STANDARD COSTING

LEARNING OUTCOMES

After studying this chapter, you will be able to:

- **Calculate** advanced variances
- **Interpret** Variances
- **Identify and Explain** the relationship of the Variances
- **Apply** Standard Costing Methods including the Reconciliation of Budgeted and Actual Profit Margins
- **Explain** the wider issues involved in changing mix e.g. Cost, Quality, and Performance Measurement issues
- **Analyse and Evaluate** Past Performance using the results of variance analysis
- **Use** Variance Analysis to assess how Future Performance of an organisation can be improved
CHAPTER OVERVIEW

ANALYSIS OF ADVANCED VARIANCES

Variance analysis is examinable both at Intermediate Level (Cost and Management Accounting) and at Final Level (Strategic Cost Management and Performance Evaluation). One main difference in syllabus between the two papers is that the Final Level syllabus includes analysis of advanced variances, as follows:

- Planning and Operational Variances
- Variance Analysis in Activity Based Costing
- Learning Curve Impact on Variances
- Relevant Cost Approach to Variance Analysis
- Variance Analysis and Throughput Accounting
- Variance Analysis in Advanced Manufacturing Environment
- Variance Analysis in Service Industry
- Variance Analysis in Public Services

Planning & Operational Variances

When the current environmental conditions are different from the anticipated environmental conditions (prevailing at the time of setting standard or plans) the use of routine analysis of variance for measuring managerial performance is not desirable / suitable. The variance analysis can be useful for measuring managerial performance if the variances computed are determined on the basis of revised targets / standards based on current actual environmental conditions.
In order to deal with the above situation i.e. to measure managerial performance with reference to material, labour and sales variances, it is necessary to compute the Planning and Operational Variances.

A *Planning Variance* simply compares a revised standard to the original standard.

An *Operational Variance* simply compares the actual results against the revised amount.

Operating Variances would be calculated after the planning variances have been established and are thus a realistic way of assessing performance.

Planning Variance
Classification of variances caused by ex-ante budget allowances being changed to an ex post basis. Also, known as a revision variance.

Operational Variance
Classification of variances in which non-standard performance is defined as being that which differs from an ex post standard. Operational variances can relate to any element of the standard product specification.

*Standard ex ante*
Before the event. An ex ante budget or standard is set before a period of activity commences.

*Standard, ex post*
After the event. An ex post budget, or standard, is set after the end of a period of activity, when it can represent the optimum achievable level of performance in the conditions which were experienced. Thus, the budget can be flexed, and standards can reflect factors such as unanticipated changes in technology and in price levels. This approach may be used in conjunction with sophisticated cost and revenue modelling to determine how far both the plan and the achieved results differed from the performance that would have been expected in the circumstances which were experienced.
### Example

<table>
<thead>
<tr>
<th>Factor</th>
<th>Original Standards (ex-ante)</th>
<th>Revised Standards (ex-post)</th>
<th>Actual (4,500 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>4,500 units×2 Kgs×₹12.50</td>
<td>4,500 units×2.25 Kgs×₹11.50</td>
<td>8,750 Kgs×₹13</td>
</tr>
</tbody>
</table>

**Traditional Variances**

Usage Variance  =  (9,000 Kgs. – 8,750 Kgs.) × ₹12.50  
                  = ₹3,125 (F)

Price Variance  =  (₹12.50 – ₹13.00) × 8,750 Kgs.  
                  = ₹4,375 (A)

Total Variance  =  ₹3,125 (F) + ₹4,375 (A)  
                  = ₹1,250 (A)

**Operational Variances**

Usage Variance  =  (10,125 Kgs. – 8,750 Kgs.) × ₹11.50  
                  = ₹15,812.50 (F)

Price Variance  =  (₹11.50 – ₹13) × 8,750 Kgs.  
                  = ₹13,125 (A)

Total Variance  =  ₹15,812.50 (F) + ₹13,125 (A)  
                  = ₹2,687.50 (F)

**Planning Variances**

Usage Variance  =  (9,000 Kgs. – 10,125 Kgs.) × ₹12.50  
                  = ₹14,062.50 (A)

Price Variance  =  (₹12.50 – ₹11.50) × 10,125 Kgs.  
                  = ₹10,125 (F)

Total Variance  =  ₹14,062.50 (A) + ₹10,125 (F)  
                  = ₹3,937.50 (A)
Direct Material Usage Variance

**Traditional Variance**

Actual vs. Original Standard

\[
\text{[Standard Quantity – Actual Quantity] \times Standard Price}
\]

**Planning Variance**

Revised Standard vs. Original Standard

\[
\text{[Standard Quantity – Revised Standard Quantity] \times Standard Price}
\]

**Operational Variance**

Actual vs. Revised Standard

\[
\text{[Revised Standard Quantity – Actual Quantity] \times Revised Standard Price}
\]

Direct Material Price Variance

**Traditional Variance**

Actual vs. Original Standard

\[
\text{[Standard Price – Actual Price] \times Actual Quantity}
\]

**Planning Variance**

Revised Standard vs. Original Standard

\[
\text{[Standard Price – Revised Standard Price] \times Revised Standard Quantity}
\]

**Operational Variance**

Actual vs. Revised Standard

\[
\text{[Revised Standard Price – Actual Price] \times Actual Quantity}
\]

**Note**

Direct Material Usage Operational Variance using Standard Price, and the Direct Material Price Planning Variance based on Actual Quantity can also be calculated. This approach reconciles the Direct Material Price Variance and Direct Material Usage Variance calculated in part.
Like Material Variances, here also Labour Efficiency and Wage Rate Variances should also be adjusted to reflect changes in environmental conditions that prevailed during the period.

Illustration

HDR Ltd produces units and incurs labour costs. A change in technology after the preparation of the budget resulted in a 25% increase in standard labour efficiency, such that it is now possible to produce 10 units instead of 8 units using 8 hours of labour- giving a revised standard labour requirement of 0.80 hours per unit. Details of actuals and budgeted for period XII are:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Original Standards (ex-ante)</th>
<th>Revised Standards (ex-post)</th>
<th>Actual (1,100 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1,100 units × 1 hrs. × ₹ 10</td>
<td>1,100 units × 0.80 hrs. × ₹ 10.00</td>
<td>1,200 hrs. × ₹ 8.50</td>
</tr>
</tbody>
</table>

Required

(i) **CALCULATE the variances for ‘X’ by**
   (a) **Traditional Variance Analysis; and**
   (b) **An approach which distinguishes between Planning and Operational Variances.**

(ii) **COMMENT on the results.**

Solution

(i) **(a) Traditional Variances**

   Efficiency Variance  =  (1,100 hrs. – 1,200 hrs.) × ₹ 10
                           =  ₹1,000 (A)

   Rate Variance         =  (₹ 10 – ₹8.50) × 1,200 hrs.
                           =  ₹1,800 (F)

   Total Variance        =  ₹1,000 (A) + ₹1,800 (F) = ₹800 (F)

(b) **Operational Variances**

   Efficiency Variance  =  (880 hrs. – 1,200 hrs.) × ₹ 10.00
                           =  ₹3,200 (A)

   Rate Variance         =  (₹10.00 – ₹8.50) × 1,200 hrs.
                           =  ₹1,800 (F)

   Total Variance        =  ₹3,200 (A) + ₹1,800 (F) = ₹1,400 (A)

**Planning Variances**

   Efficiency Variance  =  (1,100 hrs. – 880 hrs.) × ₹ 10
                           =  ₹2,200 (F)

   Rate Variance         =  (₹10 – ₹10) × 800 hrs.
                           =  ₹0

   Total Variance        =  ₹2,200 (F) + ₹0 = ₹2,200 (F)
(ii) **Comment**

In this case, the separation of the labour cost variance into operational and planning components shows a large problem in the area of labour efficiency than might otherwise have been indicated. The operational variances are based on the revised (ex post) standard and this gives a more meaningful performance benchmark than the original (ex-ante) standard.

![Direct Labour Efficiency Variance](image)

### Direct Labour Efficiency Variance

<table>
<thead>
<tr>
<th>Traditional Variance</th>
<th>Planning Variance</th>
<th>Operational Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actual vs. Original Standard</strong></td>
<td><strong>Revised Standard vs. Original Standard</strong></td>
<td><strong>Actual vs. Revised Standard</strong></td>
</tr>
<tr>
<td>([\text{Standard Time} – \text{Actual Time}] \times \text{Standard Rate})</td>
<td>([\text{Standard Time} – \text{Revised Standard Time}] \times \text{Standard Rate})</td>
<td>([\text{Revised Standard Time} – \text{Actual Time}] \times \text{Revised Standard Rate})</td>
</tr>
</tbody>
</table>

### Direct Labour Rate Variance

<table>
<thead>
<tr>
<th>Traditional Variance</th>
<th>Planning Variance</th>
<th>Operational Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actual vs. Original Standard</strong></td>
<td><strong>Revised Standard vs. Original Standard</strong></td>
<td><strong>Actual vs. Revised Standard</strong></td>
</tr>
<tr>
<td>([\text{Standard Rate} – \text{Actual Rate}] \times \text{Actual Time})</td>
<td>([\text{Standard Rate} – \text{Revised Standard Rate}] \times \text{Revised Standard Time})</td>
<td>([\text{Revised Standard Rate} – \text{Actual Rate}] \times \text{Actual Time})</td>
</tr>
</tbody>
</table>

**Note**

Direct Labour Efficiency Operational Variance using *Standard Rate*, and the Direct Labour Rate Planning Variance based on *Actual Hours* can also be calculated. This approach reconciles the Direct Labour Rate Variance and Direct Labour Efficiency Variance calculated in part.
The conventional Sales Volume Variance reports the difference between actual and budgeted sales valued at the standard price per unit. The variance just indicates whether sales volume is greater or less than expected. It does not indicate how well sales management has performed. In order to assess the performance of sales management, market conditions prevailing during the period should be taken into consideration.

Accordingly, the sales volume variance can be sub-divided into a planning variance (market size variance) and operational variance (market share variance).

**A Planning Variance** simply compares a revised standard to the original standard. An **Operational Variance** simply compares the actual results against the revised amount. **Controllable Variances** are those variances which arise due to inefficiency of a cost centre/department. **Uncontrollable Variances** are those variances which arise due to factors beyond the control of the management or concerned department of the organization.

**Variance Analysis in Activity Based Costing**

Variance analysis can be applied to activity costs (such as setup costs, product testing, quality testing etc.) to gain understanding into why actual activity costs vary from activity costs in the static budget or in the flexible budget. Interpreting cost variances for different activities requires understanding whether the costs are output unit-level, batch level, product sustaining, or facility sustaining costs.

We use the similar track to variance analysis for activity-based costing as for traditional costing. The price variance is the difference between standard price and actual price for the actual quantity of input used for each cost driver. The efficiency variance measures the difference between the actual amount of cost driver units used, and the standard allowed to make the output. We multiply the difference in quantities by the standard price per cost driver to get the rupee value of the variance.

ABC approach is based on the assumption that the overheads are basically variable (but variable with the delivery numbers and not the units output). The efficiency variance reports the cost impact of undertaking more or less activities than standard, and the expenditure variance reports cost impact of paying more or less than standard for the actual activities undertaken.

**Source:** 1- Cost Accounting: A Managerial Emphasis, 13/e by Charles T. Horngren, p275; Managerial Accounting: 2- An Introduction to Concepts, Methods and Uses by Michael W. Maher, Clyde P. Stickney, Roman L. Weil, p 362; 3- Performance Operations by Robert Scarlett, p119.

**Illustration**

**N & S Co. (NSC) is a multiple product manufacturer. NSC produces the unit and all overheads are associated with the delivery of units to its customers.**
<table>
<thead>
<tr>
<th>Particulars</th>
<th>Budget</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overheads (₹)</td>
<td>4,000</td>
<td>3,900</td>
</tr>
<tr>
<td>Output (units)</td>
<td>2,000</td>
<td>2,100</td>
</tr>
<tr>
<td>Customer Deliveries (no.’s)</td>
<td>20</td>
<td>19</td>
</tr>
</tbody>
</table>

**Required**

CALCULATE Efficiency Variance and Expenditure Variance by adopting ABC approach.

**Solution**

**Computation of Variances**

**Efficiency Variance**

\[
\text{Efficiency Variance} = \text{Cost Impact of undertaking activities more/ less than standard}
\]

\[
= (21 \text{ deliveries}^* - 19 \text{ deliveries}) \times ₹200
\]

\[
= ₹400 \ F
\]

\[^* \left(\frac{20 \text{ Deliveries}}{2,000 \text{ units.}}\right) \times 2,100 \text{ units} \]

**Expenditure Variance**

\[
\text{Expenditure Variance} = \text{Cost impact of paying more/ less than standard for actual activities undertaken}
\]

\[
= 19 \text{ deliveries} \times ₹200 - ₹3,900
\]

\[
= ₹100 \ (A)
\]

**Learning Curve- Impact on Variances**

Learning curve is a geometrical progression, which reveals that there is steadily decreasing cost for the accomplishment of a given repetitive operation, as the identical operation is increasingly repeated. The amount of decrease will be less and less with each successive unit produced. As more units are produced, people involved in production become more efficient than before. Each additional unit takes less time to produce. The amount of improvement or experience gained is reflected in a decrease in man-hours or cost. Where learning takes place with a regular pattern it is important to take account of reduction in a labour hours and cost per unit. Automated manufacturing is unlikely to have much variation or to display a regular learning curve. In less-automated processes, however, where learning curves do occur, it is important to take the resulting decline in labour hours and costs into account in setting standards, determining prices, planning production, or setting up work schedules. With the help of the learning curve theory the standard time of any batch or unit can be computed then compare the actual data with the standard and compute the variances.
Illustration

City International Co. is a multiproduct firm and operates standard costing and budgetary control system. During the month of June firm launched a new product. An extract from performance report prepared by Sr. Accountant is as follows:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Budget</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>30 units</td>
<td>25 units</td>
</tr>
<tr>
<td>Direct Labour Hours</td>
<td>180.74 hrs.</td>
<td>118.08 hrs.</td>
</tr>
<tr>
<td>Direct Labour Cost</td>
<td>₹1,19,288</td>
<td>₹79,704</td>
</tr>
</tbody>
</table>

Sr. Accountant prepared performance report for new product on certain assumptions but later on he realized that this new product has similarities with other existing product of the company. Accordingly, the rate of learning should be 80% and that the learning would cease after 15 units. Other budget assumptions for the new product remain valid.

The original budget figures are based on the assumption that the labour has learning rate of 90% and learning will cease after 20 units, and thereafter the time per unit will be the same as the time of the final unit during the learning period, i.e. the 20th unit. The time taken for 1st unit is 10 hours.

