

# Developments in the Business Environment

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## LEARNING OBJECTIVES :

After studying this unit you will be able to :

- Understand the impact of changing environment on cost and management accounting
- Know the six C's of Total Quality Management
- Appreciate the Meaning, Purpose and benefit of Activity based costing
- Discuss the Activity based Management model
- Understand the Main features of Target costing system
- Ascertain the cost accountants role in Target Costing environment
- Differentiate between the various phases of product life cycle
- Understand the concept of Value Chain Analysis, Segment analysis and Core Competencies analysis
- Identify the Role of the Management Accountant

## 1.1 THE IMPACT OF CHANGING ENVIRONMENT ON COST AND MANAGEMENT ACCOUNTING

Since the time of industrialisation, cost and management reporting has always been the responsibility of either cost accountant or financial accountants or both. Apart from the statutory balance sheet, profit and loss account and the cash flow statements, the financial accountants of companies would provide other detailed reports to the management using the same set of historical data. However allocation and apportionment of expenses to cost centres and finally their absorption on the finished product continued to be the responsibility of the costing professionals. Many companies adapted the integrated model to combine the costing and the accounting functions and get real time information, which would be of greater use than the historical data provided by financial accounts.

With the advent of financial audit and its increasing importance ever since, product costing systems have increasingly concentrated on the production portion of the value chain as shown below,

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### **RESEARCH → DEVELOPMENT → PRODUCTION → MARKETING → DISTRIBUTION → CUSTOMER SUPPORT**

This is understandable since during the first half of the nineteenth century and perhaps till a couple of decades later, manufacturing costs accounted for the bulk of total costs incurred by the industry. The reason being the lack of competitive markets resulting in less advertising and distribution costs coupled with very little marketing and customer support. Manufacturers worked in a monopolistic or a near monopolistic environment with products having long product life cycles and so did not require incurring large quantum of expenditure on functional areas like Research, Development etc. With most of the money being expended on the production function, reports provided by financial accountants for inventory valuation purposes gave enough information to the management about the majority of expenses being incurred by the company. The other costs incurred in the other than production functions of the value chain were considered discretionary and since the total quantum of such costs would not be huge, frequently they were excluded from decision-making purposes.

Manufacturing costs computed then were typically characterised by simplistic assumptions, with the use of 'blanket' overhead rates and simple labour overhead recovery bases being the common practice. In case of a relatively refined system, manufacturing overheads were segregated into fixed and variable. Whereas variable overheads could be identified with the production pattern with ease, the fixed overheads needed to be imputed over the products. This used to be done by identifying appropriate cost centres and overhead absorption rates. Fixed manufacturing overheads were initially allocated over the cost centres and then finally absorbed over the output at the rates, which were pre-established. The overhead rates were established considering the maximum output, which could be achieved by the specific cost centre as compared to the budgeted costs, which would be incurred for that level of activity. The result was that in case a company did not produce to potential, certain amount of these fixed overheads would not be absorbed over the products and hence remains unabsorbed. Such overheads were subsequently charged to the Profit and Loss Account and also provided the management with information about the productivity of the workers on the shop floor. However, Product Costing done on the basis of imputing fixed costs gives approximate results and is only useful in case the product has a long life cycle in the market. In the present competitive scenario, where innovation is the rule of the day, product life cycles have shortened and the competition has increased amongst companies at an unprecedented level. Such a scenario requires companies to produce in small batches as per customers requirements (implying higher raw material costs due to smaller purchases than before) , deliver quickly and efficiently (higher incidence of cost on the customer support and distribution functions of the value chain) and most importantly be prepared for product obsolescence. Hence, traditional costing may not be appropriate today as what it was when the market conditions were different.

The above mentioned issues in the changed industrial environment have resulted in new concepts of cost management in companies e.g. Total Quality Management, Just in Time, Activity Based Costing, Target Costing, Back flush Costing etc. These concepts have been imbibed by the Japanese, US and the other western economies with favourable results.

Today, many companies in India have adapted such systems in order to remain competitive in the modern day environment in which production is highly automated and frequently, computer aided manufacturing resorted to.

**1.2 TOTAL QUALITY MANAGEMENT**

**1.2.1** It is too often viewed as a technique whose usefulness is confined to manufacturing processes. However, TQM also assumes potentially greater importance as a tool for improved efficiency in service areas. By focusing on the management accounting function, we will devise a process through which quality improvement methods might be used to highlight problem areas and facilitate their solution. An initial understanding of the difference between the three major ‘quality’ terms, **quality control**, **quality assurance** and **quality management** is essential to the short- medium- and long-term focus of business.

