14-21   Cost allocation to divisions.

1.

	Hotel	Restaurant	Casino	Rembrandt
Revenue	$16,425,000	$5,256,000	$12,340,000	$34,021,000
Direct costs	9,819,260	3,749,172	4,248,768	17,817,200
Segment margin	$ 6,605,740	$1,506,828	$ 8,091,232	16,203,800
Fixed overhead costs				14,550,000
Income before taxes				$ 1,653,800
Segment margin %	40.22%	28.67%	65.57%	

2.

	Hotel	Restaurant	Casino	Rembrandt
Direct costs	$9,819,260	$3,749,172	$4,248,768	$17,817,200
Direct cost %	55.11%	21.04%	23.85%	100.00%
Square footage	80,000	16,000	64,000	160,000
Square footage %	50.00%	10.00%	40.00%	100.00%
Number of employees	200	50	250	500
Number of employees %	40.00%	10.00%	50.00%	100.00%

A: Cost allocation based on direct costs:

	Hotel	Restaurant	Casino	Rembrandt
Revenue	$16,425,000	$ 5,256,000	$12,340,000	$34,021,000
Direct costs	9,819,260	3,749,172	4,248,768	17,817,200
Segment margin	6,605,740	1,506,828	8,091,232	16,203,800
Allocated fixed overhead costs	8,018,505	3,061,320	3,470,175	14,550,000
Segment pre-tax income	$ (1,412,765)	$(1,554,492)	$ 4,621,057	$ 1,653,800
Segment pre-tax income % of rev.	−8.60%	−29.58%	37.45%	

B: Cost allocation based on floor space:

	Hotel	Restaurant	Casino	Rembrandt
Revenue	$16,425,000	$ 5,256,000	$12,340,000	$34,021,000
Direct costs	9,819,260	3,749,172	4,248,768	17,817,200
Segment margin	6,605,740	1,506,828	8,091,232	16,203,800
Allocated fixed overhead costs	$ 7,275,000	$ 1,455,000	$ 5,820,000	$14,550,000
Segment pre-tax income	$ (669,260)	$ 51,828	$ 2,271,232	$ 1,653,800
Segment pre-tax income % of rev.	–4.07%	0.99%	18.41%	

C: Cost allocation based on number of employees

	Hotel	Restaurant	Casino	Rembrandt
Revenue	$16,425,000	$ 5,256,000	$12,340,000	$34,021,000
Direct costs	9,819,260	3,749,172	4,248,768	17,817,200
Segment margin	6,605,740	1,506,828	8,091,232	16,203,800
Allocated fixed overhead costs	$ 5,820,000	$ 1,455,000	$ 7,275,000	$14,550,000
Segment pre-tax income	$ 785,740	$ 51,828	$ 816,232	$ 1,653,800
Segment pre-tax income % of rev.	4.78%	0.99%	6.61%	

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3. Requirement 2 shows the dramatic effect of the choice of cost allocation base on segment pre-tax income as a percentage of revenues:

		Pre-tax Income Percentage		
Allocation Base		**Hotel**	**Restaurant**	**Casino**
Direct costs		–8.60%	–29.58%	37.45%
Floor space		–4.07	0.99	18.41
Number	of	4.78	0.99	6.61
employees				

The decision context should guide (a) whether costs should be allocated and (b) the preferred cost allocation base. Decisions about, say, performance measurement, may be made on a combination of financial and nonfinancial measures. It may well be that Rembrandt may prefer to exclude allocated costs from the financial measures to reduce areas of dispute.

Where cost allocation is required, the cause-and-effect and benefits-received criteria are recommended in Chapter 14. The $14,550,000 is a fixed overhead cost. This means that on a short-run basis, the cause-and-effect criterion is not appropriate, but Rembrandt could attempt to identify the cost drivers for these costs in the long run when these costs are likely to be more variable. Rembrandt should look at how the $14,550,000 cost benefits the three divisions. This will help guide the choice of an allocation base in the short run.

4. The analysis in requirement 2 should not guide the decision on whether to shut down any of the divisions. The overhead costs are fixed costs in the short run. It is not clear how these costs would be affected in the long run if Rembrandt shut down one of the divisions. Also, each division is not independent of the other two. A decision to shut down, say, the restaurant, likely would negatively affect the attendance at the casino and possibly the hotel. If Rembrandt did shut down the restaurant, it might consider outsourcing restaurant services. Rembrandt should examine the future revenue and future cost implications of different resource investments and strategies to reduce costs in the three divisions. This is a future-oriented exercise, whereas the analysis in requirement 2 is an analysis of past costs.

