



Standard Costs and Variance Analysis

INTRODUCTION

This document focuses on two related topics: the development and use of standard costs, and the calculation and interpretation of variances, i.e. the analysis of deviations from those standard costs in the actual results.

STANDARD COSTS

Definition and Purpose of Standard Costs

A **standard cost** is a carefully predetermined cost. Narrowly defined, it is the estimated cost to manufacture a single unit of a product or to perform a single service. More broadly defined, it is the estimated cost of a product, job, project, or operation, including manufacturing, selling, and administrative costs.

A **budgeted cost** is a standard cost multiplied by a volume figure. In other words, a standard cost is a unit cost while a budgeted cost is a total amount, although the terms are often used interchangeably.

Because standard costs are incorporated into budgeting systems, they play a key role in the planning, control, motivation, and performance evaluation functions of management. Having predetermined costs provides timely information to help managers plan and make decisions about product emphasis, bidding, and pricing, since such decisions often have to be made before production is complete. For control purposes, standard costs allow for a detailed analysis of variances between actual performance and budgeted performance, to determine where inefficiencies or problems exist. Because standard costs provide concrete targets that employees can aspire to achieve, they can also be used to motivate employees to minimize inefficiencies and to correct problems. Commitment to attaining standards is usually enhanced when employees have been involved in setting the standards. Finally, evaluation of performance against predetermined standards is generally perceived to be fairer than evaluation based on vague expectations.

Standard costs may provide additional benefits if they are incorporated into the accounting system. A **standard costing system**, also known as a standard cost system, is an accounting system that uses standard costs to accumulate material, labour, and overhead costs. Standard costing systems are often more practical than actual or normal costing systems, and simplify the accounting process and records. For

example, subsidiary ledgers need only record the quantities of raw materials on hand, since their associated cost is the standard cost.

Types of Standard Costs

Two types of standard costs exist. **Ideal standards**, or **theoretical standards**, reflect a situation where there is maximum efficiency, i.e. where employees always work efficiently, the best quality materials are always available, input prices are the lowest possible, machines never break down, power failures never occur, etc. **(Currently) attainable standards**, or **practical standards**, reflect efficient performance within realistic or normal operating conditions. They are more flexible than ideal standards because they allow for normal spoilage, ordinary machine breakdowns, and lost time, etc.

Most organizations use attainable standards since they are believed to be more effective in motivating employees to perform well. Use of ideal standards may discourage employees from trying to meet standards that are perceived to be unattainable and may lead to sacrificing product quality in an effort to reduce costs. Nevertheless, ideal standards are useful for organizations pursuing a continuous improvement strategy or facing a crisis that requires extraordinary efforts. When ideal standards are used, employees can be evaluated on and rewarded for satisfactory progress towards the ideal standards.

Development of Standard Costs

Developing standards for direct materials costs involves selecting the desired combination of quality, quantity, and price. Setting standards for labour costs requires understanding the nature of the work and the skill levels of employees. Developing standards for overhead costs involves the selection of a valid cost allocation base and a reasonable level of activity. The organization may use a single plant-wide rate or multiple departmental rates.

Several techniques are available to develop standard costs:

1. **Activity analysis (or task analysis)** – Identify and evaluate all activities required to complete a product, job, or operation to determine exactly how much direct materials should be required, how long each step performed by direct labourers should take, and how machinery should be used in the production process, etc.
2. **Historical data** – Use historical data in conjunction with management judgment to ensure that standards do not perpetuate past inefficiencies.
3. **Benchmarking** – Collect information from other firms in the same industry or firms considered to have “best practices” across industries.
4. **Market expectations and strategic decisions** – Determine the standard required to achieve a target cost or to achieve satisfactory progress towards a continuous improvement strategy.

A competitive global marketplace has resulted in increasing use of the last two methods, along with or instead of the traditional first two methods.

VARIANCE ANALYSIS

Variance analysis is the process of measuring and evaluating actual performance against standards or budgeted performance targets. **Static-budget variances**, or **master-budget variances**, are the differences between actual amounts and static-budget amounts. Static-budget variances are of limited use since they compare a cost or revenue result against a budget that typically reflects a budgeted volume level that usually differs from actual. For example, it may compare a budget of 100 units to an actual output of 80 units.

Two additional types of variances can be calculated based on the flexible budget. A flexible budget restates the master budget using the achieved level of production and sales. **Flexible-budget variances** are differences between the actual results and the flexible-budget amounts for the actual output achieved. To use the same analogy as above, a budget output of 80 units would be compared to an actual output of 80 units. **Sales-volume variances** are differences between the flexible-budget amounts and the static-budget amounts. See Appendix A for variance formulas.

By convention, variances are computed by subtracting the budgeted or standard amount from the actual amount. Variances are favourable when they result in an increase in profit; they are unfavourable when they result in a reduction in profit. Therefore, positive cost variances are unfavourable since actual costs exceed budgeted costs; and negative cost variances are favourable since actual costs are less than budgeted costs. Similarly, positive revenue variances are favourable since actual revenues exceed budgeted revenues; and negative revenue variances are unfavourable since actual revenues fall short of budgeted revenues.