**1.2.2 Definitions:**

**Quality :** It is a measure of goodness to understand how a product meets its specifications.

**Quality Cost :** Cost of performing the activities to check failure in meeting the quality specification. These activities are of four types – i) Prevention costs ii) appraisal costs iii) Internal failure costs iv) External failure costs.

Prevention costs	Appraisal Costs	Internal Failure Costs	External Failure Costs
Quality Engineering	Inspection	Scrap	Revenue loss
Quality training	Product acceptance	Rework	Warranties
Quality Audits	Packaging inspection	Re-inspection	Discount due to defects
Design Review	Field testing	Re-testing	Product liability
Quality circles etc	Continuing supplier verification etc	Repair etc	warranty etc

**Quality Control (QC)** It is concerned with the *past*, and deals with data obtained from previous production which allow action to be taken to stop the production of defective units.

**Quality Assurance (QA)** It deals with the *present*, and concerns the putting in place of systems to prevent defects from occurring.

**Quality Management (QM)** It is concerned with the *future*, and manages people in a process of continuous improvement to the products and services offered by the organisation.

Thus while section of the QA is responsible for systems which prevent departures from budgeted costs and corrective mechanisms to prevent future departures from budgeted costs. QM uses the skills and participation of the workforce to reduce the costs of production of goods and services. It becomes TQM when it embraces the whole organisation.

In this section of the chapter we will consider an in-depth study of the implementation of the TQM process in the management accounting function. A systematic process is adopted to identify and implement solutions to prioritized opportunities for improvement. The TQM

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approach highlights the need for a customer oriented approach to management reporting, eliminating some of our more traditional reporting practices.

TQM seeks to increase customer satisfaction by finding the factors that limit current performance. The practice of TQM in a manufacturing environment has produced tangible improvements in efficiency and profit-ability as a result of many small improvements. The generation of similar results in the areas of overhead costs and particularly, indirect labour productivity, is long overdue. Performance measurement and quality improvement are not the sole domain of manufacturing industry, but detailed applications of the new management accounting practices to the professional service environment remain rare. This chapter focuses on such an implementation by detailing the opportunities for improvement in a management accounting environment.

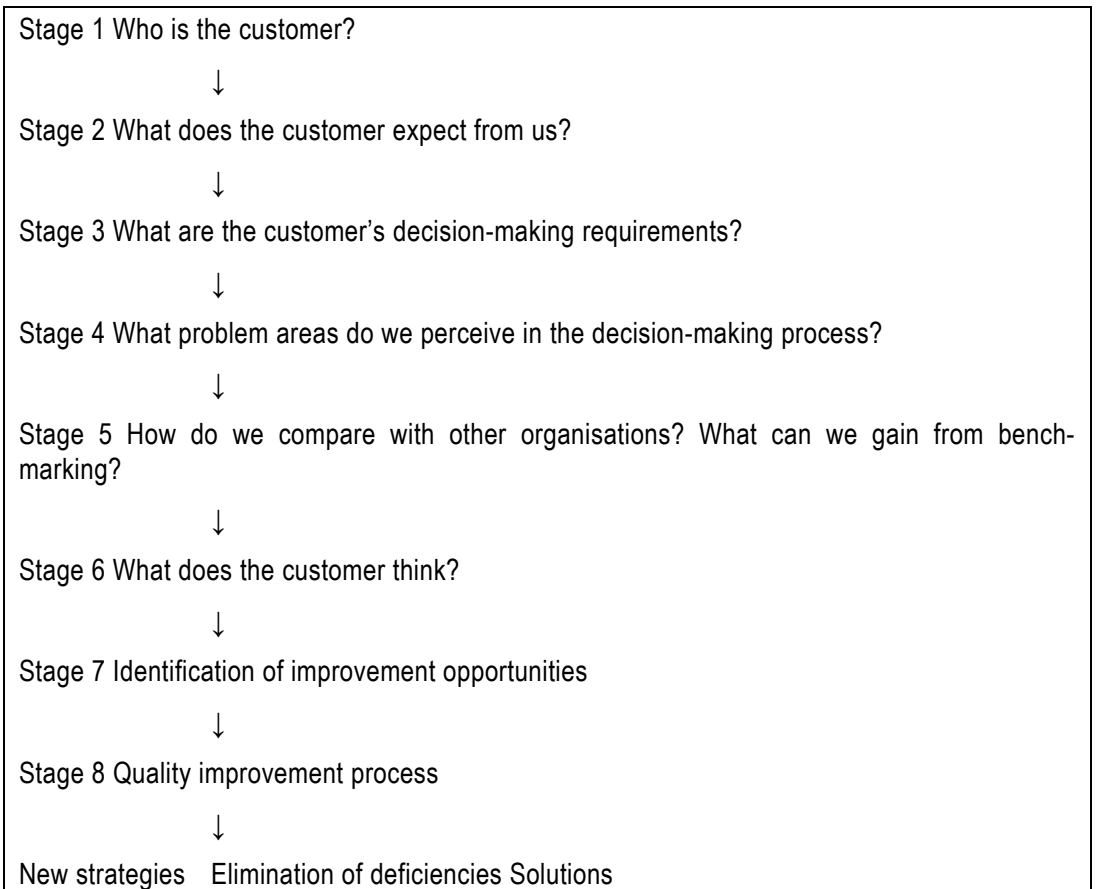
On the shop-floor, quality concepts have been based around the involvement of employees and an approach according to which each worker sees the next person on the assembly line as their customer. The application of quality concepts to service areas, like the accounting function, requires a similar approach, necessitating a focus on customer requirement. The 'customers' are the receivers of a 'product' – in this case periodic management accounting reports – whose 'satisfaction' is determined by the usefulness of this product in the decision-making process.

