning objectives are:

- Differentiate between costing and pricing.
- Identify the inputs, transforming mechanisms and outputs related to the cost and pricing process.
- Understand the budgeting process.
- Calculate financial ratios related to the costing and pricing of projects.
- Understand the reasoning behind the costing and pricing process outputs.

Terms to Know

- Cash flow
- Competitive advantage
- Cost
- Financial management
- Inputs
- Opportunity cost
- Outputs
- Price
- Profit
- Return on assets (ROA)
- Return on investment (ROI)
- Transforming mechanism

Key Points for Review

- **Costing and Pricing**
  - Costing follows scope determination and quantification and precedes pricing and budgeting.
  - Cost can be categorized into direct or indirect cost.
  - Direct costs are those that are specific and tangible to the project, and include the costs of materials, labor, equipment, etc.
  - Indirect costs are those costs not directly accountable or tangible to the project, such as business taxes, home office overhead, or transportation fleet distributed cost.
  - Pricing can be defined as the determination of the amount to be charged to the client including:
    - ✓ Direct cost

        - ✓ Indirect cost
        - ✓ Contingency
        - ✓ Profit
    - Seller vs buyer perspective determines price vs cost – e.g. $100,000 transaction
        - ✓ $100,000 is the price including profit from seller's perspective
        - ✓ $100,000 is the cost from the buyer's perspective
    - Cost-Pricing Process Inputs
        - ✓ WBS/Scope
        - ✓ Historical records
        - ✓ Vendor quotations
    - Transforming mechanism (Tools and techniques)
        - ✓ Cost and pricing strategies
        - ✓ Financial management
    - Outputs
        - ✓ Project estimate
        - ✓ Project acquisition
        - ✓ Business decision

❖ **Budgeting process**
- Activity cost estimates
- Scope baseline
- Project schedule
- Contracts

❖ **Forecasting**
- Applying earned value method
- Using Cost Performance Index (CPI) to calculate Estimate at Complete (EAC)
- Early prediction of overrun when EAC is higher than Budget at Completion (BAC)

❖ **Financial management**
- Return on investment (ROI)
- Return on assets (ROA)
- Net profit margin

❖ **Project Acquisition and Business Decision**
- Review financial ratios (e.g. ROI, ROA, net profit margin) to determine the validity of acquisitions and support business decisions.

Check on Learning

1. Which of the following is not a major step in the Cost-Pricing process?

    A. Inputs
    B. Transforming mechanisms (Tools & Techniques)
    C. Outputs
    D. Bid award

2. Which item is not a major output to the Cost-Pricing process?

    A. Project Estimate
    B. Project acquisition
    C. Business decision
    D. Resource loaded CPM schedule

3. Which item is not considered a direct cost?

    A. Labor
    B. Material
    C. Site overhead
    D. Equipment

4. Historical records for costing and pricing a project does not include:

    A. Quantity take-offs
    B. Cost reports
    C. Competitor pricing
    D. Bid breakdowns

5. Inputs to the costing- pricing process do not include:

    A. Scope of work
    B. Historical records
    C. Vendor quotations
    D. Sales forecasts

6. Inputs to the budget development process include:

    A. Activity cost estimates
    B. Scope baseline
    C. Project schedule
    D. All of the above

7. Which financial management tool is best for comparing projects in the same industry?

    A. Net profit margin
    B. Return on assets
    C. Gross profit margin
    D. Break-even analysis

8. In regards to the difference between price and cost, which statement is incorrect?

    A. The vendor's price is the cost to the contractor
    B. The vendor's price plus the contractor's markup is the cost to the client
    C. The bid price to the owner is the contractor's cost
    D. The subcontractor quote is the contractor's cost

Solutions

1. D Bid Award
   Refer to Chapter 2, “Cost-Pricing Process” topic & Figure 2.2

2. D Resource Loaded Schedule
   Refer to Chapter 2, “Cost-Pricing Process” topic & Figure 2.2

3. C Site Overhead is not considered a direct cost
   Refer to Chapter 2, Figure 2.1

4. C Competitor pricing
   Refer to Chapter 2, “Historical Records” topic

5. D Sales Forecasts
   Refer to Chapter 2, “Inputs” topic & Figure 2.2

6. D All of the above
   Refer to Chapter 2, “Budgeting” topic

7. B Return on Assets
   Refer to Chapter 2, “Financial Management” topic

8. C The bid price to the owner is the contractor’s cost
   Refer to Chapter 2, “Conclusion” topic

Chapter 3 – Materials

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Introduction/Learning Objectives

Materials are the key resource in most of the projects and production endeavors. Materials are purchased by those using them, rather than being manufactured by the subject entity. Materials range from the simplest of raw materials to the most complex fabricated materials with a large range in between. This chapter provides a basic understanding of the use of raw and finished materials (as a resource) in projects and production/manufacturing processes. The key learning objectives are:

- Identify types of project materials
- Understand the issues involved in selecting and handling materials
- Understand the principles of materials purchasing and management, including the proper amount of stock to save money and avoid waste or production delays
- Understand possible safety hazards associated with materials and be aware of regulations governing worker and materials safety
- Understand the relationship of 'material' topics to the cost engineering processes of estimating, economic analysis, value engineering, planning, scheduling and project management

Terms to Know

- Bulk material
- Competing characteristics
- Engineered materials
- Fabricated material
- Handling, raw material
- Procurement
- Safety stock
- Surplus
- Waste

Key Points for Review

- **Materials Competition**
  - Economical and market forces often drive the selection of a particular material to use in the finished product/project.
  - Balancing best possible use/material type with risk, selling economics, safety and intended use is necessary.

- **Materials Handling Considerations**
  - It includes balancing of the cost and efficiency of materials handling issues.

