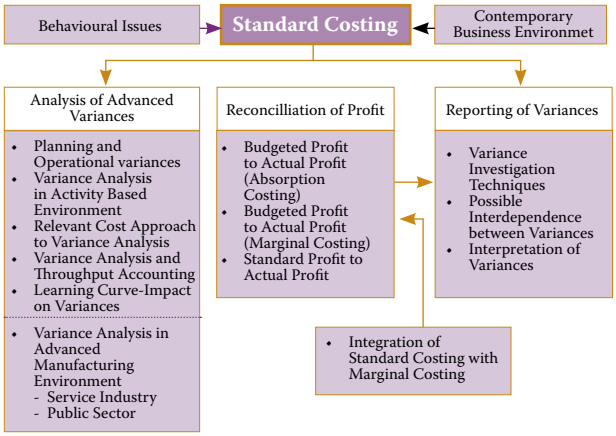
"Competition on dimensions other than price—on product features, support services, delivery time, or brand image, for instance—is less likely to erode profitability because it improves customer value and can support higher prices."

– Michael Porter

Strategic issues are increasingly becoming important, cost management has transformed from a traditional role of product costing and operational control to a broader, strategic focus. Strategic Cost Management (SCM) requires that professional accountants hold new skills that extend *beyond their traditional practices*. They must collaborate with corporate strategists in creating, managing, and protecting value. SCM emphases on developing, implementing and monitoring strategies in order to *enhance value for the organization*. Such a focus *would not be possible without* understanding the key role that *Performance Management* plays in strategy and value creation. Syllabus links strategy, management control systems and performance management. The various models of performance management, the strategy mapping process, as well as flowing performance measures in performance management, are part of the curriculum.

STANDARD COSTING

CHAPTER OVERVIEW



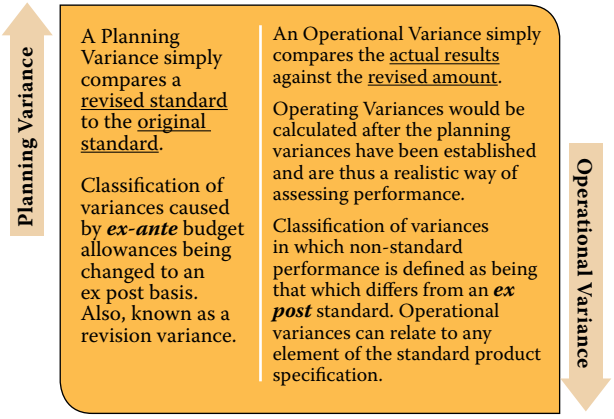
ANALYSIS OF ADVANCED VARIANCES

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 & 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.

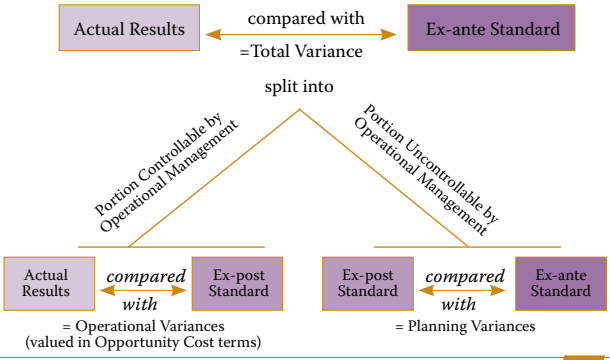


Standard ex ante

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.



Direct Material Usage Variance

Traditional Variance
Actual vs. Original Standard
[Standard Quantity – Actual Quantity] × Standard Price

Planning Variance
Revised Standard vs. Original Standard
[Standard Quantity – Revised Standard Quantity] × Standard Price

Operational Variance
Actual vs. Revised Standard
[Revised Standard Quantity – Actual Quantity] × *Revised Standard Price*

Direct Material Price Variance

Traditional Variance
Actual vs. Original Standard
[Standard Price – Actual Price] × Actual Quantity

Planning Variance
Revised Standard vs. Original Standard
[Standard Price – Revised Standard Price] × *Revised Standard Quantity*

Operational Variance
Actual vs. Revised Standard
[Revised Standard Price – Actual Price] × 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.

Direct Labour Efficiency Variance

Traditional Variance
Actual vs. Original Standard
[Standard Time – Actual Time] × Standard Rate

Planning Variance
Revised Standard vs. Original Standard
[Standard Time – Revised Standard Time] × Standard Rate

Operational Variance
Actual vs. Revised Standard
[Revised Standard Time – Actual Time] × *Revised Standard Rate*

Direct Labour Rate Variance

Traditional Variance
Actual vs. Original Standard
[Standard Rate – Actual Rate] × Actual Time

Planning Variance
Revised Standard vs. Original Standard
[Standard Rate – Revised Standard Rate] × *Revised Standard Time*

Operational Variance
Actual vs. Revised Standard
[Revised Standard Rate – Actual Rate] × Actual Time

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 will 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 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.

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[2].

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[3].

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[4].

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 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.

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 operatio*n 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[5]

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.

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.

Standard Costing in Public Sector[6]

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)

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.

RECONCILIATION OF PROFIT

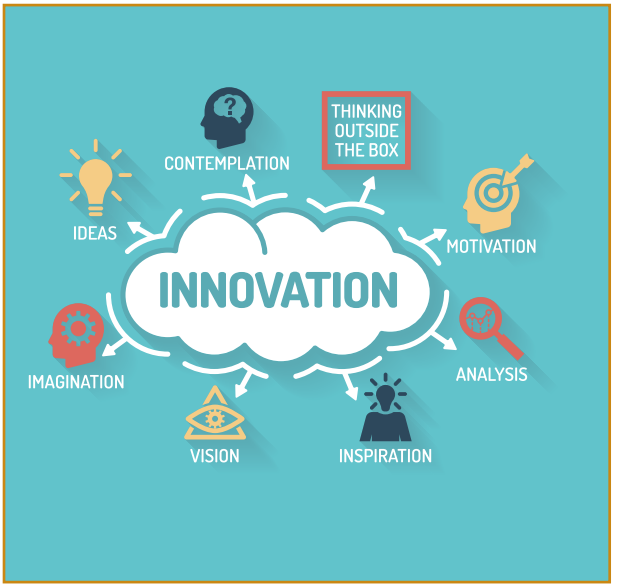
Generally, under variance analysis we compute various variances from the actual and the standard/budgeted data. Sometimes all or a few variances and actual data are made available and from that we are required to prepare standard product cost sheet, original budget and to reconcile the budgeted profit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