Required

Show the variances that reconcile the actual labour figures with revised budgeted figures (for actual output) in as much detail as possible.

Note:

The learning index values for a 90% and a 80% learning curve are −0.152 and −0.322 respectively.

\[
\begin{align*}
\log 2 &= 0.3010, \log 3 = 0.47712, \log 5 = 0.69897, \log 7 = 0.8451, \text{antilog of 0.6213} = 4.181, \text{antilog of 0.63096} = 4.275
\end{align*}
\]

Solution

Working Note

The usual learning curve model is

\[ y = ax^b \]

Where

\[ y = \text{Average time per unit for } x \text{ units} \]
\[ a = \text{Time required for first unit} \]
\[ x = \text{Cumulative number of units produced} \]
\[ b = \text{Learning coefficient} \]
W.N.1

Time required for first 15 units based on revised learning curve of 80% (when the time required for the first unit is 10 hours)

\[ y = 10 \times (15)^{-0.322} \]

\[ \log y = \log 10 - 0.322 \times \log 15 \]

\[ \log y = \log 10 - 0.322 \times \log (5 \times 3) \]

\[ \log y = \log 10 - 0.322 \times [\log 5 + \log 3] \]

\[ \log y = 1 - 0.322 \times [0.69897 + 0.47712] \]

\[ \log y = 0.6213 \]

\[ y = \text{antilog of 0.6213} \]

\[ y = 4.181 \text{ hours} \]

Total time for 15 units = 15 units \times 4.181 hours

= 62.72 hours

Time required for first 14 units based on revised learning curve of 80% (when the time required for the first unit is 10 hours)

\[ y = 10 \times (14)^{-0.322} \]

\[ \log y = \log 10 - 0.322 \times \log 14 \]

\[ \log y = \log 10 - 0.322 \times \log (2 \times 7) \]

\[ \log y = \log 10 - 0.322 \times [\log 2 + \log 7] \]

\[ \log y = 1 - 0.322 \times [0.3010 + 0.8451] \]

\[ \log y = 0.63096 \]

\[ y = \text{antilog of 0.63096} \]

\[ y = 4.275 \text{ hrs} \]

Total time for 14 units = 14 units \times 4.275 hrs

= 59.85 hrs

Time required for 25 units based on revised learning curve of 80% (when the time required for the first unit is 10 hours)

Total time for first 15 units = 62.72 hrs

Total time for next 10 units = 28.70 hrs \([(62.72 - 59.85) \text{ hours} \times 10 \text{ units}] \)

Total time for 25 units = 62.72 hrs + 28.70 hrs

= 91.42 hrs
W.N.2
Computation of Standard and Actual Rate

Standard Rate
\[
\text{Standard Rate} = \frac{\text{₹1,19,288}}{180.74 \text{ hrs.}} = \text{₹660.00 per hr.}
\]

Actual Rate
\[
\text{Actual Rate} = \frac{\text{₹79,704}}{118.08 \text{ hrs.}} = \text{₹675.00 per hr.}
\]

W.N.3
Computation of Variances

Labour Rate Variance
\[
\text{Labour Rate Variance} = \text{Actual Hrs} \times (\text{Std. Rate} - \text{Actual Rate})
\]
\[
= 118.08 \text{ hrs} \times (\text{₹660.00} - \text{₹675.00})
\]
\[
= \text{₹1,771.20 (A)}
\]

Labour Efficiency Variance
\[
\text{Labour Efficiency Variance} = \text{Std. Rate} \times (\text{Std. Hrs} - \text{Actual Hrs})
\]
\[
= \text{₹660} \times (91.42 \text{ hrs} - 118.08 \text{ hrs})
\]
\[
= \text{₹17,595.60 (A)}
\]

Statement of Reconciliation (Actual Figures Vs Budgeted Figures)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Cost</td>
<td>79,704.00</td>
</tr>
<tr>
<td>Less: Labour Rate Variance (Adverse)</td>
<td>1,771.20</td>
</tr>
<tr>
<td>Less: Labour Efficiency Variance (Adverse)</td>
<td>17,595.60</td>
</tr>
<tr>
<td>Budgeted Labour Cost (Revised)*</td>
<td>60,337.20</td>
</tr>
</tbody>
</table>

\[
\text{Budgeted Labour Cost (Revised)*} = \text{Std. Hrs} \times \text{Std. Rate}
\]
\[
= 91.42 \text{ hrs} \times \text{₹660}
\]
\[
= \text{₹60,337.20}
\]

Relevant Cost Approach to Variance Analysis

Traditional approach to variance analysis is to compute variances based on total actual cost for production inputs and total standard cost applied to the production output. This is ambiguous, when inputs are limited. Failure to use limited inputs properly leads not only to increased acquisition cost but also to a lost contribution. Therefore, it is necessary to consider the lost contribution in variance analysis. When this approach is used, price or expenditure variances are not affected.
Variance Analysis and Throughput Accounting

Variance analysis has no emphasis on the constrained resources. Instead, it is based on the efficiency and cost of operation of each part of the manufacturing system, rather than the ability of the entire system to generate a profit. Thus, a firm may find that it attains excellent efficiency and price variances by having long manufacturing rounds and buying in large quantities. A system based on constraint management will likely show very odd results under a variance reporting system. For example, when a terminal upstream from the constrained resource runs out of work, a manager functioning under throughput accounting system will shut it down in order to avoid the formation of an unnecessary level of work-in-process inventory. However, this will result into a negative labor efficiency variance, since the terminal’s staff is not actively producing anything. Throughput accounting does use variance analysis, but not the ones used by a traditional system. Instead, its main emphasis is on tracking variations in the size of the inventory buffer placed before the constrained resource, to confirm that the constraint is never halted due to an inventory shortage.

Variance Analysis in Advanced Manufacturing Environment/ High-Technology Firms

The variance analysis generally applies to all types of organizations; however, high-technology firms like Audio Technology, Automotive, Computer Engineering, Electrical and Electronic Engineering, Information Technology, Medical devices, Nanotechnology, Semiconductors, Telecommunication apply the model somewhat differently. Now much of electronic industry is highly automated. A large part of manufacturing process is computerized. In the high-technology environment that is emerging, many costs that once were largely variable have become fixed, most becoming committed fixed cost. Some high technology manufacturing organizations have found that the two largest variable costs involve materials and power to operate machines. In these companies, the emphasis of variance analysis is placed on direct materials and variable manufacturing overhead.

Much of the manufacturing labour consists of highly skilled experts/operators/programmers are largely committed cost. Firms don’t want to take risk losing such highly trained personnel even during an economic downturn. The result is less direct labour and more overhead. For these firms labour variances may no longer be meaningful because direct labour is a committed cost, not a cost expected to vary with output.

Standard Costing in Service Sector

Standard Costing can be equally applicable for various types of industries for example accountants, solicitors, dentists, hairdressers, transport companies and hotels. Service industries comprise a wide range of different businesses that differ in size and types of service provided. Standard costing and variance analysis is more tough to apply to service sector organizations as major portion of their cost is comprised of overhead expenses rather than production expenses. While traditional variance analysis of overheads does not deliver very useful information for overheads control purposes, application of activity based costing can provide an effective basis for variance analysis of overheads in service sector organizations although this may need significant time and effort in the implementation of a MIS.
**McDonaldization**

McDonaldization is a process of rationalisation, which takes a task and breaks it down into smaller tasks. This is repeated until all tasks have been broken down to the smallest possible level. The resulting tasks are then rationalised to find the single most efficient method for completing each task. All other methods are then deemed inefficient and discarded.1

The impact of McDonaldization is that standards can be more accurately set and assessed. It can be easily ascertained that how much time and cost should go into each activity. The principles can be applied to many other services, such as hairdressing, dentistry, or opticians' services.

Source: www.mcdonaldization.com/whatisit.shtml

**Standard Costing in Public Sector**

In order to cost control in public sector (e.g. street cleaning refuse disposal and so on), regular variance analysis is required. Actual unit costs should be calculated on a monthly basis and compared with estimated unit cost. To achieve this comparison, information needs to be maintained about the unit of service adopted. For example, statistics would be maintained on the number of visits made and the number of hours worked. In this example, time recording may be beneficial in providing the detailed information necessary for variance analysis. Actual monthly costs should be taken from the organisation's financial management system and each month financial reports should be produced which offer an accurate image of budgeted vs actual expenditure. These reports are must for budgetary control. Actual expenditure reported on financial systems may require some modification to take account of:

- Trade Payables (services used but bills unpaid)
- Accruals (services used but bills yet to be received)
- Timing Differences (some costs are not incurred evenly over the year)

Source: Costing and Pricing Public Sector Services: Essential Skills for the Public Sector (2011) By Jennifer Bean, Lascelles Hussey

**STANDARD MARGINAL COSTING**

Standards and Variances can be calculated on the basis of marginal costing. A standard marginal costing system incorporates only costs which are variable to the product. Accordingly, the absorption of fixed costs, and the variances derived therefrom, do not feature in a standard marginal costing system. When Marginal Costing is in use there is no Overhead Volume Variance, because Marginal Costing does not absorb Fixed Overhead. Fixed Overhead Expenditure Variance is the only variance for Fixed Overhead in a Marginal Costing system. It is calculated as in an Absorption Costing system.
Sales Variances

Sales Variances can be used to analyse the performance of the revenue centres on broadly identical terms to those for manufacturing costs. The most important aspect of sales variance calculations is that they are calculated in terms of **profit** or **contribution**. Sales directly influences the total profits. Thus, a more meaningful performance measure will be obtained by comparing the results of the sales function in terms of **profit** or **contribution** rather than sales revenue.

In standard absorption costing system, **profit margins** are used (selling price less total unit manufacturing cost), whereas with a standard marginal costing system, **contribution** (selling price less unit manufacturing variable cost) are used to calculate the variances.

If marginal costing approach is adopted, sales contribution variance pursues to identify the influence of the sales function on the difference between budget and actual contribution.

“Sales function is responsible for the sales volume and the unit selling price, but not the unit manufacturing costs, the standard cost of sales and not the actual cost of sales is deducted from actual sales price.”

Sales Contribution Variance is the difference between the actual contribution and budgeted contribution (based on standard unit costs).

Sales Contribution Variance

\[
\text{Sales Contribution Variance} = \text{Actual Contribution} - \text{Budgeted Contribution}
\]

The effect of using standard costs throughout the contribution calculations means that the sales variances arise because of changes in those variables controlled by the sales function (i.e. selling prices and sales quantity). Therefore, it is possible to analyse the sales contribution variance into two sub-variances – a sales contribution price variance and a sales contribution volume variance.

**Sales Contribution Price Variance**

\[
\text{Sales Contribution Price Variance} = (\text{Actual Contribution per unit} - \text{Standard Contribution per unit}) \times \text{Actual Quantity}
\]

**Sales Contribution Volume Variance**

\[
\text{Sales Contribution Volume Variance} = (\text{Actual Quantity} - \text{Budgeted Quantity}) \times \text{Standard Contribution per unit}
\]

* based on standard unit costs

Where a company sells several different products that have different contributions, the sales volume contribution variance can be divided into a sales quantity and sales mix variance. The quantity variance measures the effect of changes in physical volume on total contribution, and the mix variance measures the impact arising from actual sales mix being different from budgeted sales mix.
Sales Contribution Mix Variance

\[
\text{Sales Contribution Mix Variance} = (\text{Actual Quantity} - \text{Actual Quantity in Budgeted Proportions}) \times \text{Standard Contribution per unit}
\]

Sales Contribution Quantity Variance

\[
\text{Sales Contribution Quantity Variance} = (\text{Actual Quantity in Budgeted Proportion} - \text{Budgeted Quantity}) \times \text{Standard Contribution per unit}
\]

Where industry's sales data is readily available, it is possible to divide the sales quantity variance into a component due to change in market size and a component due to change in market share: The formulae and calculations of the market size and market share variances are as follows:

Market Size Variance

\[
\text{Market Size Variance} = [\text{Budgeted Market Share} \% \times (\text{Actual Industry Sales Quantity in units} - \text{Budgeted Industry Sales Quantity in units}) \times (\text{Average Budgeted Contribution per unit})]
\]

Market Share Variance

\[
\text{Market Share Variance} = [(\text{Actual Market Share} \% - \text{Budgeted Market Share} \%) \times (\text{Actual Industry Sales Quantity in units}) \times (\text{Average Budgeted Contribution per unit})]
\]

---

**RECONCILIATION OF PROFIT**

Generally, under variance analysis we compute various variances from the actual and the standard/budgeted data. Sometimes all or a few variances and actual data are made available and from that we are required to prepare standard product cost sheet, original budget and to reconcile the budgeted profit with the actual profit.

