Part 1
Financial Planning, Performance and Control

Section B - Performance Management
(25% - Levels A, B, and C)

Section B, Performance Management, is 25% of the exam, another large part. Section B covers Operational Control (management-by-exception approach) in U.7 and Management Control (management-by-objectives approach) in U.8. Factors to be analyzed for control and performance evaluation include revenues, costs, profits, and investment in assets. Variance analysis based on flexible budgets and standard costs is heavily tested, as is responsibility accounting for revenue, cost, contribution, and profit centers. The balanced scorecard is included in this coverage, as are quality considerations.
Introduction

**PERFORMANCE EVALUATION AND CONTROL**

Performance evaluation is the process by which managers at all levels gain information about the performance of tasks within the firm and judge that performance against pre-established criteria as set out in budgets, plans, and goals. Performance evaluation is applied for each of the three management functions: operations, marketing, and finance.

**Operational Control** (management-by-exception approach) *versus* **Management Control** (management-by-objectives approach)

Operational Control means the evaluation of operating level employees by mid-level managers.

Operational control,
- which focuses on detailed short-term performance measures,
- has a management-by-exception approach; that is, it identifies units or individuals whose performance does not comply with expectations so that the problem can be promptly corrected.

**Operational Control Issues:**

- Standard Costing and Variance Measures (unit 7)
  - Analyze performance against operational goals
  - Direct Materials Variances
  - Direct Labor Variances
  - Overhead Variances
  - Sales Variances
  - Mix and Yield Variances

**Management control** refers to the evaluation by upper-level managers of the performance of mid-level managers. Management control focuses on higher-level managers and long-term, strategic issues.

**Management control Issues:**

- Responsibility Accounting and Performance Measures (unit 8)
  - Responsibility Centers
  - Contribution and Segment Reporting
  - Common Costs
  - Transfer Pricing
  - Performance measures & Financial Measures (ROI, RI and EVA)
  - The Balanced Scorecard

CMA EXAM: For variances you need to be able to both calculate the variances and interpret the information that you get through variance analysis. This will require the memorization of the variance formulas, but also an understanding of what each formula is calculating.

Mathematically, the majority of the questions will come from variance analysis and performance measurement parts of this section. A number of variances are covered, and you need to know not only how to calculate them, but also what they mean and who can affect them. While the variance topic may seem large and overwhelming at first, when it is broken down into its individual elements it will become easier.
CMA EXAM: The performance measurement portions focus on a few performance measures, specifically Return on Investment (ROI) and Residual Income (RI). For these measurements you need to know what they are, how they are calculated and how they are used. You also need to be able to identify the weaknesses that are inherent in each one. Responsibility accounting is the breaking down of costs into those costs that can be controlled by the manager and those that cannot be controlled by the manager. There are a number of different cost classifications and allocation methods within this section that you need to be aware of.

Transfer pricing is a topic that you need to know from both a theoretical standpoint and a numerical one as well. The questions may require you to understand the issues that company faces in establishing the transfer price as well as being able to calculate an acceptable transfer price under certain situations.

The final topic covered in this Section is performance feedback, and more specifically the balanced scorecard, you need to know conceptually what the balanced scorecard is and how it works as well as be familiar with its application.
Introduction
In Chapter 2, you saw how budgets assist managers in their function as planners. We now turn to how budgets - specifically flexible budgets - are used to evaluate feedback on variances, aiding managers in their control function. Feedback enables managers to compare actual results — that is, what is happening — with planned performance — what should have been happening according to plans. Flexible budgets and variances help managers gain insights into why the actual results differ from the planned performance. That "why" is what this chapter is about. Controlling operations assists managers in attaining the budgeted goals they set out to accomplish. Assessing operating results provides feedback to managers and helps them gain insights into the causes that led to the operating results. By learning from the past, managers can control the future.

The Use of standards
- To set performance expectations,
- evaluate and control operations,
- motivate employees, and encourage efforts toward their goals.
- allows a manager to identify the cost to manufacture and sell a product or provide a service,
- to find causes and attributes of cost overruns or efficient operations, and
- to manage by exception.

THE USE OF VARIANCES
Each variance we compute is the difference between an amount based on an actual result and the corresponding budgeted amount — that is, the actual amount of something and the amount it was supposed to be according to the budget. The budgeted amount is a point of reference from which comparisons may be made.

- **Variance analysis enables management by exception:** Variance analysis enables management by exception, the practice of giving attention primarily to significant deviations from expectations (whether favorable or unfavorable) and areas not operating as expected (such as a shortfall in sales of a product) and giving less attention to areas operating as expected. Attending to operations not performing within expected limits is likely to yield the best ratio of the benefits of investigation to costs.

- **Variance analysis assigns responsibility:** The purpose of identifying and assigning responsibility for variances is to determine who is likely to have information that will enable management to find solutions. The constructive approach is to promote learning and continuous improvement in manufacturing operations, not to assign blame.

- **Variances will guide managers to seek explanations** and to take early corrective action, ensuring that future operations will be as planned.

- **Sometimes variances suggest a change in strategy.** Excessive defect rates for a new product may suggest a flawed product design. Executives may then want to reevaluate their product strategies.

- **Variances may signify that standards need to be reevaluated.** Management is signaled that corrective action may be needed.

- Variances assist managers in their planning and control decisions.

- Variances used in performance evaluation (discussed in more detail later).
This chapter explores the uses of budgets and standard costing systems in operations. We will start our discussion with comparing actual results with master static budget followed by introducing flexible budget.

**EVALUATING OPERATING RESULTS: STATIC BUDGETS AND FLEXIBLE BUDGETS**

Two aspects of operations are generally of interest to management in assessing operations: effectiveness in attaining goals and efficiency in carrying out operations.

**Effectiveness and Efficiency**

An operation is effective if it has attained or exceeded its goals. An operation is efficient if it has not wasted resources. An operation may be effective but inefficient, and it may be efficient but ineffective.

The master budget, or static budget, discussed in Chapter 2, is based on the level of output planned at the start of the budget period. It’s static in the sense that the budget is developed for a single planned output level. When variances are computed from a static budget at the end of the period, adjustments are not made to the budgeted amounts for the actual output level in the budget period.

*A master budget delineates the desired operating results for the period and is a common starting point in assessing the effectiveness of operations.*

**Assessing Effectiveness**

Master budgets are prepared for a single activity level. Comparing actual results with the master budget reveals operating income variances.
Assessing Effectiveness

An important short-term goal for a company is to earn the budgeted operating income for the period. A company’s effectiveness is often measured by comparing the actual amount of operating income earned to the amount in the master budget.

Accounting System at Webb

Webb manufactures and sells a designer jacket that requires tailoring and many hand operations. Sales are made to distributors who sell to independent clothing stores and retail chains. Webb’s only costs are manufacturing costs; it incurs no costs in other value chain functions such as marketing and distribution. We assume that all units manufactured in April 2003 are sold in April 2003. There are no beginning inventories or ending inventories. Webb has three variable-cost categories. The budgeted variable cost per jacket for each category is

<table>
<thead>
<tr>
<th>Variable Cost</th>
<th>Cost Category per Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct materials costs</td>
</tr>
<tr>
<td></td>
<td>Direct manufacturing labor costs</td>
</tr>
<tr>
<td></td>
<td>Variable manufacturing overhead costs</td>
</tr>
<tr>
<td></td>
<td>Total variable costs</td>
</tr>
</tbody>
</table>

The number of units manufactured is the cost driver for direct materials, direct manufacturing labor, and variable manufacturing overhead. The relevant range for the cost driver is from 0 to 12,000 jackets.

