# CHAPTER 5

# FLEXIBLE BUDGET, VARIANCES, AND MANAGEMENT CONTROL

## 4.1 Overview of Budgeting

A **variance** is the difference between actual results and expected performance. The expected performance is also called **budgeted performance**, which is a point of reference for making comparisons.

**The Use of Variances**

- Variances lie at the point where the planning and control functions of management come together.
- They assist managers in implementing their strategies by enabling **management by exception**. This is the practice of focusing management attention on areas that are not operating as expected (such as a large shortfall in sales of a product) and devoting less time to areas operating as expected. In other words, by highlighting the areas that have deviated most from expectations, variances enable managers to focus their efforts on the most critical areas.
- Variances are also used in performance evaluation and to motivate managers - example incentives.
- Sometimes variances suggest that the company should consider a change in strategy.

**Illustration**

Consider Webb Company, a firm that manufactures and sells jackets. The jackets require tailoring and many other hand operations. Webb sells exclusively to distributors, who in turn sell to independent clothing stores and retail chains. For simplicity, we assume that Webb's only costs are in the manufacturing function; Webb incurs no costs in other value-chain functions, such as marketing and distribution. We also assume that all units manufactured in April 2011 are sold in April 2011. Therefore, all direct materials are purchased and used in the same budget period, and there is no direct materials inventory at either the beginning or the end of the period. No work-in-process or finished goods inventories exist at either the beginning or the end of the period. Webb has three variable-cost categories.

The budgeted variable cost per jacket for each category is as follows:

| Cost Category | Variable Cost per Jacket |
|---|---|
| - Direct material costs | $60 |
| - Direct manufacturing labor costs | 16 |
| - Variable manufacturing overhead costs | 12 |
| - **Total variable costs** | **$88** |

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. Budgeted and actual data for April 2011 follow:

- Budgeted fixed costs for production between 0 and 12,000 jackets $276,000
- Budgeted selling price $ 120 per jacket
- Budgeted production and sales 12,000 jackets
- Actual production and sales 10,000 jackets

## 4.2 Static Budgets and Static-Budget Variances

- The **static budget**, or master budget, is based on the level of output planned at the start of the budget period. The master budget is called a static budget because the budget for the period is developed around a single (static) planned output level.
- The **static-budget variance** (see Exhibit 3-1, column 2) is the difference between the actual result and the corresponding budgeted amount in the static budget.
- A **favorable variance**—denoted as F —has the effect, when considered in isolation, 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 as U — has the effect, when viewed in isolation, of decreasing operating income relative to the budgeted amount.

**Exhibit 4-1** Static-Budget-Based Variance Analysis for Webb Company for April 2011

**Level 1 Analysis**

| | Actual Results (1) | Static-Budget Variances (2) = (1) − (3) | Static Budget (3) |
|---|---|---|---|
| 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 mfg overhead | 130,500 | 13,500 F | 144,000 |
| Total variable costs | 950,100 | 105,900 F | 1,056,000 |
| Contribution margin | 299,900 | 84,100 U | 384,000 |
| Fixed costs | 285,000 | 9,000 U | 276,000 |
| **Operating income** | **$ 14,900** | **$ 93,100 U** | **$ 108,000** |

- Remember, Webb produced and sold only 10,000 jackets, although managers anticipated an output of 12,000 jackets in the static budget. *Managers want to know how much of the static-*

*budget variance is because of inaccurate forecasting of output units sold and how much is due to Webb's performance in manufacturing and selling 10,000 jackets.* Managers, therefore, create a flexible budget, which enables a more in-depth understanding of deviations from the static budget.

## 4.3 Flexible Budgets, Flexible-Budget Variances and Sales-Volume Variances

### A. Flexible Budget

- A **flexible budget** calculates budgeted revenues and budgeted costs based on *the actual output in the budget period*. The flexible budget is prepared at the end of the period (April 2011), after the actual output of 10,000 jackets is known.
- The flexible budget is the *hypothetical* budget that Webb would have prepared at the start of the budget period if it had correctly forecast the actual output of 10,000 jackets.
- 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 adjusted, from 12,000 jackets to 10,000 jackets.
- Webb develops its flexible budget in three steps.

**Step 1: Identify the Actual Quantity of Output.**

In April 2011, Webb produced and sold Actual Quantity of **10,000 jackets**.

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

Flexible-budget revenues = BSPU x AQ = \$120 per jacket * 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 * 10,000 jackets | \$ 600,000 |
| Direct manufacturing labor, \$16 per jacket * 10,000 jackets | 160,000 |
| Variable manufacturing overhead, \$12 per jacket * 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** |

❖ These three steps enable Webb to prepare a flexible budget, as shown in Exhibit 3-2, column 3. The flexible budget allows for a more detailed analysis of the \$93,100 unfavorable static-budget variance for operating income.

**Exhibit 4-2** Flexible-Budget-Based Variance Analysis for Webb Company for April 2011

**Level 2 Analysis**

| | Actual Results (1) | Flexible-Bud. Variances (2) = (1) - (3) | Flexible Bud. (3) | Sales-Volume Variances (4) = (3)-− (5) | Static Budget (5) |
|---|---|---|---|---|---|
| Units sold | 10,000 | 0 | 10,000 | 2,000 U | 12,000 |
| Revenues | $ 1,250,000 | $50,000 F | $1,200,000 | $240,000 U | $1,440,000 |
| Variable costs | | | | | |
| Direct materials | 621,600 | 21,600 U | 600,000 | 120,000 F | 720,000 |
| Direct mfg labor | 198,000 | 38,000 U | 160,000 | 32,000 F | 192,000 |
| Variable mfg overhead | 130,500 | 10,500 U | 120,000 | 24,000 F | 144,000 |
| Total variable costs | 950,100 | 70,100 U | 880,000 | 176,000 F | 1,056,000 |
| Contribution margin | 299,900 | 20,100 U | 320,000 | 64,000 U | 384,000 |
| Fixed mfg costs | 285,000 | 9,000 U | 276,000 | 0 | 276,000 |
| **Operating income** | **$ 14,900** | **$29,100 U** | **$ 44,000** | **$ 64,000 U** | **$ 108,000** |
| **Level 2** | | **$29,100 U** | | **$ 64,000 U** | |
| | | **Flexible-budget variance** | | **Sales-volume variance** | |
| **Level 1** | | | **$93,100 U** | | |
| | | | **Static-budget variance** | | |

- ❖ Exhibit 4-2 shows the flexible-budget-based variance analysis for Webb, which subdivides the $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.