Flexible Budget Variances

Direct Materials and Direct Labour Cost Variances

Flexible-budget cost variances for variable costs are divided into two components: price variances and efficiency variances. **Price variances**, also known as **rate variances** (especially in the case of labour), capture the change in profit resulting from differences between the standard price for a unit of material or labour and the actual price paid. **Efficiency variances**, also known as **usage or quantity variances**, measure the change in profit resulting from differences between the actual amount of materials or labour used and the amount that should have been used based on the standard quantity allowed for the actual output.

The relationship between the price and efficiency variances has to be considered when evaluating these variances since there are often tradeoffs to be made. In particular, higher-priced raw materials may be of a higher quality and result in production

efficiencies, whereas lower-priced raw materials may be of an inferior quality and lead to more spoilage and scrap. Similarly, if higher wages for direct labour reflect higher levels of skills and experience, employees may be more productive. As well, there are usually inter-relationships between materials and labour variances. For example, better quality materials may be easier to use, and highly-skilled employees may be more careful and efficient in their use of materials.

Some organizations calculate the materials price variance based on actual quantity of inputs purchased rather than used, since the purchasing group is accountable for materials price variances while the production group is accountable for efficiency variances. However, basing both price and efficiency variances on usage makes it easier to consider how the two are interrelated and is more appropriate in just-in-time environments where coordinating the purchase and usage of materials is essential.

Decomposing Material and Labour Efficiency Variances: Mix and Yield Variances

An organization may be able to use varying proportions of different raw materials (e.g. different types of fruit to make canned fruit salad) and/or different grades or skill-levels of labour. When inputs can be substituted such that the proportions of the inputs are different than the budget proportions, material and labour efficiency variances can be further decomposed into mix and yield variances. The **mix variance** reflects the effect on income of substituting inputs that have different standard costs. The **yield variance** reflects a combination of the efficiency loss or gain from not using the standard mix of inputs and any other efficiency losses or gains in the process.

Variable Overhead Spending and Efficiency Variances

While the calculation of overhead spending and efficiency variances parallels that of materials and labour, interpreting these variances is more complicated.

Variable overhead price variances are usually referred to as **spending** variances. In practice, variable overhead variances are determined by department and by cost pools so that management can examine each item that is out of line.

The variable overhead spending variance is a composite factor that may be caused by changes in prices of variable overhead items such as supplies, utilities, and maintenance, as well as efficient or inefficient use of the variable overhead items (e.g. turning off machines when they are not in use, spilling supplies).

The **variable overhead efficiency variance** formula assumes that there is a clear-cut proportional relationship between the underlying cost driver (e.g. direct labour hours, machine hours, number of units produced) and variable overhead expenses. Therefore, an unfavourable overhead efficiency variance will arise when more units of the cost driver are used than budgeted. Conversely, there will be a favourable overhead efficiency variance whenever fewer units of the cost driver are used than budgeted. If the cost driver is direct labour hours and more labour hours are used (perhaps because

employees are less experienced than expected), it is assumed that consumption or use of variable overhead items such as supplies and indirect labour (supervision) will increase in proportion to the increase in labour hours. If the cost driver is machine hours and more machine hours are used, it is assumed that variable overhead costs will increase proportionately to the increase in machine hours because more electricity will be used, maintenance will be performed more frequently than budgeted, etc.

Fixed Overhead Cost Variances

In a standard costing system, a predetermined rate for applying fixed overhead costs is calculated based on total expected fixed factory overhead and total expected activity for the year. Thus, fixed factory overhead is applied as though it were a variable cost, yet the fixed overhead rate per unit is only applicable for one specific volume level.

The flexible budget for fixed overhead is identical to the master budget as long as the flexible budget activity level is within the relevant range. Furthermore, no fixed overhead efficiency variance is computed since, in the short-run, fixed overhead is not affected by efficiency—that is why it is categorized as fixed.

At year end, there will be a difference between actual factory overhead costs and applied factory overhead costs. This overapplied or underapplied overhead can be subdivided into a spending variance and an output-level variance.

The **fixed overhead spending variance**, or **budget variance**, is similar to the variable overhead spending variance. It is the difference between the amount actually spent and the amount budgeted to be spent. Since fixed costs are often beyond immediate managerial control, the spending variance does not measure managerial performance in most cases.

The **output-level variance**, or **production-volume variance**, results from unitizing fixed costs. It is the amount of fixed overhead that is overabsorbed or underabsorbed by the products as a result of operating at a level that differs from the production level used to calculate the predetermined overhead rate. The output-level variance measures the cost of not producing up to the master-budget capacity or the benefit from better-than-budgeted usage of plant resources. This variance is only calculated under an absorption costing system since fixed overhead is a period cost under a variable costing system.

Sales-Price Variances

Sales-price variances (or selling-price variances) measure the change in income resulting from actual selling prices being different than budgeted prices. Although sales-price variances are one of two main types of sales variances (the other being sales-volume variances), they are flexible-budget variances. Sales-price variances may reflect competitive factors over which a firm has little control, but they may also reflect problems with the perceived attractiveness of a firm's products or services compared to those of competitors.