Reconciliation Statement-I
Budgeted Profit to Actual Profit (Absorption Costing)

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 Margin Variances (in terms of Profit)				
Sales Margin Price Variance		☐		
Sales Margin Volume Variance				
Sales Margin Mix Variance	☐			
Sales Margin Quantity Variance	☐	☐	☐	☐
Actual Profit				☐

Reconciliation Statement-II
Budgeted Profit to Actual Profit (Marginal Costing)

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	NA			
Fixed Overhead Efficiency Variance	NA	NA	☐	
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				
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 Variance (in terms of Profit)				
Sales Margin Price Variance		☐		
Sales Margin Volume Variance				
Sales Margin Mix Variance	NA			
Sales Margin Quantity Variance	NA	NA	☐	☐
Actual Profit				☐

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 undertaken 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 Investigating Variance[7]

Simple Rule of Thumb Model

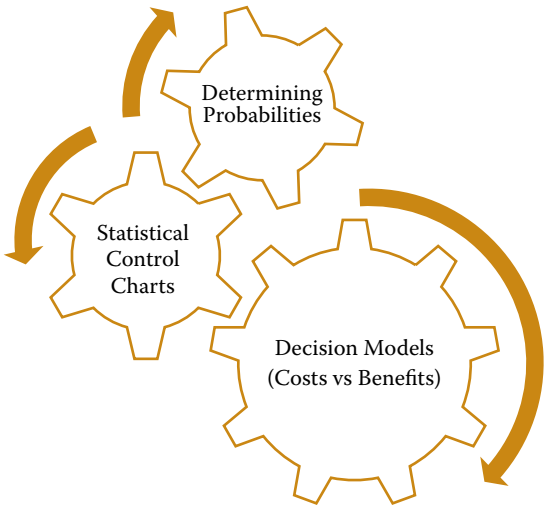
It is based on arbitrary criteria such as investigating if the absolute size of a variance is greater than a certain amount or if the ratio of the variance to the total cost exceeds some predetermined percentage. They are based on *managerial judgement* and do not consider statistical significance.

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.

$$Z = \frac{x-\mu}{\sigma}$$

$$Z = \frac{3.00 - 2.50}{0.25}$$

$$Z = 2.0$$

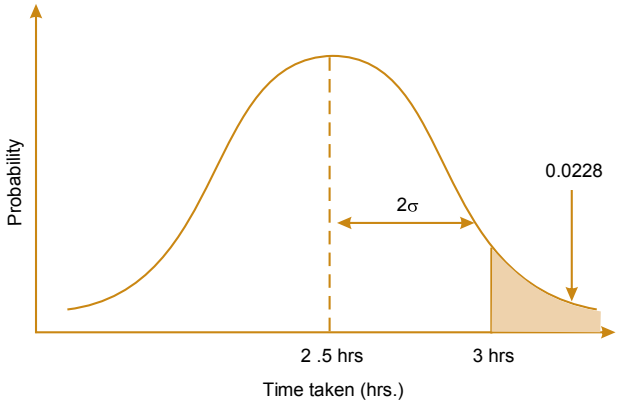
$$P\ (Z = 2.0) = 0.9772$$

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 falls to the right of $\mu+2\sigma$. 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*.

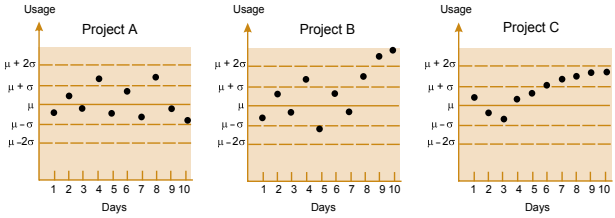
The past observations are used to estimate the population mean and the population standard deviation σ. Assuming that the distribution of possible outcomes is normal, then, when the process is under control, we should expect

68.27% of the observations to fall within the range μ+ σ from the mean;

95.45% of the observations to fall within the range μ+ 2σ from the mean;

99.8% of the observations to fall within the range μ+ 3σ from the mean.

For example, if control limits are set based on 2σ 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 2σ control limits is out of control.



Above Figure shows three control charts, with the outer horizontal lines representing a possible control limit of 2σ, 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 *probability* that the process is 'Out of Control'

B is the *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 *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 *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 > 25/ 100 *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.

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.

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.

Labour Rate Variance

- Change in the *composition* of the workforce can impact direct labour costs.

Labour Efficiency Variance

- *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.

Fixed Overhead Variance

- 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 Variance

- 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.*
- 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.*

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:-

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

BEHAVIOURAL ISSUES[8]

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 an 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.

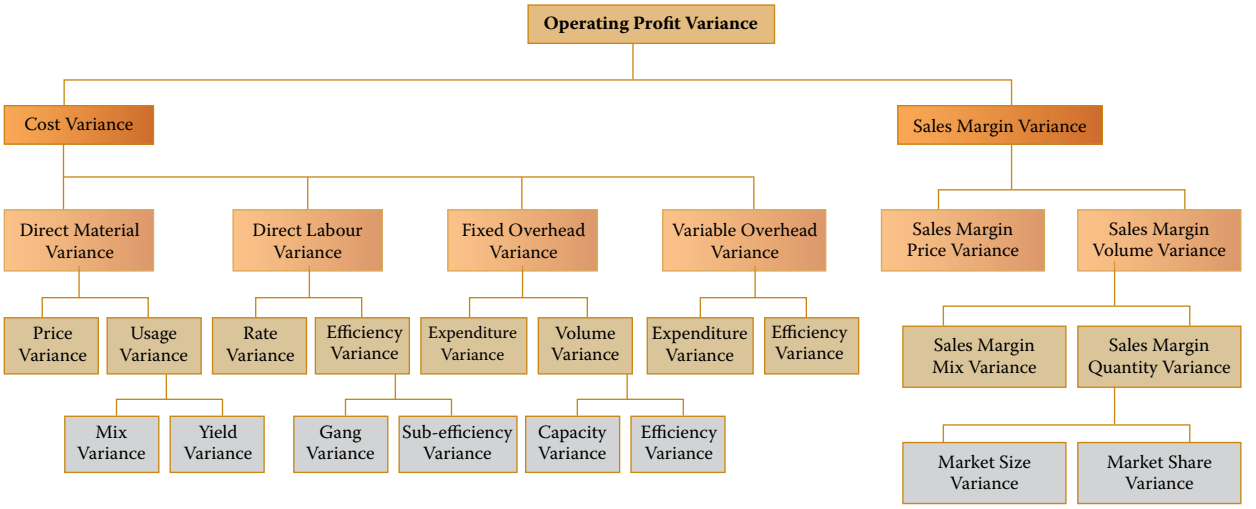
Ethics[9]