Some important concepts are given below:
Reconciliation Statement-I
Budgeted Profit to Actual Profit (Absorption Costing)

<table>
<thead>
<tr>
<th>Budgeted Profit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(Budgeted Quantity × Standard Margin)</td>
<td></td>
</tr>
</tbody>
</table>

**Effect of Variances**

**Material Cost Variance**
- Material Price Variance
- Material Usage Variance
  - Material Mix Variance
  - Material Yield Variance

**Labour Cost Variance**
- Labour Rate Variance
- Labour Idle Time Variance
- Labour Efficiency Variance
  - Labour Mix Variance
  - Labour Sub-Efficiency Variance

**Variable Overhead Cost Variances**
- Variable Overhead Expenditure Variance
- Variable Overhead Efficiency Variance

**Fixed Overhead Cost Variances**
- Fixed Overhead Expenditure Variance
- Fixed Overhead Volume Variance
  - Fixed Overhead Capacity Variance
  - Fixed Overhead Efficiency Variance

**Sales Margin Variances (in terms of Profit)**
- Sales Margin Price Variance
- Sales Margin Volume Variance
  - Sales Margin Mix Variance
  - Sales Margin Quantity Variance

| Actual Profit |  |
## Budgeted Profit
(Budgeted Quantity × Standard Margin)

### Effect of Variances

#### Material Cost Variance
- Material Price Variance
- Material Usage Variance
  - Material Mix Variance
  - Material Yield Variance

#### Labour Cost Variance
- Labour Rate Variance
- Labour Idle Time Variance
- Labour Efficiency Variance
  - Labour Mix Variance
  - Labour Sub-Efficiency Variance

#### Variable Overhead Cost Variances
- Variable Overhead Expenditure Variance
- Variable Overhead Efficiency Variance

#### Fixed Overhead Cost Variances
- Fixed Overhead Expenditure Variance
- Fixed Overhead Volume Variance
  - Fixed Overhead Capacity Variance
  - Fixed Overhead Efficiency Variance

#### Sales Contribution Variances
- Sales Contribution Price Variance
- Sales Contribution Volume Variance
  - Sales Contribution Mix Variance
  - Sales Contribution Quantity Variance

### Actual Profit
Reconciliation Statement-III
Standard Profit to Actual Profit (Absorption Costing)

**Standard Profit**
(Actual Quantity × Standard Margin)

**Effect of Variances**

<table>
<thead>
<tr>
<th>Material Cost Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Price Variance</td>
</tr>
<tr>
<td>Material Usage Variance</td>
</tr>
<tr>
<td>Material Mix Variance</td>
</tr>
<tr>
<td>Material Yield Variance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour Cost Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour Rate Variance</td>
</tr>
<tr>
<td>Labour Idle Time Variance</td>
</tr>
<tr>
<td>Labour Efficiency Variance</td>
</tr>
<tr>
<td>Labour Mix Variance</td>
</tr>
<tr>
<td>Labour Sub-Efficiency Variance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Overhead Cost Variances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Overhead Expenditure Variance</td>
</tr>
<tr>
<td>Variable Overhead Efficiency Variance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixed Overhead Cost Variances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Overhead Expenditure Variance</td>
</tr>
<tr>
<td>Fixed Overhead Volume Variance</td>
</tr>
<tr>
<td>Fixed Overhead Capacity Variance</td>
</tr>
<tr>
<td>Fixed Overhead Efficiency Variance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Margin Variance (in terms of Profit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Margin Price Variance</td>
</tr>
<tr>
<td>Sales Margin Volume Variance</td>
</tr>
<tr>
<td>Sales Margin Mix Variance</td>
</tr>
<tr>
<td>Sales Margin Quantity Variance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual Profit</th>
</tr>
</thead>
</table>

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Illustration

Osaka Manufacturing Co. (OMC) is a leading consumer goods company. The budgeted and actual data of OMC for the year 2018-19 are as follows-

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Budget</th>
<th>Actual</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales / Production (units)</td>
<td>2,00,000</td>
<td>1,65,000</td>
<td>(35,000)</td>
</tr>
<tr>
<td>Sales (₹)</td>
<td>21,00,000</td>
<td>16,92,900</td>
<td>(4,07,100)</td>
</tr>
<tr>
<td>Less: Variable Costs (₹)</td>
<td>12,66,000</td>
<td>10,74,150</td>
<td>1,91,850</td>
</tr>
<tr>
<td>Less: Fixed Costs (₹)</td>
<td>3,15,000</td>
<td>3,30,000</td>
<td>(15,000)</td>
</tr>
<tr>
<td>Profit</td>
<td>5,19,000</td>
<td>2,88,750</td>
<td>(2,30,250)</td>
</tr>
</tbody>
</table>

The budgeted data shown in the table is based on the assumption that total market size would be 4,00,000 units but it turned out to be 3,75,000 units.

Required

PREPARE a statement showing reconciliation of budget profit to actual profit through marginal costing approach for the year 2018-19 in as much detail as possible.

Solution

Statement of Reconciliation - Budgeted Vs Actual Profit

<table>
<thead>
<tr>
<th>Particulars</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted Profit</td>
<td>5,19,000</td>
</tr>
<tr>
<td>Less: Sales Volume Contribution - Planning Variance (Adverse)</td>
<td>52,125</td>
</tr>
<tr>
<td>Less: Sales Volume Contribution - Operational Variance (Adverse)</td>
<td>93,825</td>
</tr>
<tr>
<td>Less: Sales Price Variance (Adverse)</td>
<td>39,600</td>
</tr>
<tr>
<td>Less: Variable Cost Variance (Adverse)</td>
<td>29,700</td>
</tr>
<tr>
<td>Less: Fixed Cost Variance (Adverse)</td>
<td>15,000</td>
</tr>
<tr>
<td>Actual Profit</td>
<td>2,88,750</td>
</tr>
</tbody>
</table>

Workings

Basic Workings

Budgeted Market Share (in %) = \[
\frac{2,00,000\text{units}}{4,00,000\text{units}} = 50\%
\]

Actual Market Share (in %) = \[
\frac{1,65,000\text{units}}{3,75,000\text{units}} = 44\%
\]
STANDARD COSTING

Budgeted Contribution  
= ₹21,00,000 – ₹12,66,000  
= ₹8,34,000

Average Budgeted Contribution (per unit)  
= ₹8,34,000  
= ₹2,00,000  
= ₹4.17

Standard Sales Price (per unit)  
= ₹21,00,000  
= ₹2,00,000  
= ₹10.50

Actual Sales Price (per unit)  
= ₹16,92,900  
= ₹1,65,000  
= ₹10.26

Standard Variable Cost (per unit)  
= ₹12,66,000  
= ₹2,00,000  
= ₹6.33

Actual Variable Cost (per unit)  
= ₹10,74,150  
= ₹1,65,000  
= ₹6.51

CALCULATION OF VARIANCES

Sales Variances

Volume Contribution Planning*  
= Budgeted Market Share % × (Actual Industry Sales Quantity in units – Budgeted Industry Sales Quantity in units) × (Average Budgeted Contribution per unit)  
= 50% × (3,75,000 units – 4,00,000 units) × ₹4.17  
= 52,125 (A)  
(*) Market Size Variance

Volume Contribution Operational**  
= (Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity in units) × (Average Budgeted Contribution per unit)  
= (44% – 50 %) × 3,75,000 units × ₹4.17  
= 93,825 (A)  
(**) Market Share Variance

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Price  
= Actual Sales – Standard Sales  
= Actual Sales Quantity \times (Actual Price – Standard Price)  
= 1,65,000 \text{ units} \times (₹10.26 – ₹10.50)  
= 39,600 (A)

**Variable Cost Variances**

Cost  
= Standard Cost for Production – Actual Cost  
= Actual Production \times (Standard Cost \textit{per unit} – Actual Cost \textit{per unit})  
= 1,65,000 \text{ units} \times (₹6.33 – ₹6.51)  
= ₹29,700 (A)

**Fixed Cost Variances**

Expenditure  
= Budgeted Fixed Cost – Actual Fixed Cost  
= ₹3,15,000 – ₹3,30,000  
= ₹15,000 (A)

### INVESTIGATION OF VARIANCES

Variances focus attention on deviations, but all deviations cannot be taken as ‘out of Control’ situations. However, variance investigation on the other hand may not be fruitful in any given situation considering that it requires resources and thus a cost benefit analysis should be considered before undertaking investigation. Investigating variances is a key step in using variance analysis as part of performance management. "Interpretation may suggest possible cause of variances but investigation must arrive at definite conclusions about the cause of the variance so that action to correct the variance can be effective." There are behavioural as well as technical consequences to the decision to investigate variances. If no variances are investigated, it may cease to be motivated by the system which produce variances. Investigating favourable and adverse variances may create positive behavioural reinforcements, with implications for motivation, aspiration levels and inter-departmental relationships.

### Factors to be Considered When Investigating Variance

Certain set of factors should be considered before undertaking the variance investigation of the actual performance against the estimates set.

**Size**: A standard is seen as an average of the estimates and therefore small variations seen from the standard should be ignored and not investigated further. In addition, organizations can establish limits and the variances seen beyond those limits should be undertaken for further investigation.
Type of Variance: Adverse variance is given more importance by the organization over favourable variances seen with regards to the estimates.

Cost: The costs associated with the undertaking of the investigation should be lower than the benefits associated with the investigation of variances for the organization to undertake the said investigation.

Pattern in variance: The variances need to be monitored over a period of time and if the variance of a particular cost is seen to be worsening over time then in that case the investigation in relation to the variance needs to be undertaken.

Budgetary process: In case the budgetary process is uncontrollable and unrealistic then in that case the investigation should be re-evaluating the budgetary process rather than undertaking investigation of the variances.

Method Used for Investing Variance

Simple Rule of Thumb Model

It is based on arbitrary criteria such as investigating if the absolute size of a variance is greater than a certain amount or if the ratio of the variance to the total cost exceeds some predetermined percentage. They are based on managerial judgement and do not consider statistical significance.

Statistical Decision Model

For the statistical models, two mutually exclusive states are possible. First assumes that the system is 'In Control' and a variance is simply due to random fluctuations around the expected outcome. The second possible state is that the system is in some way 'Out of Control' and corrective action can be taken to remedy the situation.

An investigation is undertaken when the probability that an observation comes from an ‘In-Control’ distribution falls below some arbitrarily determined probability level.

A number of cost variance investigation models have been proposed that determine the statistical probability that a variance comes from an ‘In Control’ distribution.

Determining Probabilities

'In Control' state can be stated in the form of a known probability distribution such as a normal one.

Let's take example, consider a situation where the standard time required for a particular project has been derived from the average of a series of past experience made under 'close' supervision. The average time is 2.5 hrs. per unit of output. We shall consider that the actual observations were normally distributed with a standard deviation of 15 minutes. Suppose that the actual time taken for a week was 3,000 hrs. for output of 1,000 units. Thus, average time taken was 3 hrs. per unit of output. We can determine the probability of perceiving an average time of 3 hrs. or more when the process is under control through application of normal distribution theory. An observation of an average time taken of 3 hrs. per unit of output is 2 standard deviations from the expected value, where, for a normal distribution,
Probability of Completing the Project in 3 hrs.

\[ Z = \frac{x - \mu}{\sigma} \]

\[ Z = \frac{3.00 - 2.50}{0.25} \]

\[ Z = 2.0 \]

\[ P(Z = 2.0) = 0.9772 \]

Probability of Completing the Project in more than 3 hrs.

\[ P = 1 - 0.9772 \]

\[ = 0.0228 \]

The shaded area illustrates that 0.0228 of the area under the curve ($\mu + 2\sigma$). Thus, the probability of actual time taken per unit of output being 3 hrs. or more when the operation is under control is 2.28%.

It is likely that this observation comes from another distribution and that the time taken for the week is out of control.

**Statistical Control Charts**

Statistical quality control is used mainly for monitoring and maintaining of the quality of products and services, but within a standard costing framework, statistical control charts can be used to monitor accounting variances. For example, labour usage could be plotted on a control chart on an hourly basis for each project. This process would consist of sampling the output from a project and plotting on the chart the mean usage of resources per unit for the sample output.

A control chart is a graphic presentation of a series of past observations in which each observation is plotted relative to pre-set points on the expected distribution. Only observations beyond specified pre-set control / tolerance limits are considered for investigation. The control limits are set based on a series of past observations of a process when it is under control, and thus working efficiently. It is assumed that the past observations can be represented by a normal distribution.
The past observations are used to estimate the population mean $\mu$ and the population standard deviation $\sigma$. Assuming that the distribution of possible outcomes is normal, then, when the process is under control, we should expect

- 68.27% of the observations to fall within the range $\mu + \sigma$ from the mean;
- 95.45% of the observations to fall within the range $\mu + 2\sigma$ from the mean;
- 99.8% of the observations to fall within the range $\mu + 3\sigma$ from the mean.

For example, if control limits are set based on $2\sigma$ from the mean then this would show 4.55% (100% - 95.45%) of future observations would result from pure chance when the process is under control. Therefore, there is a high probability that an observation outside the $2\sigma$ control limits is out of control.

Above Figure shows three control charts, with the outer horizontal lines representing a possible control limit of $2\sigma$, so that all observations outside this range are investigated.

For Project A the process is deemed to be in control because all observations fall within the control limits.

For Project B the last two observations suggest that the project is out of control. Therefore, both observations should be investigated.

With Project C, the observations would not prompt an investigation because all the observations are within the control limits. However, the last six observations show a gradually increasing usage in excess of the mean, and the process may be out of control. Statistical procedures that consider the trend in recent usage as well as daily usage can also be used.

Statistical decision models have been extended to incorporate the costs and benefits of investigation.

Decision rule to investigate if

$$PB > C$$
Where,

- \( P \) is the \textit{probability} that the process is ‘Out of Control’

- \( B \) is the \textit{benefit} associated with returning the process to its 'In-Control' state if the process is ‘Out of Control’. Benefit represents the cost saving that will arise through bringing the system back under control and thereby avoiding variances in future periods.

- \( C \) is the \textit{cost} will be incurred when an investigation is undertaken and includes the manager’s time spent on investigation, the cost of interrupting the production process, and the cost of correcting the process. \( C \) is known with certainty.

The model requires an estimate of \( P \), the probability that the process is ‘Out of Control’. Bierman et al. (1961) have suggested that the probabilities could be determined by computing the probability that a particular observation, such as a variance, comes from an 'In Control' distribution. It also considers that the 'In-Control' state can be expressed in the form of a known probability distribution such as a \textit{normal distribution}.

Let us assume that the incremental cost of investigating the labour efficiency variance in our example is \( ₹ 25 \). Assume also that the estimated benefit \( B \) from investigating a variance and taking corrective action is \( ₹ 100 \).

Investigate if

\[
P > \frac{25}{100} \text{ or } 0.25
\]

Consider our example, the probability of an observation of 3 hrs (or larger) was 0.0228. The probability of the process being ‘Out of Control’ is one minus the probability of being ‘In Control’. Thus, \( P = 0.9772 (1 - 0.0228) \). We ascertained that the variance should be investigated if the probability that the process is ‘Out of Control’ is > 0.25. The process should therefore be investigated.

\[1 \text{ Reference: Management and Cost Accounting by Colin M. Drury}\]

\section*{POSSIBLE INTERDEPENDENCE BETWEEN VARIANCES}

It is a term used to express the way in which the cause of one variance may be wholly or partially explained by the cause of another variance. For control purposes, it might therefore be essential to look at several variances together and not in isolation.

Some examples of interdependence between variances are listed below:

- Use of cheaper material which is poorer quality, the material price variance will be favourable, but this can cause more wastage of materials leading to adverse usage variance.

- Using more skilled labour to do the work will result in an adverse labour rate variance, but productivity might be higher as a result due to experienced labour.
Changing the composition of a team might result in a cheaper labour mix (favourable mix variance) but lower productivity (adverse yield variance).

Workers trying to improve productivity (favourable efficiency variance) in order to get bonus (adverse rate variance) might use materials wastefully in order to save time (adverse materials usage).

Cutting sales prices (adverse sales price variance) might result in higher sales demand from customers (favourable sales volume variance).

Similarly, favourable sales price variance may result in adverse sales volume variance.

**INTERPRETATION OF VARIANCES**

There can be a number of potential causes leading to variances in the operational costs

**Material Price Variance**

- Might be caused due to the use of a different supplier.
- Order size can result in variance.
- Any form of unexpected increase in buying costs such as higher delivery charges.
- Efficiency or inefficiency associated with the buying procedure adopted.
- Lack of appropriate inventory control can result in emergency purchase of material resulting in adverse variance.