## B. Sales-Volume Variances

- The **sales-volume variance** is the difference between a flexible-budget amount and the corresponding static-budget amount because it arises *solely* from the difference between 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.
- The sales-volume variance in operating income for Webb measures the change in budgeted contribution margin because Webb sold only 10,000 jackets rather than the budgeted 12,000.
- Webb's managers determine that the unfavorable sales-volume variance in operating income could be because of one or more of the following reasons:
  - ✓ The overall demand for jackets is not growing at the rate that was anticipated.
  - ✓ Competitors are taking away market share from Webb.
  - ✓ Webb did not adapt quickly to changes in customer preferences and tastes.
  - ✓ Budgeted sales targets were set without careful analysis of market conditions.

- ✓ Quality problems developed that led to customer dissatisfaction with Webb's jackets.
- ❖ *These flexible-budget variances are a better measure of operating performance than static-budget variances because they compare actual revenues to budgeted revenues and actual costs to budgeted costs for the same 10,000 jackets of output.*

**C. Flexible-Budget Variances**

- The **flexible-budget variance** is the difference between an actual result and the corresponding flexible-budget amount.

**Flexible-budget variance = Actual result - Flexible-budget amount**

- The $29,100 U of operating income arises because actual selling price, actual variable cost per unit, and actual fixed costs differ from their budgeted amounts.
- The actual results and budgeted amounts for the selling price and variable cost per unit are as follows:

| | Actual Result | Budgeted Amount |
|---|---|---|
| **Selling price** | $125.00 ($1,250,000 ÷ 10,000 jackets) | $120.00 ($1,200,000 ÷ 10,000 jackets) |
| **VC per jacket** | $ 95.01 ($ 950,100 ÷ 10,000 jackets) | $ 88.00 ($ 880,000 ÷ 10,000 jackets) |

- The flexible-budget variance for total **variable costs** is unfavorable ($70,100 U) for the actual output of 10,000 jackets. It's unfavorable because of one or both of the following:
- ✓ Webb used greater quantities of inputs (such as direct manufacturing labor-hours) compared to the budgeted quantities of inputs.
- ✓ Webb incurred higher prices per unit for the inputs (such as the wage rate per direct manufacturing labor-hour) compared to the budgeted prices per unit of the inputs.
- ❖ *You should always think of variance analysis as providing suggestions for further investigation rather than as establishing conclusive evidence of good or bad performance.*

## 4.4 Price Variances and Efficiency Variances for Direct-Cost Inputs

- To gain further insight, almost all companies subdivide the flexible-budget variance for direct-cost inputs into two more-detailed variances:
- ❖ A **price variance** that reflects the difference between an actual input price and a budgeted input price
- ❖ An **efficiency variance** that reflects the difference between an actual input quantity and a budgeted input quantity
- The information available from these variances (which we call level 3 variances) helps managers to better understand past performance and take corrective actions to implement superior strategies in the future.

- Managers generally have more control over efficiency variances than price variances because the quantity of inputs used is primarily affected by factors inside the company (such as the efficiency with which operations are performed), while changes in the price of materials or in wage rates may be largely dictated by market forces outside the company.

**A. <u>Obtaining Budgeted Input Prices and Budgeted Input Quantities</u>**

To calculate price and efficiency variances, Webb needs to obtain budgeted input prices and budgeted input quantities. Webb's three main sources for this information are past data, data from similar companies, and standards.

1. **Actual input data from past periods.**
   - These historical data could be analyzed for trends or patterns to obtain estimates of budgeted prices and quantities.
   - The advantage of past data is that they represent quantities and prices that are real rather than hypothetical and can serve as benchmarks for continuous improvement.
   - Another advantage is that past data are typically available at low cost.
   - However, there are limitations to using past data, it can include inefficiencies such as wastage of direct materials and they also do not incorporate any changes expected for the budget period.
2. **Data from other companies that have similar processes.**
   - The benefit of using data from peer firms is that the budget numbers represent competitive benchmarks from other companies.
   - The main difficulty of using this source is that input price and input quantity data from other companies are often not available or may not be comparable to a particular company's situation.
3. **Standards developed by Webb.**
   - A **standard** is a carefully determined price, cost, or quantity that is used as a benchmark for judging performance.
   - Standards are usually expressed on a per-unit basis. Consider how Webb determines its direct manufacturing labor standards.
   - Webb conducts engineering studies to obtain 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 worker 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.

- 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.
- 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** | **X** | **Standard price per input unit** |

***a) 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

**Standard DM cost per jacket = 2 square yards * $30 per square yard = $60**

***b) 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

**Standard direct mfg labor cost per jacket = 0.8 labor-hour * $20 per labor-hour = $16**

- ❖ How are the words "budget" and "standard" related? Budget is the broader term. To clarify, budgeted input prices, input quantities, and costs need *not* be based on standards.
- ❖ As we saw previously, they could be based on past data or competitive benchmarks, for example. However, when standards *are* used to obtain budgeted input quantities and prices, the terms "standard" and "budget" are used interchangeably.
- ❖ In its standard costing system, Webb uses standards that are attainable through efficient operations but that allow for normal disruptions.
- ❖ An alternative is to set more challenging standards that are more difficult to attain. Setting challenging standards can increase motivation and performance. If, however, standards are regarded by workers as essentially unachievable, it can increase frustration and hurt performance.

