MEASURING PRODUCTIVITY
"From Air to Market"

Takin' Care of Business

#4

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AICPA

#4 MEASURING PRODUCTIVITY "From Air to Market"

Learning Activity

Performance Measurement: *Students, as the "inventors" of a revolutionary new sneaker called Air Zone, evaluate the productivity of two companies manufacture sneakers to decide which company can make Air Zone a business success.*

Learning Objectives

1. Understand the concepts of efficiency (inefficiency) and effectiveness (ineffectiveness) in a production process.
2. Calculate the efficiency (inefficiency) and/or effectiveness (ineffectiveness) of assets that factor into the measurement of productivity.
3. Calculate the productivity of a manufacturing process.

Assessment

Students will: (1) calculate the efficiency/inefficiency and effectiveness/ineffectiveness of two sneaker manufacturing companies by comparing standard results to actual results, (2) calculate the dollar savings or dollar cost resulting from efficiencies/effectiveness or inefficiencies/ineffectiveness, and (3) determine which manufacturing company is most productive by accumulating dollar savings and dollar costs.

Academic Standard

"Students formulate questions that can be addressed with data, and collect, organize, and display relevant data." (NCTM)

"Explain the importance of productivity and how investments and technology affect productivity."(NBEA)

Business Skill

Management Consulting: Productivity assessment is a management tool that helps companies analyze their business and technological processes to determine the degree to which goals and objectives are being met. CPAs help companies identify critical success factors in their organization and track them over time to determine the efficiency and effectiveness of the processes in place.

Procedure

- **Distribute a copy of the Overview to your students.** Explain the terms "efficiency" and "effectiveness" and the concept of productivity in the business world.
- **Review** how calculations for "efficiency" and "effectiveness" are made in the business world to evaluate productivity in a manufacturing process.

  For instance:
  effectiveness (ineffectiveness) = actual output – estimated output

  efficiency (inefficiency) = actual input – estimated input.

Example 1:

Actual output:
120 sneakers per hour
Estimated output:
100 sneakers per hour

Effective: 20 sneakers per hour

If each sneaker has a cost of $15, the dollar savings attributable to the company's operating effectiveness is $300.

Example 2:

Actual output:
100 sneakers per hour

Estimated output:
120 sneakers per hour

Ineffective:
–20 sneakers per hour

If each sneaker has a cost of $15, the dollar cost attributable to the company's operating ineffectiveness is $300.

- **Distribute copies of Activity #4** to each student and ask them to calculate the productivity of the Sneaker Factory and Footwear, Inc.

TEACHING-TIPS

For a complete lesson and activity on the services provided by CPAs, see Activity #12, *A Day in the Life*.

Overview

Advancements and improvements in technology, such as faster computers and user-friendly computer software, are assets that allow people to perform tasks in a more productive manner or to engage in activities they otherwise could not do. For example, more powerful personal computers allow students and business people alike to perform their jobs more effectively and efficiently. In addition, new technologies, such as the Internet, allow both business people and students to communicate with associates and friends like never before.

Inventions and new technologies, as well as technological improvements in existing products, serve one of two purposes: enabling people to increase their productivity in accomplishing a task, or allowing people to engage in activities they otherwise could not. Productivity is defined or categorized into two segments, efficiency and effectiveness. In turn, the success of a new or existing asset or technology is traced to how efficient and how effective (i.e., "how productive") that asset or technology is.

