Chapter 2
Job-Order Costing for Manufacturing and Service Companies

QUESTIONS

1. Manufacturing costs include all costs associated with the production of goods. Examples of manufacturing costs are: labor costs of workers directly involved with manufacturing goods, cost of all materials directly traced to products, indirect factory labor, indirect materials used in production, depreciation of production equipment, and depreciation of the manufacturing facility.

   Nonmanufacturing costs are all costs that are not associated with the production of goods. These typically include selling costs and general and administrative costs.

2. Product costs are assigned to goods produced. Product costs are assigned to inventory and become an expense when inventory is sold. Period costs are not assigned to goods produced. Period costs are identified with accounting periods and are expensed in the period incurred.

3. Two common types of product costing systems are (1) job-order costing systems and (2) process costing systems.

   Job-order costing systems are generally used by companies that produce individual products or batches of unique products. Companies that use job-order costing systems include custom home builders, airplane manufacturers, and ship-building companies.

   Process costing is used by companies that produce large numbers of identical items that pass through uniform and continuous production operations. Process costing tends to be used by beverage companies and producers of chemicals, paints, and plastics.

4. A job cost sheet is a form that is used to accumulate the cost of producing a job. The job cost sheet contains detailed information on direct materials, direct labor, and manufacturing overhead used on the job.

5. Actual overhead is not known until the end of the accounting period. If managers used actual overhead rates to apply overhead to jobs, they would have to wait until the end of the period to determine the cost of jobs. In order to make timely decisions, managers may need to know the cost of jobs before the end of the accounting period.

6. An important characteristic of a good overhead allocation base is that it should be strongly related to overhead cost. Assume that setup costs are classified as manufacturing overhead. The number of setups that a job requires would be a better allocation base for setup costs than would the number of direct labor hours worked on that job. Number of setups is more closely related to setup costs than is the number of direct labor hours and, therefore, number of setups is a better allocation base.

7. In highly automated companies where direct labor cost is a small part of total manufacturing costs, it is unlikely that overhead costs vary with direct labor. Further, in such companies, predetermined overhead rates based on direct labor may be quite large. Thus, even a small change in labor (the allocation base) could have a large effect on the overhead cost allocated to a job.

   Companies that are capital-intensive should consider using machine hours as an allocation base (or better still, they should consider the use of an activity-based costing system, which is discussed in more detail in Chapter 5).

8. It is necessary to apportion underapplied or overapplied overhead among Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold accounts if the amount in the Manufacturing Overhead account is material whether a debit or credit balance.

9. An unexpected increase in production would typically result in overhead being overapplied. Overhead is applied using a predetermined rate which equals estimated total overhead cost (including variable and fixed overhead) divided by the estimated level of the allocation base. Overhead applied equals the predetermined rate times the actual use of the allocation base. An unexpected increase in production means that the fixed component of the predetermined overhead rate will be multiplied by a larger number than anticipated. Thus, more fixed overhead will be applied than the company is likely to incur.

10. As companies move to computer-controlled manufacturing systems, direct labor will likely decrease (due to decreased need for workers) and manufacturing overhead will likely increase (due to higher depreciation costs associated with the computer-controlled systems).

EXERCISES

E1. [LO 6]. Managers at Company A will perceive that overhead cost allocated to jobs increases with the amount of direct labor used. If they are evaluated on how well they control the cost of jobs, they will try to cut back on labor, which not only reduces labor costs but also overhead allocated to jobs they supervise. Following similar logic, managers at Company B will cut back on machine time and managers at Company C will make a special effort to control material costs (by reducing waste, searching for

lower prices, etc). Note that the measure of performance (reduction in job costs) combined with the approach to allocating overhead drives managers to focus on different factors—this is a good example of "You get what you measure!"

E2. [LO 8, 10]. If over- or under-applied overhead is large, we typically allocate it to work in process, finished goods and cost of goods sold based on the relative balances in these accounts. However, if a company uses JIT, the balances in work in process and finished goods are likely to be quite small compared to the balance in cost of goods sold. Thus, there will be only a small difference between assigning all of the over- or under-applied overhead to cost of goods sold versus apportioning it among the three accounts based on their relative balances.

E3. [LO 10]. The seven criteria for the Baldrige award are as follows:

Leadership – Examines how senior executives guide the organization and how the organization addresses its responsibilities to the public and practices good citizenship.

Strategic planning – Examines how the organization sets strategic directions and how it determines key action plans.

Customer and market forces – Examines how the organization determines requirements and expectations of customers and markets; builds relationships with customers; and acquires, satisfies and retains customers.

Measurement, analysis, and knowledge management – Examines the management, effective use, analysis, and improvement of data and information to support key organization processes and the organization's performance management system.