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14-25 Variance analysis, multiple products.

1. Budget for 2014

	Selling Price (1)	Variable Cost per Unit (2)	Contrib. Margin per Unit (3) = (1) – (2)	Units Sold (4)	Sales Mix (5)	Contribution Margin (6) = (3) × (4)
Kola	$10.00	$5.50	$4.50	500,000	40%	$2,250,000
Limor	7.50	4.00	3.50	750,000	60	2,625,000
Total				1,250,000	100%	$4,875,000

Actual for 2014

	Selling Price (1)	Variable Cost per Unit (2)	Contrib. Margin per Unit (3) = (1) – (2)	Units Sold (4)	Sales Mix (5)	Contribution Margin (6) = (3) × (4)
Kola	$10.10	$5.75	$4.35	504,300	41%	$2,193,705
Limor	7.75	3.70	4.05	725,700	59	2,939,085
Total				1,230,000	100%	$5,132,790

Solution Exhibit 14-25 presents the sales-volume, sales-quantity, and sales-mix variances for each product and in total for 2014.

$$\text{Sales-volume variance} = \left(\begin{array}{c} \text{Actual} \\ \text{quantity of} \\ \text{units sold} \end{array} - \begin{array}{c} \text{Budgeted} \\ \text{quantity of} \\ \text{units sold} \end{array} \right) \times \begin{array}{c} \text{Budgeted} \\ \text{contribution margin} \\ \text{per unit} \end{array}$$

Kola	= (504,300 – 500,000) × $4.50	=	**$19,350 F**
Limor	= (725,700 – 750,000) × $3.50	=	85,050 U
Total			**$65,700 U**

$$\text{Sales-quantity variance} = \left(\begin{array}{c} \text{Actual units} \\ \text{of all} \\ \text{products sold} \end{array} - \begin{array}{c} \text{Budgeted units} \\ \text{of all} \\ \text{products sold} \end{array} \right) \times \begin{array}{c} \text{Budgeted} \\ \text{sales-mix} \\ \text{percentage} \end{array} \times \begin{array}{c} \text{Budgeted} \\ \text{contribution margin} \\ \text{per unit} \end{array}$$

Kola	= (1,230,000 – 1,250,000) × 0.40 × $4.50	=	**$36,000 U**
Limor	= (1,230,000 – 1,250,000) × 0.60 × $3.50	=	42,000 U
Total			**$78,000 U**

$$\underset{\text{variance}}{\text{Sales-mix}} = \underset{\substack{\text{all products} \\ \text{sold}}}{\text{Actual units of}} \times \left(\underset{\substack{\text{sales-mix} \\ \text{percentage}}}{\text{Actual}} - \underset{\substack{\text{sales-mix} \\ \text{percentage}}}{\text{Budgeted}} \right) \times \underset{\substack{\text{contribution margin} \\ \text{per unit}}}{\text{Budgeted}}$$

Kola	=	**1,230,000 × (0.41 – 0.40) × $4.50**	=	**$55,350 F**
Limor	=	**1,230,000 × (0.59 – 0.60) × $3.50**	=	**43,050 U**
Total				**$12,300 F**

2.   The breakdown of the unfavorable sales-volume variance of $65,700 shows that the biggest contributor is the 20,000 unit decrease in sales resulting in an unfavorable sales-quantity variance of $78,000. There is a partially offsetting favorable sales-mix variance of $12,300 in contribution margin as a result of the sales mix shifting in favor of the more profitable Kola (contribution margin of $4.50 versus contribution margin of $3.50 for Limor).