- **Materials Handling Principles**

- Material movement should be over the shortest distance possible
- Terminal time should be in the shortest time possible
- Eliminate manual material handling when mechanized methods are feasible
- Avoid partial transport loads
- Materials should be readily identifiable and retrievable

❖ **Materials Handling Decision Factors**
- Type and characteristics of material being handled
- Sourcing and transport considerations
- Production system considerations
- Facility type and throughput considerations
- Cost considerations

❖ **Material Types and Related Information**
- **Raw materials**: used in production or fabrication
- **Bulk materials**: partially processed or fabricated before being incorporated into a new product or facility
- **Fabricated materials**: bulk materials transformed into custom-fit items for a particular product or project
- **Engineered/designed materials:** require substantial engineering, procurement and construction effort to attain final form

❖ **Production Materials Purchase and Management**
- Key to offering competitive price
- Proper quality of materials selected/used through specifications
- Vendor surveillance and traceability
- Quality assurance/control
- Economic order quantity (EOQ):

EOQ = $[\sqrt{2xDxP/S}]$

where:
D = annual demand; P = purchase order costs; S = storage/carrying costs

Reorder Point (RP) = [(O x R) + I]

where:
RP = reorder point; O = order time; R = production rate; I = minimum inventory level or safety stock

- Just-In-Time (JIT) inventory techniques
- Individual purchase orders and systems contracts
- Materials inspection
- Expediting
- Global materials decisions

❖ **Plant Materials Management**
- Not product or project specific, but mid-stream materials used in support of the production of

products or finished work elements

- Specialized plant materials: critical equipment parts with long lead time; supplementing parts availability
- Plant materials benchmarking: learning from other organization's material management practices

❖ **Materials Waste Product and Hazard Issues**

- Governmental regulations compliance and communications issues:
  - ✓ Material safety data sheets (MSDS).
  - ✓ Environmental regulations: e.g. US regulates three categories of hazardous waste handlers:
    - Generators
    - Transporters
    - Owners and operators of Treatment, Storage, and Disposal facilities
- Material life cycle: All materials have a life cycle from "cradle to grave"
- Waste materials and surplus management.

❖ **Future Developments**

- The use and continued advancement in computerized techniques and 3D printing.

Check on Learning

1. Which of the following statements regarding material handling is true?

    A. Poor material handling can result in damage to raw materials or the finished product
    B. Efficient material handling can slow production operations
    C. Material handling has no significant issues
    D. Material handling in not a requirement; as inefficiencies are labor based

2. All of the following decision factors affect material handling except:

    A. Material to be handled
    B. Employee type
    C. Production system type
    D. Material handling costs

3. Which one of the following represents the four basic material categories?

    A. Rare materials, surplus materials, fabricated materials, engineered/designed materials
    B. Raw materials, bulk materials, fabricated materials, engineered/designed materials
    C. Raw materials, bulk materials, fabricated materials, long lead materials
    D. Raw materials, pre-packed materials, fabricated materials, engineered/designed materials

4. Which one of the following represents the three general areas affecting the production materials purchased and management?

    A. Materials specifications, material vendor surveillance and traceability, materials quantity
    B. Materials quality, material vendor surveillance and traceability, materials cost
    C. Materials quality, material vendor volume and production, materials quantity
    D. Materials quality, material vendor surveillance and traceability, materials quantity

5. Which of the following is not used to calculate Economic Order Quantity?

    A. Annual demand
    B. Production rate
    C. Purchase order costs
    D. Storage/carrying costs

6. Which of the following is not used to calculate the Reorder Point?

    A. Order time
    B. Sales
    C. Production rate
    D. Safety stock

7. US Resource Conservation and Recovery Act (RCRA) does not regulate the following category:

    A. Pipelines
    B. Generators
    C. Transporters
    D. Owners and operators of TSD facilities

8. The Globally Harmonized System (GHS) of Classification and Labeling of Chemicals, is a system for standardizing and harmonizing the classification and labeling of chemicals. It addresses the following:

    A. Defining health, physical, and environmental hazards of chemicals;
    B. Creating classification processes that use available data on chemicals for comparison with the defined hazard criteria; and,
    C. Communicating hazard information, as well as protective measures, on labels and Material Safety Data Sheets (MSDS)
    D. All of the above

9. Which statement applies to Just-in-Time techniques for materials procurement?

    A. Remove safety stocks
    B. Cause fast tracking
    C. Cost more than they save
    D. Is not actually a procurement strategy

Solutions

1. A Poor Material handling can result in damage to raw materials or the finished product
   Refer to Chapter 3, “Material Handling Decision Factors” topic

2. B Employee type
   Refer to Chapter 3, “Material Handling Decision Factors” topic

3. B Raw materials, bulk materials, fabricated materials, engineered/design materials.
   Refer to Chapter 3, “Types of Material and Related Information” topic

4. D Materials quality, material vendor surveillance and traceability, materials quantity.
   Refer to Chapter 3, “Production Materials Purchase and Management” topic

5. B Production rate
   Refer to Chapter 3, “Economic Order Quantity” topic

6. B Sales
   Refer to Chapter 3, “Economic Order Quantity” topic

7. A Pipelines
   Refer to Chapter 3, “Environmental regulations” topic

8. D All of the above
   Refer to Chapter 3, “Safety Data Sheets and Hazard Communication” topic

9. A Remove Safety Stocks
   Refer to Chapter 3, “Just-In-Time Inventory Techniques” topic

Chapter 4 – Labor

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Introduction/Learning Objectives

Labor is one of the most important resources for a project. An owner, employer, or a project manager of any industry needs to have a complete understanding of how the labor force works. This chapter provides an overview of the different classifications of labor, the different types of labor wages and benefits and also indirect and overhead labor and other costs. This chapter also illustrates the methodology of determining realistic value of labor cost. The key learning objectives are:

- Identify different classifications of labor and how each contributes to the final completed project.
- Develop labor rates for estimating.
- Develop and use weighted average rates/composite crew rates.
- Include indirect and overhead labor and other costs.
- Estimate work hours for a given work scope at a given location.
- Use labor hours to monitor work progress.