**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 2011 is as follows:

| Direct Materials 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 * $28) [**shown in Exhibit 3-2, 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 mfg labor costs (9,000 * $22) [**shown in Exhibit 7-2, column 1**] | **$198,000** |

- Let's use the Webb Company data to illustrate the price variance and the efficiency variance for direct-cost inputs.

**B. Price variance for direct cost inputs.**

- A **price variance** is the difference between actual price and budgeted price, multiplied by actual input quantity, such as direct materials 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 manufacturing labor.

**Price variances for Webb's two direct-cost categories are as follows:**

**Price variance = (Actual price of input - Budgeted price of input)*Actual quantity of input**

| Direct-Cost Category | AP of input | - | BP of input | | AQ of input | Price Variance |
|---|---|---|---|---|---|---|
| **Direct materials** | ($28 per sq. yard | - | $30 per sq. yard) | * | 22,200 square yards | = **$44,400 F** |
| **Direct mfg labor** | ($22 per hour | - | $20 per hour) | * | 9,000 hours | = **$18,000 U** |

- Always consider a broad range of possible causes for a price variance. For example, Webb's favorable direct materials price variance could be due to one or more of the following:
  - Webb's purchasing manager negotiated the direct materials prices more skillfully than was planned for in the budget.
  - The purchasing manager changed to a lower-price supplier.
  - Webb's purchasing manager ordered larger quantities than the quantities budgeted, thereby obtaining quantity discounts.
  - Direct material prices decreased unexpectedly because of, say, industry oversupply.
  - Budgeted purchase prices of direct materials were set too high without careful analysis of market conditions.
  - The purchasing manager received favorable prices because he was willing to accept unfavorable terms on factors other than prices (such as lower-quality material).
- Webb's response to a direct materials price variance depends on what is believed to be the cause of the variance.

**C. Efficiency Variance for direct cost inputs.**

An **efficiency variance** is the difference between actual input quantity used—such as square yards of cloth of direct materials—and budgeted input quantity allowed for actual output, multiplied by budgeted price. An efficiency variance is sometimes called a **usage variance**. Let's explore efficiency variances in greater detail so we can see how managers use these variances to improve their future performance.

| | | | |
|---|---|---|---|
| **Efficiency Variance =** | **Actual quantity of input used** | **-** | **Budgeted quantity of input allowed for actual output * Budgeted price of input** |

- The idea here is that a company is inefficient if it uses a larger quantity of input than the budgeted quantity for its actual level of output; the company is efficient if it uses a smaller quantity of input than was budgeted for that output level.

**The efficiency variances for each of Webb's direct-cost categories are as follows:**

| Direct-Cost Category | (AQ of input | - | BQ of input ) | BP of input | Efficiency Variance |
|---|---|---|---|---|---|
| **Direct materials** | [22,200 sq. yds. | - | (10,000 units*2 sq. yds./unit)] | *$30 per sq. yard | |
| | = (22,200 sq. yds. | - | 20,000 sq. yds.) | $30 per sq. yard | = **$66,000 U** |
| **Direct mfg labor** | [9,000 hours | - | (10,000 units*0.8 hour/unit)] | * $20 per hour | |
| | = (9,000 hours | - | 8,000 hours) | * $20 per hour | = **20,000 U** |

- As with price variances, there is a broad range of possible causes for these efficiency variances. For example, Webb's unfavorable efficiency variance for direct manufacturing labor could be because of one or more of the following:
  - Webb's personnel manager hired under skilled workers.
  - Webb's production scheduler inefficiently scheduled work, resulting in more manufacturing labor time than budgeted being used per jacket.
  - Webb's maintenance department did not properly maintain machines, resulting in more manufacturing labor time than budgeted being used per jacket.
  - Budgeted time standards were set too tight without careful analysis of the operating conditions and the employees' skills.

Exhibit 3-3 provides an alternative way to calculate price and efficiency variances. It also illustrates how the price variance and the efficiency variance subdivide the flexible budget variance.