The budgeted fixed manufacturing costs are
- for production between 0 and 12,000 jackets: $276,000
- The budgeted selling price is $120 per jacket.
- The static budget for April 2003 is based on selling 12,000 jackets.
- Actual sales for April 2003 were 10,000 jackets.

Exhibit 7-1, column 3, presents the static budget for Webb Company for April 2003.

In this book, “level” followed by a number denotes the amount of detail shown by a variance analysis. Level 0 reports the least detail Level 1 offers more information, and so on. We will use the example of Webb Company to illustrate static budgets and flexible budgets and their related variances.

Favorable variance vs. unfavorable variance

A favorable variance—denoted F in this book—has the effect of increasing operating income relative to the budgeted amount. For revenue items, F means actual revenues exceed budgeted revenues. For cost items, F means actual costs are less than budgeted costs.

An unfavorable variance—denoted U in this book—has the effect of decreasing operating income relative to the budgeted amount.

The significance of variances depends not only on their amount but also on their direction, frequency, and trend. Moreover,
STATIC-BUDGET VARIANCES

A static-budget variance is the difference between an actual result and the corresponding budgeted amount in the static budget. Exhibit 7-1 shows the Level 0 and Level 1 variance analyses for April 2003. Level 0 gives the least detailed comparison of the actual and budgeted operating income. The unfavorable variance of $93,100 in Exhibit 7-1 for Level 0 is simply the result of subtracting the static-budget operating income of the $108,000 from the actual operating income of $14,900:

\[
\text{Static-budget variance} = \text{Actual result} - \text{Static-budget amount}
\]

\[
= \$14,900 - \$108,000
= \$93,100, \text{ or } \$93,100 \text{ U}
\]

The difference between the actual operating income and the master static budget operating income is the operating income variance—a measure of the effectiveness of the period.

Webb Company was not effective in attaining its goal for the period; its operation fell 86 percent short of its budgeted operating income.

EXHIBIT 7-1 Static-Budget-Based Variance Analysis for Webb Company for April 2003

LEVEL 0 ANALYSIS

<table>
<thead>
<tr>
<th>Actual operating income</th>
<th>$14,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted operating income</td>
<td>108,000</td>
</tr>
<tr>
<td>Static-budget variance for operating income</td>
<td>$93,100 U</td>
</tr>
</tbody>
</table>

Level 1 analysis in Exhibit 7-1 provides managers with more detailed information on the static-budget variance for operating income of \$93,100 U. The additional information added in Level 1 indicates how each of the line items of operating income—revenues, individual variable costs, and fixed costs—add up to the static-budget variance of \$93,100. The budgeted contribution margin percentage of 26.7% decreases to 24.0% for the actual results.

LEVEL 1 ANALYSIS

| Units sold | 10,000 | (2,000) U | 12,000 |
| Revenues | \$1,250,000 | \$(190,000) U | \$1,440,000 |
| Variable costs | | | |
| Direct materials | \$621,600 | \$(98,400) F | \$720,000 |
| Direct manufacturing labor | \$198,000 | \$6,000 U | \$192,000 |
| Variable manufacturing overhead | \$130,500 | \$(13,500) F | \$144,000 |
| Total variable costs | \$950,100 | \$(105,900) F | \$1,056,000 |
| Contribution margin | \$299,900 | 24.0% | \$(84,100) U | \$384,000 |
| Fixed costs | \$285,000 | \$9,000 U | \$276,000 |
| Operating income | \$14,900 | \$(93,100) U | \$108,000 |

\[ \text{Static Budget variance} \]
a $F = \text{favorable effect on operating income; } U = \text{unfavorable effect on operating income.}$

b Contribution margin percentage = \$299,900 / \$1,250,000 = 24.0%$

c Contribution margin percentage = \$384,000 / \$1,440,000 = 26.7%$

<table>
<thead>
<tr>
<th>In addition to the operating income variance, Exhibit 7-1 reports the difference between the master budget and the actual operating result for each reported item such as units sold, sales, and others. One notable item is the variance that actual sales deviated from the master budget by 2000 units or $190,000—a decrease from the budgeted amount of 16.7% in units and 13.2% in sales dollars.</th>
</tr>
</thead>
</table>

| Exhibit 7-1 also reports that the variable expense incurred in April is $950,100 less than the budgeted amount—a favorable variance. This comparison probably would lead us to conclude that the primary reason for Webb failure to be effective in earning its budgeted net income is the shortfall in sales. The shortfall is so large that even with a good control of expenses, as evidenced by the substantial favorable variance in variable expenses, the firm still suffers a substantial decrease in operating income and, as a result, failed to be effective in earning the budgeted $108,000 in operating income. |

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**Flexible Budget**

**The Flexible Budget**

The relevant question is . . .

“**How much of the favorable cost variance is due to lower activity, and how much is due to good cost control?**”

To answer the question, we must **flex** the budget to the actual activity.

A **flexible budget** will help me evaluate efficiency.

**The Flexible Budget**

A **flexible budget is a budget that adjusts revenues and expenses for changes in output achieved.**

In this chapter we emphasize flexible budgets. A flexible budget calculates budgeted revenues and budgeted costs based on the actual output level in the budget period. A **flexible budget** is calculated at the end of the period when the actual output is known; a **static budget** is developed at the start of the budget period based on the planned output level for the period. As we show, a flexible budget enables managers to compute variances that provide more information than the information from variances in a static budget.
STEPS IN DEVELOPING A FLEXIBLE BUDGET
The flexible budget is prepared at the end of the period (April 2003) after the actual output level of 10,000 jackets is known. The flexible budget is the budget that Webb would have prepared at the start of the budget period had it correctly forecast the actual output level of 10,000 jackets. In preparing the flexible budget:

1. The budgeted selling price is the same $120 per jacket used in preparing the static budget.
2. The budgeted variable costs are the same $88 per jacket used in the static budget.
3. The budgeted fixed costs are the same static budget amount of $276,000 (because the 10,000 jackets produced falls within the relevant range of 0 to 12,000 jackets for which fixed costs are $276,000).

The only difference between the static budget and the flexible budget is that the static budget is prepared for the planned output of 12,000 jackets, whereas the flexible budget is based on the actual output of 10,000 jackets: The static budget is being "flexed" or adapted from 12,000 jackets to 10,000 jackets. In preparing the flexible budget for 10,000 jackets, all costs are assumed to be either variable or fixed with respect to the number of jackets produced.

Webb develops its flexible budget in three steps.

Step 1: Identify the Actual Quantity of Output. In April 2003, Webb produced and sold 10,000 jackets.

Step 2: Calculate the Flexible Budget for Revenues Based on Budgeted Selling Price and Actual Quantity of Output.