Terms to Know

- Direct labor
- Indirect labor
- Labor rates
- Labor wage
- Overhead labor
- Performance monitoring

Key Points for Review

- **Labor classifications**
  - Direct labor
  - Indirect labor
  - Overhead labor

- **Basic Wage:**
  - Sources of basic wages data may include:
    - ✓ Data bases from previous projects
    - ✓ Labor contracts
    - ✓ Unit rates supplied by contracting and engineering firms
    - ✓ Local chamber of commerce data
    - ✓ Government labor statistics
    - ✓ Published labor data bases
    - ✓ Standardized estimating publications such as Means and Aspen

- **Fringe Benefits**
  - Paid time off
  - Medical and life insurance benefits
  - Government mandated benefits

- **Engineering/Contractors Overhead and Profit**
  - Base wages including fringes
  - Worker's Compensation (if applicable)
  - Overhead
  - Profit (if applicable for time and material situations)

- **Fully Loaded or Billing Rate**
  - Sick time
  - Vacation
  - Holidays

- **Overtime Wages**
  - Premium wage paid for work in excess of regular working hours
  - Some benefits are not added to overtime hours
  - Social Security and Medicare are calculated as a percentage added to overtime rate

- **Weighted Average Rates/Crew Composition Rates**
  - Average of differing experience and skill levels

- **Methods for Estimating Indirect and Overhead Labor Cost**
  - Total staff hours applied to wage rates to compute indirect labor
  - Historical data to compute adders for indirect labor costs

- **Estimating Work Hours to Complete a Job**
  - Labor productivity adjustment factors
  - Learning curve (experience curve) and its effect on productivity

- **Performance Monitoring**
  - Earned value computations (SPI and CPI)
    - ✓ SPI = BCWP (EV)/ BCWS (PV)
    - ✓ CPI = BCWP (EV)/ ACWP (AC)
  - Understanding how to use graphical presentation of earned value data

- **Work Sampling**
  - Method to determine production or unit rates for specific work activities
  - Used in setting up a company database, or determining the relationship between work at an individual site and labor standards, which have been or may be used for estimating projects in the future
  - Comparisons can then be made against existing experience or databases to determine the most reasonable data to use as the standard
  - Used for estimating projects in the future
  - The data can be used to determine how the actual work is deviating from the standard

Check on Learning

1. In a 40-hour per week work year, how many hours would a machinist work given the following:

   - Sick leave allowed = 5 days
   - Vacation days = 10 days
   - Paid holidays = 10 days

   Assume that all sick time is used.

   A. 2040 hours
   B. 1960 hours
   C. 1880 hours
   D. 1920 hours

2. You have the following crew mix. Calculate the composite direct crew hourly wage.

XYZ Production Crew	Direct Wage
1 Foreman	$25.00 per/hr.
2 Operators	$18.00 per/hr.
2 Helpers	$12.00 per/hr.
1 Mechanic	$15.00 per/hr.

   A. $11.67
   B. $25.00
   C. $16.67
   D. $20.00

3. The following personnel are assigned to a construction project. Classify them into indirect and overhead personnel and calculate the per hour cost added per direct work hour for each classification. The total direct work-hours are 10,000 for the month.

	No.	Hrs./month	Wages/hr.
Payroll Personnel	2	172	$35
Procurement	2	10	$40
Plant Cost and Scheduling	3	172	$45
Human Resources	2	25	$45
Corporate Computer Support	5	50	$55
Construction Management	3	172	$60

   A. Indirects = $1.68, Overheads = $6.62
   B. Indirects = $6.62, Overheads = $1.68
   C. Indirects = $3.53, Overheads = $4.78
   D. Indirects = $1.60, Overheads = $6.70

4. Given the standard labor cost for 100 LF of footing 8 inches by 12 inches = $125.00, if the jobsite conditions are:

   - Jobsite conditions: average
   - Worker Skill: poor
   - Temperature: 80 degrees
   - Work week: 50 hours

   What is the adjusted unit rate given the factors below?

Jobsite conditions	Good	+4%
	Average	+7%
	Poor	+12%
Worker skill level	High	+3.5%
	Average	+8%
	Poor	+15.5%
Temperature	Below 40°F or above 85°F, add 1 percent per degree of variance	
Work weeks in excess of 40 hours	40 – 48 hours	+7.5%
	49 – 50 hours	+13.5%
	51 – 54 hours	+18%
	55 – 59 hours	+23%

   A. $161.25
   B. $170.00
   C. $153.13
   D. $165.00

5. You are given the following information for a five-day work activity:

Description	Day 1	Day 2	Day 3	Day 4	Day 5	CPI	SPI
Cumulative hours (plan)	60	85	136	175	215		
Actual hours expended	48	72	144				
Cumulative hours earned							
Cumulative earned percentages	15%	28%	57%				

   Calculate the cumulative hours earned and determine the CPI and the SPI.

   A. CPI = 0.90, SPI = 0.85
   B. CPI = 0.54, SPI = 0.57
   C. CPI = 0.85, SPI = 0.90
   D. CPI = 1.18, SPI = 1.11

6. You are 10 weeks into a project and the following information is in your weekly project status report:

   - CPI = 1.02
   - SPI = 0.98

   These indicators mean:

   A. Project is ahead of schedule and over budget
   B. Project is behind schedule and under budget
   C. Project is behind schedule and over budget
   D. Project is ahead of schedule and under budget

7. Which of the following are U.S. and State government mandated labor benefits?

   A. Medicare, Social Security, & State Unemployment
   B. State Unemployment, 401k, & Vacation
   C. Medicare, Social Security, & State Retirement Fund
   D. Medicare, Social Security, & Travel, Per Diem, & Lodging

8. One of the most important items affecting the learning curve is the productivity improvement that results from a crew performing _____ type operations.

   A. Non-repetitive
   B. Repetitive
   C. Skill of the Craft
   D. Machining

9. One common way to compute Estimate at Completion (EAC) is to take the Budget at Completion (BAC) and:

   A. Divide by SPI
   B. Multiply by SPI
   C. Multiply by CPI
   D. Divide by CPI

Solutions

1. C

52 weeks x 5 days per week x 8 hours per day		= 2,080 hours
Less:	Sick time @ 5 days x 8 hours	= -40 hours
	Vacation @ 10 days x 8 hours	= -80 hours
	Holidays @ 10 days x 8 hours	= -80 hours
	S/T	= -200 hours

Answer = 1,880 hours

Refer to Chapter 4, "Fringe Benefits" topic

2. C

1 x $25.00	= $25.00
2 x $18.00	= $36.00
2 x $12.00	= $24.00
1 x $15.00	= $15.00
6	$100.00