Sales-Volume Variances

The **sales-volume variance** measures the change in income resulting from actual sales volume being different than budgeted sales volume.

Decomposing the Sales-Volume Variance: Sales-Quantity Variance and Sales-Mix Variance

In multiple product firms, the sales-volume variance can be decomposed into a sales-quantity variance and a sales-mix variance.

The **sales-quantity variance** calculates the change in profit resulting from a change in the quantity of products sold. The sales-quantity variance can be separated into a **market-share variance** that isolates the impact of capturing more or less market-share than budgeted and a **market-size variance** that isolates the impact on the firm's profit of a change in the overall market size.

The **sales-mix variance** measures the change in profit resulting from a change in the mix of products sold. A favourable variance indicates that the actual sales mix included a higher than budgeted proportion of products that have higher contribution margins. An unfavourable variance indicates an actual sales mix with a higher proportion of products that have lower contribution margins.

Cautions About Variance Analysis

Variances indicate that something is different than expected, but they do not tell management what went wrong. There are many possible causes of variances. For example, an unfavourable direct materials efficiency variance could be caused by poor design of the product and/or manufacturing process, problems with the quality or availability of materials from suppliers, carelessness on the part of employees, inadequate training of employees, inappropriate assignment of labour or machines to specific jobs, scheduling congestion due to rush orders, overly-optimistic standards, and/or errors in recording raw materials usage.

Variance analysis is further complicated by the inter-relationships among variances. For example, the purchase of poor quality materials may result in a favourable materials price variance but an unfavourable materials efficiency variance. It may also slow down workers, resulting in an unfavourable labour efficiency variance. In turn, if labour hours are the cost-allocation base for variable overhead, there will also be an unfavourable variable overhead efficiency variance.

Finally, variances tell only part of the story. They tell management whether the organization performed better or worse than planned, but they do not tell management how much better or worse the situation could have been. For example, although the materials price variance was unfavourable, it is possible that the situation could have been much worse if the purchasing department had not taken a number of measures to

counteract rising material costs, such as placing larger orders with fewer suppliers. Alternatively, a favourable sales-quantity variance does not reveal how many additional sales opportunities were lost due to complacency on the part of sales managers.

When investigating variances, the emphasis should be on determining the causes of the variances with a view to taking corrective action and learning how to improve future operations. If too much emphasis is placed on blaming managers rather than understanding the underlying problems, managers may be motivated to inflate standards or distort actual results.

Not all variances warrant investigation. Most organizations use a materiality threshold, such as a prescribed dollar amount, a prescribed percentage of the standard cost, a combination of these two size thresholds, or a statistical guideline. However, other criteria besides materiality should be considered. These include whether the benefits of investigating the variance outweigh the costs, whether the variance is consistently or repeatedly occurring, whether there has been a trend in the variance over a period of time, how important the item is to the production process or service experience, and whether someone in the organization has the ability to control a particular cost or revenue.

Although many of the examples cited in the previous paragraphs refer to unfavourable variances, it is also important to investigate significant favourable variances as a possible cue that standards were set too low or that circumstances have changed enough to warrant the development of new standards. For example, employees may have developed a better way of performing a specific task, or new machinery may offer significant efficiencies.

Sample Problem to Illustrate Calculation and Interpretation of Variances

Ferguson Foundry Limited (FFL) manufactures two models of wood stoves, Basic and Deluxe. The company has a good sales force and achieved record profits in 2006. FFL's president, Mark Ferguson, has just reviewed the financial statements of FFL for the fiscal year ended May 31, 2007. The results for the year were both a shock and a disappointment. Despite having sold more stoves than anticipated, profits had declined from 2006 and were significantly below the budgeted amount.

The following information is available: a statement of budgeted and actual results (Exhibit A), a statement of standards costs prepared last year (Exhibit B), and some market and job-cost data (Exhibit C).

Mark Ferguson has requested a report from FFL's newly-hired controller explaining why the company did not meet its budgeted profit level for fiscal 2007.

Exhibit A
Static Budget and Actual Results
For the Year Ended May 31, 2007

	Static Budget		
	Basic	Deluxe	Total
Sales volume (in units)	<u>4,500</u>	<u>5,500</u>	<u>10,000</u>
Budget Selling Price/Unit	\$300	\$800	
Sales revenue	\$1,350,000	\$4,400,000	\$5,750,000
Variable costs:			
Direct materials	315,000	1,045,000	1,360,000
Direct labour – unskilled	126,562	412,500	539,062
– skilled	278,438	907,500	1,185,938
Overhead	202,500	660,000	862,500
Selling and administration	<u>67,500</u>	<u>220,000</u>	<u>287,500</u>
Total variable costs	<u>990,000</u>	<u>3,245,000</u>	<u>4,235,000</u>
Contribution margin	<u>\$ 360,000</u>	<u>\$1,155,000</u>	<u>\$ 1,515,000</u>
Fixed costs:			
Manufacturing			750,000
Selling and administration			<u>132,500</u>
Total fixed costs			<u>882,500</u>
Operating income			<u>\$ 632,500</u>