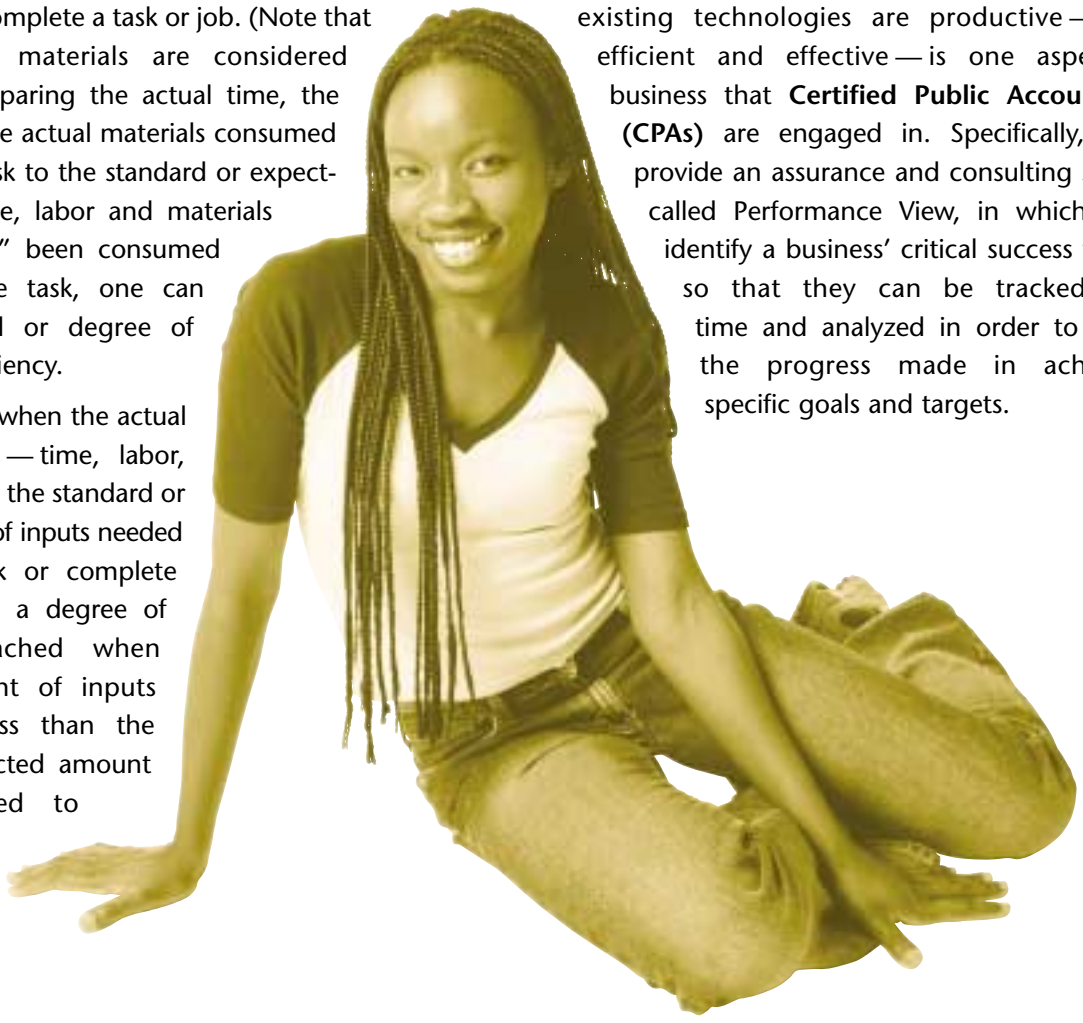
Efficiency and effectiveness are both measured in comparison terms. Efficiency, for example, is measured by comparing actual "inputs" to standard or expected inputs needed to complete a task or job. (Note that time, labor and materials are considered "inputs.") By comparing the actual time, the actual labor and the actual materials consumed in completing a task to the standard or expected amount of time, labor and materials that "should have" been consumed in completing the task, one can determine a level or degree of efficiency or inefficiency.

Inefficiency occurs when the actual amount of inputs — time, labor, materials — exceed the standard or estimated amount of inputs needed to perform a task or complete a job. Conversely, a degree of efficiency is reached when the actual amount of inputs consumed are less than the estimated or expected amount of inputs needed to perform a task.

In contrast to efficiency where "inputs" are measured, effectiveness is a measure of "outputs." Effectiveness, a comparison measure as well, compares the actual completed "product" to that of a standard product, or what the "end" or finished product "should" be. For example, does the finished product accomplish — in a productive manner — the task it was intended to accomplish, or does the end result embody the characteristics that it was intended to embody? If the finished product or end result does not meet established standards or expectations, a degree of ineffectiveness is gauged. By contrast, if the finished product or end result exceeds expectations, a level of effectiveness if gauged.

As noted above, a new or existing technology is only successful if it is productive. That is, the technology must be both efficient and effective to be productive and therefore successful. If a technology, for example, is efficient but not effective, or vice-versa, it is not considered productive and therefore not successful. By combining a technology's efficiency and effectiveness measures, one can determine the technology's degree of productivity.

The process of determining the degree to which new and existing technologies are productive — both efficient and effective — is one aspect of business that **Certified Public Accountants (CPAs)** are engaged in. Specifically, CPAs provide an assurance and consulting service called Performance View, in which CPAs identify a business' critical success factors so that they can be tracked over time and analyzed in order to assess the progress made in achieving specific goals and targets.



Activities

How Much Money Can Your New Shoe Do?

You have just invented a revolutionary new product called Air Zone. Air Zone is a basketball sneaker that absorbs the energy generated by an "impact," such as when a player jumps and then lands during a game, and converts it into new energy for the next time the player jumps.

You have contacted two sneaker-manufacturing companies that have expressed interest in bringing Air Zone to market. Each company uses the same technology and equipment to produce and assemble sneakers. Your task is to determine which of the two companies—The Sneaker Factory or Footwear, Inc.—is more productive, and therefore the more profitable.

Each company has provided you with last year's productivity reports for one day.

PART-1: Production of sneaker soles.

Equipment is designed to produce 100 Air Zone sneaker soles a day.

Sneaker Factory produced 120 soles in one day.

Footwear, Inc. produced 95 soles in one day.

1. Calculate the effectiveness or ineffectiveness of Sneaker Factory and Footwear, Inc. in terms of soles produced.
2. Using your answers from #1 and assuming that each new sole is valued at $55, calculate the dollar savings attributed to each company if it operates effectively and the dollar cost attributed to each if it operates ineffectively.

	Step 1: Sneaker Soles	Sneaker Factory	Footwear Inc.
1	Effective/(Ineffective)	20 sneaker soles–effective	sneaker soles
2	Savings/(Cost)	$1,100	$

PART-2: Application of leather casings to sneaker soles.