There is a danger of viewing TQM in terms of statistical processes and control charts. It is much more than this. Quality is not some vague utopian ideal associated with 'goodness'; it can be seen as requiring that we conform to very specific performance requirements. Close enough is *not* good enough in this respect. The cost of quality is the monetary impact of a failure to conform, a measurable characteristic which can be reduced through a system of prevention in much the same way as safety standards are implemented.

In a manufacturing environment the cost of quality might be viewed as the sum of the costs associated with scrap, reworks, warranty claims and inspection expenses. The same costs are those associated with management accounting procedures which produce inaccurate, error-prone or untimely services for their 'customers'. Errors in the wages function, for example, are perceived as intolerable, so it is inappropriate that they be any more acceptable elsewhere.

### 1.2.4 Operationalising TQM

In order to make the concept of total quality management operationalising figure 1 outlines a systematic process for the examination of a number of fundamental questions. The focus is on the accounting function with the objective of implementing a process which will lead to the adoption of new strategies, the solving of problems and the elimination of identifiable deficiencies. The first four stages of this procedure are conducted internally within the management accounting team. They comprise a situation audit of current practice embracing corporate culture, product and customers.



**Figure 1. The process of reviewing the management accounting function**

### **Stage 1 : Who is the customer ?**

A team approach was adopted to generate priorities in the identification of customers and critical issues in the provision of decision-support information. This provided a structured, group decision-making process for reaching consensus through the assignment of ranked priorities together with an environment conducive to the development of creative suggestions. The nominal group technique discussed earlier was employed. The ranking or perceived customer importance reveals the priority customers for management accounting services as :

1. manager;
2. engineers; and
3. leading hands.

### **Stage 2 : What does the customer expect from us ?**

Managers having been identified as the priority group in receipt of accounting output, a second brainstorming session was used to generate a comprehensive list of their perceived

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expectations from the accounting function. Multi-voting was again used to identify the relative importance of these expectations, providing a ranking of 12 accounting functions:

1. compliance with procedures;
2. focus on problems;
3. performance reviews;
4. provision of budget information;
5. assessment of proposals;
6. payment of salaries;
7. tax advice;
8. management processes advice;
9. information forecasting;
10. commercial training;
11. information-processing skills; and
12. professional advice.

### **Stage 3 : What are the customer's decision-making requirements ?**

Brainstorming revealed a list of 18 processes perceived to be major elements of the service provided by management accountants :

1. pay people (wages and salaries);
2. pay accounts (vendors and contractors);
3. keep the books of account;
4. budget;
5. forecast;
6. audit;
7. conduct business-impact analyses;
8. manage authorisation procedures;
9. issue guidelines;
10. maintain a library of procedures;
11. analyse performance;
12. manage licences;
13. contribute to meetings;
14. manage property;

15. carry out strategic planning;
16. train others;
17. evaluate insurance requirements; and
18. produce *ad hoc* reports;

Combining management perceptions of customer expectations and the importance of the various functions, we find four processes clearly ranked as the key areas of importance to managers:

1. performance analysis;
2. *ad hoc* reporting;
3. strategic planning; and
4. contribution to meetings.

This series of steps, therefore, establishes managers as the priority customers for management accounting reporting and procedures, while performance analysis is the priority consideration in their use of management accounting information.

Typically, management accountants focus on the analysis of total performance in cost centres, using cost-per-unit comparisons and calculations of variance to generate plans. Where the focus is on quality improvement, the overriding need is to stay close to the customers and follow their suggestions. In this way, a decision-support system can be developed, incorporating both financial and non-financial information, which provides a flexible reporting system meeting user requirements.

In order to do this properly, we need to know:

- the nature of the decisions being made;
- the nature of the decision-making process; and
- the degree to which information requirements are being met.