SOLUTION EXHIBIT 14-25

Sales-Mix and Sales-Quantity Variance Analysis of Soda King for 2014

	Flexible Budget: Actual Units of All Products Sold × Actual Sales Mix × Budgeted Contribution Margin Per Unit	**Actual Units of** All Products Sold × Budgeted Sales Mix × Budgeted Contribution Margin Per Unit	**Static Budget:** Budgeted Units of All Products Sold × Budgeted Sales Mix × Budgeted Contribution Margin Per Unit
Kola	1,230,000 × 0.41 × $4.50 = $2,269,350	1,230,000 × 0.4 × $4.50 = $2,214,000	1,250,000 × 0.4 × $4.50 = $2,250,000
Limor	1,230,000 × 0.59 × $3.50 = 2,539,950	1,230,000 × 0.6 × $3.50 = 2,583,000	1,250,000 × 0.6 × $3.50 = 2,625,000
	$4,809,300	$4,797,000	$4,875,000

$ 12,300 F   Sales-mix variance $ 78,000 U   Sales-quantity variance

$65,700 U
Sales-volume variance

F = favorable effect on operating income; U= unfavorable effect on operating income

14-26 Market-share and market-size variances (continuation of 14-25).

	Actual	**Budgeted**
Western region	12.3 million	10 million
Soda King	1.23 million	1.25 million
Market share	10%	12.5%

[1.] **Actual market share: 1,230,000 units ÷ 12,300,000 units = 0.10, or 10%**
[2.] **Budgeted market share: 1,250,000 units ÷ 10,000,000 units = 0.125, or 12.5%**
[3.] **Budgeted average contribution margin per unit $4,875,000 ÷ 1,250,000 units = $3.90 per unit**

Solution Exhibit 14-26 presents the sales-quantity variance, market-size variance, and market-share variance for 2014.

$$\text{Market share variance} = \text{Actual market size in units} \times \left(\text{Actual market share} - \text{Budgeted market share} \right) \times \text{Budgeted contribution margin per composite unit for budgeted mix}$$

= **12,300,000 × (0.10 – 0.125) × $3.90**
= **12,300,000 × 0.025 × $3.90**
= **$1,199,250 U**

$$\text{Market-size variance} = \left(\text{Actual market size in units} - \text{Budgeted market size in units} \right) \times \text{Budgeted market share} \times \text{Budgeted contribution margin per composite unit for budgeted mix}$$

= **(12,300,000 – 10,000,000) × 0.125 × $3.90**
= **2,300,000 × 0.125 × $3.90**
= **1,121,250 F**

* The market share variance is unfavorable because the actual 10% market share was lower than the budgeted 12.5% market share.
* The market size variance is favorable because the market size increased 23% [(12,300,000 – 10,000,000) ÷ 10,000,000].

The unfavorable market-share variance was greater than the increase in market size variance resulting in an unfavorable sales-quantity variance.

Sales-Quantity Variance
$78,000 U

Market-share variance
$1,199,250 U

Market-size variance
$1,121,250 F
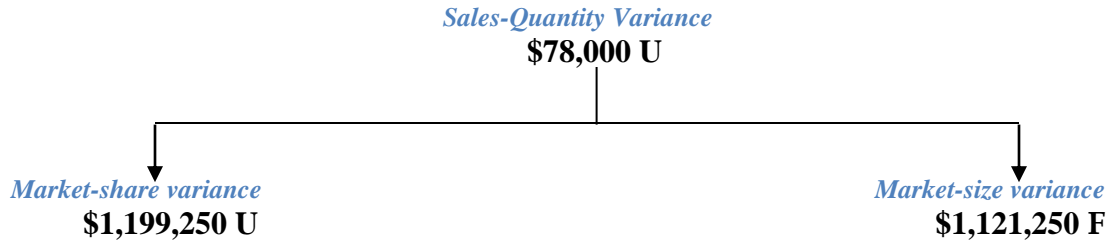
SOLUTION EXHIBIT 14-26

Market-Share and Market-Size Variance Analysis of Soda King for 2014

Actual Market Size × Actual Market Share × Budgeted Average Contribution Margin Per Unit	Actual Market Size × Budgeted Market Share × Budgeted Average Contribution Margin Per Unit	Static Budget: Budgeted Market Size × Budgeted Market Share × Budgeted Average Contribution Margin Per Unit
$12,300,000 \times 0.10^a \times \$3.90^b$	$12,300,000 \times 0.125^c \times \$3.90^b$	$10,000,000 \times 0.125^c \times \$3.90^b$
$4,797,000	$5,996,250	$4,875,000

$1,199,250 U $1,121,250 F

Market-share variance   Market-size variance

$78,000 U

Sales-quantity variance

F = favorable effect on operating income; U = unfavorable effect on operating income