**Material Usage Variance**

- Purchase of inferior quality material.
- Implementation of better quality control.
- Increased efficiency in production can help in bringing down wastage rate.
- Changes made in the material mix.
- Careless way of handling material by production department.
- Change in method of production/ design.
- Pilferage of material from the production department.
- Poor inspection.

**Labour Rate Variance**

- Unexpected increase in the pay rate of labour.
Level of experience of the labour can impact the direct cost of labour.
- Payment of bonuses added to the direct labour costs.
- Change in the composition of the workforce can impact direct labour costs.

**Labour Efficiency Variance**
- Improvement in work or productivity efficiency.
- Workforce mix can have an impact upon labour efficiency levels.
- Industrial action in relation to workforce.
- Poor supervision of the workforce.
- Learning curve effect upon the labour efficiency levels.
- Resource shortages causing an unexpected delay and lowering of labour efficiency levels.
- Using inferior quality of material.
- Introduction of new machinery resulting in improvement of labour productivity levels.

**Overhead Variances**
- Fixed Overhead Expenditure Variance (adverse) are caused by spending in excess of the budget.
- Fixed Overhead Volume Variance is caused by changes in production volume.
- Variable Overhead Expenditure Variance are often caused by changes in machine running costs.
- Variable Overhead Efficiency Variances- Causes are similar to those for a direct labour efficiency variance.

**Sales Price Variance**
- Higher discounts given to customers in order to encourage bulk purchases.
- The effect of low price offers during a marketing campaign.
- Poor performance by sales personnel.
- Market conditions or economic conditions forcing changes in prices across the industry.

**Sales Volume Variance**
- Successful or unsuccessful direct selling efforts.
- Successful or unsuccessful marketing efforts (for example, the effects of an advertising campaign).
- Unexpected changes in customer preferences and buying patterns.
STANDARD COSTING

- Failure to satisfy demand due to production difficulties.
- Higher demand due to a cut in selling prices, or lower demand due to an increase in sales prices.

**Illustration**

Queensland Chemicals (QC) manufactures high-quality chemicals C-1, C-2 and C-3. Extracts from the budget for last year are given below:

<table>
<thead>
<tr>
<th></th>
<th>C-1</th>
<th>C-2</th>
<th>C-3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales Quantity (kg)</strong></td>
<td>1,000</td>
<td>3,250</td>
<td>750</td>
</tr>
<tr>
<td><strong>Average Selling Price</strong></td>
<td>17,600</td>
<td>2,560</td>
<td>22,400</td>
</tr>
<tr>
<td><strong>Direct Material (C₂H₆O) Cost</strong></td>
<td>8,000</td>
<td>1,280</td>
<td>9,600</td>
</tr>
<tr>
<td><strong>Direct Labour Cost</strong></td>
<td>3,200</td>
<td>480</td>
<td>4,800</td>
</tr>
<tr>
<td><strong>Variable Overhead Cost</strong></td>
<td>320</td>
<td>48</td>
<td>480</td>
</tr>
</tbody>
</table>

The budgeted direct labour cost per hour was ₹160.

Actual results for last year were as follows:

<table>
<thead>
<tr>
<th></th>
<th>C-1</th>
<th>C-2</th>
<th>C-3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales Quantity (units)</strong></td>
<td>900</td>
<td>3,875</td>
<td>975</td>
</tr>
<tr>
<td><strong>Average Selling Price</strong></td>
<td>19,200</td>
<td>2,480</td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Direct Material(C₂H₆O) Cost</strong></td>
<td>8,800</td>
<td>1,200</td>
<td>10,400</td>
</tr>
<tr>
<td><strong>Direct Labour Cost</strong></td>
<td>3,600</td>
<td>480</td>
<td>4,800</td>
</tr>
<tr>
<td><strong>Variable Overhead Cost</strong></td>
<td>480</td>
<td>64</td>
<td>640</td>
</tr>
</tbody>
</table>

The actual direct labour cost per hour was ₹150. Actual variable overhead cost per direct labour hour was ₹20. QC follows just in time system for purchasing and production and does not hold any inventory.

**Required**

*INTERPRET the Sales Mix Variance and Sales Quantity variance in terms of contribution.*

**Solution**

**Variance Interpretation**

The sales quantity variance and the sales mix variance describe how the sales volume contribution variance has been affected by a change in the total quantity of sales and a change in the relative mix of products sold.
From the figures arrived for the sales quantity contribution variance, we can observe that the increase in total quantity sold would have gained an additional contribution of ₹2,124,600, if the actual sales volume had been in the budgeted sales proportion.

The sales mix contribution variance shows that the variation in the sales mix resulted in a curtailment in profit by ₹570,600. The change in the sales mix has resulted in a relatively higher proportion of sales of C-2 which is the chemical that earns the lowest contribution and a lower proportion of C-1 which earn a contribution significantly higher. The relative increase in the sale of C-3 however, which has the highest unit contribution, has partially offset the switch in mix to C-2.

**Workings**

**Statement Showing Standard Contribution**

<table>
<thead>
<tr>
<th></th>
<th>C-1</th>
<th>C-2</th>
<th>C-3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Selling Price</strong></td>
<td>17,600</td>
<td>2,560</td>
<td>22,400</td>
</tr>
<tr>
<td><strong>Direct Material (C₂H₆O) Cost</strong></td>
<td>8,000</td>
<td>1,280</td>
<td>9,600</td>
</tr>
<tr>
<td><strong>Direct Labour Cost</strong></td>
<td>3,200</td>
<td>480</td>
<td>4,800</td>
</tr>
<tr>
<td><strong>Variable Overhead Cost</strong></td>
<td>320</td>
<td>48</td>
<td>480</td>
</tr>
<tr>
<td><strong>Contribution</strong></td>
<td>6,080</td>
<td>752</td>
<td>7,520</td>
</tr>
</tbody>
</table>

**Sales Contribution Mix Variance**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>900</td>
<td>1,150</td>
<td>250 (A)</td>
<td>6,080</td>
<td>1,520 (A)</td>
</tr>
<tr>
<td>C-2</td>
<td>3,875</td>
<td>3,737.50</td>
<td>137.50 (F)</td>
<td>752</td>
<td>103.40 (F)</td>
</tr>
<tr>
<td>C-3</td>
<td>975</td>
<td>862.50</td>
<td>112.50 (F)</td>
<td>7,520</td>
<td>846 (F)</td>
</tr>
<tr>
<td></td>
<td>5,750</td>
<td>5,750</td>
<td></td>
<td></td>
<td>570.60 (A)</td>
</tr>
</tbody>
</table>

**Sales Contribution Quantity Variance**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>1,000</td>
<td>1,150</td>
<td>150 (F)</td>
<td>6,080</td>
<td>912 (F)</td>
</tr>
<tr>
<td>C-2</td>
<td>3,250</td>
<td>3,737.50</td>
<td>487.50 (F)</td>
<td>752</td>
<td>366.60 (F)</td>
</tr>
<tr>
<td>C-3</td>
<td>750</td>
<td>862.50</td>
<td>112.50 (F)</td>
<td>7,520</td>
<td>846 (F)</td>
</tr>
<tr>
<td></td>
<td>5,000</td>
<td>5,750</td>
<td></td>
<td></td>
<td>2,124.60 (F)</td>
</tr>
</tbody>
</table>
Case Scenario

Natural Spices manufactures and distributes high-quality spices to gourmet food shops and top quality restaurants. Gourmet and high-end restaurants pride themselves on using the freshest, highest-quality ingredients.

Natural Spices has set up five state of the art plants for meeting the ever-growing demand. The firm procures raw material directly from the centers of produce to maintain uniform taste and quality. The raw material is first cleaned, dried and tested with the help of special machines. It is then carefully grounded into the finished product passing through various stages and packaged at the firm’s ultraclean factory before being dispatched to customers.

The following variances pertain to last week of operations, arose as a consequence of management’s decision to lower prices to increase volume.

<table>
<thead>
<tr>
<th>Variance</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Volume Variance</td>
<td>18,000 (F)</td>
</tr>
<tr>
<td>Sales Price Variance</td>
<td>14,000 (A)</td>
</tr>
<tr>
<td>Purchase Price Variance</td>
<td>10,000 (F)</td>
</tr>
<tr>
<td>Labour Efficiency Variance</td>
<td>11,200 (F)</td>
</tr>
<tr>
<td>Fixed Cost Expenditure Variance</td>
<td>4,400 (F)</td>
</tr>
</tbody>
</table>

**Required**

(i) **IDENTIFY** the ‘Critical Success Factors’ for Natural Spices.

(ii) **EVALUATE** the management’s decision with the ‘Overall Corporate Strategy’ and ‘Critical Success Factors’.

**Solution**

(i) Gourmet and high-end restaurants recognise Natural Spices on the basis of its high quality of spices. Therefore, quality is most critical success factor of Natural Spices. There are other factors which cannot be ignore such as price, delivery options, attractive packing etc. But all are secondary to the quality.

(ii) Deliberate action of cutting price to increase sales volume indicates that firm is intending to expand its market to retail market and street shops which is price sensitive.

*Purchase Price Variance* is clearly indicating that firm has purchased raw material at lower price which may be due to buying of lower quality of material. Similarly, positive *Efficiency Variance* is indicating cost cutting and stretching resources.

It appears that firm is intending to expand its market to retail market and street shops by not only reducing the price but also compromising its quality which is opposing its current strategy of high quality.

Management should monitor the trends of variances on regular basis and take appropriate action in case of evidence of permanent decline in quality. Here, customer feedback is also very important.
REPORTING OF VARIANCES

Computation of variances and their reporting is not the final step towards the control of various elements of cost. It in fact demands an analysis of variances from the side of the executives, to ascertain the correct reasons for their occurrence. After knowing the exact reasons, it becomes their responsibility to take necessary steps so as to stop the re-occurrence of adverse variances in future. To enhance the utility of such a reporting system it is necessary that such a system of reporting should not only be prompt but should also facilitate the concerned managerial level to take necessary steps. Variance reports should be prepared after keeping in view its ultimate use and its periodicity. Such reports should highlight the essential cost deviations and possibilities for their improvements. In fact the variance reports should give due regard to the following points:-

(i) The concerned executives should be informed about what the cost performance should have been.
(ii) How close the actual cost performance is with reference to standard cost performance.
(iii) The analysis and causes of variances.
(iv) Reporting should be based on the principle of management by exception.
(v) The magnitude of variances should also be stated.

BEHAVIOURAL ISSUES

Variance analysis may encourage short-termism due to their inherent tendency towards short-term, quantified objectives and results.

A negative perception of an organization’s variance analysis process can also encourage other sub-optimal behaviour among employees such as attempts to include budget slacks.

The behavioural issues connected with variance analysis could be managed by participating employees during budget setting so that they do not assess the procedure as biased. It is also vital for an organization's performance measurement system to be based on a extensive range of quantitative and qualitative measures so as to encourage management to adopt a long-term view that is aligned with an organization’s strategic direction.

Source: Managerial Accounting: A Focus on Ethical Decision Making by Steve Jackson, Roby Sawyers, Greg Jenkins

Ethics

Variance analysis for evaluating performance can have strong ethical consequences. For example, standard costing methods have been proposed for medicine as a means for improving performance. Interpretation of a favourable variance may be difficult because it either reflects insufficient treatment or compliance to guidelines. Most hospitals in various countries are reimbursed as specified by the diagnostic related groups (DRG). Each DRG has specified standard “length of stay”. If a patient leaves the hospital early, the hospital is financial impacted favourably but a patient staying longer than the specified time costs the hospital money.

STANDARD COSTING IN CONTEMPORARY BUSINESS ENVIRONMENT

- Products in these environments tend not to be standardised
- Standard costs become outdated quickly
- Variance reports may arrive too late to solve problems
- Variance analysis may not give enough detail
- The emphasis is on continuous improvement so pre-set standards become less useful
- Modern environments often use ideal standards rather than current standards
- Production is highly automated

Modern Production Environment

Source: Accounting: An Introduction, 6/E By Peter Atrill, Eddie McLaney, David Harvey

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## Sales Variances (Absorption Costing)

### Sales Margin Variance\(^*\)

(Actual Margin) Less (Budgeted Margin)

\[
[(AQ \times AM) - (BQ \times SM)]
\]

---

### Sales Margin Price Variance

(Actual Margin)

\[\text{Less}\]

(Standard Margin)

\[
[(AM \times AQ) - (SM \times AQ)]
\]

Or

\[
[AQ \times (AM - SM)]
\]

### Sales Margin Volume Variance

(Standard Margin)

\[\text{Less}\]

(Budgeted Margin)

\[
[(SM \times AQ) - (SM \times BQ)]
\]

Or

\[
[SM \times (AQ - BQ)]
\]

### Sales Margin Mix Variance

(Standard Margin)

\[\text{Less}\]

(Revised Standard Margin)

\[
(AQ \times SM) - (RAQ \times SM)
\]

Or

\[
SM \times (AQ - RAQ)
\]

**Alternative Formula**

\[
\text{Total Actual Qty. (units)} \times \{\text{Average Standard Margin per unit of Actual Mix} \quad \text{Less} \quad \text{Average Budgeted Margin per unit of Budgeted Mix}\}
\]

### Sales Margin Quantity Variance

(Revised Standard Margin)

\[\text{Less}\]

(Budgeted Margin)

\[
(RAQ \times SM) - (BQ \times SM)
\]

Or

\[
SM \times (RAQ - BQ)
\]

**Alternative Formula**

\[
\text{Average Budgeted Margin per unit of Budgeted Mix} \times \{\text{Total Actual Qty. (units)} \quad \text{Less} \quad \text{Total Budgeted Qty. (units)}\}
\]

### Market Size Variance

\[
\text{[Budgeted Market Share \% \times (Actual Industry Sales Quantity in units} \quad \text{Budgeted Industry Sales Quantity in units)} \times \text{Average Budgeted Margin per unit]}\]

### Market Share Variance

\[
\text{[(Actual Market Share \% - Budgeted Market Share \%) \times (Actual Industry Sales Quantity in units} \times \text{Average Budgeted Margin per unit]}\]

\(^*\text{in terms of profit}\)
Note:

BQ = Budgeted Sales Quantity
AQ = Actual Sales Quantity
RAQ = Revised Actual Sales Quantity
SM = Standard Margin
AM = Actual Margin

Market Size Variance

Budgeted Market Share % × (Actual Industry Sales Quantity in units – Budgeted Industry Sales Quantity in units) × (Average Budgeted Margin per unit)

