

Chapter 2: Productivity

Problem 1:

Barry's Tire Service completed 100 tire changes, six brake jobs, and 16 alignments in an eight-hour day with his standard crew of six mechanics. A brake specialist costs \$16 per hour, a tire changer costs \$8 per hour, and an alignment mechanic costs \$14 per hour. The materials cost for a day was \$2000, and overhead cost was \$500.

- a. What is the shop's labor productivity if the retail price for each respective service is \$60, \$150, and \$40?
- b. What is the multifactor productivity, if the crew consisted of two of each type mechanic?

Problem 2:

The Abco Company manufactures electrical assemblies. The current process uses 10 workers and produces 200 units per hour. You are considering changing the process with new assembly methods that increase output to 300 units per hour, but will require 14 workers. Particulars are as follows:

	CURRENT PROCESS	NEW PROCESS
OUTPUT (UNITS / HOUR)	200	300
NUMBER OF WORKERS	10	14
MATERIAL COST / HOUR	\$120	\$150

Workers are paid at a rate of \$10 per hour, and overhead is charged at 140% (or 1.4 times) labor costs. Finished switches sell for \$20 / unit.

- a. Calculate the multifactor productivity for the current process
- b. Calculate the multifactor productivity for the new process
- c. Determine if the new process should be implemented

Problem 3:

Tried and True Clothing has opened four new stores in college towns across the state. Data on monthly sales volume and labor hours are given below.

- a. Which store location has the highest labor productivity?

Store	Annandale	Blacksburg	Charlottesville	Danville
Sales volume	\$40,000	\$12,000	\$60,000	\$25,000
Labor hours	250	60	500	200

Tried and True's accountant (from Problem 1-1) suggests that monthly rent and hourly wage rate also be factored into the productivity calculations. Annandale pays the highest average wage at \$6.75 an hour. Blacksburg pays \$6.50 an hour, Charlottesville \$6, and Danville \$5.50. The cost to rent store space is \$1800 a month in Annandale, \$2000 a month in Blacksburg, \$1200 a month in Charlottesville, and \$800 a month in Danville.

- b. Which store is most productive?
- c. Tried and True is not sure it can keep all four stores open. Based on multifactor productivity, which store would you close? What other factors should be considered?

Problem 4:

Posey Ceramics makes ceramic vases for a chain of department stores. The output and cost figures over the past four weeks are shown here. Labor costs \$10 an hour, and materials are \$4 a pound.

Week	1	2	3	4
Units of output	2,000	4,000	5,000	7,000
# workers	4	4	5	6
Hours per week per worker	40	48	56	70
Material (lbs.)	286	570	720	1,000

Calculate the

- a. labor productivity (in hrs),
- b. material productivity (in lbs),
- c. multifactor productivity for each week.
- d. Comment on the results.

Problem 1:

- a.
$$\frac{(100 \times 60 + 6 \times 150 + 16 \times 40)}{6 \times 8} = \$157/hr$$
- b.
$$\frac{\{(100 \times 60) + (6 \times 150) + (16 \times 40)\}}{\{(2 \times 8 \times 16) + (2 \times 8 \times 8) + (2 \times 8 \times 14) + 2000 + 500\}} = 2.43$$

Problem 2:

- a.
$$\frac{(200)(\$20)}{(10)(\$10) + \$120 + (1.4)(10)(\$10)} = \frac{\$4,000}{\$360} = \underline{\underline{11.11}}$$
- b.
$$\frac{(300)(\$20)}{(14)(\$10) + \$150 + (1.4)(14)(\$10)} = \frac{\$6,000}{\$486} = \underline{\underline{12.35}}$$
- c. The new process increases multifactor productivity and should be implemented.

Problem 3:

- a. The Blacksburg store is the most productive.

Store	Annandale	Blacksburg	Charlottesville	Danville
Sales volume	\$40,000	\$12,000	\$60,000	\$25,000
Labor hours	250	60	500	200
Productivity=Sales/Labor	\$160	\$200	\$120	\$125

- b. Charlottesville is the most productive.

	Annandale	Blacksburg	Charlottesville	Danville
Sales volume	\$40,000	\$12,000	\$60,000	\$25,000
Labor hours	250	60	500	200
Labor cost/hr	\$6.75	\$6.50	\$6.00	\$5.50
Rent	\$1,800	\$2,000	\$1,200	\$800
Productivity	11	5	14	13

- c. Based on productivity, the Blacksburg store should be closed. Other factors to consider include total revenue, potential for growth, and options for reducing costs.

Problem 4:

Material productivity is stable over the 4 weeks. Labor productivity increases in week 2 and decreases in weeks 3 and 4.

Week	1	2	3	4
Units of output	2,000	4,000	5,000	7,000
# workers	4	4	5	6
Hours per week	40	48	56	70
Labor cost per hour	\$10	\$10	\$10	\$10
Material (lbs.)	286	570	720	1,000
Material cost per lb.	\$4	\$4	\$4	\$4

Labor productivity	1.25	2.08	1.79	1.67
Material productivity	1.75	1.75	1.74	1.75
Multifactor productivity	0.73	0.95	0.88	0.85