Workforce focus – Examines how the organization enables its workforce to develop its full potential and how the workforce is aligned with the organization's objectives.

Process management – Examines aspects of how key production/delivery and support processes are designed, managed, and improved.

Results – Examines the organization's performance and improvement in its key business areas: customer satisfaction, financial and marketplace performance, human resources, supplier and partner performance, operational performance, and governance and social responsibility.

E4. [LO 4].

a. P
b. P
c. J
d. J
e. P
f. J

E5. [LO 1, 2].

a. Y	e. N
b. N	f. Y
c. Y	g. Y
d. Y	h. N

E6. [LO 3, 6]. Note that direct materials are charged to Work in Process Inventory while indirect materials are charged to Manufacturing Overhead.

Work in Process Inventory	200,000	
Raw Materials Inventory		200,000
Manufacturing Overhead	10,000	
Raw Materials Inventory		10,000

E7. [LO 3, 6]. Note that direct materials are charged to Work in Process Inventory while indirect materials are charged to Manufacturing Overhead.

Work in Process Inventory	1,500	
Raw Materials Inventory		1,500
(250 + 350 + 400 + 500 = 1,500)		
Manufacturing Overhead	100	
Raw Materials Inventory		100

E8. [LO 3, 6]. Note that direct labor is charged to Work in Process Inventory while indirect labor is charged to Manufacturing Overhead.

Work in Process Inventory	70,000	
Wages Payable		70,000
Manufacturing Overhead	50,000	
Wages Payable		50,000

E9. [LO 3, 6].

a. **Job No. 201**

110 hrs. × $10/hr	$ 1,100
90 hrs. × $21/hr.	1,890
40 hrs. × $12/hr.	480
Total	$3,470

Job No. 202

50 hrs. × $20/hr.	$1,000

Job No. 203
70 hrs. × $18/hr. $1,260

b. Labor Report for the month of February (by job):

Job	Time Ticket	Hours	Rate	Cost
201	2101	110	10.00	$1,100
201	2102	90	21.00	1,890
201	2103	40	12.00	480
		240		3,470
202	2104	50	20.00	1,000
203	2105	70	18.00	1,260
	Total labor charges			$5,730

Work in Process Inventory	5,730	
Wages Payable		5,730

E10. [LO 7].

(1) Predetermined overhead allocation rate based on direct labor hours:
$900,000 ÷ 60,000 DLH = $15 per direct labor hour

(2) Predetermined overhead allocation rate based on direct labor costs:
$900,000 ÷ $1,800,000 = $0.50 per dollar of direct labor

(3) Predetermined overhead allocation rate based on machine hours:
$900,000 ÷ 30,000 machine hours = $30 per machine hour

E11. [LO 6, 7, 9].

a. The use of predetermined overhead rates makes it possible to cost jobs immediately after they are completed. If a company used an actual overhead rate, then job costs would not be available until the end of the accounting period. If Franklin Computer Repair charges customers based on actual job cost, it would be unacceptable to have to wait until the end of the accounting period to bill customers.

b. The overhead rate is:
$500,000 ÷ $800,000 = $0.625 per dollar of technician wages.

Total job cost = $200 + $100 + ($100 x $0.625) = $362.50

E12. [LO 6, 7].

a. Predetermined overhead rates:

Allocation base	Predetermined Overhead Rate
Direct labor hours	$1,000,000 ÷ 40,000 DLH = $25 per direct labor hour
Direct labor cost	$1,000,000 ÷ $625,000 = $1.60 per dollar of direct labor cost
Machine hours	$1,000,000 ÷ 20,000 MH = $50 per machine hour
Direct material cost	$1,000,000 ÷ $800,000 = $1.25 per dollar of direct material

b. Cost of Job No. 253 using different allocation bases:

Cost	DLH	DL cost	MH	DM cost
Direct Materials	$3,000	$3,000	$ 3,000	$3,000
Direct labor	1,800	1,800	1,800	1,800
Manufacturing Overhead*	3,750	2,880	7,500	3,750
Total	$8,550	$7,680	$12,300	$8,550

*Overhead rates in "a" above x actual activity.

E13. [LO 3, 6, 7].

a. Overhead applied is equal to $3 × $100,000 of direct labor = $300,000.