**Exhibit 4-3** Columnar Presentation of Variance Analysis: Direct Costs for Webb Company for April 2011

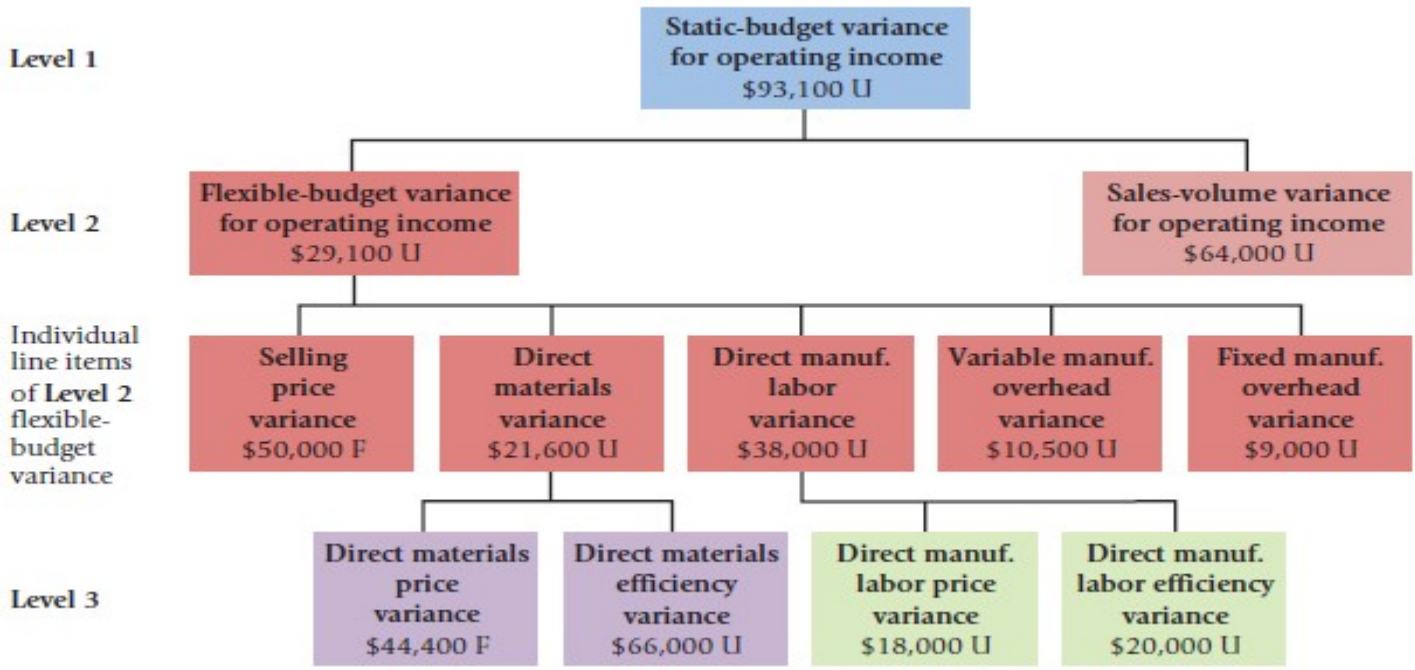
**Level 3 Analysis**

| | Actual Costs Incurred (Actual Input Quantity × Actual Price) (1) | Actual Input Quantity × Budgeted Price (2) | Flexible Budget (Budgeted Input Quantity Allowed for Actual Output × Budgeted Price) (3) |
|---|---|---|---|
| Direct Materials | (22,200 sq. yds. × $28/sq. yd.) $621,600 | (22,200 sq. yds. × $30/sq. yd.) $666,000 | (10,000 units × 2 sq. yds./unit × $30/sq. yd.) $600,000 |
| Level 3 | $44,400 F Price variance | | $66,000 U Efficiency variance |
| Level 2 | $21,600 U Flexible-budget variance | | |
| Direct Manufacturing Labor | 9,000 hours × $22/hr. $198,000 | 9,000 hours × $20/hr. $180,000 | 10,000 units × 0.8 hr./unit × $20/hr. $160,000 |
| Level 3 | $18,000 U Price variance | | $20,000 U Efficiency variance |
| Level 2 | $38,000 U Flexible-budget variance | | |

[a]F = favorable effect on operating income; U = unfavorable effect on operating income.

## D. Summary of Price and Efficiency Variances

**Exhibit 4-4** Summary of Level 1, 2, and 3 Variance Analyses



The summary of variances highlights three main effects:

1. Webb sold 2,000 fewer units than budgeted, resulting in an unfavorable sales volume variance of $64,000. Sales declined because of quality problems and new styles of jackets introduced by Webb's competitors.
2. Webb sold units at a higher price than budgeted, resulting in a favorable selling-price variance of $50,000. Webb's prices, however, were lower than the prices charged by Webb's competitors.
3. Manufacturing costs for the actual output produced were higher than budgeted—direct materials by $21,600, direct manufacturing labor by $38,000, variable manufacturing overhead by $10,500, and fixed overhead by $9,000 because of poor quality of cloth, poor maintenance of machines, and under skilled workers.

## 4.5 Overhead cost variance and management control

**Standard costing** is a costing system that:

a. Traces direct costs to output produced by multiplying the standard prices or rates by the standard quantities of inputs allowed for actual outputs produced and
b. Allocates overhead costs on the basis of the standard overhead-cost rates times the standard quantities of the allocation bases allowed for the actual outputs produced.

### A. Developing Budgeted Variable Overhead Rates

Budgeted variable overhead cost-allocation rates can be developed in four steps. We use the Webb example to illustrate these steps.

**Step 1: Choose the Period to Be Used for the Budget.** Webb uses a 12-month budget period.

**Step 2: Select the Cost-Allocation Bases to Use in Allocating Variable Overhead Costs to Output Produced.**

- Webb's operating managers select machine-hours as the cost-allocation base because they believe that machine-hours is the only cost driver of variable overhead.
- Based on an engineering study, Webb estimates it will take 0.40 of a machine-hour per actual output unit. For its budgeted output of 144,000 jackets in 2011, Webb budgets **57,600** (0.40 X 144,000) machine-hours.

**Step 3: Identify the Variable Overhead Costs Associated with Each Cost-Allocation Base.**

- Webb groups all of its variable overhead costs, including costs of energy, machine maintenance, engineering support, indirect materials, and indirect manufacturing labor in a single cost pool. Webb's total budgeted variable overhead costs for 2011 are **$1,728,000**.

**Step 4: Compute the Rate per Unit of Each Cost-Allocation Base Used to Allocate Variable Overhead Costs to Output Produced.**

- Dividing the amount in Step 3 ($1,728,000) by the amount in Step 2 (57,600 machine-hours), Webb estimates a rate of $30 per standard machine-hour for allocating its variable overhead costs.
- In standard costing, the variable overhead rate per unit of the cost-allocation base ($30 per machine-hour for Webb) is generally expressed as a standard rate per output unit.
- Webb calculates the budgeted variable overhead cost rate per output unit as follows:

| | | | | |
|---|---|---|---|---|
| **Budgeted variable overhead cost rate per output unit** | **=** | **Budgeted input allowed per output unit** | ***** | **Budgeted variable overhead cost rate per input unit** |

= 0.40 hour per jacket * $30 per hour

= **$12 per jacket**

- Webb uses $12 per jacket as the budgeted variable overhead cost rate in both its static budget for 2011 and in the monthly performance reports it prepares during 2011.
- Managers help control variable overhead costs by budgeting each line item and then investigating possible causes for any significant variances.

**B. Developing Budgeted Fixed Overhead Rates**

- The process of developing the budgeted fixed overhead rate is the same as that detailed earlier for calculating the budgeted variable overhead rate. The four steps are as follows:

**Step 1: Choose the Period to Use for the Budget.**

- As with variable overhead costs, the budget period for fixed overhead costs is typically 12 months to help smooth out seasonal effects.