Or

(Budgeted Market Share % × Actual Industry Sales Quantity in units – Budgeted Market Share % × Budgeted Industry Sales Quantity in units) × (Average Budgeted Margin per unit)

Or

(Required Sales Quantity in units – Total Budgeted Quantity in units) × (Average Budgeted Margin per unit)

Market Share Variance

(Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity in units) × (Average Budgeted Margin per unit)

Or

(Actual Market Share % × Actual Industry Sales Quantity in units – Budgeted Market Share % × Actual Industry Sales Quantity in units) × (Average Budgeted Margin per unit)

Or

(Total Actual Quantity in units – Required Sales Quantity in units) × (Average Budgeted Margin per unit)

Market Size Variance + Market Share Variance

(Required Sales Quantity in units – Total Budgeted Quantity in units) × (Average Budgeted Margin per unit)

Add

(Total Actual Quantity in units – Required Sales Quantity in units) × (Average Budgeted Margin per unit)

Equals to

(Total Actual Quantity in units – Total Budgeted Quantity in units) × (Average Budgeted Margin per unit)

Sales Margin Quantity Variance
### Sales Variances (Marginal Costing)

<table>
<thead>
<tr>
<th>Sales Contribution Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Actual Contribution) Less (Budgeted Contribution)</td>
</tr>
<tr>
<td>[ (AQ \times AC) - (BQ \times SC) ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Contribution Price Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Actual Contribution) Less (Standard Contribution)</td>
</tr>
<tr>
<td>[ [(AC \times AQ) - (SC \times AQ)] ]</td>
</tr>
<tr>
<td>Or [ AQ \times (AC - SC) ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Contribution Volume Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Standard Contribution) Less (Budgeted Contribution)</td>
</tr>
<tr>
<td>[ [(SC \times AQ) - (SC \times BQ)] ]</td>
</tr>
<tr>
<td>Or [ SC \times (AQ - BQ) ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Contribution Mix Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Standard Contribution) Less (Revised Standard Contribution)</td>
</tr>
<tr>
<td>[ (AQ \times SC) - (RAQ \times SC) ]</td>
</tr>
<tr>
<td>Or [ SC \times (AQ - RAQ) ]</td>
</tr>
</tbody>
</table>

**Alternative Formula**
\[
\text{[Total Actual Qty. (units) } \times \{\text{Average Standard Contribution per unit of Actual Mix Less Average Budgeted Contribution per unit of Budgeted Mix}\}\]

<table>
<thead>
<tr>
<th>Sales Contribution Quantity Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Revised Standard Contribution) Less (Budgeted Contribution)</td>
</tr>
<tr>
<td>[ (RAQ \times SC) - (BQ \times SC) ]</td>
</tr>
<tr>
<td>Or [ SC \times (RAQ - BQ) ]</td>
</tr>
</tbody>
</table>

**Alternative Formula**
\[
\text{[Average Budgeted Contribution per unit of Budgeted Mix } \times \{\text{Total Actual Qty. (units) Less Total Budgeted Qty. (units)\}]}\]

<table>
<thead>
<tr>
<th>Market Size Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Budgeted Market Share % \times (Actual Industry Sales Quantity in units - Budgeted Industry Sales Quantity in units) \times (Average Budgeted Contribution per unit)]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Market Share Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>[(Actual Market Share % - Budgeted Market Share %) \times (Actual Industry Sales Quantity in units) \times (Average Budgeted Contribution per unit)]</td>
</tr>
</tbody>
</table>
Note:

- BQ = Budgeted Sales Quantity
- AQ = Actual Sales Quantity
- RAQ = Revised Actual Sales Quantity
  = Actual Quantity Sold Rewritten in Budgeted Proportion
- SC = Standard Contribution
  = Standard Price per Unit – Standard Cost (variable) per Unit
- AC = Actual Contribution
  = Actual Sales Price per Unit – Standard Cost (variable) per Unit

### Market Size Variance

\[
\text{Budgeted Market Share } \times \left( \text{Actual Industry Sales Quantity in units} - \text{Budgeted Industry Sales Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\]

Or

\[
\left( \text{Budgeted Market Share } \times \text{Actual Industry Sales Quantity in units} - \text{Required Sales Quantity in units} \right) \times \left( \text{Total Budgeted Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\]

### Market Share Variance

\[
\left( \text{Actual Market Share } - \text{Budgeted Market Share} \right) \times \left( \text{Actual Industry Sales Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\]

Or

\[
\left( \text{Actual Market Share } \times \text{Actual Industry Sales Quantity in units} - \text{Budgeted Market Share } \times \text{Actual Industry Sales Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\]

Or

\[
\left( \text{Total Actual Quantity in units} - \text{Required Sales Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\]

### Market Size Variance + Market Share Variance

\[
\left( \text{Required Sales Quantity in units} - \text{Total Budgeted Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\] Add

\[
\left( \text{Total Actual Quantity in units} - \text{Required Sales Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\] Equals to

\[
\left( \text{Total Actual Quantity in units} - \text{Total Budgeted Quantity in units} \right) \times \left( \text{Average Budgeted Contribution per unit} \right)
\]

### Sales Contribution Quantity Variance

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- **Sales Price Variance** is equal to **Sales Margin/ Contribution Price Variance**. This is because, for the actual quantity sold, standard cost remaining constant, change in selling price will have equal impact or turnover and profit/ contribution.
- **Sales Margin Volume Variance** is equal to **Sales Volume Variance × Budgeted Net Profit Ratio**
- **Sales Contribution Volume Variance** is equal to **Sales Volume Variance × Budgeted PV Ratio**

<table>
<thead>
<tr>
<th>A Relation: Sales Margin Volume Variance in terms of Profit &amp; Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Margin Volume Variance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sales Margin Volume Variance</td>
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<td></td>
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<tr>
<td>Sales Margin Volume Variance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sales Contribution Volume Variance</td>
</tr>
</tbody>
</table>

*Note: Production units equals to Sales units for both actual & budget.*
## Sales Variances (Turnover or Value)

### Sales Variance

\[
\text{Sales Variance} = (\text{Actual Sales}) \text{ Less } (\text{Budgeted Sales})
\]

\[
= [(AQ \times AP) - (BQ \times SP)]
\]

### Sales Price Variance

\[
\text{Sales Price Variance} = \text{(Actual Sales) Less (Standard Sales)}
\]

\[
\text{[(AP \times AQ) \text{ Less } (SP \times AQ)]}
\]

\[
\text{Or}
\]

\[
\text{[AQ \times (AP - SP)]}
\]

### Sales Volume Variance

\[
\text{Sales Volume Variance} = \text{(Standard Sales) Less (Budgeted Sales)}
\]

\[
\text{[(SP \times AQ) \text{ Less } (SP \times BQ)]}
\]

\[
\text{Or}
\]

\[
\text{[SP \times (AQ - BQ)]}
\]

### Sales Mix Variance

\[
\text{Sales Mix Variance} = \text{(Standard Sales) Less (Revised Standard Sales)}
\]

\[
\text{[(SP \times AQ) \text{ Less } (SP \times RAQ)]}
\]

\[
\text{Or}
\]

\[
\text{[SP \times (AQ - RAQ)]}
\]

### Sales Quantity Variance

\[
\text{Sales Quantity Variance} = \text{(Revised Standard Sales) Less (Budgeted Sales)}
\]

\[
\text{[(SP \times RAQ) \text{ Less } (SP \times BQ)]}
\]

\[
\text{Or}
\]

\[
\text{[SP \times (RAQ - BQ)]}
\]

### Alternative Formula

\[
\text{[Total Actual Quantity (units) \times \{Average Standard Price per unit of Actual Mix Less Average Budgeted Price per unit of Budgeted Mix\]]}
\]

### Alternative Formula

\[
\text{[Average Budgeted Price per unit of Budgeted Mix \times \{Total Actual Quantity (units) Less Total Budgeted Qty (units)\]]}
\]

### Market Size Variance

\[
\text{Market Size Variance} = \text{[Budgeted Market Share % \times (Actual Industry Sales Quantity in units - Budgeted Industry Sales Quantity in units) \times (Average Budgeted Price per unit)]}
\]

### Market Share Variance

\[
\text{Market Share Variance} = \text{[(Actual Market Share % \text{ Less } Budgeted Market Share %) \times (Actual Industry Sales Quantity in units \times (Average Budgeted Price per unit))}
\]

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<table>
<thead>
<tr>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BQ = Budgeted Sales Quantity</td>
</tr>
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</tr>
<tr>
<td>RAQ = Revised Actual Sales Quantity</td>
</tr>
<tr>
<td>= Actual Quantity Sold Rewritten in Budgeted Proportion</td>
</tr>
<tr>
<td>SP = Standard Selling Price per Unit</td>
</tr>
<tr>
<td>AP = Actual Selling Price per Unit</td>
</tr>
</tbody>
</table>

### Market Size Variance

$$\text{Budgeted Market Share} \% \times (\text{Actual Industry Sales Quantity in units} – \text{Budgeted Industry Sales Quantity in units}) \times (\text{Average Budgeted Price per unit})$$

Or

$$\left(\text{Budgeted Market Share} \% \times \text{Actual Industry Sales Quantity in units} – \text{Budgeted Market Share} \% \times \text{Actual Industry Sales Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

Or

$$\left(\text{Required Sales Quantity in units} – \text{Total Budgeted Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

### Market Share Variance

$$\left(\text{Actual Market Share} \% – \text{Budgeted Market Share} \%\right) \times (\text{Actual Industry Sales Quantity in units}) \times (\text{Average Budgeted Price per unit})$$

Or

$$\left(\text{Actual Market Share} \% \times \text{Actual Industry Sales Quantity in units} – \text{Budgeted Market Share} \% \times \text{Actual Industry Sales Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

Or

$$\left(\text{Total Actual Quantity in units} – \text{Required Sales Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

### Market Size Variance + Market Share Variance

$$\left(\text{Required Sales Quantity in units} – \text{Total Budgeted Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

Add

$$\left(\text{Total Actual Quantity in units} – \text{Required Sales Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

Equals to

$$\left(\text{Total Actual Quantity in units} – \text{Total Budgeted Quantity in units}\right) \times (\text{Average Budgeted Price per unit})$$

### Sales Quantity Variance
### Direct Material Variances

#### Direct Material Total Variance

\[ \text{[Standard Cost} – \text{Actual Cost]} \]

(The difference between the **Standard Direct Material Cost** of the actual production volume and the **Actual Cost** of Direct Material)

\[ [(\text{SQ} \times \text{SP}) – (\text{AQ} \times \text{AP})] \]

#### Direct Material Price Variance

\[ \text{[Standard Cost of Actual Quantity} – \text{Actual Cost]} \]

(The difference between the **Standard Price** and **Actual Price** for the **Actual Quantity**)

\[ [(\text{SP} – \text{AP}) \times \text{AQ}] \]

Or

\[ [(\text{SP} \times \text{AQ}) – (\text{AP} \times \text{AQ})] \]

#### Direct Material Usage Variance

\[ \text{[Standard Cost of Standard Quantity for Actual Production} – \text{Standard Cost of Actual Quantity]} \]

(The difference between the **Standard Quantity** specified for actual production and the **Actual Quantity used**, at Standard Purchase Price)

\[ [(\text{SQ} – \text{AQ}) \times \text{SP}] \]

Or

\[ [(\text{SQ} \times \text{SP}) – (\text{AQ} \times \text{SP})] \]

#### Direct Material Mix Variance

\[ \text{[Standard Cost of Actual Quantity in Standard Proportion} – \text{Standard Cost of Actual Quantity]} \]

(The difference between the **Actual Quantity in standard proportion** and **Actual Quantity in actual proportion**, at Standard Purchase Price)

\[ [(\text{RAQ} – \text{AQ}) \times \text{SP}] \]

Or

\[ [(\text{RAQ} \times \text{SP}) – (\text{AQ} \times \text{SP})] \]

**Alternative Formula**

\[ \text{[Total Actual Quantity (units) \times \{Average Standard Price per unit of Standard Mix Less Average Standard Price per unit of Actual Mix\}]} \]

**Direct Material Yield Variance**

\[ \text{[Standard Cost of Standard Quantity for Actual Production} – \text{Standard Cost of Actual Quantity in Standard Proportion]} \]

(The difference between the **Standard Quantity specified for actual production** and **Actual Quantity in standard proportion**, at Standard Purchase Price)

\[ [(\text{SQ} – \text{RAQ}) \times \text{SP}] \]

Or

\[ [(\text{SQ} \times \text{SP}) – (\text{RAQ} \times \text{SP})] \]

**Alternative Formula**

\[ \text{[Average Standard Price per unit of Standard Mix \times \{Total Standard Quantity (units) Less Total Actual Quantity (units)\}]} \]
Note:

SQ = Standard Quantity = Expected Consumption for Actual Output
AQ = Actual Quantity of Material Consumed
RAQ = Revised Actual Quantity = Actual Quantity Rewritten in Standard Proportion
SP = Standard Price per Unit
AP = Actual Price per Unit
(*) = Standard Cost refers to ‘Standard Cost of Standard Quantity for Actual Output’
(#) = Direct Material Total Variance (also known as material cost variance)

Material Purchase Price Variance

[Standard Cost of Actual Quantity – Actual Cost]
(The difference between the Standard Price and Actual Price for the actual quantity of material purchased)

\[\text{Material Purchase Price Variance} = (\text{SP} - \text{AP}) \times \text{PQ}\]

Or

\[\text{Material Purchase Price Variance} = (\text{SP} \times \text{PQ}) - (\text{AP} \times \text{PQ})\]

Note:

PQ = Purchase Quantity
SP = Standard Price
AP = Actual Price
# Direct Labour Variances

## Direct Labour Total Variance

\[
\text{Direct Labour Total Variance} = (\text{Standard Cost} - \text{Actual Cost})
\]

(The difference between the Standard Direct Labour Cost and the Actual Direct Labour Cost incurred for the production achieved)

\[
((\text{SH} \times \text{SR}) - (\text{AH}^* \times \text{AR}))
\]

## Direct Labour Rate Variance

\[
\text{Direct Labour Rate Variance} = (\text{Standard Cost of Actual Time} - \text{Actual Cost})
\]

(The difference between the Standard Rate per hour and Actual Rate per hour for the Actual Hours paid)

\[
[(\text{SR} - \text{AR}) \times \text{AH}^*] \\
\text{Or} \\
[(\text{SR} \times \text{AH}^*) - (\text{AR} \times \text{AH}^*)]
\]

## Direct Labour Idle Time Variance

\[
\text{Direct Labour Idle Time Variance} = (\text{Standard Rate per Hour} \times \text{Actual Idle Hours})
\]