Work in Process Inventory	$300,000	
Manufacturing Overhead		$300,000

b. Actual overhead is $260,000

Manufacturing Overhead	260,000	
Raw Materials Inventory		40,000
Wages Payable		80,000
Utilities Payable		25,000
Accumulated Depreciation		60,000
Repairs Payable		55,000

E14. [LO 8, 10].

a. Overhead applied is $300,000 while actual overhead is $260,000. Thus, Manufacturing Overhead has a $40,000 credit balance. The journal entry to close the account to Cost of Goods Sold is:

Manufacturing Overhead	40,000	
Cost of Goods Sold		40,000

b. Closing the balance in Manufacturing Overhead leads to product costs that are consistent with actual overhead costs rather than estimated overhead costs.

c. Because Star Plastics uses a just-in-time inventory system, the balances in Work in Process and Finished Goods are likely to be quite small compared to Cost of Goods Sold. Thus, there is not likely to be a significant difference between charging the entire amount of overapplied overhead to Cost of Goods Sold versus apportioning it among Work in Process, Finished Goods and Cost of Goods Sold.

E15. [LO 3, 6].

Cost Summary: Job 325	
Direct Material	$ 10,000
Direct Labor (250 hours x $16/hour)	4,000
Manufacturing Overhead:	
($25 per direct labor hour x 250 hours)	6,250
Total	$20,250

E16. [LO 6, 7, 9].

Estimated overhead = $210,000 which is allocated based on cost of attorney and paraprofessional time.

Budgeted salaries: (5 × $100,000) + (9 x $50,000) = $950,000

Predetermined overhead rate = $210,000 ÷ $950,000 = $0.22 per dollar of attorney and paraprofessional time.

If client services require $45,000 in salaries, then indirect costs assigned are:

$45,000 × $0.22 = $9,900.

E17. [LO 8]. Since the Manufacturing Overhead account has an ending credit balance (before adjustment), manufacturing overhead for the period is overapplied. The problem states that the balance is material—this suggests that we prorate the balance among Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold.

Accounts	Balance	% of Total	Total Overapplied	Adjustment
Work in Process Inventory	$ 500,000	25	$90,000	$22,500
Finished Goods Inventory	600,000	30	90,000	27,000
Cost of Goods Sold	900,000	45	90,000	40,500
Total	$2,000,000			$90,000

Manufacturing Overhead	90,000	
Work in Process Inventory		22,500
Finished Goods Inventory		27,000
Cost of Goods Sold		40,500

E18. [LO 10]. Examples of negative events that would require a company holding inventory are as follows:

1. Strikes at a supplier would interrupt delivery of critical materials.
2. Unanticipated machine break-down would interrupt production.
3. Natural disasters or terrorist attacks would interrupt delivery of materials.

E19. [LO 6]. Estimated manufacturing overhead was $2,000,000 and eighty percent was fixed. When the sequence of material movements was changed and 30,000 of machine hours were saved, $1,600,000 (80% of $2,000,000) would remain unchanged. If variable manufacturing overhead is approximately $4 per hour ($400,000÷100,000) the new variable portion would be $280,000 ($4 x (100,000 – 30,000)) which would make the total overhead about $1,880,000. The savings is only $120,000 or $4 per hour, much less than $20 per hour.

E20. *Student answers will vary. See below for possible ideas.*

One concept is the calculation of cost of goods manufactured and cost of goods sold. This concept is very important to someone who is an accountant for a manufacturing company. Accountants will need accurate information about direct materials, direct labor, and manufacturing overhead in determining the cost of manufacturing products. From there, accountants can calculate the company's cost of goods sold. It is important for these numbers to be calculated correctly since an overstatement of cost of goods sold will lead to an understatement of net income and vice versa. Accountants have a responsibility to gather correct information and communicate this information to others who rely on it. Thus, accountants must make sure that accurate cost records are kept throughout each year.

PROBLEMS

P1. [LO 3].

a.

Satterfield's Custom Glass
Schedule of Cost of Goods Manufactured
For the Year Ended December 31, 2014

Beginning balance in work in process inventory		$ 210,000
Add current manufacturing costs:		
Direct material	$2,500,000	
Direct labor	3,000,000	
Manufacturing overhead	1,700,000	7,200,000
Total		7,410,000
Less ending balance in work in process inventory		300,000
Cost of goods manufactured		$7,110,000

b.

Satterfield's Custom Glass
Income Statement
For the Year Ended December 31, 2014

Sales		$8,500,000
Less cost of goods sold:		
Beginning finished goods inventory	$ 500,000	
Add cost of goods manufactured	7,110,000	
Cost of goods available for sale	7,610,000	
Less ending finished goods inventory	400,000	7,210,000
Gross profit		1,290,000
Less nonmanufacturing expenses:		
Selling & admin. expenses		800,000
Net income		$ 490,000

P2. [LO 3].

a.