**Step 2: Select the Cost-Allocation Bases to Use in Allocating Fixed Overhead Costs to Output Produced.**

- Webb uses machine-hours as the only cost-allocation base for fixed overhead costs. Why? Because Webb's managers believe that, in the long run, fixed overhead costs will increase or decrease to the levels needed to support the amount of machine-hours.
- Therefore, in the long run, the amount of machine-hours used is the only cost driver of fixed overhead costs. The number of machine-hours is the denominator in the budgeted fixed overhead rate computation and is called the **denominator level** or, in manufacturing settings, the **production-denominator level**. For simplicity, we assume Webb expects to operate at capacity in fiscal year 2011—with a budgeted usage of **57,600** machine-hours for a budgeted output of **144,000 jackets**.

**Step 3: Identify the Fixed Overhead Costs Associated with Each Cost-Allocation Base.**

- Because Webb identifies only single cost-allocation base —machine-hours— to allocate fixed overhead costs, it groups all such costs into a single cost pool. Costs in this pool include depreciation on plant and equipment, plant and equipment leasing costs, and the plant manager's salary.
- Webb's fixed overhead budget for 2011 is **$3,312,000**.

**Step 4: Compute the Rate per Unit of Each Cost-Allocation Base Used to Allocate Fixed Overhead Costs to Output Produced.**

- Dividing the $3,312,000 from Step 3 by the 57,600 machine-hours from Step 2, Webb estimates a fixed overhead cost rate of $57.50 per machine-hour:

| | | | | | |
|---|---|---|---|---|---|
| **Budgeted fixed overhead cost per unit of cost-allocation base** | = | **Budgeted total costs in fixed overhead cost pool** / **Budgeted total quantity of cost-allocation base** | = | **$3,312,000 / 57,600** | = **$57.50 per machine-hour** |

In standard costing, the $57.50 fixed overhead cost per machine-hour is usually expressed as a standard cost per output unit. Recall that Webb's engineering study estimates that it will take 0.40 machine-hour per output unit. Webb can now calculate the budgeted fixed overhead cost per output unit as follows:

| | | | | |
|---|---|---|---|---|
| **Budgeted fixed overhead cost per output unit** | = | **Budgeted quantity of cost-allocation base allowed per output unit** | * | **Budgeted fixed overhead cost per unit of cost-allocation base** |

= 0.40 of a machine-hour per jacket * $57.50 per machine-hour

= **$23.00 per jacket**

- When preparing monthly budgets for 2011, Webb divides the $3,312,000 annual total fixed costs into 12 equal monthly amounts of $276,000.

**C. Variable Overhead Cost Variances**

We now illustrate how the budgeted variable overhead rate is used in computing Webb's variable overhead cost variances. The following data are for April 2011, when Webb produced and sold 10,000 jackets:

| | Actual Result | Flexible-Budget Amount |
|---|---|---|
| 1. Output units (jackets) | 10,000 | 10,000 |
| 2. Machine-hours per output unit | 0.45 | 0.40 |
| 3. Machine-hours (1 * 2) | 4,500 | 4,000 |

| | | |
|---|---|---|
| 4. Variable overhead costs | $130,500 | $120,000 |
| 5. Variable overhead costs per machine-hour (4 ÷ 3) | $ 29.00 | $ 30.00 |
| 6. Variable overhead costs per output unit (4 ÷ 1) | $ 13.05 | $ 12.00 |

**Flexible-Budget Analysis**

The **variable overhead flexible-budget variance** measures the difference between actual variable overhead costs incurred and flexible-budget variable overhead amounts.

**VOH flexible-budget variance = Actual costs incurred - Flexible-budget amount**

= $130,500 - $120,000

= **$10,500 U**

- Webb's managers would want to know why actual costs exceeded the flexible-budget amount. Did Webb use more machine-hours than planned to produce the 10,000 jackets? If so, was it because workers were less skilled than expected in using machines? Or did Webb spend more on variable overhead costs, such as maintenance?
- Just as we illustrated in the flexible-budget variance for direct-cost items, Webb's managers can get further insight into the reason for the $10,500 unfavorable variance by subdividing it into the efficiency variance and spending variance.

**i. Variable Overhead Efficiency Variance**

The **variable overhead efficiency variance** is the difference between actual quantity of the cost-allocation base used and budgeted quantity of the cost-allocation base that should have been used to produce actual output, multiplied by budgeted variable overhead cost per unit of the cost-allocation base.

| | | | | | |
|---|---|---|---|---|---|
| **Variable Overhead efficiency = variance** | **Actual quantity of variable overhead cost-allocation base used for actual output** | **-** | **Budgeted quantity of variable overhead cost-allocation base allowed for actual output** | ***** | **Budgeted variable overhead cost per unit of cost-allocation base** |