Flexible-budget revenues = $120 per jacket x 10,000 jackets
= $1,200,000

Step 3: Calculate the Flexible Budget for Costs Based on Budgeted Variable Cost per Output Unit, Actual Quantity of Output, and Budgeted Fixed Costs.

Flexible-budget variable costs
- Direct materials, $60 per jacket x 10,000 jackets = $600,000
- Direct manufacturing labor, $16 per jacket x 10,000 jackets = $160,000
- Variable manufacturing overhead, $12 per jacket x 10,000 jackets = $120,000
  Total flexible-budget variable costs = $880,000

Flexible-budget fixed costs = $276,000

Flexible-budget total costs = $1,156,000

Question: If the flexible budget (FB) is based on actual output, which isn't known until the end of the period, how can it be a budget?

Answer: The FB shows the costs that should have been incurred (the budgeted costs) to achieve the actual output level. The FB is the budget we would have made at the beginning of the period if we had perfectly predicted the actual output level.

These three steps enable Webb to prepare a flexible budget as shown in Exhibit 7-2, column 3. Webb uses the flexible budget to move to a Level 2 variance analysis that further subdivides the $93,100 unfavorable static-budget variance for operating income.

Prepared by: Sameh Y. El-lithy, CMA, CIA.
Assessing Efficiency: FLEXIBLE-BUDGET VARIANCES AND SALES-VOLUME VARIANCES

With the help of a flexible budget, we can separate the difference between the operating result and the master budget into two variances: the flexible budget variance and the sales volume variance.

Exhibit 7-2 shows the Level 2 flexible-budget-based variance analysis for Webb. The Level 2 variances subdivide the Level 1 $93,100 unfavorable static-budget variance for operating income into two parts: a flexible-budget variance of $29,100 U and a sales-volume variance of $64,000 U.

Level 1

Static-budget variance
$93,100 U
Actual vs. Master static

Level 2

Flexible-budget variance
$29,100 U
The flexible budget variance is the difference between the operating result and the flexible budget amount at the actual output level of the period. A flexible budget variance measures efficiency in resources to using input attain the operating results of the period.

Sales-volume variance
$64,000 U
The sales volume variance is the difference between the flexible budget and the master or static budget and it measures the effect of changes in units of sales on sales, expenses, contribution margins, and operating income.

What useful information comes from subdividing the static-budget variance into its two components?

Remember, Webb actually produced and sold 10,000 jackets, although the static budget had anticipated an output of 12,000 jackets. Managers would like to know how much of the static-budget variance is due to

Creating a flexible budget makes it possible for managers to learn these two amounts.
Sales-Volume Variances

Keep in mind the flexible-budget amounts in column 3 of Exhibit 7-2 and the static budget amounts in column 5 are both computed using budgeted selling prices, budgeted variable cost per jacket, and budgeted fixed costs. The only distinction is that the flexible budget amount is calculated using the actual output level, whereas the static-budget amount is calculated using the budgeted output level. The difference between these two amounts is called the sales-volume variance because it represents the difference caused solely by the difference in the 10,000 actual quantity (or volume) of jackets sold and the 12,000 quantity of jackets expected to be sold in the static budget.

\[
\text{Sales-volume variance for operating income} = \text{Budgeted CM per unit } \times (\text{Actual Units sold} - \text{static-budget units sold})
\]

\[
= \left(\$120 \text{ per jacket} - \$88 \text{ per jacket}\right) \times (10,000 \text{ jackets} - 12,000 \text{ jackets})
\]

\[
= -\$64,000, \text{ or } \$64,000 \text{ U}
\]

In our Webb example, this sales-volume variance for operating income arises solely because of inaccurate forecasting of output units sold: Webb sold only 10,000 jackets, 2,000 fewer than the budgeted 12,000 jackets. Note particularly, budgeted selling price and budgeted variable cost per unit are held constant in computing sales-volume variances. Hence:

\[
\text{Sales volume variance for operating income} = \text{Budgeted CM per unit } \times (\text{Actual Units sold} - \text{static-budget units sold})
\]

\[
= \left(\$120 \text{ per jacket} - \$88 \text{ per jacket}\right) \times (10,000 \text{ jackets} - 12,000 \text{ jackets})
\]

\[
= -\$64,000, \text{ or } \$64,000 \text{ U}
\]

Note that the operating income sales volume variance is the same as the contribution margin sales volume variance. This happens because fixed expenses in the master budget and the flexible budget usually do not change. Thus, an alternative way to compute the operating income sales volume variance is to multiply the difference in units of sales actually sold and in the master (static) budget by the master budget contribution margin per unit.

Sales volume variance Interpretation

Significant sales volume variances can have serious implications for strategic management. A significant unfavorable sales volume variance can indicate that the market is smaller than the level planned when the firm set its strategy and the goal for the period. The firm might need to modify or abandon its strategy.
An insignificant sale volume variance can indicate that the firm's strategy and operating plans are on track to attain its goals. A significant favorable sales volume variance can indicate that the firm needs to pursue a more aggressive strategy or operating goal.

Webb’s unfavorable sales-volume variance could be due to one or more of the following:

1. The overall demand for jackets is not growing at the rates that were anticipated.
2. Competitors are taking away market share from Webb.
3. Webb did not adapt quickly to changes in customer preferences and tastes.
4. Quality problems developed that led to customer dissatisfaction with Webb's jackets.
5. Budgeted sales targets were set without careful analysis of market conditions.

How Webb responds to the unfavorable sales-volume variance will be influenced by what is presumed to be the cause of the variance. For example, if Webb believes the variance was caused by market-related reasons (reasons 1 or 2), the sales manager would be in the best position to explain what happened and to suggest corrective actions, such as sales promotions, that may be needed. If however, the unfavorable variance was caused by quality problems, the manufacturing manager would be in the best position to analyze the causes and to suggest strategies for improvement, such as changes in the manufacturing process or investments in new machines.

**EXHIBIT 7 – 2 level 2 Flexible-Budget-Based Variance Analysis for Webb Company for April 2003a**

<table>
<thead>
<tr>
<th>Actual Results</th>
<th>Flexible-Budget Variances</th>
<th>Flexible Budget</th>
<th>Sales-Volume Variances</th>
<th>Static Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units sold</td>
<td>(1)</td>
<td>(2)=(1)-(3)</td>
<td>(3)</td>
<td>(4)=(3)-(5)</td>
</tr>
<tr>
<td>Revenues</td>
<td>$1,250,000</td>
<td>50,000 F</td>
<td>$1,200,000</td>
<td>(240,000)U</td>
</tr>
<tr>
<td>Variable costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials</td>
<td>$621,600</td>
<td>21,600 U</td>
<td>$600,000</td>
<td>(120,000)F</td>
</tr>
<tr>
<td>Direct manufacturing labor</td>
<td>$198,000</td>
<td>38,000 U</td>
<td>$160,000</td>
<td>(32,000)F</td>
</tr>
<tr>
<td>Variable manufacturing overhead</td>
<td>$130,500</td>
<td>10,500 U</td>
<td>$120,000</td>
<td>(24,000)F</td>
</tr>
<tr>
<td>Total variable costs</td>
<td>$950,100</td>
<td>70,100 U</td>
<td>$880,000</td>
<td>(176,000)F</td>
</tr>
<tr>
<td>Contribution margin</td>
<td>$299,900</td>
<td>(20,100)U</td>
<td>$320,000</td>
<td>(64,000)U</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>$285,000</td>
<td>9,000 U</td>
<td>$276,000</td>
<td>0</td>
</tr>
<tr>
<td>Operating income</td>
<td>$14,900</td>
<td>(29,100)U</td>
<td>$44,000</td>
<td>(64,000)U</td>
</tr>
</tbody>
</table>

Flexible-budget variance: $29,100U
Sales-volume variance: $64,000U
Static-budget variance: $93,100U
**Flexible-Budget Variances (Operating Income Flexible Budget Variance)**

Operating income flexible budget variances measure efficiencies in operations that are primarily internal to the firm.