	Actual Results		
	Basic	Deluxe	Total
Sales volume (in units)	<u>7,200</u>	<u>4,800</u>	<u>12,000</u>
Sales revenue	\$2,340,000	\$3,360,000	\$5,700,000
Variable costs:			
Direct materials	486,000	820,800	1,306,800
Direct labour – unskilled	320,040	508,781	828,821
– skilled	428,760	681,619	1,110,379
Overhead	374,400	595,200	969,600
Selling and administration	<u>108,000</u>	<u>192,000</u>	<u>300,000</u>
Total variable costs	<u>1,717,200</u>	<u>2,798,400</u>	<u>4,515,600</u>
Contribution margin	<u>\$ 622,800</u>	<u>\$ 561,600</u>	<u>\$1,184,400</u>
Fixed costs:			
Manufacturing			780,000
Selling and administration			<u>139,500</u>
Total fixed costs			<u>919,500</u>
Operating income			<u>\$ 264,900</u>

**Exhibit B
Unit Cost Standards
For the Year Ended May 31, 2007**

	Basic Wood Stove	Deluxe Wood Stove
Direct materials:		
Standard quantity per unit	70 kilograms	190 kilograms
Standard price per kilogram	\$1.00	\$1.00
Direct labour:		
Standard quantity per unit	6 hours	16 hours
Unskilled labour	2.25 hours	6 hours
Skilled labour	3.75 hours	10 hours
Standard rate per hour		
Unskilled labour	\$12.50	\$12.50
Skilled labour	\$16.50	\$16.50
Variable overhead:		
Standard quantity per unit	6 hours	16 hours
Standard rate per hour	\$7.50	\$7.50
Variable selling and administration rate per unit	\$15.00	\$40.00

**Exhibit C
Market and Job-Cost Data
For the Year Ended May 31, 2007**

Market Data:	
Expected total market sales of wood stoves	100,000 units
Actual total market sales of wood stoves	133,333 units

Summary of Job Cost Sheets:

	Basic	Deluxe	Total
Units of wood stoves produced	7,200	4,800	12,000
Direct materials:			
Actual quantity used in kilograms	540,000	912,000	1,452,000
Actual price per kilogram			\$0.90
Direct labour:			
Actual hours worked	46,800	74,400	121,200
Unskilled	25,200	40,061.5	
Skilled	21,600	34,338.5	
Actual rate per hour			
Unskilled	\$12.70	\$12.70	
Skilled	\$19.85	\$19.85	
Actual variable overhead allocated on the basis of direct labour hours	\$374,400	\$595,200	\$969,600

Solution to Sample Problem

Memo

Date: June 30, 2007
To: Mark Ferguson, President
From: C.M. Accountant, Controller
Re: Fiscal 2007 Performance against Budget

Ferguson Foundry Limited's (FFL) profit in 2007 was \$367,600 lower than budgeted despite having sold 2,000 more wood stoves. This report will rely primarily on variance analysis to determine the reasons why the company did not meet its profitability goals.

As shown in Exhibit 1, the actual contribution margin of the Basic model in 2007 was \$6.50 more than the predetermined standard, due to a \$25 increase in the selling price that more than offset the \$18.50 increase in variable costs per unit. On the other hand, while the actual cost of the Deluxe model was \$7 lower than the standard cost, this model was sold for \$100 less than the budgeted price, resulting in an actual contribution margin that was \$93 below standard. A more detailed breakdown of these changes and their impact on profit will be provided in the subsequent analysis of variances.

Exhibit 2 provides a summary of the two main types of variances. Flexible-budget variances are due to costs or selling prices being different than standard. They summarize the difference between actual results and a flexible-budget that is based on the actual sales quantity of 12,000 units. Sales-volume variances result from selling more than the budgeted volume of 10,000 stoves. The unfavourable flexible-budget variance of \$436,600 and the favourable sales-volume variance of \$69,000 can both be broken down into detailed variances, as summarized in Exhibit 3. The calculations for these variances are shown in Exhibit 4.

The reasons for FFL's profit being significantly below budget can be divided into marketing-related and production-related factors, as also summarized in Exhibit 3.

Marketing-Related Factors:

1. **Price Changes** – The positive effects of increasing the price of the Basic model by \$25 (8.3%) were outweighed by a \$100 (12.5%) reduction in the price of the Deluxe model. The overall impact of price changes was a \$300,000 reduction in FFL's profit, as shown by the Sales-Price Variance. The reason for the large reduction in the price of the Deluxe model should be investigated. It could reflect decreasing demand for this model, increasing competition, an overly-optimistic standard price, and/or the fact that FFL's Deluxe model is becoming less attractive to consumers than comparable models offered by competitors.
2. **Change in Mix of Sales** – FFL sold more Basic models and fewer Deluxe models than budgeted. Basic models comprised 60% of the actual sales volume, instead of

the budgeted 45%, while Deluxe models comprised only 40% of actual sales instead of the budgeted 55%. Since the Deluxe model has a higher standard contribution margin per unit (\$210 versus \$80), the different mix of sales reduced FFL's profit by \$234,000, as shown by the Sales Mix Variance. The increased proportion of Basic models sold may reflect changing consumer tastes, mistaken estimates of the relative demand for the two models, less competition in the Basic model segment of the industry and more intense competition in the Deluxe segment, and/or the fact that FFL's Deluxe model is not well received in the marketplace while its Basic model is. These same factors have been identified as possible reasons for having to reduce the price of the Deluxe model, since there may well be common causes for both the decline in the demand for the Deluxe model and the need to reduce its price.