Equipment is designed to apply 100 leather casings to Air Zone sneaker soles in one day.

Sneaker Factory applied 75 leather casings in one day.

Footwear, Inc. applied 115 leather casings in one day.

1. Calculate the effectiveness or ineffectiveness of Sneaker Factory and Footwear, Inc. in terms of leather casings applied.
2. Using your answers from #1 and assuming that each leather casing is valued at $35, calculate the dollar savings attributed to each company if it operates effectively and the dollar cost attributed to it if it operates ineffectively.

	Step 2: Leather casings	Sneaker Factory	Footwear Inc.
1	Effective/(Ineffective)	leather casings	leather casings
2	Savings/(Cost)	$	$

PART-3: Apply color to leather casings.

Equipment applies color to the leather casing once the casing is applied to Air Zone. It is estimated that this equipment can color 600 pairs of sneakers at a cost of $3,000 based on 10 hours of operation. Each pair of colored sneaker is valued at $20.

Sneaker Factory colored 600 pairs of sneakers in 12 hours during one day.

Footwear, Inc. colored 600 pairs of sneakers in 8 hours during one day.

1. Calculate the effectiveness or ineffectiveness of Sneaker Factory and Footwear, Inc. in terms of sneakers colored.
2. Using your answers from #1, calculate the total savings attributed to each company if it operates effectively and the dollar cost attributed to it if it operates ineffectively.
3. Calculate the efficiency or inefficiency of Sneaker Factory and Footwear, Inc. in terms of hours of operation.
4. Using your answers from #3, calculate the total cost attributed to each company if it operates efficiently and the dollar cost attributed to it if it operates inefficiently.

	Step 3: Apply color	Sneaker Factory	Footwear Inc.
1	Effective/(Ineffective)	pairs of sneakers	pairs of sneakers
2	Savings/(Cost)	$	$
3	Efficient/(Inefficient)	hours	2 hours–efficient
4	Savings/(Cost)	$	$
5	Total Savings/(Cost)		

What's The Bottom Line?

Using your Productivity Assessments (Steps 1, 2 and 3), calculate the productivity of Sneaker Factory and Footwear, Inc. in terms of total dollar savings or total dollar cost for one day of operation. Based on your calculations, which company would you select to bring Air Zone to market?

	Sneaker Factory	Footwear Inc.
Step 1: Sneaker soles	$	$
Step 2: Leather casings	$	$
Step 3: Apply color	$	$
Total	**$**	**$**

Answers

PART-1: Production of sneaker soles.

	Step 1: Sneaker Soles	Sneaker Factory	Footwear Inc.
1	Effective/(Ineffective)	20 sneaker soles – effective	5 sneaker soles – ineffective
2	Savings/(Cost)	$1,100	($275)

PART-2: Application of leather casings to sneaker soles.

	Step 1: Sneaker Soles	Sneaker Factory	Footwear Inc.
1	Effective/(Ineffective)	25 leather casings – ineffective	15 leather casings – effective
2	Savings/(Cost)	($875)	$525

PART-3: Apply color to leather casings.

	Step 3: Apply color	Sneaker Factory (a)	Footwear Inc. (b)
1	Effective/(Ineffective)	120 pairs of sneakers – ineffective	120 pairs of sneakers – effective
2	Savings/(Cost)	($2,400)	$2,400
3	Efficient/(Inefficient)	2 hours – inefficient	2 hours – efficient
4	Savings/(Cost)	($600)	$600
5	Total Savings/(Cost)	($3,000)	$3,000

What's The Bottom Line?

	Sneaker Factory	Footwear Inc.
Step 1: Sneaker soles	$1,100	($275)
Step 2: Leather casings	($875)	$525
Step 3: Apply color	($3,000)	$3,000
Total	**($2,775)**	**$3,250**

(a) Sneaker Factory

Estimate: 600 pairs of sneakers in 10 hours = 60 pairs per hour

Actual: 600 pairs of sneakers in 12 hours = 50 pairs per hour; or 12 actual hours x 60 pairs (estimate) = 720 pairs

1. Ineffective: 10 pairs per hour (50 actual - 60 estimate) x 12 hours = 120 pairs; or 720 pairs - 600 estimate = 120 pairs

2. Cost: 120 pairs x $20 per pair = $2,400

Estimate: 10 hours at $300 per hour; or $3,000 / 10 hours = $300 / hour

Actual: 12 hours

3. Inefficient: 2 hours

4. Cost: 2 hours at $300 per hour = $600

(b) Footwear, Inc.

Estimate: 600 pairs of sneakers in 10 hours = 60 pairs per hour

Actual: 600 pairs of sneakers in 8 hours = 75 pairs per hour

1. Effective: 15 pairs per hour (75 actual - 60 estimate) x 8 hours = 120 pairs; or 2 hours (10 estimate – 8 actual) x 60 pairs per hour estimate = 120 pairs

2. Savings: 120 pairs x $20 per pair = $2,400

Estimate: 10 hours at $300 per hour; or $3,000 / 10 hours = $300 / hour

Actual: 8 hours

3. Efficient: 2 hours

4. Savings: 2 hours at $300 per hour = $600