Factors contributing to operating income flexible budget variances include:

- deviations in selling prices,
- variable costs, and
- fixed costs.

Management is likely to have controls or influences on these factors. Substantial or continuous unfavorable operating income flexible budget variances can diminish the feasibility of the strategy and jeopardize its continuation.

The first three columns of Exhibit 7-2 compare actual results with flexible-budget amounts. Flexible-budget variances are in column 2 for each line item in the income statement:

| Flexible-budget variance = Actual results - Flexible-budget amount |
|---|---|---|

The operating income line in Exhibit 7-2 shows the flexible-budget variance is $29,100 U ($14,900 - $44,000). The $29,100 U arises because actual selling price, variable cost per unit, and fixed costs differ from their budgeted amounts. The actual and budgeted amounts for the selling price and variable cost per unit are:

<table>
<thead>
<tr>
<th>Actual Amount</th>
<th>Budgeted Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price</td>
<td>$125.00 ($1,250,000 ÷ 10,000 jackets)</td>
</tr>
<tr>
<td>Variable cost per jacket</td>
<td>$95.01 ($950,100 ÷ 10,000 jackets)</td>
</tr>
</tbody>
</table>

### Selling Price variance

The flexible-budget variance for revenues is called the selling-price variance because it arises solely from differences between the actual selling price and the budgeted selling price:

\[
\text{Selling-price variance} = (\text{Actual selling price} - \text{Budgeted selling price}) \times \text{Units sold}
\]

\[
= (\$125\text{per jacket} - \$120\text{ per jacket}) \times 10,000\text{ jackets}
\]

\[
= \$50,000, \text{ or } \$50,000\text{ F}
\]
Variable cost variance

The flexible-budget variance for variable costs is unfavorable for the actual output of 10,000 jackets. It's unfavorable because either

(a) Webb used more quantities of inputs (such as direct manufacturing labor-hours) relative to the budgeted quantities of inputs, or
(b) Webb incurred higher prices per unit for the inputs (such as the wage rate per direct manufacturing labor-hour) relative to the budgeted prices per unit for the inputs, or
(c) both (a) and (b).

Higher input quantities relative to the budget and/or higher input prices relative to the budget could be the result of Webb deciding to produce a superior product to what was planned in the budget, or the result of inefficiencies in Webb's manufacturing and purchasing, or both. *You should always think of variance analysis as providing suggestions for further investigation rather than as establishing conclusive evidence of good or bad performance.*

Need for Further Analysis of the Variable Expense Flexible Budget Variance

Different factors may drive each of these variances. An aggregated total amount, such as the total variable expense flexible budget variance can mask poor performance in one or more of the cost components or operating divisions, especially when there are offsetting materials, labor and manufacturing overhead.

Fixed cost variance

The actual fixed costs of $285,000 are $9,000 more than the budgeted amount of $276,000. This higher fixed cost decreases operating income, making this flexible-budget variance unfavorable.

**PRICEVARIANCES AND EFFICIENCY VARIANCES FOR DIRECT-COST INPUTS (DM&DL)**

We now illustrate how the Level 2 flexible-budget variance for direct-cost inputs can be further subdivided into two more detailed variances, which are Level 3 variances:

1. A price variance that reflects the difference between an actual input price and a budgeted input price
2. An efficiency variance that reflects the difference between an actual input quantity and a budgeted input quantity

Managers generally have more control over efficiency variances than price variances. That's because the quantity of inputs used is primarily affected by factors inside the company, whereas price changes are primarily due to market forces outside the company.

The information available from these Level 3 variances helps managers better understand past performance and better plan for future performance.
Obtaining Budgeted Input Price and Budgeted Input Quantities

To calculate price and efficiency variances, Webb needs to obtain budgeted input prices and budgeted input quantities. Webb’s three main sources of information are

1. Actual input data from past periods.
2. Data from other companies that have similar processes.
3. Standards developed by Webb

1. Actual input data from past periods.
   Most companies have past data on actual input prices and actual input quantities. These past prices and quantities could be used as the budgeted prices and quantities in a flexible budget. Past data are typically available at low cost. Nevertheless, there are limitations to using this source of data: (i) past data can include inefficiencies, and (ii) past data do not incorporate any expected changes for the budget period.

2. Data from other companies that have similar processes.
   The main limitation of using this source is that input price and input quantity data from other companies may not be available.

3. Standards developed by Webb. A standard is a carefully determined price, cost, or quantity. A standard is usually expressed on a per unit basis. Consider how Webb determines its standards. Using engineering studies, Webb conducts a detailed breakdown of the steps required to make a jacket.

   Each step is assigned a standard time based on work performed by a skilled operator using equipment operating in an efficient manner.

   There are two advantages of using standard times:
   (i) they aim to exclude past inefficiencies, and
   (ii) they aim to take into account changes expected to occur in the budget period.

   An example of (ii) is the decision for leasing of new sewing machines that operate at a faster speed and enable output to be produced with lower defect rates.

Standards for DM & DL

<table>
<thead>
<tr>
<th>Standards for DM &amp; DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>The standard manufacturing labor cost for each jacket is computed by multiplying the standard time allowed to produce a jacket by the standard wage rate that Webb expects to pay its operators. Similarly, Webb determines the standard quantity of square yards of cloth required by a skilled operator to make each jacket, the standard price per square yard of cloth, and (by multiplying them together) the standard direct material cost of a jacket.</td>
</tr>
</tbody>
</table>

The term "standard" refers to many different things. Always clarify its meaning and how it is being used.