3. **Decreased Market Share in a Growing Total Market** – FFL's profit was \$303,000 higher than budgeted due to selling 2,000 more stoves than budgeted, as shown by the Sales Quantity Variance. Although this is positive, the increased sales quantity can be attributed solely to benefiting from a 33% increase in the size of the market for wood stoves. Based on its budgeted market share of 10%, the overall increase in profit due to the increase in the size of the market was \$505,000, as shown by the Market Size Variance. The fact that FFL obtained only a 9% market share, instead of 10%, reduced this amount by \$202,000, as shown by the Market Share Variance. The combined impact of obtaining a 9% share of the larger market was a \$303,000 increase in profit.
4. **Increased Selling and Administration Costs** – Although the variable selling and administration costs were right on standard, an increase in the fixed costs reduced profit by \$7,000.

Production-Related Factors:

1. **Direct Materials Price and Usage** – The favourable Direct Materials Price Variance of \$145,200 indicates that FFL experienced substantial savings in direct materials costs during 2007. This may have resulted from volume discounts that were not considered in setting the standards and that arose as a result of the higher production volumes. However, the unfavourable Direct Materials Usage Variance of \$36,000 indicates that FFL used more materials than budgeted. This suggests that the lower-priced materials may have been of a lower-quality that resulted in more wastage.
2. **Direct Labour Price and Usage** – The unfavourable Labour Rate Variance of \$200,446 reflects that FFL's wages were higher than budgeted. In particular, skilled workers were paid \$19.85 per hour instead of the budgeted \$16.50, and unskilled workers were paid \$12.70 per hour instead of \$12.50. The large wage increase for skilled employees reflects an industry-wide shortage of skilled foundry workers, something that apparently was not anticipated when setting the standard wage rates. If the skilled wage was higher than the industry average, it may also indicate

that FFL has difficulty attracting employees, and the reasons for this should be investigated. On the positive side, FFL was able to use a higher-than-standard proportion of unskilled labourers (almost 54% versus the standard of 37.5%), increasing net income by \$79,246, as shown by the Labour Mix Variance. However, using more unskilled labour reduced the overall productivity of the workers, who took a total of 121,200 hours to produce 12,000 stoves instead of the 120,000 hours dictated by the standards. This reduced net income by \$18,000, as shown by the Labour Yield Variance.

3. Variable Overhead Price and Usage – Since direct labour is also the cost driver for variable overhead, the unfavourable Variable Overhead Usage Variance of \$9,000 simply reflects the usage of more hours to make the stoves. The unfavourable Variable Overhead Spending Variance of \$60,600 may reflect inefficiencies in the use of overhead (such as leaving lights or machinery on when not in use) and/or higher-than-expected rates for electricity, supplies, or supervisory salaries, etc. The size of this variance may indicate that the budget did not accurately reflect current rates for various overhead items.
4. Fixed Cost Increases – Fixed manufacturing costs increased by 4%, reducing net income by a total of \$30,000. This increase may have been necessary given the increased volume and change in production mix. Perhaps increased investment in machinery, supervisory staff or other fixed costs may have been required to accommodate the increased sales volume. It should be determined whether these higher costs are expected to continue in the future.

Summary

Overall, in terms of marketing-related factors, it appears that FFL's budget projections were not based on an accurate assessment of the industry. In particular, FFL underestimated the growth in the size of the market. FFL also appears to have misjudged the market's preference for Deluxe versus Basic models of wood stoves. FFL should study the market environment more carefully to ensure that both its production plans and marketing efforts are appropriate directed in the future.

From a production perspective, FFL's manufacturing costs were significantly higher than budget due primarily to the large increase in the skilled labour rate, along with higher variable and fixed overhead costs. Although some potential causes for these increases have been outlined above, further investigation is warranted to determine the exact causes. Since the increase in the skilled labour rate may be largely outside of FFL's control, it may be prudent to assess the feasibility of either redesigning the production process to permit heavier reliance on unskilled labour without any loss in productivity or using internal training programs to increase the proportion of skilled labourers in FFL's employ.

CONCLUSION

This document has illustrated how the use of standard costs enables a firm to perform detailed variance analysis to help explain differences between actual profits and budgeted profits. Variances are best thought of as “symptoms” of problems; investigation is required to identify the causes of these problems.