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[10]

- Products ***not to be standardised***
- Standard costs become ***outdated quickly***
- Production is ***highly automated***
- Often use ***ideal standards***
- The emphasis is on ***continuous improvement***
- Analysis may ***not give enough detail***
- Reports may ***arrive too late*** to solve problems

FORMULAE



Sales Variances (Absorption Costing)

Sales Margin Variance*
(Actual Margin) *Less* (Budgeted Margin)
[(AQ × AM) – (BQ × SM)]

Sales Margin Price Variance
(Actual Margin) *Less* (Standard Margin)
[(AM × AQ) – (SM × AQ)]
Or [AQ × (AM – SM)]

Sales Margin Volume Variance
(Standard Margin) *Less* (Budgeted Margin)
[(SM × AQ) – (SM × BQ)]
Or [SM × (AQ – BQ)]

Sales Margin Mix Variance
(Standard Margin) *Less* (Revised Standard Margin)
(AQ × SM) – (RAQ × SM)
Or SM × (AQ – RAQ)
Alternative Formula
[Total Actual Qty. (units) × {*Average* Standard Margin *per unit* of Actual Mix Less *Average* Budgeted Margin *per unit* of Budgeted Mix}]

Sales Margin Quantity Variance
(Revised Standard Margin) *Less* (Budgeted Margin)
(RAQ × SM) – (BQ × SM)
Or SM × (RAQ – BQ)
Alternative Formula
[*Average* Budgeted Margin *per unit* of Budgeted Mix × {Total Actual Qty. (units) Less Total Budgeted Qty. (units)}]

Market Size Variance
[Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales 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*)]

* *in terms of profit*

Note:

BQ	=	Budgeted Sales Quantity
AQ	=	Actual Sales Quantity
RAQ	=	Revised Actual Sales Quantity
	=	Actual Quantity Sold Rewritten in Budgeted Proportion
SM	=	Standard Margin
	=	Standard Price per Unit – Standard Cost per Unit
AM	=	Actual Margin
	=	Actual Sales Price per Unit – Standard Cost per Unit

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)

Sales Contribution Variance
(Actual Contribution) *Less* (Budgeted Contribution) [(AQ × AC) – (BQ × SC)]

Sales Contribution Price Variance
(Actual Contribution) *Less* (Standard Contribution)
[(AC × AQ) – (SC × AQ)]
Or [AQ × (AC – SC)]

Sales Contribution Volume Variance
(Standard Contribution) *Less* (Budgeted Contribution)
[(SC × AQ) – (SC × BQ)]
Or [SC × (AQ – BQ)]

Sales Contribution Mix Variance
(Standard Contribution) *Less* (Revised Standard Contribution)
(AQ × SC) – (RAQ × SC)
Or SC × (AQ – RAQ)
Alternative Formula
[Total Actual Qty. (units) × {*Average* Standard Contribution *per unit* of Actual Mix Less *Average* Budgeted Contribution *per unit* of Budgeted Mix}]

Sales Contribution Quantity Variance
(Revised Standard Contribution) *Less* (Budgeted Contribution)
(RAQ × SC) – (BQ × SC)
Or SC × (RAQ – BQ)
Alternative Formula
[*Average* Budgeted Contribution *per unit* of Budgeted Mix × {Total Actual Qty. (units) Less Total Budgeted Qty. (units)}]

Market Size Variance
[Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*)]

Market Share Variance
[(Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*)]

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

Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*) ***Or***
(Budgeted Market Share % × Actual Industry Sales Quantity *in units* – Budgeted Market Share % × Budgeted Industry Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*) ***Or***
(Required Sales Quantity *in units* – Total Budgeted Quantity *in units*) × (*Average* Budgeted Contribution *per unit*)

Market Share Variance

(Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*) ***Or***
(Actual Market Share % × Actual Industry Sales Quantity *in units* – Budgeted Market Share % × Actual Industry Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*) ***Or***
(Total Actual Quantity *in units*– Required Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*)

Market Size Variance + Market Share Variance

(Required Sales Quantity *in units* – Total Budgeted Quantity *in units*) × (*Average* Budgeted Contribution *per unit*) ***Add***
(Total Actual Quantity *in units*– Required Sales Quantity *in units*) × (*Average* Budgeted Contribution *per unit*) ***Equals to***
(Total Actual Quantity *in units* – Total Budgeted Quantity *in units*) × (*Average* Budgeted Contribution *per unit*)

Sales Contribution Quantity Variance

- **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**

A Relation
Sales Margin Volume Variance in terms of Profit & Contribution

Sales Margin Volume Variance	Standard Margin Per Unit × (Actual Quantity – Budgeted Quantity) ***Or***
Sales Margin Volume Variance	[Standard *Contribution* Per Unit – Standard Fixed Overheads Per Unit] × (Actual Quantity – Budgeted Quantity) ***Or***
Sales Margin Volume Variance	[Standard *Contribution* Per Unit × (Actual Quantity – Budgeted Quantity)] – [Standard Fixed Overheads Per Unit × (Actual Quantity – Budgeted Quantity)] ***Or***
Sales Margin Volume Variance	Sales Contribution Volume Variance – Fixed Overhead Volume Variance ***Or***
Sales Contribution Volume Variance	Sales Margin Volume Variance + Fixed Overhead Volume Variance
Note: Production units equals to Sales units for both actual & budget.	