- **A standard input** is a carefully determined quantity of input - such as square yards of cloth or direct manufacturing labor-hours - required for one unit of output, such as a jacket.
- **A standard price** is a carefully determined price that a company expects to pay for a unit of input. In the Webb example, the standard wage rate is an example of a standard price of a direct manufacturing labor-hour.
- **A standard cost** is a carefully determined cost of a unit of output - for example the standard direct manufacturing labor cost of a jacket at Webb.
Standard cost per output unit for each variable direct-cost input = Standard input allowed for one output unit \times \text{Standard price per unit input unit}

Standard cost per jacket for each variable direct-cost input = Standard input allowed for one output unit \times \text{Standard price per input unit}

Standard direct material cost per jacket: 2 square yards of cloth input allowed per output unit (jacket) manufactured, at $30 standard price per square yard

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard direct material cost per jacket =</td>
<td>2 square yards</td>
<td>$30 per square yard = $60</td>
</tr>
</tbody>
</table>

Standard direct manufacturing labor cost per jacket: 0.8 manufacturing labor-hour of input allowed per output unit manufactured, at $20 standard price per hour.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard direct manufacturing labor cost per jacket =</td>
<td>0.8 hour</td>
<td>$20 per hour = $16</td>
</tr>
</tbody>
</table>

"Budget" vs. "Standard"

How are the words "budget" and "standard" related? Budget is the broader term. As the description above indicates, budgeted input prices, budgeted input quantities, and budgeted costs need not be based on standards. However, when standards are used to obtain budgeted input quantities and budgeted input prices, the terms "standard" and "budget" mean the same thing and are used interchangeably. In its standard costing system, Webb uses standards that are attainable through efficient operations but allow for normal disruptions.

Data for Calculating Webb’s Price Variances and Efficiency Variances

Consider Webb’s two direct-cost categories. The actual cost for each of these categories for the 10,000 jackets manufactured and sold in April 2003 is

Direct material purchased and used

1. Square yards of cloth input purchased and used 22,200
2. Actual price incurred per square yard $28
3. Direct material costs (22,200 x $28) [Exhibit 7-2, column 1] $621,600

Direct manufacturing labor

1. Direct manufacturing labor-hours 9,000
2. Actual price incurred per direct manufacturing labor-hour $22
3. Direct manufacturing labor costs (9,000 x $22) [Exhibit 7-2, column 1] $198,000

Price variance vs. Efficiency variance

- **A price variance** is the difference between the actual price and the budgeted price multiplied by the actual quantity of input, such as direct material purchased or used.
  - A price variance is sometimes called an **input-price variance or rate variance**, especially when referring to a price variance for direct labor.
- **An efficiency variance** is the difference between the actual quantity of input used - such as square yards of cloth of direct materials - and the budgeted quantity of input that should have been used to produce the actual output, multiplied by the budgeted price.
  - An efficiency variance is sometimes called a **usage variance**.
Exhibit 7-3 shows how the price variance and the efficiency variance subdivide the flexible budget variance.

**Consider the panel for direct materials.**

- The direct material **flexible-budget variance** of $21,600 U is the difference between the actual costs incurred (actual input quantity x actual price) shown in column 1 and the flexible budget (budgeted input quantity allowed for actual output x budgeted price) shown in column 3.
  - Column 2 (actual input quantity x budgeted price) is inserted between column 1 and column 3. The difference between columns 1 and 2 is the **price variance** of $44,400 F because the same actual input quantity is multiplied by the **actual price** in column 1 and the **budgeted price** in column 2.
  - The difference between columns 2 and 3 is the efficiency variance of $66,000 U because the same budgeted price is multiplied by the **actual input quantity** in column 2 and the **budgeted input quantity allowed for actual output** in column 3. See how the direct material price variance, $44,400 F, plus the direct material **efficiency variance**, $66,000 U, equals the direct material flexible-budget variance, $21,600 U.

We next discuss the price variances and the efficiency variances in greater detail.

### Price Variances

The formula for computing the price variance is:

<table>
<thead>
<tr>
<th>Direct Material</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM Price variance</td>
<td>$(AP - SP) \times AQ$</td>
</tr>
<tr>
<td>DL Price variance</td>
<td>$(AR - SR) \times AH$</td>
</tr>
</tbody>
</table>

- **AP**: Actual Price, **AR**: Actual Rate, **SP**: Std. Price, **SR**: Std Rate, **AQ**: Actual Quantity, **AH**: Actual Hours.
Price variances for Webb's two direct-cost categories are

<table>
<thead>
<tr>
<th>Direct-Cost Category</th>
<th>Actual price of input</th>
<th>Budgeted price of input</th>
<th>Actual quantity of input</th>
<th>Price Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct material</td>
<td>($28 per sq. yard)</td>
<td>($30 per sq. yard)</td>
<td>22,200 square yards</td>
<td>($44,400) F</td>
</tr>
<tr>
<td>Direct manufacturing</td>
<td>($22 per hour)</td>
<td>($20 per hour)</td>
<td>9,000 hours</td>
<td>18,000 U</td>
</tr>
</tbody>
</table>

Interpreting the Direct material price variance

Possible causes of a favorable direct materials price variance are:

For example, Webb's favorable direct material price variance could be due to one or more of the following:

- An unexpected price change for the materials, changes in freight costs, variation in grades of the purchased items, rush orders, or other causes.
- Webb's purchasing manager negotiated the direct material price more skillfully than was planned for in the budget.
- The purchasing manager changed to a lower-price supplier.
- Webb's purchasing manager bought in larger quantities than the quantities budgeted, thereby obtaining quantity discounts.
- Direct material prices decreased unexpectedly due to, say, industry oversupply.
- Budgeted purchase prices for direct material were set without careful analysis of market conditions.
- The purchasing manager received unfavorable terms on factors other than price (such as lower quality material).

Responsibility of the variance

Generally speaking, the purchasing department is often the office most likely to provide an explanation or the responsibility for materials price variances, as the purchasing manager has control over the price paid for goods.

However, someone other than the purchasing manager could be responsible for a material price variance. Production may be scheduled in such a way, for example, that the purchasing manager must request express delivery. In these cases the production manager should be held responsible for the resulting price variance.

Company's response

How Webb responds to a material price variance will be vitally affected by what is presumed to be the cause of the variance. Assume Webb's managers attribute the favorable variance to the purchasing manager ordering in larger quantities than budgeted, thereby receiving quantity discounts. Webb could examine if purchasing in these larger quantities resulted in higher storage costs. If the increase in storage and inventory holding costs exceeds the quantity discounts, purchasing in larger quantities is not beneficial. For this reason some companies have reduced their materials storage to prevent their purchasing managers from ordering in larger quantities.
Interpreting the Direct labor Rate Variance

Possible causes of an unfavorable direct labor price variance are:

- Different rate for example a increase in labor rates, The firm's inability to pay the same hourly wage as specified in the standard cost sheet.
- Different labor skills, the firm's inability to use the same skill-level workers as specified in the standard cost sheet.
- The standard being set without detailed analysis of labor compensation.

Responsibility of the variance

The personnel department usually is responsible for direct labor rate variances. Production supervisors, however, could be responsible for the variance if it chooses to use employees with a different skill level than that specified in the standard cost sheet.

Efficiency Variance

For any actual level of output, the efficiency variance is the difference between the input that was actually used and the input that should have been used to produce the actual output, holding input price constant at the budgeted price:

\[
\text{Efficiency Variance} = (\text{AQ} - \text{SQ}) \times \text{SP}
\]

\[
\text{DM Quantity (Efficiency) Variance} = (22,200 - 20,000) \times 30 = $66,000 \text{U}
\]

\[
\text{DL Efficiency Variance} = (9,000 - 8,000) \times 20 = 20,000 \text{U}
\]

The idea here is that a company is inefficient if it uses a larger quantity of input than the budgeted quantity for the actual output units produced; the company is efficient if it uses fewer inputs than budgeted for the actual output units produced.