= (4,500 hours - 0.40 hr./unit * 10,000 units) * $30 per hour

= (4,500 hours - 4,000 hours) * $30 per hour

= **$15,000 U**

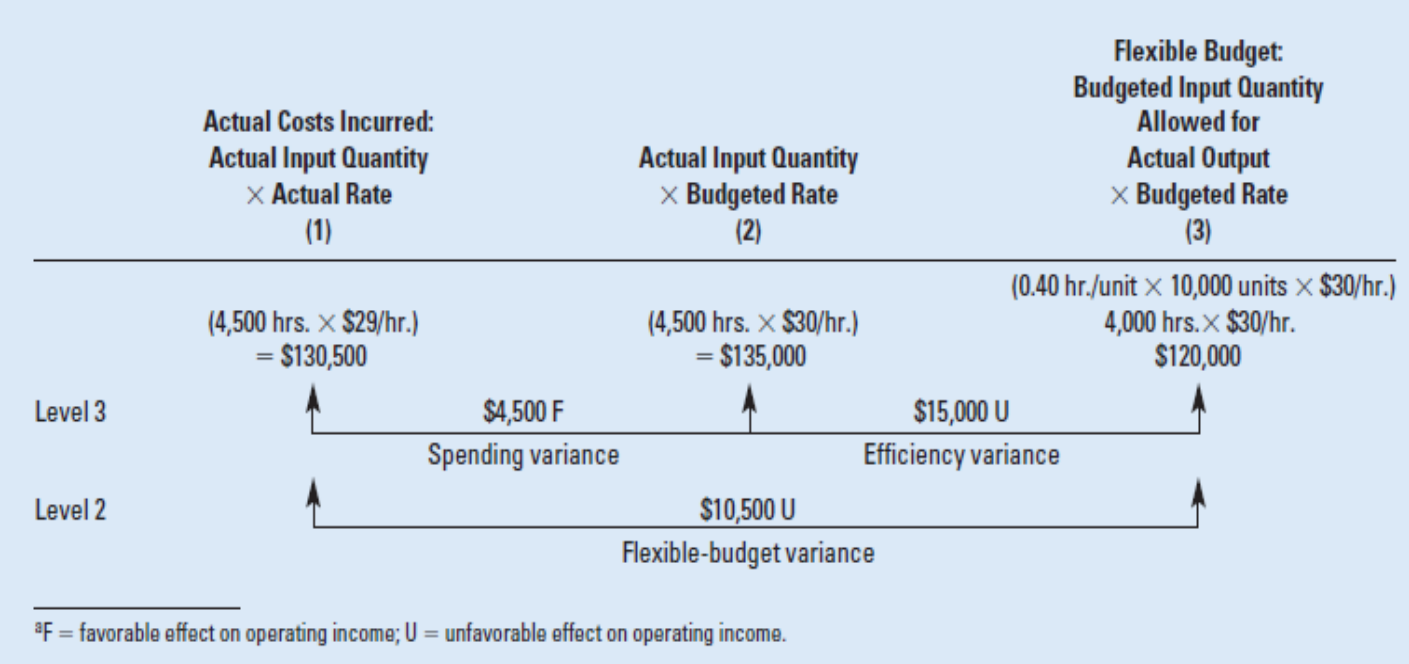
- The efficiency variance for variable overhead cost is based on the efficiency with which *the cost-allocation base* is used. Webb's unfavorable variable overhead efficiency variance of $15,000 means that the actual machine-hours (the cost-allocation base) of 4,500 hours turned

out to be higher than the budgeted machine-hours of 4,000 hours allowed to manufacture 10,000 jackets.

The following table shows possible causes for Webb's actual machine-hours exceeding budgeted machine-hours and management's potential responses to each of these causes.

| Possible Causes for Exceeding Budget | Potential Management Responses |
|---|---|
| 1. Workers were less skilled than expected in using machines. | a. Encourage the human resources department to implement better employee-hiring practices and training procedures. |
| 2. Production scheduler inefficiently scheduled jobs, resulting in more machine-hours used than budgeted. | b. Improve plant operations by installing production scheduling software. |
| 3. Machines were not maintained in good operating condition. | c. Ensure preventive maintenance is done on all machines. |
| 4. Webb's sales staff promised a distributor a rush delivery, which resulted in more machine-hours used than budgeted. | d. Coordinate production schedules with sales staff and distributors and share information with them. |
| 5. Budgeted machine time standards were set too tight. | e. Commit more resources to develop appropriate standards. |

**Exhibit 4-5** Columnar Presentation of Variable Overhead Variance Analysis: Webb Company for April 2011




[a]F = favorable effect on operating income; U = unfavorable effect on operating income.

- Management would assess the cause(s) of the $15,000 U variance in April 2011 and respond accordingly.

**ii. Variable Overhead Spending Variance**

- The **variable overhead spending variance** is the difference between actual variable overhead cost per unit of the cost-allocation base and budgeted variable overhead cost per unit of the cost-allocation base, multiplied by the actual quantity of variable overhead cost-allocation base used for actual output.

| | | | | | |
|---|---|---|---|---|---|
| **Variable Overhead = Spending Variance** | **Actual variable overhead cost per unit of cost-allocation base** | **-** | **Budgeted variable overhead cost per unit of cost-allocation base** | ***** | **Actual quantity of variable overhead cost-allocation base used for actual output** |

= ($29 per machine-hour - $30 per machine-hour) * 4,500 machine-hours

= (- $1 per machine-hour) * 4,500 machine-hours

= **$4,500 F**

- To understand the favorable variable overhead spending variance and its implications, Webb's managers need to recognize why *actual* variable overhead cost per unit of the cost-allocation base ($29 per machine-hour) is *lower* than the *budgeted* variable overhead cost per unit of the cost-allocation base ($30 per machine-hour).
- Overall, Webb used 4,500 machine-hours, which is 12.5% greater than the flexible-budget amount of 4,000 machine hours. However, actual variable overhead costs of $130,500 are only 8.75% greater than the flexible-budget amount of $120,000. Thus, relative to the flexible budget, the percentage increase in actual variable overhead costs is *less* than the percentage increase in machine-hours.
- Consequently, actual variable overhead cost per machine hour is lower than the budgeted amount, resulting in a favorable variable overhead spending variance.
- By understanding the reasons for these variances, Webb can take appropriate actions and make more precise predictions in order to achieve improved results in future periods.
- We emphasize that a favorable variable overhead spending variance is not always desirable. For example, the variable overhead spending variance would be favorable if Webb's managers purchased lower-priced, poor-quality indirect materials, hired less-talented supervisors, or performed less machine maintenance. These decisions, however, are likely to hurt product quality and harm the long-run prospects of the business.