Terra Cotta Designs
Schedule of Cost of Goods Manufactured
For the Year Ended December 31, 2014

Beginning balance in work in process inventory			$ 650,000
Add current manufacturing costs:			
Direct material:			
Beginning balance	$ 450,000		
Purchases	1,500,000		
Ending balance	(200,000)	$1,750,000	
Direct labor		2,500,000	
Manufacturing Overhead		650,000	4,900,000
Total			5,550,000
Less ending balance in work in process inventory			350,000
Cost of goods manufactured			$5,200,000

b.

Terra Cotta Designs
Income Statement
For the Year Ended December 31, 2014

Sales		$7,000,000
Less cost of goods sold:		
Beginning finished goods inventory	$ 750,000	
Add cost of goods manufactured	5,200,000	
Cost of goods available for sale	5,950,000	
Less ending finished goods inventory	350,000	5,600,000
Gross profit		1,400,000
Less nonmanufacturing expenses:		
Selling expenses	500,000	
General & admin. expenses	850,000	1,350,000
Net income		$ 50,000

P3. [LO 6].

a. **Cost of Jobs:**

	1005	**1006**	**1007**	**1008**	**1009**	**1010**
Direct materials	$650	$850	$1,550	$650	$450	$350
Direct labor	1,600	2,000	3,300	1,400	900	700
Mfg. overhead	2,880*	3,600	5,940	2,520	1,620	1,260
Total	$5,130	$6,450	$10,790	$4,570	$2,970	$2,310

*$1,600 x 180%

b.

Raw Material Inventory	5,500	
Accounts Payable		5,500
(To record purchase of steel)		
Raw Material Inventory	2,400	
Cash		2,400
(To record purchase of supplies)		
Work in Process Inventory	4,500	
Manufacturing Overhead	1,000	
Raw Material Inventory		5,500
(To record materials used in production)		
Work in Process Inventory	9,900	
Manufacturing Overhead	6,500	
Wages Payable		16,400
(To record labor)		
Work in Process Inventory	17,820	
Manufacturing Overhead		17,820
(To record overhead applied to production)		
Finished Goods Inventory	26,940	
Work in Process Inventory		26,940
(To record cost of jobs completed)		
Accounts Receivable	40,410	
Cost of Goods Sold	26,940	
Sales		40,410
Finished Goods Inventory		26,940
(To record the sale of finished goods)		

P4. [LO 3, 6].

a)

The beginning balance in Work in Process is $14,500:

Job 258	$5,000
Job 259	6,000
Job 260	3,500
Total	$14,500

The ending balance in Work in Process Inventory is $8,400:

Job 345	$2,500
Job 346	5,900
Total	$8,400

b)
The beginning balance in Finished Goods Inventory is $9,000:

Job 257	$9,000

The ending balance in Finished Goods Inventory is $11,700:

Job 341	$1,500
Job 342	3,300
Job 343	2,400
Job 344	4,500
Total	$11,700

c)
Cost of goods sold is determined as follows:

Beginning balance in work in process inventory		$14,500
Add current manufacturing costs:		
Direct material	$750,000	
Direct labor	1,650,000	
Manufacturing overhead	2,150,000	4,550,000
Total		4,564,500
Less ending balance in work in process inventory		8,400
Cost of goods manufactured		$4,556,100

Beginning finished goods inventory	$ 9,000
Add cost of goods manufactured	4,556,100
Cost of goods available for sale	4,565,100
Less ending finished goods inventory	11,700
Cost of goods sold	$4,553,400

Job 257 through Job 340 likely relate to the balance of Cost of Goods Sold.

P5. [LO 6, 7].

a. Predetermined overhead rate based on labor hours:

$12,000,000 ÷ 300,000 hours = $40 per labor hour

Overhead assigned to the model K25 shoe based on labor hours:

$40 x 11,000 hours = $440,000

Predetermined overhead rate based on labor cost:

$12,000,000 ÷ $4,800,000 = $2.50 per labor dollar

Overhead assigned to the model K25 shoe based on labor cost:

$2.50 x $165,000 = $412,500

b. Direct labor cost is the preferred allocation base because workers paid a higher rate work on more complex jobs, and more complex jobs lead to more overhead cost.

P6. [LO 6, 7].

a. Predetermined overhead rate based on direct labor cost:

$200,000 ÷ $300,000 labor cost = $0.67 per labor dollar

Predetermined overhead rate based on direct labor hours:

$200,000 ÷ 25,000 hours = $8.00 per labor hour

Predetermined overhead rate based on machine hours:

$200,000 ÷ 8,000 machine hours = $25 per machine hour

b. **Overhead based on labor cost**

	Job 9823	Job 9824
Direct material	$ 1,000	$2,000
Direct labor	1,400	1,400
Mfg. overhead	938	938
Total	$3,338	$4,338

Overhead based on labor hours

	Job 9823	Job 9824
Material	$ 1,000	$ 2,000
Labor	1,400	1,400
Overhead*	1,200	1,040
Total	$ 3,600	$ 4,440

*Actual direct labor hours x $8

Overhead based on machine hours

	Job 9823	Job 9824
Material	$1,000	$ 2,000
Labor	1,400	1,400
Overhead*	3,250	6,750
Total	$5,650	$10,150

*Actual machine hours x $25

c. Given that depreciation on equipment accounts for 75 percent of applied overhead costs, an allocation based on machine hours seems reasonable. However, users of the job cost information should keep in mind that the applied overhead portion of job cost is not an incremental cost.