Sales Variances (Turnover or Value)

Sales Variance
(Actual Sales) *Less* (Budgeted Sales)
[(AQ × AP) – (BQ × SP)]

Sales Price Variance
(Actual Sales) *Less* (Standard Sales)
[(AP × AQ) – (SP × AQ)]
Or [AQ × (AP – SP)]

Sales Volume Variance
(Standard Sales) *Less* (Budgeted Sales)
[(SP × AQ) – (SP × BQ)]
Or [SP × (AQ – BQ)]

Sales Mix Variance
(Standard Sales) *Less* (Revised Standard Sales)
(AQ × SP) – (RAQ × SP)
Or SP × (AQ – RAQ)
Alternative Formula
[Total Actual Qty. (units) × {*Average* Standard Price *per unit* of Actual Mix Less *Average* Budgeted Price *per unit* of Budgeted Mix}]

Sales Quantity Variance
(Revised Standard Sales) *Less* (Budgeted Sales)
(RAQ × SP) – (BQ × SP)
Or SP × (RAQ – BQ)
Alternative Formula
[*Average* Budgeted Price *per unit* of Budgeted Mix × {Total Actual Qty. (units) Less Total Budgeted Qty. (units)}]

Market Size Variance
[Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*)]

Market Share Variance
[(Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*)]

Note:

BQ	=	Budgeted Sales Quantity
AQ	=	Actual Sales Quantity
RAQ	=	Revised Actual Sales Quantity
	=	Actual Quantity Sold Rewritten in Budgeted Proportion
SP	=	Standard Selling Price per Unit
AP	=	Actual Selling Price per Unit

Market Size Variance

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

(Budgeted Market Share % × Actual Industry Sales Quantity *in units* – Budgeted Market Share % × Budgeted Industry Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*) ***Or***
(Required Sales Quantity *in units* –Total Budgeted Quantity *in units*) × (*Average* Budgeted Price *per unit*)

Market Share Variance

(Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*) ***Or***
(Actual Market Share % × Actual Industry Sales Quantity *in units* – Budgeted Market Share % × Actual Industry Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*) ***Or***
(Total Actual Quantity *in units*– Required Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*)

Market Size Variance + Market Share Variance

(Required Sales Quantity *in units* – Total Budgeted Quantity *in units*) × (*Average* Budgeted Price *per unit*) ***Add***
(Total Actual Quantity *in units*– Required Sales Quantity *in units*) × (*Average* Budgeted Price *per unit*) ***Equals to***
(Total Actual Quantity *in units* – Total Budgeted Quantity *in units*) × (*Average* Budgeted Price *per unit*)

Sales Quantity Variance

Direct Material Variances

Direct Material Total Variance#
[Standard Cost* *Less* Actual Cost]
(The difference between the Standard Direct Material Cost *of the actual production volume* and the Actual Cost of Direct Material)
[(SQ × SP) – (AQ × AP)]

Direct Material Price Variance
[Standard Cost of Actual Quantity *Less* Actual Cost]
(The difference between the Standard Price and Actual Price for the Actual Quantity)
[(SP – AP) × AQ]
Or
[(SP × AQ) – (AP × AQ)]

Direct Material Usage Variance
[Standard Cost of Standard Quantity for Actual Production *Less* Standard Cost of Actual Quantity]
(The difference between the Standard Quantity *specified for actual production* and the Actual Quantity *used*, at Standard Purchase Price)
[(SQ – AQ) × SP]
Or
[(SQ × SP) – (AQ × SP)]

Direct Material Yield Variance
[Standard Cost of Standard Quantity for Actual Production *Less* 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)
[(SQ – RAQ) × SP]
Or
[(SQ × SP) – (RAQ × SP)]
Alternative Formula
[*Average* Standard Price *per unit* of Standard Mix × {Total Standard Quantity (units) Less Total Actual Quantity (units)}]

Direct Material Mix Variance
[Standard Cost of Actual Quantity in Standard Proportion *Less* Standard Cost of Actual Quantity]
(The difference between the Actual Quantity *in standard proportion* and Actual Quantity *in actual proportion*, at Standard Purchase Price)
[(RAQ – AQ) × SP]
Or
[(RAQ × SP) – (AQ × SP)]
Alternative Formula
[Total Actual Quantity (units) × {*Average* Standard Price *per unit* of Standard Mix Less *Average* Standard Price *per unit* of Actual Mix}]

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)*
[(SP – AP) × PQ]
Or
[(SP × PQ) – (AP × PQ)]

Note:

PQ	=	Purchase Quantity
SP	=	Standard Price
AP	=	Actual Price

Direct Labour Variances

Direct Labour Total Variance[a]
[Standard Cost[b] – Actual Cost]
(The difference between the Standard Direct Labour Cost and the Actual Direct Labour Cost *incurred for the production achieved)*
[(SH × SR) – (AH* × AR)]

Direct Labour Idle Time Variance

Direct Labour Rate Variance
[Standard Cost of Actual Time – Actual Cost]
(The difference between the Standard Rate *per hour* and Actual Rate *per hour* for the Actual Hours *paid*)

[(SR – AR) × AH*] ***Or***
[(SR × AH*) – (AR × AH*)]

Direct Labour Efficiency Variance
[Standard Cost of Standard Time for Actual Production – Standard Cost of Actual Time]
(The difference between the Standard Hours *specified for actual production* and Actual Hours *worked* at Standard Rate)
[(SH – AH#) × SR] ***Or***
[(SH × SR) – (AH# × SR)]

Direct Labour Mix Variance *Or* Gang Variance
[Standard Cost of Actual Time *Worked* in Standard Proportion – 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)
[(RAH – AH#) × SR] ***Or***
[(RAH × SR) – (AH# × SR)]
Alternative Formula
[Total Actual Time *Worked* (hours) × {*Average* Standard Rate *per hour* of Standard Gang Less *Average* Standard Rate *per hour* of Actual Gang@}]
@ on the basis of hours worked

Direct Labour Yield Variance *Or* Sub-Efficiency Variance
[Standard Cost of Standard Time for Actual Production – 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)
(SH – RAH) × SR ***Or***
(SH × SR) – (RAH × SR)
Alternative Formula
[*Average* Standard Rate *per hour* of Standard Gang × {Total Standard Time (hours) Less Total Actual Time *Worked* (hours)}]

Direct Labour Idle Time Variance

[Standard Rate per Hour × Actual Idle Hours]