Composite crew hourly wage = $100/6 = $16.67

Refer to Chapter 4, "Developing Labor Rates" topic

3. B

Indirects	No.	Hrs./Mth.	Wages/Hr.	Total	
Construction Management	3	172	$60	3x172x60	= $30,960
Plant Cost and Scheduling	3	172	$45	3x172x45	= $23,220
Payroll Personnel	3	172	$35	2x172x35	= $12,040
					= $66,220

Indirect Allocation = $66,220/10,000 direct work hours = $6.62 per work hour

Overhead	No.	Hrs./Mth.	Wages/Hr.	Total	
Procurement	2	10	$40	2x10x40	= $800
Human Resources	2	25	$45	2x25x45	= $2,250
Corp. Computer Support	5	50	$55	2x50x55	= $13,750
					= $16,800

Overhead Allocation = $16,800/10,000 direct work hours = $1.68 per work hour

Refer to Chapter 4, "Indirect and Overhead Labor" topic

4. B

Adders		
Jobsite conditions	Average	+7%
Worker skill	Poor	+15.5%
Temperature	80°F	+0%
Work week	50 hours	+13.5%
Total adders		+36%

Unit Rate = $125.00 x 1.36 = $170.00

Refer to Chapter 4, "Developing Labor Rates" topic

5. C

Day 1 earned	= .15 x 215	= 32.25
Day 2 earned	= .28 x 215	= 60.20
Day 3 earned	= .57 x 215	= 122.55
CPI = earned/expended	= 122.5/144	= 0.85
SPI = earned/planned	= 122.5/136	= 0.90

Refer to Chapter 4, “Performance Monitoring” topic

6. B Project is behind schedule and under budget.
Refer to Chapter 4, “Performance Monitoring” topic

7. A Medicare, Social Security, & State Unemployment.
Refer to Chapter 4, “Fringe Benefits” topic

8. B Repetitive
Refer to Chapter 4, “Learning curve” Topic

9. D Divide by CPI
Refer to Chapter 4, “Performance Monitoring” topic

Chapter 5 – Engineering Role and Project Success

Neil D. Opfer, CCP CEP PSP FAACE

Introduction/Learning Objectives

Provide a basic understanding of the systems and their associated cost and schedule issues that lead to efficient and effective engineering efforts. The key learning objectives are:

- Identify engineering issues involved in product, project, and process development, including research, the use of CAD/CAE/CAM, product liability, patents, trade secrets, and developing prototypes.
- Understand product and process design and production issues, including process selection, standardization, manufacturability, constructability, and "make" or "buy" issues.
- Identify production health and safety issues.
- Identify issues involved in planning facility layout.
- Design assembly and flow process charts.
- Understand other engineering production/construction concepts, such as reengineering, and relate engineering decisions on product selection to their impact on process selection.

Terms to Know

- Building Information Modeling (BIM)
- Computer aided design (CAD)
- Computer aided engineering (CAE)
- Computer aided manufacturing (CAM)
- Constructability
- Maintainability
- Manufacturability
- Patent
- Product design
- Prototype
- Reengineering
- Robot
- Standardization
- System design
- Variance analysis

Key Points for Review

- **Product, Project and Process Development**
  - Pure and applied research
  - Product, project, and process life cycles
  - Computer aided design/engineering—CAD/CAE
  - Computer aided manufacturing

- Prototypes
- Patents and trade secrets
- Product liability

❖ **Product, Project and Process Design**
- Standardization
- Process selection
  - ✓ Continuous production
  - ✓ Discrete production
- Manufacturability
- Constructability
- Maintainability
- Make or buy decisions
  - ✓ Making best decisions to enhance overall quality at lower cost
- Total cost of ownership considerations

❖ **Engineering Production/Construction**
- Production health and safety
- Facility layout
- Assembly and flow process charts
- Quantitative analysis in facility layout
- Reengineering

Check on Learning

1. Research that attempts to develop a usable product or new feature to an existing product is:

    A. Pure research
    B. Applied research
    C. Market research
    D. Competitive research

2. Since June 1995 in the US and generally in all industrialized countries, a patent's duration is ____?

    A. 20 years
    B. 15 years
    C. 17 years
    D. 10 years

3. Which of the following is not an advantage of standardization in manufacturing?

    A. Less investment in spare parts
    B. Shorter time to market
    C. Product flaws will be spread over a wide variety of products
    D. Fewer equipment components resulting in faster repairs

4. Which of the following is not a type of continuous production?

    A. Petro-chemical plant
    B. Machine shop
    C. Power plant
    D. Automotive manufacturer

5. Which of the following is not a type of discrete production?

    A. Concrete pre-cast plant
    B. Structural steel fabricator
    C. Manufacturers with assembly-line methods
    D. Manufacturers of custom products

6. Continuous production method systems are less expensive in the long run because _____?

    A. High demand equals lower costs
    B. Machinery is cheaper than labor
    C. Cost of equipment is amortized over many units of production
    D. Both A and C

7. Slight changes in design that do not affect the product, but instead promote ease of assembly of the product, are referred to as _____?

    A. Constructability
    B. Process selection
    C. Manufacturability
    D. Continuous production

8. Which of the following statements is false in regards to reengineering?

    A. Radical redesign of business process
    B. Focuses on the optimization of the total organization
    C. Focuses on the sub-optimization of individuals departments
    D. The objective is to achieve dramatic improvements in critical contemporary measures

9. Which approach can reduce field labor content by allowing work to off site in a controlled environment?

    A. Constructability
    B. Process selection
    C. Manufacturability
    D. Continuous production

Solutions

1. B Applied research
   Refer to Chapter 5, “Pure and Applied Research” topic

2. A 20 years
   Refer to Chapter 5, “Patents and Trade Secrets” topic

3. C Product flaws will be spread over a wide variety of products
   Refer to Chapter 5, “Standardization” topic

4. B Machine shop
   Refer to Chapter 5, “Process Selection” topic

5. C Manufactures with assembly-line methods
   Refer to Chapter 5, “Process Selection” topic

6. D Both A and C
   Refer to Chapter 5, “Process Selection” topic

7. C Manufacturability
   Refer to Chapter 5, “Manufacturability” topic

8. C Focuses on the sub-optimization of individuals departments
   Refer to Chapter 5, “Reengineering” topic

9. A Constructability
   Refer to Chapter 5, “Constructability” topic

Chapter 6 – Machinery, Equipment, and Tools

Dr. Carl C. Chrappa

Introduction/Learning Objectives

This chapter illustrates the management of machinery, equipment, and tools related to a project and their impact on the project schedule and the costs. An overview of how to establish an equipment valuation database and identify the different categories and subcategories of the equipment value is provided. This chapter will also discuss equipment price and cost information and the current and residual values for new and used equipment. The key learning objectives are:

- Establish an equipment valuation database and identify the different equipment value categories and subcategories.
- Research equipment price and cost information.
- Understand the factors that affect current and residual values for new and used equipment.