(The difference between the Actual Hours paid and Actual Hours worked at Standard Rate)

\[
[(\text{AH}^* - \text{AH}^#) \times \text{SR}] \\
\text{Or} \\
[(\text{AH}^* \times \text{SR}) - (\text{AH}^# \times \text{SR})]
\]

## Direct Labour Efficiency Variance

\[
\text{Direct Labour Efficiency Variance} = (\text{Standard Cost of Standard Time for Actual Production} - \text{Standard Cost of Actual Time})
\]

(The difference between the Standard Hours specified for actual production and Actual Hours worked at Standard Rate)

\[
((\text{SH} - \text{AH}^#) \times \text{SR}) \\
\text{Or} \\
((\text{SH} \times \text{SR}) - (\text{AH}^# \times \text{SR}))
\]

## Direct Labour Mix Variance

\[
\text{Direct Labour Mix Variance} = (\text{Standard Cost of Actual Time Worked in Standard Proportion} - \text{Standard Cost of Actual Time Worked})
\]

(The difference between the Actual Hours worked in standard proportion and Actual Hours worked in actual proportion, at Standard Rate)

\[
[(\text{RAH} - \text{AH}^#) \times \text{SR}] \\
\text{Or} \\
[(\text{RAH} \times \text{SR}) - (\text{AH}^# \times \text{SR})]
\]

## Direct Labour Yield Variance

\[
\text{Direct Labour Yield Variance} = (\text{Standard Cost of Standard Time for Actual Production} - \text{Standard Cost of Actual Time Worked} in Standard Proportion)
\]

(The difference between the Standard Hours specified for actual production and Actual Hours worked in standard proportion, at Standard Rate)

\[
((\text{SH} - \text{RAH}) \times \text{SR}) \\
\text{Or} \\
((\text{SH} \times \text{SR}) - (\text{RAH} \times \text{SR}))
\]

## Alternate Formula for Direct Labour Total Variance

\[
\text{Alternate Formula} = [\text{Total Actual Time Worked} (\text{hours}) \times \{\text{Average Standard Rate per hour of Standard Gang} \text{ Less Average Standard Rate per hour of Actual Gang}])
\]

@ on the basis of hours worked

## Alternate Formula for Direct Labour Efficiency Variance

\[
\text{Alternate Formula} = [\text{Average Standard Rate per hour of Standard Gang} \times \{\text{Total Standard Time} (\text{hours}) \text{ Less Total Actual Time Worked} (\text{hours})\}]
\]
Note:

- **SH** = Standard Hours = Expected time (Time allowed) for Actual Output
- **AH** = Actual Hours paid for
- **AH** = Actual Hours worked
- **RAH** = Revised Actual Hours = Actual Hours (worked) rewritten in Standard Proportion
- **SR** = Standard Rate per Labour Hour
- **AR** = Actual Rate per Labour Hour Paid
- **(2)** = Standard Cost refers to ‘Standard Cost of Standard Time for Actual Output’
- **(1)** = Direct Labour Total Variance (also known as labour cost variance)

In the absence of idle time

Actual Hours Worked = Actual Hours Paid

Idle Time is a period for which a workstation is available for production but is not used due to e.g. shortage of tooling, material, or operators. During Idle Time, Direct Labour Wages are being paid but no output is being produced. The cost of this can be identified separately in an Idle Time Variance, so that it is not ‘hidden’ in an adverse Labour Efficiency Variance.

Some organizations face Idle Time on regular basis. In this situation, the Standard Labour Rate may include an allowance for the cost of the expected idle time. Only the impact of any unexpected or abnormal Idle Time would be included in the Idle Time Variance.
Fixed Production Overhead Variances

Fixed Overhead Total Variance

\[(\text{Absorbed Fixed Overheads}) \text{ Less } (\text{Actual Fixed Overheads})\]

Fixed Overhead Expenditure Variance

\[(\text{Budgeted Fixed Overheads}) \text{ Less } (\text{Actual Fixed Overheads})\]

Fixed Overhead Volume Variance

\[(\text{Absorbed Fixed Overheads}) \text{ Less } (\text{Budgeted Fixed Overheads})\]

Fixed Overhead Capacity Variance

\[(\text{Budgeted Fixed Overheads for Actual Hours}) \text{ Less } \text{(Budgeted Fixed Overheads})\]

Fixed Overhead Efficiency Variance

\[(\text{Absorbed Fixed Overheads}) \text{ Less } \text{(Budgeted Fixed Overheads for Actual Hours})\]

Or

Fixed Overhead Capacity Variance

\[(\text{Budgeted Fixed Overheads for Actual Hours}) \text{ Less } \text{(Possible Fixed Overheads})\]

Fixed Overhead Calendar Variance

\[(\text{Possible Fixed Overheads}) \text{ Less } \text{(Budgeted Fixed Overheads})\]

Fixed Overhead Efficiency Variance

\[(\text{Absorbed Fixed Overhead}) \text{ Less } \text{(Budgeted Fixed Overheads for Actual Hours})\]

# Actual Hours (Worked)
Note:

**Standard Fixed Overheads for Production (Absorbed)**
= Standard Fixed Overhead Rate per Unit × Actual Production in Units
= Standard Fixed Overhead Rate per Hour × Standard Hours for Actual Production

**Budgeted Fixed Overheads**
= It represents the amount of fixed overhead which should be spent according to the budget or standard during the period
= Standard Fixed Overhead Rate per Unit × Budgeted Production in Units
= Standard Fixed Overhead Rate per Hour × Budgeted Hours

**Actual Fixed Overheads Incurred**

**Budgeted Fixed Overheads for Actual Hours**
= Standard Fixed Overhead Rate per Hour × Actual Hours

**Possible Fixed Overheads**
= Expected Fixed Overhead for Actual Days Worked
= Budgeted Fixed Overhead \( \times \) Actual Days

\(@\)
= Fixed Overhead Total Variance also known as ‘Fixed Overhead Cost Variance’

---

### Fixed Overhead Efficiency Variance

(Absorbed Fixed Overheads) – (Budgeted Fixed Overheads for Actual Hours)

Or

(Standard Fixed Overhead Rate per Hour \( \times \) Standard Hours for Actual Output) – (Standard Fixed Overhead Rate per Hour \( \times \) Actual Hours)

Or

Standard Fixed Overhead Rate per Hour \( \times \) (Standard Hours for Actual Output – Actual Hours)

---

### Fixed Overhead Capacity Variance

(Budgeted Fixed Overheads for Actual Hours) – (Budgeted Fixed Overheads)

Or

(Standard Fixed Overhead Rate per Hour \( \times \) Actual Hours) – (Standard Fixed Overhead Rate per Hour \( \times \) Budgeted Hours)

Or

Standard Fixed Overhead Rate per Hour \( \times \) (Actual Hours – Budgeted Hours)
### Fixed Overhead Volume Variance-I

(Absorbed Fixed Overheads) – (Budgeted Fixed Overheads)  
Or  
(Standard Fixed Overhead Rate per Unit × Actual Output) – (Standard Fixed Overhead Rate per Unit × Budgeted Output)  
Or  
Standard Fixed Overhead Rate per Unit × (Actual Output – Budgeted Output)

### Fixed Overhead Volume Variance-II

(Absorbed Fixed Overheads) – (Budgeted Fixed Overheads)  
Or  
(Standard Fixed Overhead Rate per Hour × Standard Hours for Actual Output) – (Standard Fixed Overhead Rate per Hour × Budgeted Hours)  
Or  
Standard Fixed Overhead Rate per Hour × (Standard Hours for Actual Output – Budgeted Hours)  
Or  
Standard Fixed Overhead Rate per Hour × (Standard Hours per Unit × Actual Output – Standard Hours per Unit × Budgeted Output)  
Or  
(Standard Fixed Overhead Rate per Hour × Standard Hours per Unit) × (Actual Output – Budgeted Output)  
Or  
Standard Fixed Overhead Rate per Unit × (Actual Output – Budgeted Output)

Overhead Variances can also be affected by idle time. It is usually assumed that Overheads are incurred when labour is working, not when it is idle. Accordingly, **hours worked** has been considered for the calculation of Variable and Fixed Overheads Variances.
Variable Production Overhead Variances

**Variable Overhead Total Variance**

(Standard Variable Overheads for Production – Actual Variable Overheads)

**Variable Overhead Expenditure (Spending) Variance**

(Budgeted Variable Overheads for Actual Hours)

Less

(Actual Variable Overheads)

**Variable Overhead Efficiency Variance**

(Standard Variable Overheads for Production)

Less

(Budgeted Variable Overheads for Actual Hours)

*Note:*

**Standard Variable Overheads for Production/Charged to Production**

= Standard/Budgeted Variable Overhead Rate per Unit × Actual Production (Units)

= Standard Variable Overhead Rate per Hour × Standard Hours for Actual Production

**Actual Overheads Incurred**

**Budgeted Variable Overheads for Actual Hours**

= Standard Variable Overhead Rate per Hour × Actual Hours

(\(^{(*)}\))

= Variable Overhead Total Variance also known as ‘Variable Overhead Cost Variance’

**Variable Overhead Efficiency Variance**

(Standard Variable Overheads for Production) – (Budgeted Overheads for Actual Hours)

Or

(Standard Variable Overhead Rate per Hour × Standard Hours for Actual Output) – (Standard Variable Overhead Rate per Hour × Actual Hours)

Or

Standard Variable Overhead Rate per Hour × (Standard Hours for Actual Output – Actual hours)

**Variable Overhead Expenditure Variance**

(Budgeted Variable Overheads for Actual Hours) – (Actual Variable Overheads)

Or

(Standard Rate per Hour × Actual Hours) – (Actual Rate per Hour × Actual Hours)

Or

Actual Hours × (Standard Rate per Hour – Actual Rate per Hour)
Planning & Operational Variances- A Planning Variance simply compares a revised standard to the original standard.

An Operational Variance simply compares the actual results against the revised amount.

Operating variances would be calculated after the planning variances have been established and are thus a realistic way of assessing performance.

Controllable Variances are those variances which arises due to inefficiency of a cost centre /department. Uncontrollable Variances are those variances which arises due to factors beyond the control of the management or concerned department of the organization.

Variance Analysis in Activity Based Costing - Variance analysis can be applied to activity costs (such as setup costs) to gain insight into why actual activity costs differ from activity costs in the static budget or in the flexible budget. Interpreting cost variances for different activates requires understanding whether the costs are output unit-level, batch level, product sustaining, or facility sustaining costs.

Variance Analysis in Advanced Manufacturing Environment/ High Technology Firms - In the high-technology environment, large part of manufacturing process is computerized. Many costs that once were largely variable have become fixed, most becoming committed fixed cost. Some high technology manufacturing organizations have found that the two largest variable costs involve materials and power to operate machines. In these companies, the emphasis of variance analysis is placed on direct materials and variable manufacturing overhead. For these firms labour variances may no longer be meaningful because direct labour is a committed cost, not a cost expected to vary with output.

Impact of Learning Curve - Learning curve is a geometrical progression, which reveals that there is steadily decreasing cost for the accomplishment of a given repetitive operation, as the identical operation is increasingly repeated. The amount of decrease will be less and less with each successive unit produced. Automated manufacturing is unlikely to have much variation or to display a regular learning curve. In less-automated processes, however, where learning curves do occur, it is important to take the resulting decline in labour hours and costs into account in setting standards, determining prices, planning production, or setting up work schedules.

Investigation of Variances - An investigation should only be undertaken if the benefits expected from the investigation exceeds the costs of searching for and correcting the source of the variance. Interpretation may suggest possible cause of variances but investigation must arrive at definite conclusions about the cause of the variance so that action to correct the variance can be effective.
- **Relevant Cost Approach** to Variance Analysis is used if inputs are limited. Failure to use limited inputs properly leads not only to increased acquisition cost but also to a lost contribution. Therefore, it is necessary to consider the lost contribution in variance analysis. When this approach is used, price or expenditure variances are not affected.

- **Standard Costing in Service Sector** - Use of activity based costing can provide a constructive basis for variance analysis of overheads in service sector organizations.

- **McDonaldization** – Breaking tasks into smallest possible units and rationalising them to find the single most efficient method for completing each task. All other tasks are discarded. Standards can be more accurately set and assessed. Helpful in services like hairdressing, dentistry, or opticians’ services.

- **Behavioural Issues of Standard Costing** – Focus on short term, sub-optimal behaviour of the employees like incorporation of budget slacks. These issues can be overcome by involving employees in budget preparation and taking a long-term view of organisation strategy incorporating various qualitative and quantitative measures.

- **Possible Interdependence between Variances** – Using cheaper materials will result in a favourable material price variance, but using the cheaper material in production might increase the wastage rate (adverse material usage) and cause a fall in labour productivity (adverse labour and variable overhead efficiency). A more expensive mix of materials (adverse mix variance) might result in higher output yields (favourable yield variance).

Using more experienced labour to do the work will result in an adverse labour rate variance, but productivity might be higher as a result (favourable labour and variable overhead efficiency).

- Standard costing may be inappropriate in the modern production environment because: products may not be standardised, get outdated quickly, automation of production, emphasis on continuous improvement, delay in problem solving.
Planning and Operational Variances

1. Managing Director of Petro-KL Ltd (PTKLL) thinks that Standard Costing has little to offer in the reporting of material variances due to frequently change in price of materials.

PTKLL can utilize one of two equally suitable raw materials and always plan to utilize the raw material which will lead to cheapest total production costs. However, PTKLL is frequently trapped by price changes and the material actually used often provides, after the event, to have been more expensive than the alternative which was originally rejected.

During last accounting period, to produce a unit of ‘P’ PTKLL could use either 2.50 Kg of ‘PG’ or 2.50 kg of ‘PD’. PTKLL planned to use ‘PG’ as it appeared it would be cheaper of the two and plans were based on a cost of ‘PG’ of ₹1.50 per Kg. Due to market movements, the actual prices changed and if PTKLL had purchased efficiently the cost would have been:

‘PG’ ₹2.25 per Kg;
‘PD’ ₹2.00 per Kg

Production of ‘P’ was 1,000 units and usage of ‘PG’ amounted to 2,700 Kg at a total cost of ₹6,480/-

Required

CALCULATE the material variance for ‘P’ by:

(i) Traditional Variance Analysis; and
(ii) An approach which distinguishes between Planning and Operational Variances.