The efficiency variances for each of Webb's direct-cost categories are

<table>
<thead>
<tr>
<th>Category</th>
<th>Actual</th>
<th>Budgeted quantity</th>
<th>Efficiency variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct material</td>
<td>[22,200 sq. yds. - (10,000 units \times 2 sq. yds. unit)] \times $30per sq. yard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= (22,200sq. yds. - 20,000sq. yds.) \times $30per sq. yard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= $66,000U</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct manuf. labor</td>
<td>[9,000 hours \times 0.8 hour/unit] \times $20per hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= (9,000hours - 8,000hours) \times $20per hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 20,000U</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Note: distinguish inputs from output
The flexible budget for inputs is based on the budgeted quantity of inputs allowed for actual output level (BOIA).
To understand BQIA in the Webb example, distinguish inputs (square yards of cloth, direct manufacturing labor-hours) from output (jackets). BQIA is computed by multiplying the actual quantity of output produced times how much of each input should have been used per output unit.

General conclusion
The two manufacturing efficiency variances - direct material efficiency variance and direct manufacturing labor efficiency variance - are unfavorable because more input was used than was budgeted, resulting in a decrease in operating income.

Interpreting the Direct Materials Usage (quantity) Variance
- Using faulty machines or other production factors,
- Using inferior material quality or substitutions of the material for other materials
- Inadequate training or inexperienced employees,
- Poor supervision

Responsibility of the variance
Generally speaking, it is the responsibility of the production department to see that material usage is kept in line with standards. There may be times, however, when the purchasing department is responsible for an unfavorable material usage (quantity) variance by buying inferior material.

Interpreting the Direct labor Efficiency Variance
- Employees or supervisors are new on the job or inadequately trained, Webb's personnel manager hired underskilled workers. or Supervision is inadequate.
- Undermotivated workers
- Employee skill levels are different from those specified in the standard cost Sheet.
- Scheduling is poor, Webb's production scheduler inefficiently scheduled work, resulting in more manufacturing labor time than budgeted being used per jacket. Or Batch sizes are different from the standard size.
- Using faulty equipment, causing breakdowns and work interruptions
- Materials are different from those specified.
- Machines or equipment are not in proper working condition, Webb's Maintenance Department did not properly maintain machines, resulting in more manufacturing labor time than budgeted being used per jacket.
- Insufficient demand for the company’s product accompanied with fixed labor contracts, with the intent of the company to keep every worker busy.
- Budgeted time standards were set too tight without careful analysis of the operating conditions and the employees' skills.
Company’s response
Suppose Webb’s managers determine that the unfavorable variance is due to poor machine maintenance. Webb may then have a team consisting of plant engineers and machine operators develop a future maintenance schedule so that there will be fewer breakdowns adversely affecting labor time and product quality.

Responsibility of the variance
A direct labor efficiency variance usually is the responsibility of the production department. There may be times, however, when the purchasing department is responsible for an unfavorable direct labor Efficiency Variance by buying inferior material.

Summary of Variances
Exhibit 7-4 is a summary of the Level 2, and 3 variances. Note how the variances in Level 3 aggregate to the variances in Level 2 and how the variances in Level 2 aggregate to the variances in Level 1. The variances show why actual operating income is $14,900 when the static budget operating income is $108,000. Recall, a favorable variance has the effect of increasing operating income relative to the static budget, and an unfavorable variance has the effect of decreasing operating income relative to the static budget.
MANAGEMENT USES OF VARIANCES

Performance Measurement Using Variances

Variance analysis is often used for performance evaluation. Two attributes of performance are commonly evaluated:

- Effectiveness: the degree to which a predetermined objective or target is met.
- Efficiency: the relative amount of inputs used to achieve a given output level. The fewer the inputs used for a given level of output or the greater the output for a given level of input, the greater the efficiency.

Be careful to understand the causes of a variance before using it for performance evaluation.

Suppose a Webb purchasing manager has just negotiated a deal that results in a favorable price variance for direct material. The deal could have achieved a favorable variance for any or all of three reasons:

1. The purchasing manager bargained effectively with suppliers.
2. The purchasing manager secured a discount for buying in bulk with fewer purchase orders. Alas, buying larger quantities than necessary for the short run resulted in excessive inventory.
3. The purchasing manager accepted a bid from the lowest-priced supplier after only minimal effort to check that the supplier monitored the quality of the material before shipping it.

If the purchasing manager's performance is evaluated solely on price variances, then the evaluation will be positive. Reason 1 would support this favorable conclusion - the purchasing manager bargained effectively. Reasons 2 and 3 have short-run gains, buying in bulk or making less effort to check the supplier’s quality-monitoring procedures. However, these short-run gains could be offset by higher inventory storage costs or higher inspection costs and defect rates on Webb's production line, leading to unfavorable direct manufacturing labor and direct materials efficiency variances.

Companies are increasingly evaluating performance based on the effect a manager’s action has had on the total costs of the company as a whole. In the purchasing manager example, Webb may ultimately lose more money because of reasons 2 and 3 than it gains from the favorable price variance. Do not automatically interpret a favorable variance as "good news."

A benefit of variance analysis is that it highlights individual aspects of performance. However, if any single performance measure (for example, a labor efficiency variance or a consumer rating report) receives excessive emphasis, managers will tend to make decisions that make that particular performance measure look good. These actions may conflict with the company’s overall goals, inhibiting them from being achieved. This faulty perspective on performance usually arises when top management designs a performance evaluation and reward system that does not emphasize total company objectives.

Multiple Causes of Variances and Organization Learning

Variances often affect one another. For example, an unfavorable direct material efficiency variance may be related to a favorable direct material price variance due to a purchasing manager buying lower-priced, lower-quality materials. Do not interpret variances in isolation of each other. The causes of variances in one part of the value chain can be the result of decisions made in another part of the value chain of the company or even in another company. Consider an unfavorable direct material efficiency variance on Webb's production line.
Possible operational causes of this variance across the value chain of the company are

1. Poor design of products or processes,
2. Poor work on the production line,
3. Underskilled labor force,
4. Inappropriate assignment of labor or machines to specific jobs, and
5. Congestion due to scheduling a large number of rush orders from Webb's sales representatives.
6. Webb's suppliers do not manufacture cloth materials of uniformly high quality. Item 6 describes an even broader perspective on the cause of the unfavorable direct material efficiency variance by considering actions taken in the supply chain of companies.

The focus of variance analysis is to understand why variances arise and how to use that understanding to learn and to improve performance. For instance, to reduce the unfavorable direct material efficiency variance, a company may seek improvements in product design, in the quality of supplied materials, and in the commitment of the manufacturing labor force to do the job right the first time, among other improvements. Sometimes an unfavorable direct material efficiency variance may signal a need to change product strategy, perhaps because the product cannot be made at a low enough cost. Variance analysis should not be a tool to "play the blame game" (that is, seeking a person to blame for every unfavorable variance). Rather, it should help the company learn about what happened and how to perform better.