Terms to Know

- Fair market value-in-place
- Fair market value-in-exchange
- Fair value
- Forced liquidation value
- Orderly liquidation value
- Replacement cost
- Reproduction cost
- Residual value
- Salvage value
- Scrap value

Key Points for Review

- **Equipment Value Categories**
  - Replacement cost new (new equipment cost)
    - ✓ Reproduction cost
    - ✓ Replacement cost
    - ✓ Fair value
  - Market value (used equipment, secondary market value). Subcategories are ranked in decreasing order of monetary value:
    - ✓ Fair market value-in-place
    - ✓ Fair market value-in-exchange
    - ✓ Orderly liquidation value
    - ✓ Forced liquidation value
    - ✓ Salvage value/part-out value
    - ✓ Scrap value

- **Equipment Condition Terms & Definitions**
  - Example 1:
    - ✓ Very Good
    - ✓ Good
    - ✓ Fair
    - ✓ Poor
    - ✓ Scrap
  - Example 2:
    - ✓ Excellent
    - ✓ Good
    - ✓ Average
    - ✓ Fair
    - ✓ Poor

- **Data Filing**
  - By standard industry classification (SIC)
  - By equipment class and type
  - By industry category
  - By equipment manufacturer's name

- **Residual Value Curves**
  - L-shape curve
  - U-shape curve
  - Regulatory change curve
  - High obsolescence curve
  - New tax law/high inflation curve

- **Variables Affecting Residual Value**
  - Initial cost
  - Maintenance
  - Use, wear, and tear
  - Population
  - Age
  - Method of sale
  - Economy
  - Changes in technology
  - Foreign exchange
  - Tax laws
  - Legislation/regulation
  - Location of equipment

- **Residual Value Determination Methods**
  - Income approach (present value of future cash flows)
  - Market approach (Trade data)
- **Caution on Using Residual Curve**

- The use of the residual curve should be only for conceptual “order of magnitude” purposes, not for determining actual residual value.

❖ **Inflation Factor**
- Use “machine-specific” instead of “industry-specific” inflation indices to improve reliability.

Check on Learning

1. When using market value method to assess equipment value, which one of the following will have the highest value?

    A. Fair market value-in-place
    B. Orderly liquidation value
    C. Fair market value-in-exchange
    D. Salvage value/part-out value

2. Cost adjustments are applied to normalize used equipment value. Which one of the following is not generally applied to add or deduct from the used equipment sales data?

    A. The location of the sales
    B. The same equipment, but with different years of manufacture
    C. Color of the equipment
    D. Condition of the equipment

3. Owner/leasing companies routinely apply an inflation factor to analyze residual value. Which one of the following inflation factor generally yields the highest reliability?

    A. Consumer price index (CPI)
    B. Industry-specific indices
    C. Machine-specific indices
    D. ENR equipment cost indices

4. Equipment value category-Replacement Cost New has three subcategories, what are the three subcategories?

    A. Reproduction cost, replacement cost, and fair value
    B. Replacement cost, fair value, and depreciation
    C. Fair value, reproduction cost, and depreciation
    D. Depreciation, replacement cost, and salvage value

5. The “normal” residual value curve of long-lived equipment usually follows an L-shaped curve. The high-tech equipment, such as a computer, exhibits what type of curve shape?

    A. Normal
    B. Regulation change
    C. High obsolescence
    D. High inflation

6. Residual analysis formats differ from company to company, but should contain the same basic elements. Of the two more popular formats used in the industry, which item below is not an element of either format type?

    A. Manufacturer
    B. Equipment description
    C. Life expectancy
    D. Equipment serial number

7. Generally speaking, there are 12 items that should be considered in estimating residual values; which list best describes those items?

    A. Initial cost, maintenance, location of equipment, and use, wear and tear
    B. Population, age, legislation and regulation, and economy
    C. Changes in technology, foreign exchange, tax laws, and method of sales
    D. All of the above

8. From a practical standpoint in determining residual values, the _____ is oftentimes believed to be the most accurate estimating methodology, because of its reliance on sales and trade data.

    A. Market approach
    B. Cost approach
    C. Income approach
    D. Vendor inquiry approach

9. The two major categories of equipment values that are used to establish an equipment valuation database are?

    A. Replacement cost new
    B. Market value
    C. Salvage value
    D. Both A and B

10. Based on available information during a 1980's study, it was found that guarantee companies annually experienced losses (on their guarantees) in the area of only ___ percent of the total values guaranteed.

    A. 2.5
    B. 1.5
    C. 1.0
    D. 2.0

Solutions

1. A Fair market value-in-place yields the highest value
   Refer to Chapter 6, “Equipment Value Categories” topic

2. C The color of equipment is generally not considered
   Refer to Chapter 6, “Trade Data/Cost Adjustments” topic

3. C The machine-specific indices tailor to each type of equipment and have the highest reliability
   Refer to Chapter 6, “Calculating Residual Values” topic

4. A Reproduction Cost, Replacement Cost, and Fair Value
   Refer to Chapter 6, “Equipment Value Categories” topic

5. C High Obsolescence - The high-tech equipment has a short life and follows the high obsolescence type curve shape
   Refer to Chapter 6, “Residual Value Curves” topic

6. D Equipment Serial Number
   Refer to Chapter 6, “Residual Valuation Formats” topic

7. D All the above
   Refer to Chapter 6, “Variables That Affect Residual Value” topic

8. A Market Approach
   Refer to Chapter 6, “Determining Residual Value Methodology” topic

9. D Both A and B
   Refer to Chapter 6, “Conclusion” topic

10. B 1.5
    Refer to Chapter 6, “Calculating Residual Values” topic

Chapter 7 – Economic Cost

Neil D. Opfer, CCP CEP PSP FAACE

Introduction/Learning Objectives

Facing the heightened global competition, cost professionals need to sharpen their knowledge and skills of economic costs. Making the right decision to pursue a project, product or service requires a sound understanding of the time value of money, tax impact, depreciation, and economic analysis techniques. The key learning objectives are:

- Evaluate, on an economic analysis basis, the differences between two or more alternative courses of action.
- Understand such concepts and techniques as depreciation methods, net present value, annual cash flow analysis, rate-of-return, benefit-cost analysis, and payback periods.