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

[(AH* – AH#) × SR]
Or
[(AH* × SR) – (AH# × SR)]

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
(b)	=	Standard Cost refers to 'Standard Cost of Standard Time for Actual Output'
(a)	=	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@
(Absorbed Fixed Overheads) *Less*
(Actual Fixed Overheads)

Fixed Overhead Expenditure Variance
(Budgeted Fixed Overheads)
Less
(Actual Fixed Overheads)

Fixed Overhead Volume Variance
(Absorbed Fixed Overheads)
Less
(Budgeted Fixed Overheads)

Fixed Overhead Efficiency Variance
(Absorbed Fixed Overheads)
Less
(Budgeted Fixed Overheads for Actual Hours#)

Fixed Overhead Capacity Variance
(Budgeted Fixed Overheads for Actual Hours#)
Less
(Budgeted Fixed Overheads)

Or

Fixed Overhead Total Variance@
(Absorbed Fixed Overheads) *Less*
(Actual Fixed Overheads)

Fixed Overhead Expenditure Variance
(Budgeted Fixed Overheads)
Less
(Actual Fixed Overheads)

Fixed Overhead Volume Variance
(Absorbed Fixed Overheads)
Less
(Budgeted Fixed Overheads)

Fixed Overhead Calendar Variance
(Possible Fixed Overheads)
Less
(Budgeted Fixed Overheads)

Fixed Overhead Capacity Variance
(Budgeted Fixed Overheads for Actual Hours#)
Less
(Possible Fixed Overheads)

Fixed Overhead Efficiency Variance
(Absorbed Fixed Overhead)
Less
(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
$= \frac{\text{Budgeted Fixed Overhead}}{\text{Budgeted Days}} \times \text{Actual Days}$

(@)
= 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 × Standard Hours for Actual Output) – (Standard Fixed Overhead Rate per Hour × Actual Hours)
Or
Standard Fixed Overhead Rate per Hour × (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 × Actual Hours) – (Standard Fixed Overhead Rate per Hour × Budgeted Hours) ***Or***
Standard Fixed Overhead Rate per Hour × (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#)

 # Actual Hours (Worked)

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

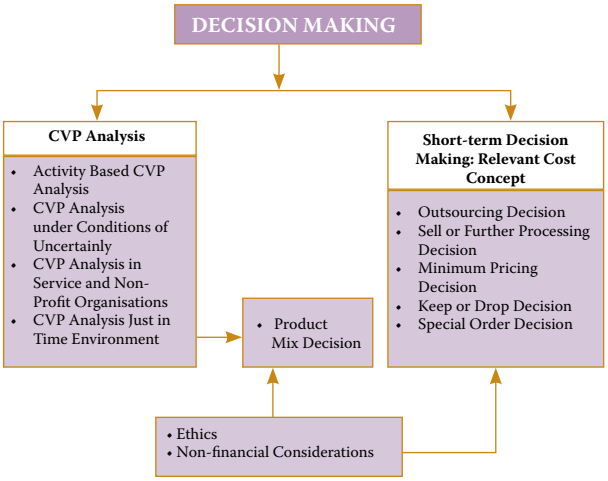
(@)
= Variable Overhead Total Variance also known as 'Variable Overhead Cost Variance'

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*)

DECISION MAKING

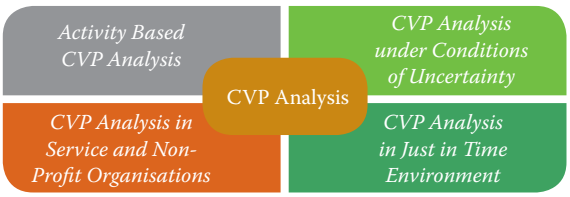
CHAPTER OVERVIEW



CVP ANALYSIS[11]

CVP analysis involves analysing the interrelationships among revenues, costs, levels of activity, and profits. CVP analysis is useful for numerous decisions related to production, pricing, marketing, cost structure, and many more. Although CVP analysis is most useful for planning, it can also be used to assist with ***controlling decisions*** and ***evaluating decisions***.

Consider a decision about choosing *additional features of an existing product* i.e. product modification. Different choices can affect selling prices, variable cost per unit, fixed costs, units sold, and operating income. CVP analysis helps managers make product decisions by estimating the *expected profitability* of these choices.



Activity Based CVP Analysis

Conventional CVP analysis assumes *volume based* measures. An alternative approach is activity based costing. In an activity-based costing system, costs are segregated into unit and *non-unit-based* categories. Activity-based costing acknowledges that some costs vary with units produced and some costs do not. However, while activity-based costing admits that non-unit- based costs are fixed with respect to production volume changes, it also argues that many non-unit-based costs vary with respect to other cost drivers. In contrast, the volume based approach combines the cost of these activities and treat them as fixed costs since they do not vary with output volume. Activity based costing provides a more accurate determination of costs because it separately identifies and traces non- unit based costs to products rather than combining them in a pool of fixed costs as volume based approach does.

The Break-even can then be expressed as follows:

Break-even units = [Fixed costs + (Setup cost × Number of Setups) + (Engineering Cost × Number of Engineering Hours)]/ (Price - Unit Variable Cost)

A comparison of the ABC break-even point with the conventional break-even point reveals two important differences.

First, the fixed costs differ. Some costs previously identified as being fixed may actually vary with non-unit cost drivers, in this case setups and engineering hours.

Second, the numerator of the ABC break-even equation has two non-unit-variable cost terms: one for batch-related activities and one for product- sustaining activities.

"The use of activity-based costing does not mean that CVP analysis is less valuable. In fact, it becomes more valuable, since it delivers more precise understandings concerning cost behaviour. These understandings produce better decisions. CVP analysis within an activity-based framework, however, must be improved".

CVP Analysis - Conditions of Uncertainty

Cost-Volume-Profit analysis suffers from a limitation that it ***does not consider*** adjustments for *risk and uncertainty*. A possible approach by which uncertainty can be incorporated into the analysis is to apply *normal distribution theory*.

If the manager is comparing this product with other products then this approach will enable him or her to assess the risk involved for each product, as well as to compare the relative break-even points and expected profits. The analysis can be changed to include fixed cost, variable cost and selling price as *uncertain variables*. The effect of treating these variables as uncertain will lead to an increase in the standard deviation because the variability of the variable cost, fixed cost and selling price will add to the variability of profits.

