Discussion Questions

1. Quantitative methods can help managers evaluate alternative sales and operations plans on the basis of cost. These methods require cost estimates for each of the controllable variables, such as overtime, subcontracting, hiring, firing, and inventory investment. Say that the existing workforce is made up of 10,000 workers, each having skills valued at $40,000 per year. The plan calls for "creating alternative career opportunities"—in other words, laying off 500 employees. List the types of costs incurred when employees are laid off, and make a rough estimate of the length of time required for payroll savings to recover restructuring costs. If business is expected to improve in one year, are layoffs financially justified? What costs are incurred in a layoff that are difficult to estimate in monetary terms?
2. In your community, some employers maintain stable workforces at all costs, and others furlough and recall workers seemingly at the drop of a hat. What are the differences in markets, management, products, financial position, skills, costs, and competition that could explain these two extremes in personnel policy?
3. Consider the revenue management policies used by Harrah's Cherokee Casino & Hotel, as described in Managerial Practice 14.1. From a business ethics perspective, argue for the policies. Now argue against them.
4. Explain why management should be concerned about priority systems in service and manufacturing organizations.

Problems

Software, such as OM Explorer, Active Models, and POM for Windows, is available in myomlab. Check with your instructor on how best to use it. In many cases, the instructor wants you to understand how to do the calculations by hand. At most, the software provides a check on your calculations. When calculations are particularly complex and the goal is interpreting the results in making decisions, the software replaces entirely the manual calculations.

1. The Barberton Municipal Division of Road Maintenance is charged with road repair in the city of Barberton and the surrounding area. Cindy Kramer, road maintenance director, must submit a staffing plan for the next year based on a set schedule for repairs and on the city budget. Kramer estimates that the labor hours required for the next four quarters are 6,000, 12,000, 19,000, and 9,000, respectively. Each of the 11 workers on the workforce can contribute 500 hours per quarter. Payroll costs are $6,000 in wages per worker for regular time worked up to 500 hours, with an overtime pay rate of $18 for each overtime hour. Overtime is limited to 20 percent of the regular-time capacity in any quarter. Although unused overtime capacity has no cost, unused regular time is paid at $12 per hour. The cost of hiring a worker is $3,000, and the cost of laying off a worker is $2,000. Subcontracting is not permitted.
   a. Find a level workforce plan that relies just on overtime and the minimum amount of undertime possible. Overtime can be used to its limits in any quarter. What is the total cost of the plan and how many undertime hours does it call for?
   b. Use a chase strategy that varies the workforce level without using overtime or undertime. What is the total cost of this plan?
   c. Propose a plan of your own. Compare your plan with those in part (a) and part (b) and discuss its comparative merits.
2. Bob Carlton's golf camp estimates the following workforce requirements for its services over the next two years.

Quarter	1	2	3	4
Demand (hours)	4,200	6,400	3,000	4,800
Quarter	5	6	7	8
Demand (hours)	4,400	6,240	3,600	4,800

   Each certified instructor puts in 480 hours per quarter regular time and can work an additional 120 hours overtime. Regular-time wages and benefits cost Carlton $7,200 per employee per quarter for regular time worked up to 480 hours, with an overtime cost of $20 per hour. Unused regular time for certified instructors is paid at $15 per hour. There is no cost for unused overtime capacity. The cost of hiring, training, and certifying a new employee is $10,000. Layoff costs are $4,000 per employee. Currently, eight employees work in this capacity.
   a. Find a workforce plan using the level strategy that allows for no delay in service. It should rely only on overtime and the minimum amount of undertime necessary. What is the total cost of this plan?
   b. Use a chase strategy that varies the workforce level without using overtime or undertime. What is the total cost of this plan?
   c. Propose a better plan and calculate its total cost.
3. Continuing Problem 2, now assume that Carlton is permitted to employ some uncertified, part-time instructors, provided they represent no more than 15 percent of the total workforce hours in any quarter. Each part-time instructor can work up to 240 hours per quarter, with no overtime or undertime cost. Labor costs for part-time instructors are $12 per hour. Hiring and training costs are $2,000 per uncertified instructor, and there are no layoff costs.
   a. Propose a low-cost, mixed-strategy plan and calculate its total cost.
   b. What are the primary advantages and disadvantages of having a workforce consisting of both regular and temporary employees?