P7. [LO 7, 8].

a) Net Income, if over-applied overhead is immaterial and assigned to Cost of Goods Sold:

OH applied = .75 x $700,000 = $525,000
Actual OH = $450,000
Therefore, overhead was over-applied by $75,000

Sales	$2,500,000.00
CGS ($1,000,000 - $75,000)	925,000.00
Gross Profit	1,575,000.00
Selling & Admin. Expenses	1,000,000.00
Net Income	$ 575,000.00

b) Net Income, if over applied overhead is material and prorated among appropriate accounts.

	Balance	Proportion	Adjustment	Adjusted Balance
WIP Inventory	$ 80,000	0.071	$ 5,325	$ 74,675
FG Inventory	48,000	0.043	3,225	44,775
COGS	1,000,000	0.886*	66,450	933,550
Total	$1,128,000	1.000	$75,000	$1,053,000

*Rounded so total equals 1.000

Sales	$2,500,000.
CGS	933,550
Gross Profit	1,566,450
Selling Expenses	400,000
Admin Expenses	600,000
Net Income	$ 566,450

c. Charging the entire amount of overapplied overhead to Cost of Goods Sold results in higher net income than prorating overapplied overhead among Work in Process, Finished Goods, and Cost of Goods Sold.

P8. [LO 8].

a. If overapplied overhead is assigned to Cost of Goods Sold, the adjusted balance will be:

$440,000 - $50,000 = $390,000.

b. If overapplied overhead is assigned to Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold, the adjusted balances will be:

	Balance	Proportion	Adjustment	Adjusted Balance
WIP Inv.	$ 66,000	0.12	$ 6,000	$ 60,000
FG Inv.	44,000	0.08	4,000	40,000
COGS	440,000	0.80	40,000	400,000
Total	$550,000	1.00	$50,000	$500,000

P9. [LO 6, 7, 9].

a. Indirect cost per hour of service is $65:

50 professionals × 1,600 hours = 80,000 hours per year.

$5,200,000 indirect cost ÷ 80,000 hours = $65 per hour.

b. Estimated cost of services for a potential client:

Average salary per billable hour = $120,000 per year ÷ 1,600 hours = $75 per hour.

Professional service (100 hours × $75 per hour)	$ 7,500
Indirect costs (100 hours × $65 per hour)	6,500
Total	$14,000

P10. [LO 3, 6].

a. $30,000 + $40,000 -$15,000 = $55,000

b. $80,000 + $55,000 +$45,000 + $63,000 - $82,000 = $161,000

c. $95,000 + $161,000 - $110,000 = $146,000

d. $70,000 - $60,000 = $10,000

P11. [LO 6, 7, 8].

a. The predetermined overhead rate is $2.57 per direct labor dollar ($9,000,000 ÷ 3,500,000 = $2.57).

b. Work in Process Inventory 5,750,000
Raw Materials Inventory 5,750,000

c. Work in Process Inventory 4,000,000
Wages payable 4,000,000

d. Work in Process Inventory 10,280,000
Manufacturing Overhead 10,280,000
($4,000,000 × $2.57 = $10,280,000)

e. Cost of Goods Sold 720,000
Manufacturing overhead 720,000
($11,000,000 - $10,280,000 = $720,000)

P12. [LO 6, 7].

a.	Job 201	$17,000 × $3.25 =	$ 55,250
	Job 202	$20,500 × $3.25 =	66,625
	Job 203	$9,000 × $3.25 =	29,250
			$ 151,125

b.	Job 201	$9,500 × $3.33 =	$ 31,635
		$3,000 × $4.76 =	14,280
		$4,500 × $2.40 =	10,800
			$ 56,715
	Job 202	$5,000 × $3.33 =	$ 16,650
		$6,500 × $4.76 =	30,940
		$9,000 × $2.40 =	21,600
			$ 69,190
	Job 203	$2,000 × $3.33 =	$ 6,660
		$5,000 × $4.76 =	23,800
		$2,000 × $2.40 =	4,800
			$ 35,260
	Total		$ 161,165

c. It appears that the relation between overhead and labor cost is different in the three production departments. Thus, it is preferable to use separate overhead rates for each.