Terms to Know

- Benefit-cost ratio
- Depletion
- Depreciation
- Discount Rate
- Economic Analysis
- Economic Life
- Equivalent uniform annual benefit (EUAB)
- Equivalent uniform annual cost (EUAC)
- Future Value
- Net present value
- Opportunity Costs
- Payback periods
- Present Value
- Rate of return
- Taxes
- Time value of money

Key Points for Review

- **Types of Costs**
  - Opportunity costs
  - Sunk costs
  - Book costs
  - Incremental costs

- **Changes in Costs**
  - Inflation

- ✓ Money supply
- ✓ Exchange rates
- ✓ Demand-pull inflation
- ✓ Cost-push inflation

- Deflation
- Escalation
- Currency variation

❖ **Governmental Cost Impacts**

- Government regulations
- Taxes
  - ✓ Value added tax (VAT)
  - ✓ Effective tax rates
  - ✓ Marginal tax rates
  - ✓ Investment tax credits
- Depletion
- Depreciation methods
  - ✓ Straight-line method (SL)
  - ✓ Double-declining balance method (DDB)
  - ✓ Sum-of-years digits method (SOYD)
  - ✓ Modified accelerated cost recovery system (MACRS) – US only
  - ✓ Units of production (UOP)

❖ **Economic Analysis Techniques**

- Time value of money
  - ✓ Net present value method
  - ✓ Capitalized cost method
  - ✓ Equivalent uniform annual cost or benefit method
  - ✓ Rate of return analysis
  - ✓ Benefit-cost ratio analysis method
  - ✓ Payback period method

Check on Learning

1. _____ represents the foregone benefit by choosing one alternative over another.

    A. Book costs
    B. Sunk costs
    C. Opportunity costs
    D. Incremental costs

2. A cost that represents funds already spent by virtue of past decisions is:

    A. Opportunity cost
    B. Sunk cost
    C. Book cost
    D. Inflation

3. Book costs represent the value of an item as reflected _____.

    A. In the firm's books
    B. On the cash flows
    C. In the economic analysis decisions
    D. In the incremental costs

4. The rise in the price level of a good or service or market basket of goods and/or services is called _____.

    A. Currency variation
    B. Deflation
    C. Escalation
    D. Inflation

5. _____ is a technique to accommodate price increases or decreases during the life of the contract.

    A. Taxes
    B. Escalation
    C. Investment tax credits
    D. Depreciation

6. ABC Construction Company owns a crane with an original cost of $500,000 and an estimated salvage value of $200,000. Its life is estimated to be 15 years. Using straight-line (SL) method, calculate the depreciation of this asset.

    A. $20,000
    B. $33,333
    C. $13,500
    D. $50,000

7. ABC Construction Company owns a small tractor with an original cost of $10,000 and an estimated salvage value of $2,000. Its life is estimated to be 5 years. Using double-declining balance (DDB), in what year will the small tractor be fully depreciated?

    A. 5
    B. 4
    C. 2
    D. 1

8. A cross-country highway is built for $200,000,000 and will have maintenance costs of $500,000 per year. At 10 percent interest, what is the capitalized cost of perpetual service?

    A. $550,000,000
    B. $205,000,000
    C. $220,000,000
    D. $500,000,000

9. Two new highway systems are being considered for construction. Project West has a NPV (net present value) of benefits $30,000,000 and NPV of costs is $20,000,000. Project Southwest has a NPV of benefits $55,000,000 and NPV of costs is $45,000,000.

    Using the benefit-cost ratio analysis method, which highway system should be built?

    A. Project West should be built
    B. Project Southwest should be built
    C. Both highway systems should be built at the same time
    D. Neither highway system should be considered at all

10. As a cost professional, you are requested to perform project screening in ten minutes. Which one of following projects is worthy of further review?

    A. Project A requires $50 million investment, resulting in $20 million in benefits
    B. Project B requires $30 million investment, resulting in $14 million in benefits
    C. Project C requires $40 million investment, resulting in $15 million in benefits
    D. Project D requires $20 million investment, resulting in $3 million in benefits

Solutions

1. C Opportunity costs
   Refer to Chapter 7, "Opportunity Costs" topic

2. B Sunk costs
   Refer to Chapter 7, "Sunk Costs" topic

3. A In the firm's books
   Refer to Chapter 7, "Book Costs" topic

4. D Inflation
   Refer to Chapter 7, "Inflation" topic

5. B Escalation
   Refer to Chapter 7, "Escalation" topic

6. A

   D = depreciation charge
   C = asset original cost
   S = salvage value
   N = asset depreciable life (years)

   $D = (C – S) / N$
   $D = (500{,}000 – 200{,}000) / 15$
   $D = 300{,}000/15$
   D = **$20,000**
   Refer to Chapter 7, "Straight-line Depreciation" topic

7. B

   D = depreciation charge
   C = asset original cost
   BV_r = book value of asset at end of *r*th year
   BV_0 = book value at beginning of year 1 = C
   N = asset depreciable life (years)
   $D = (2 / N) (BV_{r-1})$

Year	DDB	DDB Calculated $	Allowable Depreciation	Book Value at Year End
1	(2/5) (10,000)	4,000	4,000	6,000
2	(2/5) (6,000)	2,400	2,400	3,600
3	(2/5) (3,600)	1,440	1,440	2,160
4	(2/5) (2,160)	864	160*	2,000
5	(2/5) (2,000)	800	0	2,000
Total		**9,504**	**8,000**	**2,000**

Because the small tractor cannot be depreciated below its salvage value of $2,000, Year 4 will see a reduced allowable depreciation of the small tractor.