A delicate balance needs to be struck between the two uses of variances we have discussed: performance evaluation and organization learning.

Variance analysis is helpful for performance evaluation, but an overemphasis on performance evaluation and meeting individual variance targets can undermine learning and continuous improvement. Why? Because achieving the standard becomes an end in and of itself. As a result, managers will seek targets that are easy to attain rather than targets that are challenging and that require creativity and resourcefulness. For example, if performance evaluation is overemphasized, Webb's manufacturing manager will prefer a standard that allows workers ample time to manufacture a jacket; he will have little incentive to improve processes and methods to reduce manufacturing time and cost.

An overemphasis on performance evaluation may also cause managers to take actions to achieve the budget and avoid an unfavorable variance, even if such actions could hurt the company in the long run. For example, the manufacturing manager may push workers to produce jackets within the time allowed, even if this action could lead to poorer quality jackets being produced. Such negative impacts are less likely to occur if variance analysis is seen as a way of promoting organization learning. Managers will then be more willing to experiment with ways to reduce manufacturing costs and will also be less likely to compromise quality to avoid unfavorable variances.
OVERHEAD VARIANCES

Overhead costs are a big part of the costs of many companies. Chemical, paper, and steel companies incur large costs to construct and maintain their physical plant and equipment: These costs are part of their overhead costs.

This chapter shows how flexible budgets and variance analysis can help managers plan and control the overhead costs of their companies. In this chapter, we focus on the indirect-cost categories of variable manufacturing overhead and fixed manufacturing overhead. And we explain why managers should be careful when interpreting variances based on overhead cost concepts developed primarily for financial reporting purposes.

Explain in what ways the planning of variable overhead costs and fixed overhead costs are similar and in what ways they differ.

**Planning of Variable & Fixed Overhead Costs**

Effective planning of variable overhead costs involves undertaking only those variable overhead activities that add value for customers using the product or service.

The key challenge with planning fixed overhead is choosing the appropriate level of capacity or investment that will benefit the company over an extended time period.

**Comprehensive example**

Maria Lopez is the newly appointed president of Laser Products. She is examining the May 2004 results for the Aerospace Products Division. This division manufactures wing parts for satellites. Lopez’s current concern is with manufacturing overhead costs at the Aerospace Products Division. Both variable manufacturing overhead costs and fixed manufacturing overhead costs are allocated to the wing parts on the basis of laser-cutting-hours.

The Budgeted cost rates are variable manufacturing overhead of $200 per hour and fixed manufacturing overhead of $240 per hour.

The budgeted laser-cutting time per wing part is 1.5 hours.

Budgeted production and sales for May 2004 is 5,000 wing parts. Budgeted fixed manufacturing overhead costs for May 2004 is $1,800,000.

Actual results for May 2004 are

| Wing parts produced and sold | 4,800 units |
| Laser-cutting-hours used | 8,400 hours |
| Variable manufacturing overhead costs | $1,478,400 |
| Fixed manufacturing overhead costs | $1,832,200 |

Required

1. Compute the spending variance and the efficiency variance for variable manufacturing overhead.
2. Compute the spending variance and the production-volume variance for flexed manufacturing overhead.
3. Give two explanations for each of the variances calculated in requirements 1 and 2.
The variable manufacturing overhead variance.
When the flexible budget for variable overhead is developed, an overhead efficiency variance and an overhead spending variance can be computed.

⇒ **Variable Overhead Flexible-Budget Variance** measures the difference between actual variable overhead costs incurred and flexible-budget variable overhead amounts

\[
\text{Variable Overhead flexible-budget variance} = \text{Actual Costs incurred} - \text{Flexible-budget amount}
\]

⇒ **The variable overhead efficiency variance**
- Evaluates the actual quantity of the cost-allocation base used relative to the budgeted quantity of the cost-allocation base.
- A function of the selected activity measure. It does not reflect overhead control.
- Variable Overhead Efficiency Variance is the difference between actual quantity of the cost-allocation base used and budgeted quantity of the cost per unit of the cost-allocation base

\[
\text{Variable Overhead Efficiency Variance} = \left\{ \begin{array}{c}
\text{Actual quantity of variable overhead cost-allocation base used for actual output} \\
- \text{Budgeted quantity of variable overhead cost-allocation base allowed for actual output}
\end{array} \right\} \times \text{Budgeted variable overhead cost per unit of cost-allocation base}
\]

⇒ **The variable overhead spending variance**
- Results from paying more or less than expected for overhead items such as supplies and utilities.
- Evaluates the actual cost per unit of the cost-allocation base relative to the budgeted cost per unit of the cost-allocation base.
- Variable Overhead Spending Variance is the difference between actual and budgeted variable overhead cost per unit of the cost-allocation base, multiplied by actual quantity of variable overhead cost-allocation base used for actual output

\[
\text{Variable Overhead Spending Variance} = \left\{ \begin{array}{c}
\text{Actual variable overhead cost per unit of cost-allocation base} \\
- \text{Budgeted variable overhead cost per unit of cost-allocation base}
\end{array} \right\} \times \text{Actual quantity of variable overhead cost-allocation base used for actual output}
\]
SOLUTION
1. and 2. See Exhibit 8-7.
3. a. Variable manufacturing overhead spending variance, $201,600 F. One possible reason for this variance is that actual prices of individual items included in variable overhead (such as cutting fluids) are lower than budgeted prices. A second possible reason is that the percentage increase in the actual quantity usage of individual items in the variable overhead cost pool is less than the percentage increase in machine-hours compared to the flexible budget.

b. Variable manufacturing overhead efficiency variance, $240,000 U. One possible reason for this variance is inadequate maintenance of laser machines, causing them to take more laser time per wing part. A second possible reason is use of undermotivated, inexperienced, or underskilled workers with the laser-cutting machines, resulting in more laser-time per wing part.
The fixed manufacturing overhead variance.

Production-volume variance

Production-Volume Variance is the difference between budgeted fixed overhead and fixed overhead allocated on the basis of actual output produced

- This variance is also known as the Denominator-Level Variance or the Output-Level Overhead Variance
- Interpretation of this variance is difficult due to the nature of the costs involved and how they are budgeted
- Fixed costs are by definition somewhat inflexible. While market conditions may cause production to flex up or down, the associated fixed costs remain the same
- Fixed costs may be set years in advance, and may be difficult to change quickly

Contradiction: Despite this, examination of the fixed overhead budget formulae reveals that it is budgeted similar to a variable cost

Results from

- The inability to operate at the activity budgeted for the period.
- Management decisions
- Unexpected changes in market demand
- Unforeseen problems in manufacturing operations

\[
\text{Production-Volume Variance} = \text{Budgeted Fixed Overhead} - \text{Fixed Overhead allocated using budgeted input allowed for actual output units produced}
\]

⇒ **Fixed Overhead Flexible-Budget Variance** is the difference between actual fixed overhead costs and fixed overhead costs in the flexible budget

This is the same amount for the **Fixed Overhead Spending Variance**

\[
\text{Fixed Overhead flexible-budget variance} = \text{Actual Costs incurred} - \text{Flexible-budget amount}
\]