P13. [LO 3, 6, 7, 8].

a. Confectioners' sugar (2,100 lbs. × $0.80)	$1,680
Granulated sugar (2,300 lbs. × $0.90)	2,070
Chocolate (900 lbs. × $4.00)	3,600
Caramel (300 lbs. × $1.50)	450
Eggs (60 doz. × $0.85)	51
Paraffin (90 lbs. × $0.50)	45
	$7,896

Raw Materials Inventory	7,896	
Accounts payable (various)		7,800
Cash		96
(To record purchase of sugar, chocolate, caramel, eggs, & paraffin)		
Work in Process Inventory	5,400	
Wages Payable		5,400
(To record direct labor cost)		
Manufacturing Overhead	2,500	
Wages Payable		2,500
(To record indirect labor cost)		
Manufacturing Overhead	6,150	
Utilities Payable		400
Rent Payable		750
Accounts Payable		5,000
(To record overhead costs incurred)		
Work in Process Inventory	6,896	
Raw Materials Inventory		6,896
(To record raw materials used: $2,500 + 7,896 - $3,500 = $6,896)		
Work in Process Inventory	7,650	
Manufacturing Overhead		7,650
(To record overhead cost applied to jobs = $17 × 450 hours)		
Finished Goods Inventory	21,446	
Work in Process Inventory		21,446
(To record production of finished goods: $6,500 + $5,400 + $6,896 + $7,650 – $5,000 = $21,446)		
Accounts Receivable	35,000	
Sales Revenue		35,000
(To record sales)		
Selling & Admin. Expenses	9,000	
Accounts Payable		9,000
(To record nonmanufacturing expenses incurred)		

Cost of Goods Sold	24,446	
Finished Goods Inventory		24,446
(To record cost of sales: $9,000 + $21,446 - $6,000)		

Cost of Goods Sold	1,000	
Manufacturing Overhead		1,000
(To record allocation of underapplied overhead to CGS)		
(6,150 + 2,500 - 7,650 = 1,000)		

b. Lane Confectioners
Income Statement for the Month of March

Revenue	$35,000	
Cost of goods sold	25,446	($24,446 + $1,000)
Gross margin	9,554	
Selling & Admin. Exp.	9,000	
Net income (loss)	$ 554	

P14. [LO 6, 7]. Approximately 66 percent of overhead costs ($160,000 + $135,000) ÷ $450,000 are related to machinery. Without additional information, it appears that machine hours would be an appropriate overhead allocation base.

The predetermined overhead allocation rate = $450,000 ÷ 15,000 machine hours = $30 per machine hour.

P15. [LO 1, 4]. **T**he following is an example of a possible virtual plant tour taken by students:

a. The product is the Hershey's Milk Chocolate Bar. The bar consists of solid chocolate. The company that manufactures the product is the Hershey Foods Corporation. Hershey Foods produce over a billion chocolate products a year. In addition to Hershey's Milk Chocolate Bars, the company produces Reese's peanut butter cups, Twizzlers, Payday bars, and York peppermint patties among other products.

b. At the start of the production process, cocoa beans are transported to the Hershey factory. The cocoa beans are cleaned and later heated at a temperature of over four hundred degrees Fahrenheit. Next, a hulling machine separates the shell and interior of each cocoa bean. The interior, known as the nib, is used to make chocolate. The nibs are grinded into a chocolate liquid, also called chocolate liquor, in a process called milling. In the next step, fresh milk is tested, pasteurized, and mixed with sugar. This mixture is slowly dried into a thick material. The milk and sugar are combined with the chocolate liquor, and the mixture is dried into a brown powder called chocolate crumb. This chocolate crumb is used to produce milk chocolate. Cocoa butter is added to the crumb,

which then becomes smoother by traveling through steel rollers. At this stage, the crumb is now a thick liquid known as chocolate paste. The paste is poured into vats called conches where granite rollers ensure that the paste is smooth. Typically, the chocolate paste stays inside the conches for one to three days. After this process, the paste is cooled and poured into moulds. In one minute, over one thousand molds can be filled with chocolate. The liquid chocolate then enters a cooling tunnel and becomes a solid candy bar. Finally, the candy bar is wrapped, and the Hershey's Milk Chocolate Bar is complete!

c. Raw materials are those materials that can be directly traced to the product. The raw materials used to make a Hershey's Milk Chocolate Bar are cocoa beans, milk, sugar, and cocoa butter. Paper is used for the wrapper of the candy bar.

d. Indirect materials are those materials that cannot be traced directly to the product. No indirect materials are used to make the candy bar. This is because all materials are conveniently traced to the finished product.