Probability distributions play important role in providing decision-making information. It provides information that helps the decision maker better understand the risks and uncertainties associated with the problem. Ultimately, this information may assist the decision maker in reaching a good decision.

Example

The selling price of a product for the next accounting period is ₹110, and the variable cost is estimated to be ₹70 per unit. The budgeted fixed costs for the period are ₹1,63,500. Estimated sales for the period are 5,000 units, and it is assumed that the probability distribution for the estimated sales quantity is normal with a standard deviation of 125 units. The selling price, variable cost and total fixed cost are assumed to be certain. What is the probability of profits being greater than ₹40,000?

The calculations are as follows:

Expected Profit = Expected Sales Volume (5,000 units) × Contribution per unit (₹40) – Fixed Costs (₹163,500)

= ₹36,500

Standard Deviation = Standard Deviation of Sales Volume (125 units) × *Contribution per unit* ₹40

= ₹5,000

Probability for profit (₹40,000):

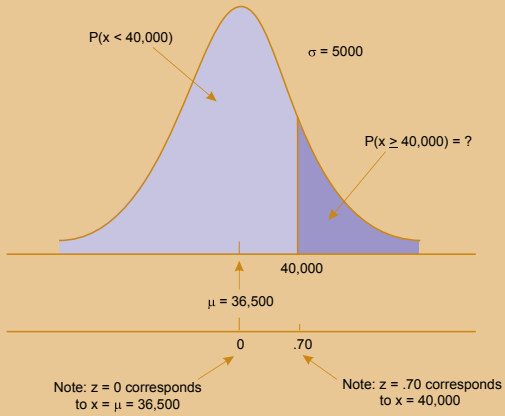
$$Z = \frac{x - \mu}{\sigma}$$

$$Z = \frac{₹40,000 - ₹36,500}{₹5,000}$$

$$Z = +0.70$$

Probability (Z = + 0.70) = 0.7580

Refer now following Figure



We see that a value of 40,000 corresponds to a value of Z = 0.70 on the standard normal distribution. Using the standard normal probability table, we see that the area under the standard normal curve to the left of Z = 0.70 is 0.7580. Thus, 1.000 – 0.7580 = 0.2420 is the probability that profit will exceed 40,000.

CVP Analysis in Service and Non-Profit Organisations

CVP analysis can also be applied to decisions by service and non-profit organisations. To apply CVP analysis in service and non-profit organisations, we need to *focus on measuring their output*, which is different from tangible units sold by manufacturing and merchandising companies.

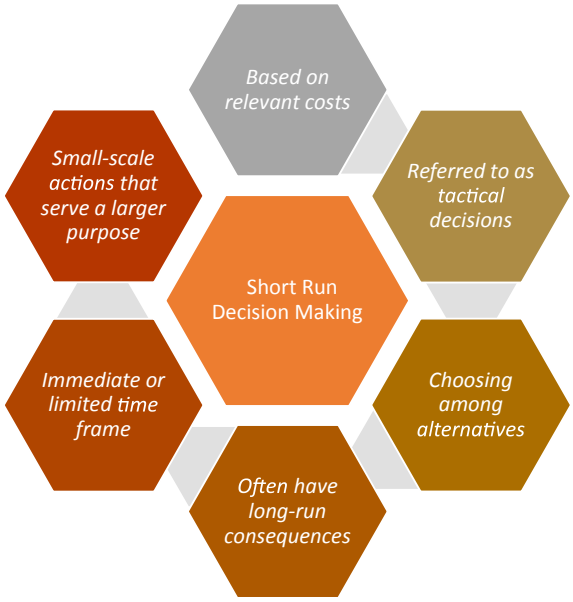
CVP Analysis in Just in Time Environment

In a firm has implemented *Just in Time,* the variable cost per unit sold is reduced, and fixed costs are increased. Direct labor is considered as fixed instead of variable. On the other hand, direct material vary with production volume (unit- based variable cost) due to emphasis on *total quality* and *long-term purchasing.* Waste, scrap, and quantity discounts are removed. Other unit-based variable costs, such as power and sales commissions, also exist. Further, the batch - level variable is absent as in Just in Time, the batch is equal to one unit. Therefore, the cost equation for Just in Time can be expresses as follows:

Total Cost = Fixed Cost + (Unit variable Cost × Number of Units) + (Engineering Cost × Number of Engineering hours)

"Managers often use CVP analysis to guide other decisions, many of them are of strategic nature due to tremendous potential of increase in the profitability and organisational effectiveness"

SHORT RUN DECISION MAKING



Short-run decision making involves the act of choosing one course of action among various feasible alternatives available. Short-term decisions sometimes are referred to as tactical, or relevant, decisions because they involve choosing between alternatives with an immediate or limited time frame.

Strategic decisions, on the other hand, usually are long term in nature because they involve choosing between different strategies that attempt to provide a *competitive advantage* over a long time frame.

Short run decisions involve evaluation of the costs and benefits of short term actions, such as *whether to make a product or outsource, whether to accept a special order, whether to keep or drop an unprofitable segment, and whether to sell a product as is or process it further.* If resources are limited, managers may also have to decide on the *most appropriate product mix.* While such decisions tend to be *short run* in nature, it should be emphasized that they often have ***long-run consequences***.

Consider a second example, suppose that a company is thinking about producing a component instead of buying it from suppliers. The immediate objective may be to lower the cost of making the main product. Yet this decision may be a small part of the overall strategy of establishing a cost leadership position for the firm. Therefore, short-run decisions often are *small-scale actions* that *serve a larger purpose*[12].

The tactical decision making approach just described emphasized the importance of identifying and using **relevant costs**. But how do we identify and define the costs that affect the decision?

For a cost to be relevant to a decision it must be

- A future cost, i.e. related to the future.
- A differential Cost, i.e. its level must be different for each of the alternatives under consideration.

Accordingly, only future costs can be relevant to decisions. However, to be relevant, a *cost must not only be a future cost but must also differ from one alternative to another.* If a future cost is the same for more than one alternative, it has no effect on the decision. Such a cost is irrelevant cost. The ability to identify relevant and irrelevant costs is a vital decision making skill.