4. The Donald Fertilizer Company produces industrial chemical fertilizers. The projected manufacturing requirements (in thousands of gallons) for the next four quarters are 80, 50, 80, and 130, respectively. A level workforce is desired, relying only on anticipation inventory as a supply option. Stockouts and backorders are to be avoided, as are overtime and undertime.

   a. Determine the quarterly production rate required to meet total demand for the year, and minimize the anticipation inventory that would be left over at the end of the year. Beginning inventory is zero.

   b. Specify the anticipation inventory that will be produced.

   c. Suppose that the requirements for the next four quarters are revised to 80, 130, 50, and 80, respectively. If total demand is the same, what level of production rate is needed now, using the same strategy as part (a)?

5. Management at the Davis Corporation has determined the following demand schedule (in units):

Month	1	2	3	4
Demand	500	800	1,000	1,400
Month	5	6	7	8
Demand	2,000	1,600	1,400	1,200
Month	9	10	11	12
Demand	1,000	2,400	3,000	1,000

An employee can produce an average of 10 units per month. Each worker on the payroll costs $2,000 in regular-time wages per month. Undertime is paid at the same rate as regular time. In accordance with the labor contract in force, Davis Corporation does not work overtime or use subcontracting. Davis can hire and train a new employee for $2,000 and lay off one for $500. Inventory costs $32 per unit on hand at the end of each month. At present, 140 employees are on the payroll and anticipation inventory is zero.

   a. Prepare a production plan using a mixed strategy that only uses a level workforce and anticipation inventory as its supply options. Minimize the inventory left over at the end of the year. Layoffs, undertime, vacations, subcontracting, backorders, and stockouts are not options. The plan may call for a one-time adjustment of the workforce before month 1.

   b. Prepare a production plan with the chase strategy, relying only on hires and layoffs.

   c. Compare and contrast these two plans on the basis of annual costs and other factors that you believe to be important.

   d. Propose a better plan than these two plans, and explain why you believe it is better.

6. The Flying Frisbee Company has forecasted the following staffing requirements for full-time employees. Demand is seasonal, and management wants three alternative staffing plans to be developed.

Month	1	2	3	4
Requirement	2	2	4	6
Month	5	6	7	8
Requirement	18	20	12	18
Month	9	10	11	12
Requirement	7	3	2	1

The company currently has 10 employees. No more than 10 new hires can be accommodated in any month because of limited training facilities. No backorders are allowed, and overtime cannot exceed 25 percent of regular-time capacity in any month. There is no cost for unused overtime capacity. Regular-time wages are $1,500 per month, and overtime wages are 150 percent of regular-time wages. Undertime is paid at the same rate as regular time. The hiring cost is $2,500 per person, and the layoff cost is $2,000 per person.

   a. Prepare a staffing plan utilizing a level workforce strategy, minimizing undertime. The plan may call for a one-time adjustment of the workforce before month 1.

   b. Using a chase strategy as much as possible, prepare a plan that is consistent with the constraint on hiring and minimizes use of overtime.

   c. Prepare a low-cost, mixed-strategy plan.

   d. Which strategy is most cost-effective? What are the advantages and disadvantages of each plan?

7. The Twilight Clothing Company makes jeans for children. Management prepared a forecast of sales (in pairs of jeans) for next year and now must prepare a production plan. The company has traditionally maintained a level workforce strategy. Currently, all eight workers have been with the company for a number of years. Each employee can produce 2,000 pairs of jeans during a 2-month planning period. Every year management authorizes overtime in periods 1, 5, and 6, up to a maximum of 20 percent of regular-time capacity. Management wants to avoid stockouts and backorders and will not accept any plan that calls for such shortages. It also does not want to consider vacation scheduling as a supply option. At present, finished goods inventory holds 12,000 pairs of jeans. The demand forecast is as follows:

Period	1	2	3
Sales	25,000	6,500	15,000
Period	4	5	6
Sales	19,000	32,000	29,000

a. Is it feasible to hold the workforce constant, assuming that overtime is used only in periods 1, 5, and 6? Explain.

b. Find two alternative plans that would satisfy management's concern over stockouts and backorders, disregarding costs. What trade-offs between these two plans must be considered?