e. Direct labor is the labor that can be conveniently traced to the product. The workers who are considered direct labor perform a number of jobs. Some workers clean the cocoa beans upon entry into the Hershey factory and then place the beans in storage. Other people operate the heating and hulling machines. In addition, employees work the machines that grind nibs from the cocoa beans into chocolate liquor. More workers test the milk upon arrival and mix it with sugar. Furthermore, employees are used to operate the machines that smooth the chocolate mixture near the end of the production process. As the process nears completion, some workers operate the molding machines.

f. Indirect labor is the labor that cannot be conveniently traced to the product. A number of employees are likely used to maintain the cleanliness of the factory. These workers clean the machines used to produce the candy bars as well as the factory floors and storage areas for the cocoa beans. Supervisors in the production department are part of the product's indirect labor, too. In addition, there are some workers who are responsible for checking in the cocoa beans, milk, and other raw materials upon arrival at the factory. Security workers are also considered indirect labor.

g. Manufacturing overhead includes costs of indirect materials, indirect labor, and other miscellaneous activities used in production. The factory building and all the equipment used to make the candy bars are long-term assets and depreciation of these assets is considered an overhead expense. Also, the property taxes paid on the factory building are overhead expenses. The factory has a number of utilities, including electricity and water, which are considered part of manufacturing overhead. Any insurance related to the factory for fire or other damage would be classified as overhead as well. Furthermore, overhead expenses at the Hershey factory include overtime premiums paid to employees who work over forty hours in a week. If a machine breaks down or a power

failure occurs, then some employees are engaged in unproductive time. This idle time is another example of manufacturing overhead expenses at the factory.

h. For this production process, a process costing system would be used. The candy bars are produced in an automated continuous production process. They are also small, identical products of low costs. Plus, these costs cannot be traced directly to each candy bar that is produced.

P16. [LO 7, 8, 9].

Overhead is overapplied

Applied overhead ($6 x 35,000)	$210,000
Actual overhead	200,000
Overapplied overhead	$ 10,000

P17. LO 7 ,8, 9

a. The predetermined overhead rate is $17 per repair technician hour ($170,000 ÷ 10,000 = $17).

b. Overhead applied = $17 × 7,000 = $119,000

Overhead applied is $119,000 while actual overhead is $140,000. Thus, overhead is underapplied by $21,000

($119,000 – $140,000 = $21,000)

c. The journal entry to close the account to Cost of Goods Sold is:

Cost of Goods Sold	21,000	
Manufacturing Overhead		21,000

P18. [LO 9].

a. The predetermined overhead rate is $2,750 per hour of operating room use.

($5,500,000 ÷ 2,000 hours = $2,750). The total overhead charge to Candice for 3 hours of operating room usage is $8,250 ($2,750 x 3 hours).

b. The total cost of the knee surgery is $24,250:

Pharmacy	$ 450
Sterile supply	1,500
Supplies other	4,500
OR services	4,500
Anesthesia	1,500
Anesthesiologist	3,500
OR overhead charges	8,250
	$24,200

Case 2-1, LO General chapter concepts and ethics

BRIXTON SURGICAL DEVICES

Summary
The COO and CFO of a public company are coming up with "schemes" to manage earnings up in an effort to beat an aggressive earnings target which determines their bonus compensation.

- Indicates how profit can be "boosted" by overproduction.
- Indicates how channel stuffing can boost profit.
- Raises the interesting question "Does compliance with GAAP equate to ethical behavior?"

Questions to ask students
1. What's the situation at Brixton Surgical Devices?
2. How do Ed and Robin plan to increase profit?
3. Are their planned methods ethical and how will they affect shareholder value?

Discussion
Ed (the COO) and Robin (the CFO) realize that their company is not likely to meet their earnings target and, in consequence, they won't receive bonuses. To increase profit, they plan to offer discounts to customers for orders in October and November that can be shipped in December. This strategy is sometimes referred to as "channel stuffing" since the sales channel is being "stuffed" with merchandise. In reality, the company is simply moving sales that would have taken place next year into the current year. Arguably, this does not violate GAAP, since the company has actual orders that are shipped before year end. However, this would require complete footnote disclosure in the annual report or shareholders will be misled and think there is a permanent increase in revenue. Subsequently, they will react quite negatively when profit is down in the first quarter of the next year.

The second strategy, increasing production to lower unit costs and bury fixed production costs in inventory, also, most likely, does not violate GAAP. But it certainly hurts shareholder value. The company is using shareholders' money to make an investment in inventory that is not really needed.