2. Ski Slope had planned, when it originally designed its budget, to buy its artificial ice for ₹10/ per kg. However, due to subsequent innovations in technology, producers slashed their prices to ₹9.70 per kg, and this figure is now considered to be a general market price for the purpose of performance assessment for the budget period. The actual price paid was ₹9.50, as the Ski Slope procurement department negotiated strongly for a better price. The other information relating to that period were as follows:

<table>
<thead>
<tr>
<th>Original Standards (ex-ante)</th>
<th>Revised Standards (ex-post)</th>
<th>Actual (5,500 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,500 units × 5 Kgs. × ₹10</td>
<td>5,500 units × 4.75 Kgs. × ₹9.75</td>
<td>27,225 Kgs. × ₹9.50</td>
</tr>
<tr>
<td>₹2,75,000</td>
<td>₹2,53,412.50</td>
<td>₹2,58,637.50</td>
</tr>
</tbody>
</table>

Required

(i) CALCULATE the variances for ‘Ice’ by

(a) Traditional Variance Analysis; and
(b) An approach which distinguishes between Planning and Operational Variances.

(ii) INTERPRET the result.
3. KONY Ltd., based in Kuala Lumpur, is the Malaysian subsidiary of Japan’s NY corporation, headquartered in Tokyo. KONY’s principal Malaysian businesses include marketing, sales, and after-sales service of electronic products & software exports products. KONY set up a new factory in Penang to manufacture and sell integrated circuit ‘Q50X-N’. The first quarter’s budgeted production and sales were 2,000 units. The budgeted sales price and standard costs for ‘Q50X-N’ were as follows:

<table>
<thead>
<tr>
<th></th>
<th>RM</th>
<th>RM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Sales Price per unit</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Standard Costs per unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit X (10 units @ RM 2.5)</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Circuit Designers (6 hrs. @ RM 2)</td>
<td>12 (37)</td>
<td></td>
</tr>
<tr>
<td>Standard Contribution per unit</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

Actual results for the first quarter were as follows:

<table>
<thead>
<tr>
<th></th>
<th>RM ’000</th>
<th>RM ’000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (2,000 units)</td>
<td></td>
<td>158</td>
</tr>
<tr>
<td>Production Costs (2,000 units)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit X (21,600 units)</td>
<td>97.20</td>
<td></td>
</tr>
<tr>
<td>Circuit Designers (11,600 hours)</td>
<td>34.80</td>
<td>(132)</td>
</tr>
<tr>
<td>Actual Contribution (2,000 units)</td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

The management accountant made the following observations on the actual results—“In total, the performance agreed with budget; however, in every aspect other than volume, there were huge differences. Sales were made at what was supposed to be the highest feasible price, but we now feel that we could have sold for RM 82.50 with no adverse effect on volume. The Circuit X cost that was anticipated at the time the budget was prepared was RM 2.5 per unit. However, the general market price relating to efficient purchases of the Circuit X during the quarter was RM 4.25 per unit. Circuit designers have the responsibility of designing electronic circuits that make up electrical systems. Circuit Designer’s costs rose dramatically with increased demand for the specialist skills required to produce the ‘Q50X-N’, and the general market rate was RM 3.125 per hour - although KONY always paid below the normal market rate whenever possible. In my opinion, it is not necessary to measure the first quarter’s performance through variance analysis. Further, our operations are fully efficient as the final contribution is equal to the original budget.”

**Required**

COMMENT on management accountant’s view.
Reconciliation of Profit

4. Trident Toys Ltd. manufactures a single product and the standard cost system is followed. Standard cost per unit is worked out as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials (10 Kgs. @ ₹4 per Kg)</td>
<td>40</td>
</tr>
<tr>
<td>Labour (8 hours @ ₹8 per hour)</td>
<td>64</td>
</tr>
<tr>
<td>Variable overheads (8 hours @ ₹3 per hour)</td>
<td>24</td>
</tr>
<tr>
<td>Fixed overheads (8 hours @ ₹3 per hour)</td>
<td>24</td>
</tr>
<tr>
<td>Standard Profit</td>
<td>56</td>
</tr>
</tbody>
</table>

Overheads are allocated on the basis of direct labour hours. In the month of April 2019, there was no difference between the budgeted and actual selling price and there were no opening or closing stock during the period.

The other details for the month of April 2019 are as under:

<table>
<thead>
<tr>
<th></th>
<th>Budgeted</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production and Sales</td>
<td>2,000 Units</td>
<td>1,800 Units</td>
</tr>
<tr>
<td>Direct Materials</td>
<td>20,000 Kgs. @ ₹4 per Kg</td>
<td>20,000 Kgs. @ ₹4 per Kg</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>16,000 Hrs. @ ₹8 per Hr.</td>
<td>14,800 Hrs. @ ₹8 per Hr.</td>
</tr>
<tr>
<td>Variable Overheads</td>
<td>₹48,000</td>
<td>₹44,400</td>
</tr>
<tr>
<td>Fixed Overheads</td>
<td>₹48,000</td>
<td>₹48,000</td>
</tr>
</tbody>
</table>

**Required**

(i) RECONCILE the budgeted and actual profit with the help of variances according to each of the following method:

(A) The conventional method

(B) The relevant cost method assuming that

(a) Materials are scarce and are restricted to supply of 20,000 Kgs. for the period.

(b) Labour hours are limited and available hours are only 16,000 hours for the period.

(c) There are no scarce inputs.

(ii) COMMENT on efficiency and responsibility of the Sales Manager for not using scarce resources.

**Interpretation of Variances**

5. NZSCO Ltd. uses standard costing system for manufacturing its single product ‘ANZ’. Standard Cost Card per unit is as follows:
STANDARD COSTING

<table>
<thead>
<tr>
<th></th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Material (1 kg per unit)</td>
<td>20</td>
</tr>
<tr>
<td>Direct Labour (6 hrs @ ₹8 per hour)</td>
<td>48</td>
</tr>
<tr>
<td>Variable Overheads</td>
<td>24</td>
</tr>
</tbody>
</table>

Actual and Budgeted Activity Levels in units for the month of Feb’19 are:

<table>
<thead>
<tr>
<th></th>
<th>Budget</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>50,000</td>
<td>52,000</td>
</tr>
</tbody>
</table>

Actual Variable Costs for the month of Feb’19 are given as under:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Material</td>
<td>10,65,600</td>
</tr>
<tr>
<td>Direct Labour (3,00,000 hrs)</td>
<td>24,42,000</td>
</tr>
<tr>
<td>Variable Overheads</td>
<td>12,28,000</td>
</tr>
</tbody>
</table>

**Required**

INTERPRET Direct Labour Rate and Efficiency Variances.

6. T-tech is a Taiwan based firm, that designs, develops, and sells audio equipment. Founded in 1975 by Mr. Boss, firm sells its products throughout the world. T-tech is best known for its home audio systems and speakers, noise cancelling headphones, professional audio systems and automobile sound systems. Extracts from the budget are shown in the following table:

### Home Audio System Division

#### Jan’2019

<table>
<thead>
<tr>
<th>System</th>
<th>Sales (units)</th>
<th>Selling Price</th>
<th>Standard Cost (per System) (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000 W PMPO</td>
<td>1,500</td>
<td>18,750</td>
<td>12,500</td>
</tr>
<tr>
<td>5,000 W PMPO</td>
<td>500</td>
<td>50,000</td>
<td>26,250</td>
</tr>
</tbody>
</table>

The Managing Director has sent you a copy of an email he received from the Sales Manager ‘K’. The content of the email was as follows:

“We have had an outstanding month. There was an adverse Sales Price Variance on the 3,000 W PMPO Systems of ₹22,50,000 but I compensated for that by raising the price of 5,000 W PMPO Systems. Unit sales of 3,000 W PMPO Systems were as expected but sales of the 5,000 W PMPOs were exceptional and gave a Sales Margin Volume Variance of ₹23,75,000. I think I deserve a bonus!”

The managing Director has asked for your opinion on these figures. You got the following information:
Actual results for Jan’ 2019 were:

<table>
<thead>
<tr>
<th>System</th>
<th>Sales (units)</th>
<th>Selling Price ₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000 W PMPO</td>
<td>1,500</td>
<td>₹17,250</td>
</tr>
<tr>
<td>5,000 W PMPO</td>
<td>600</td>
<td>₹53,750</td>
</tr>
</tbody>
</table>

The total market demand for 3,000 W PMPO Systems was as budgeted but as a result of suppliers reducing the price of supporting UHD TV System the total market for 5,000 W PMPO Systems raised by 50% in Jan’2019.

The company had sufficient capacity to meet the revised market demand for 750 units of its 5,000 W PMPO Systems and therefore maintained its market share.

**Required**

(i) CALCULATE the following Operational Variances based on the revised market details:
   - Sales Margin Mix Variance
   - Sales Margin Volume Variance

(ii) COMMENT briefly on the measurement of the K’s performance.

**ANSWERS/ SOLUTIONS**

1. (i) **Traditional Variances**

   Usage Variance  
   \[ = (2,500 \text{ Kg} - 2,700 \text{ Kg}) \times ₹1.50 \]
   \[ = ₹300 \text{ (A)} \]

   Price Variance  
   \[ = (₹1.50 - ₹2.40) \times 2,700 \text{ Kg} \]
   \[ = ₹2,430 \text{ (A)} \]

   Total Variance  
   \[ = ₹300 \text{ (A)} + ₹2,430 \text{ (A)} \]
   \[ = ₹2,730 \text{ (A)} \]

(ii) **Operational Variances**

   Usage Variance  
   \[ = (2,500 \text{ Kg} - 2,700 \text{ Kg}) \times ₹2.25 \]
   \[ = ₹450 \text{ (A)} \]

   Price Variance  
   \[ = (₹2.25 - ₹2.40) \times 2,700 \text{ Kg} \]
   \[ = ₹405 \text{ (A)} \]

   Total Variance  
   \[ = ₹450 \text{ (A)} + ₹405 \text{ (A)} \]
   \[ = ₹855 \text{ (A)} \]
Planning Variances

Controllable Variance  
\[ = (\₹2.00 - \₹2.25) \times 2,500 \text{ Kg} \]
\[ = 625 (A) \]

Uncontrollable Variance  
\[ = (\₹1.50 - \₹2.00) \times 2,500 \text{ Kg} \]
\[ = 1,250 (A) \]

Total Variance  
\[ = \₹625 (A) + \₹1,250 (A) \]
\[ = \₹1,875 (A) \]

Reconciliation  
\[ = \₹855 (A) + \₹1,875 (A) \]
\[ = \₹2,730 (A) \]

A Planning Variance simply compares a revised standard to the original standard. An Operational Variance simply compares the actual results against the revised amount. Controllable Variances are those variances which arises due to inefficiency of a cost centre /department. Uncontrollable Variances are those variances which arises due to factors beyond the control of the management or concerned department of the organization.

Planning variances are generally not controllable. Where a revision of standards is required due to environmental/technological changes that were not anticipated at the time the budget was prepared, the planning variances are truly uncontrollable. However, standards that failed to anticipate known market trends when they were set will reflect faulty standard-setting: it could be argued that these variances were controllable at the planning stage.

2. (i) (a) Traditional Variances

Usage Variance  
\[ = (27,500 \text{ Kgs.} - 27,225 \text{ Kgs.}) \times \₹10 \]
\[ = \₹2,750 (F) \]

Price Variance  
\[ = (\₹10 - \₹9.50) \times 27,225 \text{ Kgs.} \]
\[ = \₹13,612.50 (F) \]

Total Variance  
\[ = \₹2,750 (F) + \₹13,612.50 (F) \]
\[ = \₹16,362.50 (F) \]

(b) Operational Variances

Usage Variance  
\[ = (26,125 \text{ Kgs.} - 27,225 \text{ Kgs.}) \times \₹9.70 \]
\[ = \₹10,670 (A) \]
Price Variance = (₹9.70 – ₹9.50) × 27,225 Kgs.
= ₹5,445 (F)

Total Variance = ₹10,670 (A) + ₹5,445 (F)
= ₹5,225 (A)

**Planning Variances**

Usage Variance = (27,500 Kgs. – 26,125 Kgs.) × ₹10
= ₹13,750 (F)

Price Variance = (₹10 – ₹9.70) × 26,125 Kgs.
= ₹7,837.50 (F)

Total Variance = ₹13,750 (F) + ₹7,837.50 (F)
= ₹21,587.50 (F)

(ii) **Interpretation**

It is important to note that an innovation in technology is outside the control of Ski Slope and is, by nature, a planning ‘error’. Equally, the better negotiation of a price should be recognised as an operational matter. Operational variances are self-evidently under the control of operational management, so operational efficiency must be assessed with only these figures in mind. The material procurement department has clearly done well by negotiating a price reduction beyond the market dip. One might question the quality of the ice, as the usage variance is adverse (possibly the ice fails to cover the field and so more is required). Obviously, the favourable price variance is smaller than the adverse usage variance, thus, overall performance is quite poor. A supervisor cannot assess variances in isolation from each other.

3. **Comment**

As the management accountant states, and the analysis (W.N.1) presents, the overall variance for the KONI is nil. The cumulative adverse variances exactly offset the favourable variances i.e. sales price variance and circuit designer’s efficiency variance. However, this traditional analysis does not clearly show the efficiency with which the KONI operated during the quarter, as it is difficult to say whether some of the variances arose from the use of incorrect standards, or whether they were due to efficient or inefficient application of those standards.

In order to determine this, a revised ex post plan should be required, setting out the standards that, with hindsight, should have been in operation during the quarter. These revised ex post standards are presented in W.N.2.

As seen from W.N.3, on the cost side, the circuit designer’s rate variance has changed from adverse to favourable, and the price variance for component X, while remaining adverse, is significantly reduced in comparison to that calculated under the traditional analysis (W.N.1); on the sales side, sales price variance, which was particularly large and favourable in the tra-
ditional analysis (W.N.1), is changed into an adverse variance in the revised approach, reflecting the fact that the KONI failed to sell at prices that were actually available in the market.

Further, variances arose from changes in factors external to the business (W.N .4), which might not have been known or acknowledged by standard-setters at the time of planning are beyond the control of the operational managers. The distinction between variances is necessary to gain a realistic measure of operational efficiency.

W.N.1

KONY India Ltd.