* Note: An asset cannot be depreciated below its salvage value. Thus the depreciation for year 4 is limited to only $160 to claim the maximum cumulative depreciation allowance of $8,000 ($10,000 - $2,000). Year 5 has no depreciation allowance.

Refer to Chapter 7, "Sum-of-years Digit Depreciation" topic

8. B

Capitalized Cost= $200,000,000 + ($ 500,000 / 0.10)
= $200,000,000 + ($5,000,000)
= $205,000,000

Refer to Chapter 7, "Capitalized cost" topic

9. A

Project West

B/C = $30,000,000 / $20,000,000
B/C = 1.5 B/C ratio

Project Southwest

B/C = $55,000,000 / $45,000,000
B/C = 1.22 B/C ratio

On the basis of the B/C analysis, both projects have B/C ratios greater than 1, and pass the initial screening test. The next step is performing incremental B/C ratio tests by evaluating the increased cost of Project Southwest against Project West.

Incremental B/C = ($55,000-$30,000) / ($45,000 - $20,000) = 1

The incremental B/C of 1 indicates a break even situation. In this situation, Project West is preferred because of the lower investment cost.

Refer to Chapter 7, "Benefit-cost Ratio Analysis Method" topic

10. B

Based on the limited information and tight time constraint, using payback period method is the only viable economic analysis technique.

Project A Payback = B/C = $50 M/ $20M = 2.5 years
Project B Payback = B/C = $30 M/ $14M = 2.14 Years
Project A Payback = B/C = $40 M/ $15M = 2.67 Years
Project A Payback = B/C = $20 M/ $3M = 6.67 Years

Project B has the shortest payback period indicating fastest recovery of the capital investment.

Refer to Chapter 7, "Payback Period Method" topic

Chapter 8 – Activity-Based Cost Management

Gary Cokins

Introduction/Learning Objectives

The general ledger uses a chart of accounts, whereas Activity-Based Cost Management (ABC/M) uses a chart of activities. Expenses occur at the point of acquisition with third parties. This is when money (or obligation) exits the company. From the expenses, all costs calculated are representations of how those expenses flow through work activities and into outputs of the work. ABC/M ties each cost element to an activity and makes cost structure transparent. Low and non-value contributing activities can be reduced or eliminated to improve cost efficiency. The key learning objectives are:

- Understand why managers and employees are misled by arbitrary cost allocations with broad averages that violate the costing cause-and-effect principle.
- Understand how Activity-Based Cost Management (ABC/M) transforms spending expenses on resources (e.g., salaries) into calculated costs of processes, and their work activities that belong to them, and then into products, service-lines, channels and customers.
- Identify how cost drivers cause costs to occur.
- Understand how attributes are tags or scores that are attached to activities to suggest actions
- Understand how ABC/M is used in addition to strategic purposes, such as profit margin analysis, for cost management, productivity, and asset use.

Terms to Know

- Activity-based cost management (ABC/M)
- Chart of accounts
- Cost
- Cost re-assignment network
- Direct expenses
- Indirect expenses (also known as overhead or indirect costs)
- Overhead

Key Points for Review

❖ **Overhead Expenses are Displacing Direct Expenses**
  - Standard costs
    - ✓ Service organizations measure this type of output related information
    - ✓ Problems are overhead is on top of cost components
    - ✓ Overhead is an indirect expense

❖ **Impact of diversity in products, service lines, channels and customers**
  - Why indirect expenses (overhead) are displacing direct expenses?
    - ✓ Automation and technology replacing manual jobs
    - ✓ Greater variety of products and services, with more and different customers

- ✓ Introduction of greater variation and diversity creates complexity results that require more overhead
- ✓ The shift to overhead displacing direct labor reveals complexity. ABC/M points out where the complexity is and where it comes from

❖ **Activities are expressed with action verbs and trace expenses to outputs**

- **Pitfalls of using traditional cost allocations of expenses**
  - ✓ Salary and fringe benefit make up sizeable portion of controllable expenses
  - ✓ These expenses are reported as lump-sum amounts without offering insight and content of employee work
  - ✓ Managers lack the tool to control and influence expenses

- **Activity Based Cost Management (ABC/M)**
  - ✓ Translate the work activities into a general ledger of expenses
  - ✓ ABC/M is used for analysis
  - ✓ ABC/M is starting point for calculating costs for both processes and diverse outputs
  - ✓ ABC/M resolves deficiencies of traditional financial accounting
  - ✓ ABC/M is work-centric

- **Expenses must be distinguished from costs**
  - ✓ All costs are calculated costs
  - ✓ Review assumptions that are involved in conversion and translation of expenses into costs
  - ✓ Expenses occur at point of acquisition with third parties, including employee wages
  - ✓ When money exits the company, the "value" does not change
  - ✓ From expenses, all costs calculated are representations of how these expenses flow through work activities

- **Difference between ABC/M and the General Ledger and traditional cost allocations**
  - ✓ ABC/M describes activities using an action-verb-adjective-noun grammar convention, such as inspect defective products
  - ✓ ABC/M uses a chart of activities
  - ✓ ABC/M describes what it was spent for
  - ✓ ABC/M is work-centric
  - ✓ General Ledger uses a chart of accounts
  - ✓ Chart of Accounts is inaccurate for reporting business process
  - ✓ General Ledger is organized around separate departments or cost centers
  - ✓ General Ledger uses mapping to its hierarchical organization chart
  - ✓ General Ledger describes what was spent
  - ✓ General Ledger is transaction-centric

- **Activity drivers trigger the workload**
  - ✓ Each activity reveals the content of work and gives insights to what drives cost fluctuation
  - ✓ All costs actually originate with customer or beneficiary of the work
  - ✓ ABC/M provides the additional information of analysis to the data
  - ✓ Cost assignment network enables ABC/M to calculate more accurate costs of work
  - ✓ Cost allocations are structured as a one source to many distributions or cost

❖ **ABC/M is a Cost Re-assignment Network**

- ABC/M assigns 100 percent of the costs into the final products, service lines, channels, customers, and business sustaining costs. The customers are the final cost objects; their existence ultimately creates the need for an expense and cost structure in the first place. Cost objects are the persons or things that benefit from incurring work activities.
  - ✓ Three modules connected by cost assignment paths
    - Resources: Capacity to perform work. Traced to work activities
    - Work activities: Where work is performed. Assigned to cost objects
    - Final cost objects: Broad variety of outputs and services where cost accumulated