Are these two strategies ethical? The answer to this question is, of course, subjective. Based on the ethical framework presented in chapter 1, I believe the strategies are not ethical. Consider questions 3 and 5 from the 7 question framework:

3. Will an individual or an organization be harmed by any of the alternatives?

5. Would someone I respect find any of the alternatives objectionable?

Shareholders are harmed by the buildup in inventory and they will be misled by channel stuffing unless there is full disclosure (which would not suit the aims of the COO and CFO). Also, it seems quite likely that someone the COO and CFO respect will find the strategies objectionable.

Case 2-2, LO 7, 9

YSL MARKETING RESEARCH

Summary
Marketing research firm is bidding on a job and is considering various costs.

- Requires calculation of full cost and consideration of incremental costs including opportunity costs.

- Brings up the importance of factors that are difficult to quantify.

Questions to ask students
1. Summarize the situation facing YSL Marketing Research.

2. What is the expected full cost of the Surenex engagement?

3. What is the lowest amount that Connie Bachmann, a partner at YSL, can bill without hurting company profit?

4. What should Connie consider in addition to the amount just calculated?

Discussion
I begin the discussion by asking a student to summarize the situation facing YSL Marketing Research. The company has been asked to conduct a survey for Surenex—a firm that has the potential to be a valued long-run client. However, Surenex is not currently willing to pay YSL's normal billing rates.

a. A student is then asked to calculate the full cost of the project.

Full Cost

Partner salary (40 hours × $120)	$4,800
Staff salary (100 hours × $40)	4,000
Direct charges	3,000
Overhead (.31 × $8,800)	2,728
Total	$14,528

Overhead calculation

Estimated overhead	$ 496,000
÷ Estimated professional compensation	1,600,000
Overhead rate	$0.31

b. What is the lowest amount that Connie can bill on this engagement without hurting company profit? The point of this question is to show that the answer is neither the full cost ($14,528) nor the variable cost of the job (assuming the variable costs are salaries and direct charges). To answer the question, students must consider the fact that if the Surenex job is undertaken, YSL will need to turn down business for which it can bid 1.5 times compensation plus out-of-pocket costs. That is, students must consider opportunity cost. If the company takes on the Surenex job, it will miss out on billing $13,200 (1.5 x $8,800) of professional compensation on some other job. In addition, to avoid hurting profit, the company must cover out-of-pocket costs. Thus, the lowest amount that Connie can bill is $16,200.

Professional compensation	$4,800
	4,000
	$8,800
$8,800 times 1.5	$13,200
Plus: Out-of-pocket costs	3,000
Total	$16,200

c. The discussion concludes with the question, “What should Connie consider in addition to the amount just calculated?” Hopefully, a student will recognize that our previous analysis was short sighted in that we did not consider the fact that Surenex may end up being a hot company with “premium billing opportunities.” Therefore, YSL may be better off in the long-run by setting a relatively low price on the current job. Even a price that does not cover salaries and direct charges could be warranted if the prospect for future profit, from working for Surenex, is very high.

Case 2-3, LO 6, 7

DUPAGE POWDER COATING

Summary

A company has bought a computer-controlled, electrostatic powder coating system. The result is overhead has increased (due to depreciation of the system) and labor hours have decreased. Since labor hours is the overhead allocation base, the overhead rate has increased. It now appears that small jobs, which still use the old manual system, are more costly than they were in the prior year—even though they are processed using the same equipment and labor as in the prior year.

- Indicates how costs can be distorted by overhead allocation.

Questions to ask students

1. What's the situation at DuPage Powder Coating?

2. What would the job have cost in the prior year and what did it cost this year?

3. Why have the cost of small jobs increased?

4. Should the company increase the prices of small jobs since costs have increased?

Discussion

a. The cost of the job in the current year is:

Direct material	$500
Direct labor (7 hours x $20)	140
Manufacturing overhead (7 labor hours x $22.15)	155
Total cost	$795

b. The cost of the job in the prior year was:

Direct material	$500
Direct labor (7 hours x $20)	140
Manufacturing overhead (7 labor hours x $12))	84
Total cost	$724

The new overhead rate is determined as follows:

Expected total overhead	$1,440,000
÷ Expected labor hours	65,000
Overhead rate	$22.15

c. The fact that the cost of this job has increased from $724 to $795 does not indicate that the company is less efficient at handling small jobs in the current year. The increase is due to the purchase of the new equipment (which this job does not even use), which increased overhead and reduced labor, resulting in a large increase in the overhead rate.

d. The decision to raise the price of small jobs should not be affected by the apparent increase in the cost of small jobs—that increase is artificial in that small jobs don't even use the equipment that led to the higher overhead rate. A price increase should be determined based on an analysis of capacity and opportunity costs.