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Exhibit 1
Contribution Margins

	Actual Basic	Standard Basic	Actual Deluxe	Standard Deluxe
Selling price	<u>\$325.00</u>	<u>\$300.00</u>	<u>\$700.00</u>	<u>\$800.00</u>
Variable costs:				
Direct materials	67.50	70.00	171.00	190.00
Direct labour – Unskilled	44.45	28.13	106.00	75.00
- Skilled	59.55	61.87	142.00	165.00
Overhead	52.00	45.00	124.00	120.00
Selling & administration	<u>15.00</u>	<u>15.00</u>	<u>40.00</u>	<u>40.00</u>
Total variable costs	<u>238.50</u>	<u>220.00</u>	<u>583.00</u>	<u>590.00</u>
Contribution margin	<u>\$ 86.50</u>	<u>\$ 80.00</u>	<u>\$117.00</u>	<u>\$210.00</u>

Exhibit 2
Flexible Budget Report
For the Year Ended May 31, 2007 (in \$'000s)

	Actual Results	Flexible- Budget Variances	Flexible Budget	Sales- Volume Variances	Static Budget	Total Variance
Quantity (units)	<u>12,000</u>		<u>12,000</u>		<u>10,000</u>	
Sales revenue	\$5,700.0	\$(300.0)	\$6,000.0	\$250.0	\$5,750.0	\$ (50.0)
Variable costs	<u>4,515.6</u>	<u>(99.6)</u>	<u>4,416.0</u>	<u>(181.0)</u>	<u>4,235.0</u>	<u>(280.6)</u>
Contribution margin	1,184.4	(399.6)	1,584.0	69.0	1,515.0	(330.6)
Fixed costs	<u>919.5</u>	<u>(37.0)</u>	<u>882.5</u>		<u>882.5</u>	<u>(37.0)</u>
Net income before tax	<u>\$ 264.9</u>	<u>\$(436.6)</u>	<u>\$ 701.5</u>	<u>\$ 69.0</u>	<u>\$ 632.5</u>	<u>\$(367.6)</u>

Notes:

- The amounts shown in brackets represent unfavourable variances.
- The flexible sales revenue is computed as using the using the standard selling price per unit and the actual sales volumes as follows:

Basic wood stove = \$300 x 7,200 =	\$2,160,000
Deluxe wood stove = \$800 x 4,800 =	<u>3,840,000</u>
Total	<u>\$6,000,000</u>
- The flexible budget for variable costs is computed using the standard per unit costs and the actual sales volumes as follows:

Basic wood stove = \$220 X 7,200 =	\$1,584,000
Deluxe wood stove = \$590 x 4,800 =	<u>2,832,000</u>
Total	<u>\$4,416,000</u>

Exhibit 3
Summary of Variances

			Flexible Budget Variances	Sales- Volume Variances
Sales variances:				
Sales price			\$300,000 U	
Sales mix				\$234,000 U
Sales quantity				
– Market share	\$202,000 U			
– Market size	<u>505,000 F</u>			<u>303,000 F</u>
Sales volume				<u>69,000 F</u>
Total sales variance			\$300,000 U	\$69,000 F
Variable cost variances:				
Direct materials – Price	145,200 F			
– Usage	<u>36,000 U</u>		109,200 F	
Direct labour – Rate		200,446 U		
– Usage				
– Mix	79,246 F			
– Yield	<u>18,000 U</u>	<u>61,246 F</u>	139,200 U	
Overhead – Spending		60,600 U		
– Usage		<u>9,000 U</u>	69,600 U	
Selling & administration			<u>0</u>	
Total variable cost variance			<u>99,600 U</u>	
Total contribution margin variance			399,600 U	
Fixed cost variances:				
Manufacturing budget		30,000 U		
Selling and administration budget		<u>7,000 U</u>		
Total fixed cost variance			<u>37,000 U</u>	
Total variance			<u>\$436,600 U</u>	<u>\$69,000 F</u>

Note: F = Favourable; U = Unfavourable

Exhibit 4 Variance Calculations

Flexible-Budget Variances

Direct materials price variance:

Basic:	$(\$0.90 - \$1.00) \times 540,000 \text{ kg} =$	\$ (54,000) F
Deluxe:	$(\$0.90 - \$1.00) \times 912,000 \text{ kg} =$	<u>(91,200) F</u>
		<u><u>\$(145,200) F</u></u>

Direct materials usage variance:

Basic:	$(540,000 - 7,200 \times 70) \times \$1.00 =$	
	$(540,000 - 504,000) \times \$1.00 =$	\$36,000 U
Deluxe:	$(912,000 - 4,800 \times 190) \times \$1.00 =$	
	$(912,000 - 912,000) \times \$1.00 =$	<u>0</u>
		<u><u>\$36,000 U</u></u>

Direct labour rate variance:

Basic:		
Unskilled	$(\$12.70 - \$12.50) \times 25,200 =$	\$ 5,040 U
Skilled	$(\$19.85 - \$16.50) \times 21,600 =$	72,360 U
Deluxe:		
Unskilled	$(\$12.70 - \$12.50) \times 40,061.5 =$	8,012 U
Skilled	$(\$19.85 - \$16.50) \times 34,338.5 =$	<u>115,034 U</u>
	(rounded to nearest dollar)	<u><u>\$200,446 U</u></u>

Direct labour usage variance:

Basic:		
Unskilled	$(25,200 - 7,200 \times 2.25) \times \$12.50 =$	\$112,500 U
Skilled	$(21,600 - 7,200 \times 3.75) \times \$16.50 =$	(89,100) F
Deluxe:		
Unskilled	$(40,061.5 - 4,800 \times 6) \times \$12.50 =$	140,769 U
Skilled	$(34,338.5 - 4,800 \times 10) \times \$16.50 =$	<u>(225,415) F</u>
		<u><u>\$(61,246) F</u></u>

Direct labour mix percentages:

	Actual:	Standard:
Basic: Unskilled	$25,200 / 46,800 = 53.8461\%$	$2.25/6 = 37.5\%$
Skilled	$21,600 / 46,800 = 46.1539\%$	$3.75/6 = 62.5\%$
Deluxe: Unskilled	$40,061.5 / 74,400 = 53.8461\%$	$6/16 = 37.5\%$
Skilled	$34,338.5 / 74,400 = 46.1539\%$	$10/16 = 62.5\%$

Direct labour mix variance:

Unskilled:	$(53.8461\% - 37.5\%) \times 121,200 \times 12.50$	\$247,643 U
Skilled:	$(46.1539 - 62.5\%) \times 121,200 \times \16.50	<u>(326,889) F</u>

\$ (79,246) F

Direct labour yield variance:

Unskilled:	$[121,200 - (7,200 \times 6 + 4,800 \times 16)] \times 37.50\% \times \$12.50 =$	\$ 5,625 U
Skilled:	$[121,200 - (7,200 \times 6 + 4,800 \times 16)] \times 62.50\% \times \16.50	<u>12,375 U</u>

Direct labour
yield variance

\$18,000 U

Variable overhead spending variance:

Basic:	$[(\$374,400 / 46,800 \text{ hours}) - \$7.50] \times 46,800 =$	\$23,400 U
Deluxe:	$[(\$374,400 / 46,800 \text{ hours}) - \$7.50] \times 74,400 =$	<u>37,200 U</u>

\$60,600 U

Variable overhead usage variance:

Basic:	$(46,800 - 7,200 \times 6) \times \$7.50 =$	\$27,000 U
Deluxe:	$(74,400 - 4,800 \times 16) \times \$7.50 =$	<u>(18,000) F</u>

\$ 9,000 U

Variable selling and administrative variance:

$(7,200 \times 15) + (4,800 \times 40) - 300,000 = \underline{\underline{\$0}}$

Fixed manufacturing cost spending Variance:

$780,000 - 750,000 = \underline{\underline{\$30,000 U}}$

Fixed selling and administration cost spending variance:

$139,500 - 132,500 = \underline{\underline{\$7,000 U}}$

Sales-price variance:

Basic:	$7,200 \times (\$325.00 - \$300.00) = 7,200 \times \$25.00 =$	\$180,000 F
Deluxe:	$4,800 \times (\$700.00 - \$800.00) = 4,800 \times \$(100.00) =$	<u>480,000 U</u>

\$300,000 U

Sales-Volume Variances

Sales-volume variance:

Basic: $(7,200 - 4,500) \times \$80 = 2,700 \times \$80 = \$216,000 \text{ F}$
Deluxe: $(4,800 - 5,500) \times \$210 = (700) \times \$210 = \underline{147,000 \text{ U}}$

\$ 69,000 F

Sales-quantity variance:

Basic: $(12,000 - 10,000) \times (4,500 / 10,000) \times \$80 = \$72,000 \text{ F}$
Deluxe: $(12,000 - 10,000) \times (5,500 / 10,000) \times \$210 = \underline{231,000 \text{ F}}$

\$303,000 F

Budgeted average contribution margin per unit = $\$1,515,000 / 10,000 = \151.50

Market-share variance:

$133,333 \times [(12,000 / 133,333) - (10,000 / 100,000)] \times \$151.50 =$
 $133,333 \times (9\% - 10\%) \times \$151.50 = \underline{\$202,000 \text{ U}}$

Market-size variance:

$(133,333 - 100,000) \times .10 \times \$151.50 = \underline{\$505,000 \text{ F}}$

Sales-mix variance:

Basic: $(7,200 / 12,000) - (4,500 / 10,000) \times 12,000 \times \$80 = \$144,000 \text{ F}$
 $(60\% - 45\%) \times 12,000 \times \$80 =$
Deluxe: $(4,800 / 12,000) - (5,500 / 10,000) \times 12,000 \times \$210 = \underline{378,000 \text{ U}}$
 $(40\% - 55\%) \times 12,000 \times \$210 =$

\$234,000 U

APPENDIX A

Flexible Budget Variances

Direct Materials or Direct Labour Price Variance =

$$\left[\begin{array}{c} \text{Actual price of} \\ \text{input} \end{array} - \begin{array}{c} \text{Standard} \\ \text{price of input} \end{array} \right] \times \begin{array}{c} \text{Actual quantity} \\ \text{of input used}^* \end{array}$$

*To isolate materials price variance at purchase point, use quantity purchased.