Non-Financial Considerations

With increase in competition, dynamic market changes and changing needs of customers, non-financial information have gained relevance in the decision-making process. Information to which monetary value can be attached is in the nature of financial information. Information of an organization like number of employees, employee morale, customer satisfaction that cannot be expressed in monetary terms is termed non -financial in nature. *Non- financial information is **long term focused** and ensures profitability and sustainability in long term for an organization thereby evaluating the internal performance of the company.* Non- Financial information which a company should focus that would turn out to be advantageous while making decisions for a company are:

Quality	Employee Satisfaction	Customer Satisfaction
Corporate Social Responsibility	Environmental Factors	Intellectual Property
Intangible Assets	Competitor's Movements	Brand Name

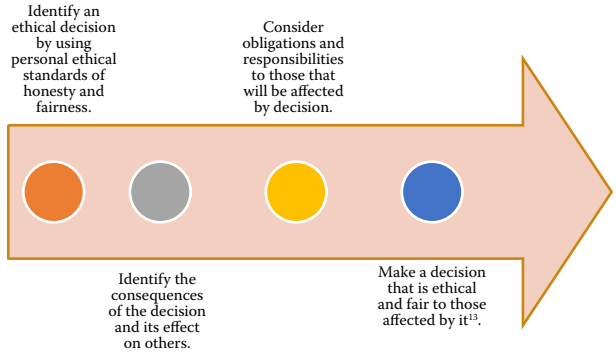
Decisions made in a business rest on the *balance between the perceived effects of financial and non-financial information.* Following are Limitations of Non- Financial Information-

Limitations of Non- Financial Information

- Time and Cost of the company involved.
- Subjective measurement – No proper of common denominator to measure performance.
- Improper measures will lead the companies to draw attention on wrong objectives.
- Lack of Statistical Reliability – Possible chances of error.
- Management Disintegration when excess of measures and indications used by the company.

Ethics

Ethics are moral principles that guide the conduct of individuals. By their behaviour and attitude, managers set the company culture.

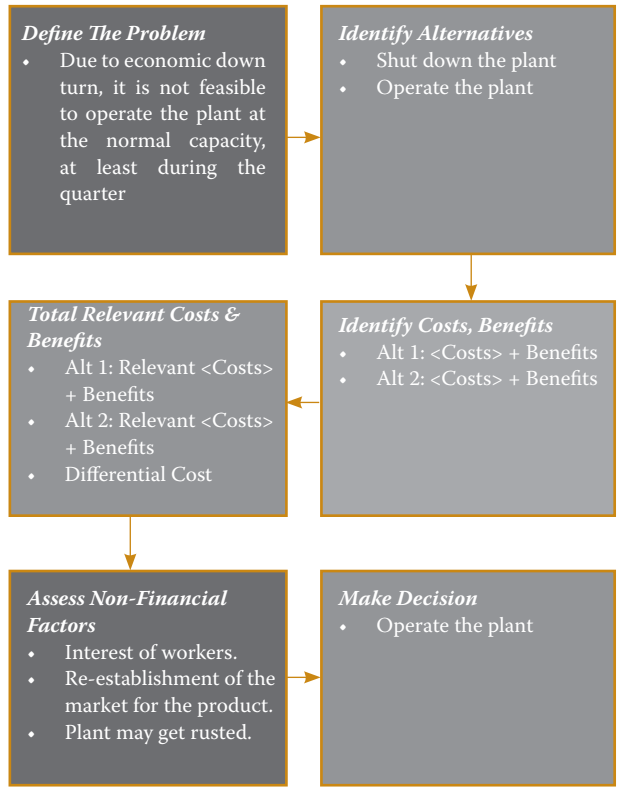


Some ethical problems can be can be avoided simply by using common sense and not focusing solely on the short term at the expense of *long term.*

Firms with a strong code of ethics can create strong customer and employee loyalty. Furthermore, a firm that values people more than profit and is viewed as operating with integrity and honour is more likely to be a commercially successful business[14].

Decision Making Model

An Application



SOME APPLICATIONS OF CVP ANALYSIS AND COST CONCEPTS

Short run decisions are many and varied but some of the more important ones, **we shall look in this chapter include:**

Outsourcing Decision[15]

Outsourcing decision is often called a 'make or buy' decision. It involves a decision of whether to continue 'making' a product versus 'buying' it from an external firm. Outsourcing enables a firm to

- reduce costs *or*
- benefit from supplier efficiencies

Outsourcing decision requires *incremental analysis*. The incremental amounts are based on the difference in the *cost of buying a product or service* compared to the *cost of producing the item or providing the service in house.*

Incremental Costs

- **Incremental Costs** are the additional costs incurred from outsourcing. The main cost is the purchase price of the products or the cost of the services that are being provided by external firms.

Incremental Cost Savings

- **Incremental Cost Savings** are reductions of costs that will no longer be incurred as a result of outsourcing. They are often called avoidable costs because if a company outsources, it can 'avoid' certain costs. Variable product cost savings are always incremental. Because they reduce total costs, they cause profits to increase. In some circumstances, a portion of fixed costs can be saved such as equipment rental costs or supervisor salaries that can be avoided.

Opportunity Costs

- **Opportunity Costs** are the costs forgone as a result of selecting a different alternative. They are always incremental. For example, if a company decides to outsource, it is able to lease its factory space that the product being outsourced no longer will occupy.

Outsourcing Decisions- Accept or Reject?

If incremental cost savings + opportunity costs < incremental costs	*If incremental cost savings + opportunity costs > incremental costs*	*If incremental cost savings + opportunity costs are = incremental costs*
reject the outsourcing, unless qualitative factors fiercely impact the decision.	accept the outsourcing unless qualitative factors fiercely impact the decision.	focus primarily on qualitative factors to evaluate the decision.

Qualitative Factors

While considering the decision to Outsourcing the management should consider qualitative aspects like quality of goods, reliability of suppliers, impact on the customers and suppliers etc.

A firm generally decides to outsource:

- If it costs less rather than to manufacture it internally;
- If the return on the necessary investment to be made to manufacture is not attractive enough;
- If the company does not have the requisite skilled manpower to make;
- If the concern feels that manufacturing internally will mean additional labour problem;
- If adequate managerial manpower is not available to take charge of the extra work of manufacturing;
- If the component shows much seasonal demand resulting in a considerable risk of maintaining inventories;
- If transport and other infrastructure facilities are adequately available;
- If the process of making is confidential or patented;
- If there is risk of technological obsolescence for the component such that it does not encourage capital investment in the component.