❖ **Using the attributes of Activity Based Cost Management**

- Identify organization work activities
  - ✓ What can be eliminated
  - ✓ What is ineffectively accomplished
  - ✓ What is required to sustain the organization
  - ✓ What can be discretionary and potentially eliminated
  - ✓ Review and classify what would be a high-value-adding activity
  - ✓ Review and classify what would be a low-value-adding activity
  - ✓ Review level of importance as critical or postponable
  - ✓ Review level of performance as exceeds or below expectations

❖ **Local versus enterprise-wide ABC/M**

- Enterprise-wide application: for strategic purposes; focusing on where to look for problems and opportunities; calculating profit margin data at all levels
  - ✓ A large parent (enterprise) ABC/M model is subdivided into its component children (local or subsets of organization) ABC/M models
  - ✓ Local or subsets of organization application: for tactical purposes; focusing on process and productivity improvement
    - Unit of costs of output made visible into modeling
    - Activity analysis—judges work based on the need, efficiency, and value

❖ **If ABC/M is the answer, what is the question?**

- Lower margin for decision errors
- ABC/M reveals where to remove waste, low-value-adding costs, and unused capacity, as well as understanding what drives their costs
- Better understanding of cause and effect connections
- Knowing real costs for outputs, product costs, and the "cost-to-serve"
- Degree of alignment of cost structure with organization's mission and strategy

❖ **ABC/M in advanced, mature users**

- Integration of the ABC/M output data with their decision support systems
- Learning skills and rules for resizing, reshaping, re-leveling, and otherwise readjusting their ABC/M systems
- Collecting and automatically importing data into the ABC/M system
- Automatically exporting the calculated data out of their ABC/M system

Check on Learning

1. Why have the indirect expenses (i.e., overhead) of most organizations been displacing the direct expenses as a relative portion of its cost structure?

    A. Machinery and automation has replaced manual work
    B. Computers and information technology has replaced manual work
    C. The expansion in diverse product lines and types of sales and distribution channels has caused complexity requiring more indirect expenses to manage the complexity
    D. White collar salaries have been rising faster than wages of front-line workers

2. How are "expenses" defined differently from "costs?"

    A. Expenses pertain only to employee expense reports
    B. In contrast to capital investments, expenses are only for items consumed within a year after being purchased
    C. There is no difference and the two terms are synonymous
    D. Expenses are when cash is paid out by the organization and costs are the calculated usage of the expense spending

3. What is the primary determinant influencing the accuracy of costs?

    A. The detail level of the general ledger cost codes
    B. The structure of the cost assignment network
    C. The quality of employee time sheets
    D. Having more than one activity cost driver

4. What are the ultimate final cost objects of a cost measurement system?

    A. Product and service line costs
    B. Customer and business sustaining costs
    C. Employee paychecks and vendor invoices
    D. Customer costs

5. How is a "local" ABC/M system different from an "enterprise-wide" ABC/M system?

    A. Local ABC/M is restricted to measure only product profitability
    B. Enterprise-wide ABC/M is intended to distribute cost reports primarily to department and cost center employees
    C. The purpose of local ABC/M reporting is mainly to drive process improvement and productivity
    D. Local ABC/M primarily feeds the pricing and quotation system

6. All the following statements are correct except:

    A. Expenses and costs are the same depending on the perspective of contractors or owners
    B. In ABC/M system, all costs are calculated representations of how expenses flow through work activities and into outputs of work
    C. The general ledger uses a chart of accounts
    D. ABC/M uses a chart of activities

7. Cost assignment network includes the following three modules:

    A. Resources, schedule, and final cost objects
    B. Resources, work activities, and schedule
    C. Resources, work activities, and final cost objects
    D. Work activities, schedule and final cost objects

8. All the following are high-value-adding activities except:

    A. Those that are critical steps that cannot be eliminated in a business process
    B. Those that are performed to resolve or eliminate quality problems
    C. Those that are performed as a result of a request or expectation of a satisfied customer
    D. Those that are performed to monitor quality problems

9. In terms of applying ABC/M, which one is incorrect?

    A. Process and productivity improvements are expected for the enterprise
    B. Process and productivity improvements are expected at the local level
    C. Enterprise-wide ABC/M can calculate profit margin data at all levels
    D. Local ABC/M is for tactical purposes

10. ABC/M provides visibility to organizations to:

    A. Remove waste
    B. Remove low-value adding activities
    C. Seek a better way to manage unused capacity
    D. All of the above

Solutions

1. C The expansion in diverse product lines and types of sales and distribution channels has caused complexity requiring more indirect costs to manage the complexity

   Refer to Chapter 8, "Impact of Diversity in Products, Service Lines, Channels, and Customers" topic

2. D Expenses are when cash is paid out by the organization, and costs are the calculated usage of the expense spending

   Refer to Chapter 8, "Activities Are Expressed With Action Verbs and Trace Expenses to Outputs" topic

3. B The structure of the cost assignment network

   Refer to Chapter 8, "ABC/M is a Cost Re-Assignment Network" topic

4. B Customer and business sustaining cost

   Refer to Chapter 8, "Using the Attributes of Activity-Based Cost Management" topic

5. C The purpose of local ABC/M reporting is mainly to drive process improvement and productivity

   Refer to Chapter 8, "Local vs. Enterprise-Wide ABC/M" topic

6. A Expenses and costs are the same depending on the perspective of contractors or owners

   Refer to Chapter 8, "Activities Are Expressed With Action Verbs and Trace Expenses to Outputs" topic

7. C Resources; work activities and final cost objects

   Refer to Chapter 8, "ABC/M is a Cost Re-Assignment Network" topic

8. D Are performed to monitor quality problems

   Refer to Chapter 8, "Local vs. Enterprise-Wide ABC/M" topic

9. A Process and productivity improvements are expected for the enterprise

   Refer to Chapter 8, "Local vs. Enterprise-Wide ABC/M" topic

10. D ABC/M provides visibility to organization to remove waste, low-value-adding activities and manage unused capacity

    Refer to Chapter 8, "Local vs. Enterprise-Wide ABC/M" topic