Direct Materials or Direct Labour Efficiency variance =

$$\left[\begin{array}{c} \text{Actual quantity of} \\ \text{input used} \end{array} - \begin{array}{c} \text{Standard quantity} \\ \text{of input allowed for} \\ \text{actual output} \end{array} \right] \times \begin{array}{c} \text{Standard price} \\ \text{of input} \end{array}$$

Direct Materials or Direct Labour Mix variance for each input =

$$\left[\begin{array}{c} \text{Actual input} \\ \text{mix} \\ \text{percentage} \end{array} - \begin{array}{c} \text{Standard input} \\ \text{mix percentage} \end{array} \right] \times \begin{array}{c} \text{Actual total quantity} \\ \text{of all inputs used} \end{array} \times \begin{array}{c} \text{Standard} \\ \text{price of input} \end{array}$$

Direct Materials or Direct Labour Yield variance for each input =

$$\left[\begin{array}{c} \text{Actual total} \\ \text{quantity} \\ \text{of all inputs used} \end{array} - \begin{array}{c} \text{Standard total} \\ \text{quantity} \\ \text{of all inputs allowed} \\ \text{for actual output} \end{array} \right] \times \begin{array}{c} \text{Standard} \\ \text{input mix} \\ \text{percentage} \end{array} \times \begin{array}{c} \text{Standard price} \\ \text{of input} \end{array}$$

Variable Overhead Spending Variance =

$$\left[\begin{array}{c} \text{Actual cost per unit} \\ \text{of cost- allocation} \\ \text{base} \end{array} - \begin{array}{c} \text{Standard cost per} \\ \text{unit of cost-allocation} \\ \text{base} \end{array} \right] \times \begin{array}{c} \text{Actual quantity} \\ \text{of cost-allocation base used} \end{array}$$

Variable Overhead Efficiency Variance =

$$\left[\begin{array}{c} \text{Actual quantity of} \\ \text{variable overhead cost-} \\ \text{allocation base used} \end{array} - \begin{array}{c} \text{Standard quantity of} \\ \text{variable overhead cost-} \\ \text{allocation base allowed for} \\ \text{actual output} \end{array} \right] \times \begin{array}{c} \text{Standard variable} \\ \text{overhead cost-} \\ \text{allocation rate} \end{array}$$

Fixed Overhead Spending Variance =

$$\text{Actual fixed overhead} - \text{Budgeted fixed overhead}$$

Output-level variance =

$$\text{Budgeted fixed overhead} - \left[\begin{array}{c} \text{Fixed overhead allocated} \\ \text{using standard quantity of} \\ \text{cost-allocation base allowed} \\ \text{for actual output} \end{array} \right] \times \left[\begin{array}{c} \text{Standard fixed} \\ \text{overhead cost-} \\ \text{allocation rate} \end{array} \right]$$

Sales-price variance =

$$\text{Actual units sold} \times \left[\begin{array}{c} \text{Actual selling price} \\ \text{Budgeted selling price} \end{array} \right] - \text{Budgeted selling price}$$

Sales-Volume Variances**Sales-volume variance =**

$$\left[\begin{array}{c} \text{Actual sales} \\ \text{volume} \end{array} - \begin{array}{c} \text{Budgeted sales} \\ \text{volume} \end{array} \right] \times \begin{array}{c} \text{Budgeted contribution} \\ \text{margin per unit} \end{array}$$

Sales-quantity variance =

$$\left[\begin{array}{c} \text{Actual units of} \\ \text{all products} \\ \text{sold} \end{array} - \begin{array}{c} \text{Budgeted units} \\ \text{of all products} \\ \text{sold} \end{array} \right] \times \begin{array}{c} \text{Budgeted} \\ \text{sales-mix} \\ \text{percentage} \end{array} \times \begin{array}{c} \text{Budgeted} \\ \text{contribution} \\ \text{margin per unit} \end{array}$$

Market-share variance =

$$\text{Actual market size in units} \times \left[\begin{array}{c} \text{Actual market} \\ \text{share} \end{array} - \begin{array}{c} \text{Budgeted} \\ \text{market share} \end{array} \right] \times \begin{array}{c} \text{Budgeted average} \\ \text{contribution margin} \\ \text{per unit} \end{array}$$

Budgeted average contribution margin per unit =

$$\text{Budgeted contribution margin} / \text{Budgeted volume}$$

Market-size variance =

$$\left[\begin{array}{c} \text{Actual market} \\ \text{size in units} \end{array} - \begin{array}{c} \text{Budgeted} \\ \text{market size in} \\ \text{units} \end{array} \right] \times \begin{array}{c} \text{Budgeted} \\ \text{market share} \end{array} \times \begin{array}{c} \text{Budgeted average} \\ \text{contribution margin} \\ \text{per unit} \end{array}$$

Sales-mix variance =

$$\left[\begin{array}{c} \text{Actual sales} \\ \text{mix} \\ \text{percentage} \end{array} - \begin{array}{c} \text{Budgeted sales} \\ \text{mix percentage} \end{array} \right] \times \begin{array}{c} \text{Actual units of all} \\ \text{products sold} \end{array} \times \begin{array}{c} \text{Budgeted} \\ \text{contribution margin} \\ \text{per unit} \end{array}$$

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