8. Gretchen's Kitchen is a fast-food restaurant located in an ideal spot near the local high school. Gretchen Lowe must prepare an annual staffing plan. The only menu items are hamburgers, chili, soft drinks, shakes, and french fries. A sample of 1,000 customers taken at random revealed that they purchased 2,100 hamburgers, 200 pints of chili, 1,000 soft drinks and shakes, and 1,000 bags of french fries. Thus, for purposes of estimating staffing requirements, Lowe assumes that each customer purchases 2.1 hamburgers, 0.2 pint of chili, 1 soft drink or shake, and 1 bag of french fries. Each hamburger requires 4 minutes of labor, a pint of chili requires 3 minutes, and a soft drink or shake and a bag of fries each take 2 minutes of labor.

The restaurant currently has 10 part-time employees who work 80 hours a month on staggered shifts. Wages are $400 per month for regular time and $7.50 per hour for overtime. Hiring and training costs are $250 per new employee, and layoff costs are $50 per employee.

Lowe realizes that building up seasonal inventories of hamburgers (or any of the products) would not be wise because of shelf-life considerations. Also, any demand not satisfied is a lost sale and must be avoided. Three strategies come to mind.

- Use a level strategy relying on overtime and undertime, with up to 20 percent of regular-time capacity on overtime.
- Maintain a base of 10 employees, hiring and laying off as needed to avoid any overtime.
- Utilize a chase strategy, hiring and laying off employees as demand changes to avoid overtime.

When performing her calculations, Lowe always rounds to the next highest integer for the number of employees. She also follows a policy of not using an employee more than 80 hours per month, except when overtime is needed. The projected demand by month (number of customers) for next year is as follows:

Jan.	3,200	July	4,800
Feb.	2,600	Aug.	4,200
Mar.	3,300	Sept.	3,800
Apr.	3,900	Oct.	3,600
May	3,600	Nov.	3,500
June	4,200	Dec.	3,000

a. Develop the schedule of service requirements for the next year.

b. Which strategy is most effective?

c. Suppose that an arrangement with the high school enables the manager to identify good prospective employees without having to advertise in the local newspaper. This source reduces the hiring cost to $50, which is mainly the cost of charred hamburgers during training. If cost is her only concern, will this method of hiring change Gretchen Lowe's strategy? Considering other objectives that may be appropriate, do you think she should change strategies?

9. The Kool King Company has followed a policy of no layoffs for most of the manufacturer's life, even though the demand for its air conditioners is highly seasonal. Management wants to evaluate the cost-effectiveness of this policy. Competitive pressures are increasing, and ways need to be found to reduce costs. The following demand (expressed in employee–month equivalents) has been forecast for next year:

Jan.	70	May	130	Sept.	110
Feb.	90	June	170	Oct.	60
Mar.	100	July	170	Nov.	20
Apr.	100	Aug.	150	Dec.	40

Additional planning data follow, with costs, inventory, and backorders expressed in employee–month equivalents:

Regular-time production cost	$1,500	Hire cost	$500/person
Overtime production cost	150% of regular-time production cost	Layoff cost	$2,000/person
Subcontracting cost	$2,500	Current backorders	10
Inventory holding cost	$100	Current inventory	0
Backorder cost	$1,000	Desired ending inventory	0
Maximum overtime	20% of regular-time capacity	Current employment	130 employees

Hiring costs are lower than layoff costs because the facility is located near a Technical Training School. Undertime is paid at the rate equivalent to regular-time production. Each employee who has been with the company at least one year also received 0.5 months of paid vacation. All 130 employees currently employed qualify for vacations next year, assuming that they remain on the workforce. Answer the following questions using *Sales and Operations Planning with Spreadsheets* Solver in OM Explorer, or an Excel spreadsheet that you developed on your own.

a. Develop an S&OP with the level strategy using overtime, undertime, and vacations as the only supply options. Use the maximum amount of overtime so as to minimize undertime. What is the total cost of this plan, and what are its advantages and disadvantages?

b. Develop an S&OP with the chase strategy. Part of your decision will be when and how many vacation periods to grant. What is the total cost of this plan, and what are its advantages and disadvantages?

c. Develop an S&OP with a lower cost than found with either the level or chase strategy, being open to the full range of supply options (including anticipation inventory). Subcontractors can supply up to 50 employee–month equivalents. What is the total cost of this plan, and what are its advantages and disadvantages?

13.