Spending Variance

Results from

- Paying more or less than expected for overhead items.
- Ineffective budget procedures
- Inadequate control of costs
- Misclassification of cost items
c. Fixed manufacturing overhead spending variance, $32,200 U. One possible reason for this variance is that the actual prices of individual items in the fixed-cost pool unexpectedly increased from the prices budgeted (such as an unexpected increase in machine leasing costs). A second possible reason is misclassification of items as fixed that are in fact variable.

d. Production-volume variance, $72,000 U. Actual production of wing parts is 4,800 units, compared with the 5,000 units budgeted. One possible reason for this variance is demand factors, such as a decline in an aerospace program that led to a decline in the demand for aircraft parts. A second possible reason is supply factors, such as a production stoppage
(Total variable overhead variance) = Over/under allocated VOH = VOH FB Variance
Variable overhead = Actual costs - Flexible-budget amount
Flexible-budget variance

FB VOH variance = Spending variance + Efficiency Variance

Variable OH Spending Variance

Variable overhead = (AH X AR) – (AH X SR)
spending variance

Or, in factored form:
AH (AR-SR)

Variable OH efficiency variance

Variable overhead efficiency variance = (AH X SR) – (SHXSR)

Or, in factored form:
SR(AH - SH)
\[(\text{Total fixed overhead variance}) = \text{Over/under allocated FOH} = \]
\[\text{Fixed OH FB variance} = (\text{Spending FOH variance}) + \text{Production Volume Variance}\]

<table>
<thead>
<tr>
<th>Fixed OH FB variance = Spending FOH variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed overhead = Actual costs - Flexible-budget</td>
</tr>
<tr>
<td>flexible-budget variance incurred amount</td>
</tr>
<tr>
<td>Budget Actual fixed - Budgeted fixed</td>
</tr>
<tr>
<td>Variance = overhead cost overhead cost</td>
</tr>
<tr>
<td>Also equal, Fixed overhead = Actual costs - Flexible-budget</td>
</tr>
<tr>
<td>spending variance incurred amount</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume = Fixed component of the (Denominator _ Standard hours) variance predetermined overhead rate ( \times ) hours allowed</td>
</tr>
<tr>
<td>Production volume = Budgeted Fixed overhead allocated using</td>
</tr>
<tr>
<td>Variance fixed - budgeted input allowed for</td>
</tr>
<tr>
<td>Overhead actual output units produced</td>
</tr>
</tbody>
</table>

The formula can also be expressed in terms of the budgeted fixed cost per output unit:

| Production volume = Budgeted Fixed overhead allocated using |
| Variance fixed - budgeted cost per output unit |
| Overhead allowed for actual output produced |
Sales Volume, Mix, and Quantity Variances

When there are multiple products, the sales volume variance can be broken down into a sales mix variance and a sales quantity variance.

\[
\text{Sales Volume Variance} = \text{Sales Mix Variance} + \text{Sales Quantity Variance}
\]

The sales volume variance is the sum of the individual sales volume variances. Each individual sales volume variance is calculated as:
Sales Volume Variance =

\[(\text{Units Sold} - \text{Units in Static Budget}) \times \text{Budgeted Standard Contribution Margin per Unit}\]

The contribution margin is calculated by taking total sales less all variable expenses. The portion of sales volume variance that is not attributable to sales quantity is caused by variations in the mix of various products a firm offers.

For example: If a tennis ball company also makes racquet balls, its sales mix variance would arise from variations in the actual sales mix of these two products compared to the budgeted sales mix. A sales mix is the ratio of any single product or service to the total of all products or services. Sales mix variance is a company-wide measure and is the sum of the sales mix variance of each type of merchandise sold by the company.

Sales Mix Variance

A sales mix variance for a particular type of product is calculated by multiplying the budgeted contribution margin per unit for that merchandise, the total number of all merchandise sold, and the difference between the actual sales mix ratio and the budgeted sales mix ratio. The sales mix variance formula is:

\[
\text{Sales Mix Variance} = \left(\frac{\text{Actual Sales Mix Ratio for a Product}}{\text{Budgeted Sales Mix Ratio for a Product}}\right) \times \text{Actual Units Sold} \times \text{Budget Contribution Margin per Unit of Product}
\]

Consider a situation in which the master budget calls for 10,000 cans of tennis balls to be sold at a unit contribution margin of $8 each and for 6,000 cans of racquet balls to be sold at a contribution margin of $4 each. The budgeted sales mix ratio for tennis balls is 10,000/16,000 or 0.625 and for racquet balls is 6,000/16,000 or 0.375. Suppose the actual sales for the period were 9,000 cans of tennis balls and 9,000 cans of racquet balls. The sales mix ratios change to 0.5 for tennis balls and 0.5 for racquet balls.

Product A Sales Volume Variance = Sales Mix Variance + Sales Quantity Variance

\[
\begin{align*}
\text{Tennis Ball Sales Volume Variance} &= (9,000 - 10,000) \times 8 \\
\text{Tennis Ball Sales Volume Variance} &= -1,000 \times 8 \\
\text{Tennis Ball Sales Volume Variance} &= \$8,000 \text{ Unfavorable}
\end{align*}
\]

Product B Sales Volume Variance = Sales Mix Variance + Sales Quantity Variance

\[
\begin{align*}
\text{Racquet Ball Sales Volume Variance} &= (9,000 - 6,000) \times 4 \\
\text{Racquet Ball Sales Volume Variance} &= 3,000 \times 4 \\
\text{Racquet Ball Sales Volume Variance} &= \$12,000 \text{ Favorable}
\end{align*}
\]

Total Sales Volume Variance = (Product A Sales Volume Variance + Product B Sales Volume Variance)

\[
\begin{align*}
\text{Total Sales Volume Variance} &= ($8,000 \text{ Unfavorable}) + ($12,000 \text{ Favorable}) \\
\text{Total Sales Volume Variance} &= \$4,000 \text{ Favorable}
\end{align*}
\]
PARTIAL AND TOTAL FACTOR PRODUCTIVITY

- Fabro, Inc. produced 1,500 units of Product RX-6 last week. The inputs to the production process for Product RX-6 were as follows:
  - 450 pounds of Direct Material A at a cost of $1.50 per pound
  - 300 pounds of Direct Material Z at a cost of $2.75 per pound
  - 300 labor hours at a cost of $15.00 per hour

What is the total factor productivity for Product RX-6?

- Total factor productivity equals units of output divided by the cost of all inputs.
- Hence, the total factor productivity equals 0.25 units per dollar input \( \frac{1,500 \text{ units}}{[(450 \text{ pounds of A } \times \$1.50) + (300 \text{ pounds of Z } \times \$2.75) + (300 \text{ labor hours } \times \$15)]} \).

What is the partial productivity for DM for Product RX-6?

- A partial productivity measure is the ratio of output quantity to input quantity for a single factor of production.
- The partial productivity for the DM, Hence, the partial productivity equals 1.00 unit per dollar input \( \frac{1,500 \text{ units}}{[(450 \text{ pounds of A } \times \$1.50) + (300 \text{ pounds of Z } \times \$2.75)]} \).