## D. Fixed Overhead Cost Variances

- At the start of 2011, Webb budgeted fixed overhead costs to be $276,000 per month. The actual amount for April 2011 turned out to be $285,000.
- The **fixed overhead flexible-budget variance** is the difference between actual fixed overhead costs and fixed overhead costs in the flexible budget:

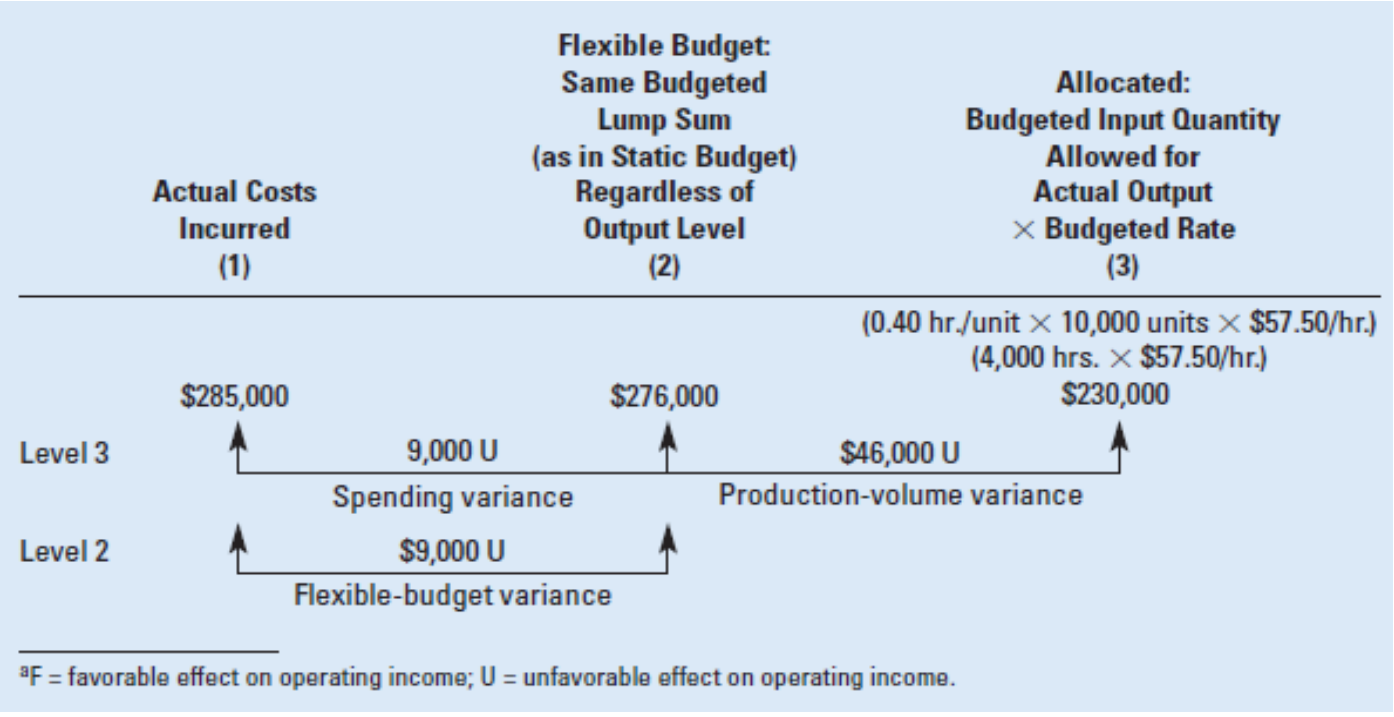
**Fixed overhead flexible-budget variance = Actual costs incurred - Flexible-budget amount**

= $285,000 - $276,000

= **$9,000 U**

- The variable overhead flexible-budget variance described earlier in this chapter was subdivided into a spending variance and an efficiency variance. There is not an efficiency variance for fixed overhead costs. That's because a given lump sum of fixed overhead costs will be unaffected by how efficiently machine-hours are used to produce output in a given budget period.
- As we will see later on, this does not mean that a company cannot be efficient or inefficient in its use of fixed-overhead-cost resources. As Exhibit 3-6 shows, because there is no efficiency variance, the **fixed overhead spending variance** is the same amount as the fixed overhead flexible-budget variance:

**Exhibit 4-6** Columnar Presentation of Fixed Overhead Variance Analysis: Webb Company for April 2011




[a]F = favorable effect on operating income; U = unfavorable effect on operating income.

**Fixed overhead spending variance = Actual costs incurred - Flexible-budget amount**

= $285,000 - $276,000

= **$9,000 U**

- Reasons for the unfavorable spending variance could be higher plant-leasing costs, higher depreciation on plant and equipment, or higher administrative costs, such as a higher-than-budgeted salary paid to the plant manager.
- Webb investigated this variance and found that there was a $9,000 per month unexpected increase in its equipment leasing costs. However, management concluded that the new lease rates were competitive with lease rates available elsewhere. If this were not the case, management would look to lease equipment from other suppliers.

**Production-Volume Variance**

- We now examine a variance—the production-volume variance—that arises only for fixed costs. Recall that at the start of the year, Webb calculated a budgeted fixed overhead rate of $57.50 per machine hour. Under standard costing, Webb's budgeted fixed overhead costs are allocated to actual output produced during the period at the rate of $57.50 per standard machine-hour, equivalent to a rate of $23 per jacket (0.40 machine-hour per jacket $57.50 per machine-hour).
- If Webb produces 1,000 jackets, $23,000 ($23 per jacket 1,000 jackets) out of April's budgeted fixed overhead costs of $276,000 will be allocated to the jackets. If Webb produces 10,000 jackets, $230,000 ($23 per jacket 10,000 jackets) will be allocated. Only if Webb produces 12,000 jackets (that is, operates at capacity), will all $276,000 ($23 per jacket 12,000 jackets) of the budgeted fixed overhead cost be allocated to the jacket output.
- The key point here is that even though Webb budgets fixed overhead costs to be $276,000, it does not necessarily allocate all these costs to output. The reason is that Webb budgets $276,000 of fixed costs to support its planned production of 12,000 jackets. If Webb produces fewer than 12,000 jackets, it only allocates the budgeted cost of capacity actually needed and used to produce the jackets.