Quarter-1

Operating Statement

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Favourable RM</th>
<th>Adverse RM</th>
<th>RM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted Contribution</td>
<td></td>
<td></td>
<td>26,000</td>
</tr>
<tr>
<td>Sales Price Variance [(RM 79 - RM 50) × 2,000 units]</td>
<td>58,000</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Circuit X Price Variance [(RM 2.50 − RM 4.50) × 21,600 units]</td>
<td></td>
<td>43,200</td>
<td></td>
</tr>
<tr>
<td>Circuit X Usage Variance [(20,000 units - 21,600 units) × RM 2.50]</td>
<td></td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>Circuit Designer’s Rate Variance [(RM 2 - RM 3) × 11,600 hrs.]</td>
<td></td>
<td>11,600</td>
<td></td>
</tr>
<tr>
<td>Circuit Designer’s Efficiency Variance [(12,000 hrs. - 11,600 hrs.) × RM 2.00]</td>
<td></td>
<td>800</td>
<td>NIL</td>
</tr>
<tr>
<td>Actual Contribution</td>
<td></td>
<td></td>
<td>26,000</td>
</tr>
</tbody>
</table>

W.N.2

Statement Showing Original Standards, Revised Standards, and Actual Results for Quarter 1

<table>
<thead>
<tr>
<th></th>
<th>Original Standards (ex-ante)</th>
<th>Revised Standards (ex-post)</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>2,000 units × RM 50.00</td>
<td>2,000 units × RM 82.50</td>
<td>2,000 units × RM 79.00</td>
</tr>
<tr>
<td>Circuit X</td>
<td>20,000 units × RM 2.50</td>
<td>20,000 units × RM 4.25</td>
<td>21,600 units × RM 4.50</td>
</tr>
<tr>
<td>Circuit Designer</td>
<td>12,000 hrs. × RM 2.00</td>
<td>12,000 hrs. × RM 3.125</td>
<td>11,600 hrs. × RM 3.00</td>
</tr>
</tbody>
</table>
W.N.3
Statement Showing Operational Variances

<table>
<thead>
<tr>
<th>Particulars</th>
<th>(₹)</th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Variances</td>
<td></td>
<td>16,500 (A)</td>
</tr>
<tr>
<td>Sales Price [(RM 79.00 - RM 82.50) × 2,000 units]</td>
<td>7,000 (A)</td>
<td></td>
</tr>
<tr>
<td>Circuit X Price [(RM 4.25 - RM 4.50) × 21,600 units]</td>
<td>5,400 (A)</td>
<td></td>
</tr>
<tr>
<td>Circuit X Usage [(20,000 units – 21,600 units) × RM 4.25]</td>
<td>6,800 (A)</td>
<td></td>
</tr>
<tr>
<td>Circuit Designer Rate [(RM 3.125 - RM 3.00) × 11,600 hrs.]</td>
<td>1,450 (F)</td>
<td></td>
</tr>
<tr>
<td>Circuit Designer Efficiency [(12,000 hrs. – 11,600 hrs.) × RM 3.125]</td>
<td>1,250 (F)</td>
<td></td>
</tr>
</tbody>
</table>

W.N.4
Statement Showing Planning Variances

<table>
<thead>
<tr>
<th>Particulars</th>
<th>(₹)</th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Variance</td>
<td></td>
<td>16,500 (F)</td>
</tr>
<tr>
<td>Sales Price [(RM 82.50 - RM 50.00) × 2,000 units]</td>
<td>65,000 (F)</td>
<td></td>
</tr>
<tr>
<td>Circuit X Price [(RM 2.50 - RM 4.25) × 20,000 units]</td>
<td>35,000 (A)</td>
<td></td>
</tr>
<tr>
<td>Circuit Designer Rate [(RM 2.00 - RM 3.125) × 12,000 hrs.]</td>
<td>13,500 (A)</td>
<td></td>
</tr>
</tbody>
</table>

4. (i) Computation of Variances

Material Usage Variance = Standard Price × (Standard Quantity – Actual Quantity)
= ₹4.00 × (18,000* Kgs. – 20,000 Kgs.)
= ₹8,000 (A)

* (1,800 units × 20,000 Kgs.)

2,000 units

Labour Efficiency Variance = Standard Rate × (Standard Hours – Actual Hours)
= ₹8.00 × (14,400* hrs. – 14,800 hrs.)
= ₹3,200 (A)

* (1,800 units × 16,000 hrs.)

2,000 units

Variable Overhead Efficiency Variance
= Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual hours
STANDARD COSTING

\[ (14,400 \text{ hrs.} \times ₹3.00) - (₹3.00 \times 14,800 \text{ hrs.}) = ₹1,200 \ (A) \]

Fixed Overhead Volume Variance

\[ = \text{Absorbed Fixed Overheads} - \text{Budgeted Fixed Overheads} \]
\[ = (14,400 \text{ hrs.} \times ₹3.00) - (16,000 \text{ hrs.} \times ₹3.00) \]
\[ = ₹4,800 \ (A) \]

Sales Margin Volume Variance

\[ = \text{Standard Margin} - \text{Budgeted Margin} \]
\[ = (1,800 \text{ units} \times ₹56.00) - (2,000 \text{ units} \times ₹56.00) \]
\[ = ₹11,200 \ (A) \]

Sales Contribution Volume Variance

\[ = \text{Standard Contribution} - \text{Budgeted Contribution} \]
\[ = (1,800 \text{ units} \times ₹80.00) - (2,000 \text{ units} \times ₹80.00) \]
\[ = ₹16,000 \ (A) \]

Statement Showing “Reconciliation Between Budgeted Profit & Actual Profit”

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Conv. Method (₹)</th>
<th>Relevant Cost Method (₹)</th>
<th>Scarce Material</th>
<th>Scarce Labour</th>
<th>No Scarce Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted Profit (2,000 units × ₹56)</td>
<td>1,12,000</td>
<td>1,12,000</td>
<td>1,12,000</td>
<td>1,12,000</td>
<td></td>
</tr>
<tr>
<td>Sales Volume Variance</td>
<td>11,200 (A)</td>
<td>NIL*</td>
<td>12,000 (A)</td>
<td>16,000 (A)</td>
<td></td>
</tr>
<tr>
<td>Material Usage Variance</td>
<td>8,000 (A)</td>
<td>24,000 (A)</td>
<td>8,000 (A)</td>
<td>8,000 (A)</td>
<td></td>
</tr>
<tr>
<td>Labour Efficiency Variance</td>
<td>3,200 (A)</td>
<td>3,200 (A)</td>
<td>7,200 (A)</td>
<td>3,200 (A)</td>
<td></td>
</tr>
<tr>
<td>Variable Overhead Efficiency Variance</td>
<td>1,200 (A)</td>
<td>1,200 (A)</td>
<td>1,200 (A)</td>
<td>1,200 (A)</td>
<td></td>
</tr>
<tr>
<td>Fixed Overhead Volume Variance</td>
<td>4,800 (A)</td>
<td>N.A.#</td>
<td>N.A. #</td>
<td>N.A. #</td>
<td></td>
</tr>
<tr>
<td>Actual Profit</td>
<td>83,600</td>
<td>83,600</td>
<td>83,600</td>
<td>83,600</td>
<td></td>
</tr>
</tbody>
</table>
Notes

Scarce Material

Based on conventional method, direct material usage variance is ₹8,000 (A) i.e. 2,000 Kg. × ₹4. In this situation material is scarce, and, therefore, material cost variance based on relevant cost method should also include contribution lost per unit of material. Excess usage of 2,000 Kg. leads to lost contribution of ₹16,000 i.e. 2,000 Kgs. × ₹8. **Total material usage variance based on relevant cost method, when material is scarce will be:** ₹8,000 (A) + ₹16,000 (A) = ₹24,000 (A). Since labour is not scarce, labour variances are identical to conventional method.

Excess usage of 2,000 Kgs. leads to loss of contribution from 200 units i.e. ₹16,000 (200 units × ₹80). It is not the function of the sales manager to use material efficiently. Hence, loss of contribution from 200 units should be excluded while computing sales contribution volume variance.

(*) → 

Therefore, sales contribution volume variance, when materials are scarce will be NIL i.e. ₹16,000 (A) - ₹16,000 (A).

Scarce Labour

Material is no longer scarce, and, therefore, the direct material variances are same as in conventional method. In conventional method, excess labour hours used are: 14,400 hrs. – 14,800 hrs. = 400 hrs. Contribution lost per hour = ₹10. Therefore, total contribution lost, when labour is scarce will be: 400 hrs. × ₹10 = ₹4,000. **Therefore, total labour efficiency variance, when labour hours are scarce will be** ₹7,200 (A) i.e. ₹3,200 (A) + ₹4,000 (A).

Excess usage of 400 hrs. leads to loss of contribution from 50 units i.e. ₹4,000 (50 units × ₹80). It is not the function of the sales manager to use labour hours efficiently. Hence, loss of contribution from 50 units should be excluded while computing sales contribution volume variance.

($) → 

Therefore, sales contribution volume variance, when labour hours are Scarce will be ₹12,000 (A) i.e. ₹16,000 (A) - ₹4,000 (A).

Fixed Overhead Volume Variance

(#) → 

The fixed overhead volume variance does not arise in marginal costing system. In absorption costing system, it represents the value of the under or over absorbed fixed overheads due to change in production volume. When marginal costing is in use there is no overhead volume variance, because marginal costing does not absorb fixed overheads.
(ii) **Comment on Efficiency and Responsibility of the Sales Manager**

In general, Gross Profit (or contribution margin) is the joint responsibility of sales managers as well as of production managers. *On one hand the sales manager is responsible for the sales revenue part, on the other hand the production manager is accountable for the cost-of-goods-sold component.* However, it is the top management who needs to ensure that the target profit is achieved by the organization. *The sales manager is accountable for prices, volume, and mix of the product, whereas the production manager must control the costs of materials, labour, factory overheads and quantities of production. The purchase manager must purchase materials at budgeted prices. The personnel manager must employ right people at the right place with appropriate wage rates.* The internal audit manager must ensure that the budgetary figures for sales and costs are being adhered by all departments which are directly or indirectly involved in contribution of making profit. Thus, sales manager is not responsible for contribution lost due to excess usage or inefficient usage of resources in case of scarce resources. Hence, such contribution lost must be excluded from the sales contribution volume variance.

5. **Interpretation**

**Direct Labour Rate Variance**

Adverse Labour Rate Variance indicates that the labour rate per hour paid is more than the set standard. The reason may include among other things such as:

(1) While setting standard, the current/ future market conditions like pending labour negotiation/ cases, has not been considered (or predicted) correctly.

(2) The labour may have been told that their wage rate will be raised or bonus will be paid if they work efficiently.

**Direct Labour Efficiency Variance**

It indicates that the workers have produced actual production quantity in less time than the time allowed. The reason for favourable labour efficiency variance may include among the other things as follows:

(1) While setting standard, workers efficiency could not be estimated properly, this may happen due to non-observance of time and motion study.

(2) The workers may be new in the factory, hence, efficiency could not be predicated properly.

(3) The foreman or personnel manager responsible for labour efficiency, while providing his/ her input at the time of budget/ standard, has adopted conservative approach.

(4) The increase in the labour rate might have encouraged the labours to do work more efficiently.
In this particular case, it may have happened that since labour payment has been increased, labour efficiency has also been increased. In a nutshell because of additional labour rate (Adverse), labour efficiency has gone up (Favourable)

**Workings**

**Labour Rate Variance**

\[
\text{Labour Rate Variance} = \text{Standard Cost of Actual Time} - \text{Actual Cost}
\]

\[
= (SR \times AH) - (AR \times AH)
\]

\[
\text{Or}
\]

\[
= (SR - AR) \times AH
\]

\[
= (\text{रू} 8.00 - \text{रू} 8.14) \times 3,00,000 \text{ hrs.}
\]

\[
= \text{रू} 42,000 \text{ (A)}
\]

(*)

**Actual Labour Rate per hour**

\[
= \frac{\text{ActualPaid}}{\text{ActualHours}}
\]

\[
= \frac{\text{रू} 24,42,000}{3,00,000 \text{ hrs.}}
\]

\[
= \text{रू} 8.14
\]

**Labour Efficiency Variance**

\[
\text{Labour Efficiency Variance} = \text{Standard Cost of Standard Time for Actual Production} - \text{Standard Cost of Actual Time}
\]

\[
= (SH \times SR) - (AH \times SR)
\]

\[
\text{Or}
\]

\[
= (SH - AH) \times SR
\]

\[
= (3,12,000^\text{s} \text{ hrs.} - 3,00,000 \text{ hrs.}) \times \text{रू} 8.00
\]

\[
= \text{रू} 96,000 \text{ (F)}
\]

($) 

**Standard Hours**

\[
= \text{Actual Production} \times \text{Std. hrs. per unit}
\]

\[
= 52,000 \text{ units} \times 6 \text{ hrs.}
\]

\[
= 3,12,000 \text{ hrs.}
\]
6. (i) Statement Showing Sales Margin Mix Variance

<table>
<thead>
<tr>
<th>System</th>
<th>Standard Margin per unit (₹)</th>
<th>Actual Qty. (units)</th>
<th>Revised Actual Quantity (units)</th>
<th>Difference (₹)</th>
<th>Variance (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000 W PMPO</td>
<td>6,250</td>
<td>1,500</td>
<td>1,400</td>
<td>+100</td>
<td>+6,25,000 (F)</td>
</tr>
<tr>
<td>5,000 W PMPO</td>
<td>23,750</td>
<td>600</td>
<td>700</td>
<td>-100</td>
<td>23,75,000 (A)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,100</td>
<td></td>
<td></td>
<td>17,50,000 (A)</td>
</tr>
</tbody>
</table>

Statement Showing Sales Margin Volume Variance

<table>
<thead>
<tr>
<th>System</th>
<th>Standard Margin per unit (₹)</th>
<th>Actual Qty. (units)</th>
<th>Budgeted Quantity (units)</th>
<th>Difference (₹)</th>
<th>Variance (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000 W PMPO</td>
<td>6,250</td>
<td>1,500</td>
<td>1,500</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>5,000 W PMPO</td>
<td>23,750</td>
<td>600</td>
<td>750</td>
<td>-150</td>
<td>35,62,500 (A)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,100</td>
<td></td>
<td></td>
<td>35,62,500 (A)</td>
</tr>
</tbody>
</table>

(ii) A Planning Variance simply compares a revised standard (that should or would have been used if planners had known in advance what was going to happen) to the original standard. A planning variance is considered as not to be controllable by management.

The market size is not within the control of the sales manager and therefore variances caused by changes in the market size would be regarded as planning variances.

However, variances caused by changes in the selling prices and consequently the selling price variances and market shares would be within the control of the sales manager and treated as operating variances.

The market size variance compares the original and revised market sizes. This is unchanged for 3,000 W PMPO Systems so the only variance that occurs relates to the 5,000 W PMPO Systems and is ₹59,37,500 (F) [250 systems × ₹23,750].

It is vital to make this distinction because as can be seen from the scenario the measurement of the ‘K’ s performance is incomplete if the revised market size is ignored.

The favourable volume variance of ₹23,75,000 referred to in the ‘K’ s e-mail is made up of two elements, one of which, the market size, is a planning variance which is outside his control. It is this that has caused the overall volume variance to be favourable, and thus ‘K’ is not responsible for the overall favourable performance.