Sell or Further Process

Sell or process further refers to a decision-making situation where an executive has to decide either to sell a component/ product/ raw material as it is or alternatively process it further by incurring additional expenses. For instance, sometime, a redundant material lying in stores for a long time may be sold as scrap at a small value or may be thrown away as waste. This material may, however, be converted into a product of higher saleable value by carrying out some further operations or processes. On further processing the component/product/raw material may not only be improved or reconditioned but will mostly fetch a higher sale value as well. Here if the *differential sales value is more than the further processing cost*, then it is beneficial to process the product further otherwise sell it without further processing. Such type of decision making problems usually arise in the case of joint products.

There are two rules to follow when ascertaining whether the further processing is worthwhile:

- Only the incremental costs and revenues of the further process are relevant
- The joint process costs are irrelevant - they are already 'sunk' at the point of separation

Qualitative Factors

Qualitative factors related to processing further decisions include resource availability such as the readiness of employees to work extra hours to further process the products and availability of materials required for the processing. In addition, the influence on customers that prefer the original product should also be considered, as sales to these customers may be lost to competitors.

Minimum Pricing Decisions

The minimum pricing approach is a useful method in situations where there is a lot of intense competition, surplus production capacity, clearance of old inventories, getting special orders and/or improving market share of the product.

The minimum price should be set at the incremental costs of manufacturing, plus opportunity costs (if any).

For this type of pricing, the selling price is the lowest price that a company may sell its product at usually the price will be the *total relevant costs of manufacturing.*

Keep or Drop Decisions[15]

Another type of operating decision that management must make is whether to keep or drop unprofitable segments, such as product lines, services, divisions, departments, stores, or outlets.

The decision is based on whether or not the segment's revenue exceeds the costs directly traceable to the segment, including any direct fixed costs.

Incremental Revenue

- **Incremental Revenue** is the difference in revenue between the original sales revenue and the new revenue that is expected to result due to dropping a segment.
- If dropping a product will cause an increase in demand for another product, the additional revenue for the other product should be taken into consideration.

Incremental Cost Savings

- Variable costs associated with a segment to be dropped are Incremental Cost Savings that cause profit to increase.
- Direct fixed costs related to a segment being dropped are avoidable if that segment is dropped because they can be eliminated if the segment is dropped.

Opportunity Costs

- **Opportunity Costs** are common in keep or drop decisions. They often arise due to rental of production space that will become vacant if the decision is made to drop a product. Opportunity costs are always incremental.

Decision - Keep or Drop?

If incremental cost savings > incremental revenue lost	*If incremental revenue lost = incremental cost savings*	*If incremental cost savings < incremental revenue lost*
the segment should be dropped, unless qualitative characteristics fiercely impact the decision.	qualitative effects must be used to make the decision.	the segment should not be dropped, unless qualitative characteristics fiercely impact the decision.

Qualitative Factors

Qualitative factors related to keep or drop decisions often include considerations of employees that will be terminated if the product is dropped, the effect a lay off might have on employees that are not terminated, effects of suppliers from which the materials needed for the product will no longer be purchased, and the effect of customers who previously purchased the product being dropped.

Special Order Decisions[15]

Special order decisions focus on whether a special priced order should be accepted or rejected. These orders often can be attractive, especially when the firm is *operating below its maximum productive capacity.*

Price discrimination laws require that firms sell identical products at the *same price to competing customers* in the same market. This law does not apply to

- Noncompeting customers from the same market.
- Potential customers in markets not ordinarily served.

Special order decisions are based on incremental analysis. Incremental analysis enables managers to emphasis on the *relevant areas of a decision.*

Incremental Revenue

- **Incremental Revenues** are the additional revenues generated from accepting the special order. The revenue can result from additional sales of products or from providing services.
- If the company is operating at less than capacity, revenue of regular customers will not be affected.
- If the company is operating at capacity, it will have to give up some regular sales in order to provide the special order.

Incremental Costs

- **Incremental Costs** are the additional costs incurred from accepting a special order. Variable operating costs include special packing, commissions, and shipping costs.
- Most often, a firm's recurring fixed costs will remain the same in total if a special order is accepted.
- Occasionally the acceptance of a special order may cause additional fixed costs such as special purpose tool, Inspection Cost. In these cases, these additional fixed costs are relevant and should be considered in an incremental analysis.

Decision - Accept or Reject?

If incremental revenue < incremental cost	*If incremental revenue = incremental cost*	*If incremental revenue > incremental cost*
reject the special order, unless qualitative characteristics fiercely impact the decision.	qualitative effects must be used to make the decision.	accept the order, unless qualitative characteristics fiercely impact the decision.

Dangers of Concentrating Excessively on a Short-Run Time Horizon[16]

- It is vital that the information presented for decision-making relates to the appropriate time horizon.
- If inappropriate time horizons are selected there is a risk that misleading information will be presented.
- Long-term considerations should always be taken into account when special pricing decisions are being evaluated.
- The effect of accepting a series of successive special orders over several periods constitutes a long-term decision.
- If demand from normal business is considered to be permanently insufficient to utilize existing capacity, then a long-term capacity decision is required.
- This decision should be based on a comparison of the relevant revenues and costs arising from using the excess capacity for special orders with the capacity costs that can be eliminated if the capacity is reduced.

Product Mix Decision

Many times, the management has to take a decision whether to produce one product or another instead. Generally, decision is made on the basis of contribution of each product. Other things being the same the product which yields the *highest contribution* is best one to produce. But, if there is shortage or limited supply of certain other resources which may act as a key factor like for example, the machine hours, then the *contribution is linked with such a key factor for taking a decision.*

For example, in an undertaking the availability of machine capacity is limited and the machine hours required for one unit of the two products are different. In such cases the contribution is to be linked with the machine hour and the product which yields the *highest contribution per machine hour* is to be preferred for taking decision.

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- **For previous capsule, final students may refer November 2017 Journal.**
- **Intermediate students may also refer pages 17 to 20 of this capsule for quick reference of 'Cost Variance' formulae.**