| **Production volume variance** | **=** | **Budgeted fixed overhead** | **-** | **Fixed overhead allocated for actual output units produced** |
|---|---|---|---|---|

= $276,000 - (0.40 hour per jacket * $57.50 per hour * 10,000 jackets)

= $276,000 - ($23 per jacket * 10,000 jackets)

= $276,000 - $230,000

= **$46,000 U**

## E. Integrated Analysis of Overhead Cost Variances

- As our discussion indicates, the variance calculations for variable overhead and fixed overhead differ:

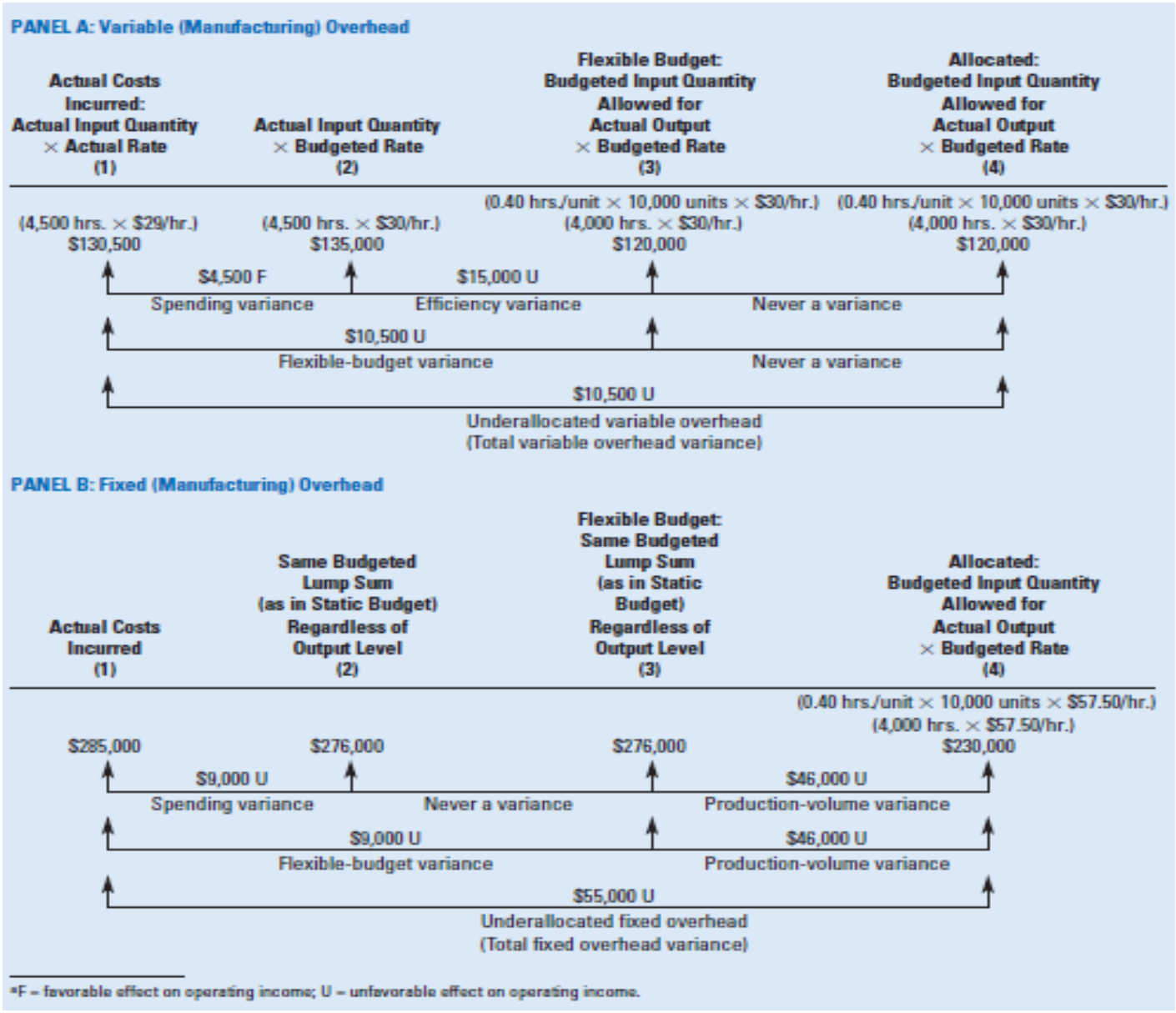
- Variable overhead has no production-volume variance.
- Fixed overhead has no efficiency variance.

- Exhibit 3-7 presents an integrated summary of the variable overhead variances and the fixed overhead variances computed using standard costs for April 2011. Panel A shows the variances for variable overhead, while Panel B contains the fixed overhead variances. As you study Exhibit 3-7, note how the columns in Panels A and B are aligned to measure the different variances. In both Panels A and B,

- The difference between columns 1 and 2 measures the spending variance.
- The difference between columns 2 and 3 measures the efficiency variance (if applicable).
- The difference between columns 3 and 4 measures the production-volume variance (if applicable).

- Panel A contains an efficiency variance; Panel B has no efficiency variance for fixed overhead. As discussed earlier, a lump-sum amount of fixed costs will be unaffected by the degree of operating efficiency in a given budget period.
- Panel A does not have a production-volume variance, because the amount of variable overhead allocated is always the same as the flexible-budget amount. Variable costs never have any unused capacity. When production and sales decline from 12,000 jackets to 10,000 jackets, budgeted variable overhead costs proportionately decline. Fixed costs are different.
- Panel B has a production-volume variance because Webb had to acquire the fixed manufacturing overhead resources it had committed to when it planned production of 12,000 jackets, even though it produced only 10,000 jackets and did not use some of its capacity.

**Exhibit 3-7** Columnar Presentation of Integrated Variance Analysis: Webb Company for April 2011




[a]F = favorable effect on operating income; U = unfavorable effect on operating income.