A survey of users is required to provide this information, but critical issues can be identified and prioritised in advance, in order to refine the necessary survey questions.

#### **Stage 4 : What problem areas do we perceive in the decision-making process ?**

Once again using brainstorming and multi-voting, the team ranked the characteristics of an accounting information system thought most desirable from a decision-making point of view, as follows :

1. **Relevance.** A targeted decision-making process.
2. **Congruence.** Consistency with the long-term strategy of the business.
3. **Comprehensibility.** Systems should be readily understandable and, therefore, readily usable, by customers.

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4. **Linkage to non-financial indicators.** Systems need to reflect the monetary impact of physical parameters.
5. **Timelines.** Systems should be on-time and on-line.

These characteristics were perceived as being areas of weakness where the greatest impact could be achieved through the implementation of improvements. It is instructive to consider some of the actual situations that might be associated with improvements in these areas.

### **Lack of relevance**

If line managers ignore most of the data reported to them by traditional cost accounting systems and treat head office cost analysis with disdain, they may prefer to perform their own specific cost investigations to determine the cause of deviations from plan, seeing management accounting reports as irrelevant and technically unrealistic. These informal systems may incorporate superior information which would be of benefit to all and which would be better incorporated within a global management information system.

The solution : develop formal and informal reporting mechanism targeted to the needs of the user.

### **Lack of congruence**

Where the management accounting system focuses entirely on the measurement of costs, then it is not surprising that employees adopt a similar focus. Where the plant level emphasis is on production and productivity, a detailed analysis of process performance evaluation may reveal that the pursuit of efficiency measures is not necessarily consistent with the stated strategic goals of the organisation as a whole. For example, a reputation for industry leadership and innovation might be aided by a strategy of rapid asset replacement. Where divisional performance – and management rewards – are based on ROI-type indicators, a short-term perspective might be adopted, inconsistent with corporate strategy. But the revaluation of old assets, no longer depreciable, through inflation indices, might promote their replacement with new, more efficient assets.

The solution : develop a robust process to ensure that the accounting department's performance analysis is linked to strategic direction.

### **Lack of comprehensibility**

If management accountants believe that they prepare detailed financial reports for their managers to enable them to report to the managing director at the monthly board meeting, and the managing director declares that he or she is cognisant with all the relevant reported material for informal sources well in advance of the meeting, then clearly the customer for existing management accounting reports is not the managing director.

Where such reports do not embrace the full extent of information generators, and fail to target a designated customer, there is room for a distinct improvement in the service offered. This may derive from more timely reporting, the provision of non-financial indicators, new performance measures, or a complete reformatting of the reporting process.



The solution: generate accounting information systems of a format and content suitable to meet user requirements.

***Absence of a link to non-financial indicators***

The focus of management accounting must move beyond summary, financial measures of manufacturing operations if it is to maintain its central evaluation and control role. If a corporate goal of rapid internal growth is being pursued through a strategy of introducing automated production processes requiring less direct labour, then products using automated machinery intensely will be under-costed if direct labour hours are used to allocate manufacturing overhead costs for products. A more flexible allocation procedure should be adopted incorporating non-financial indicators, such as inspection and set-up times, in order to provide a 'fairer' distribution. In the absence of a 'right' answer, corporate strategy might serve to provide more guidance. Perseverance with an allocation on the basis of direct labour penalises those products reliant on manual operations and provides an incentive to automate, consistent with the corporate strategy.

The solution: generate a concise group of non-financial indicators which reflect the overall performance of the company.

***Lack of timeliness***

Suppose that the management accounting team prides itself on producing its monthly operating report on the eighth working day of the following month. An unexpected equipment failure means that it is unable to meet its accustomed deadline until the fifteenth working day. The team receives no complaints or enquiries during the interim on timeliness. The following month it produces, but does not distribute, the report. There is no response from the customer. The team continues this practice for the next three months until an internal memo indicates that the customer no longer wishes to receive the report – it is now surplus to requirements. In this case, the relevance of the whole reporting process is questionable and a close look at the distribution list of any given report, if not the existence of the report itself, is advisable.

The solution: generate reports in a form and time-envelope which meets the needs of the target customer.

**Stage 5 : How do we compare with other organisations ? What can we gain from benchmarking?**

Detailed and systematic internal deliberations allow the accounting team to develop a clear idea of their own strengths and weaknesses and of the areas of most significant deficiency. The benchmarking exercise at stage 5 of the TQM review process allows us to see how other similar companies are coping with similar problems and opportunities.

**Stage 6 : What does the customer think ?**

Respondents to the survey were encouraged to talk freely about their attitudes towards accounting information services, within a semi-structured outline covering :

1. nature of decisions made;

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2. use made of existing formal reports;
3. preferred format (graphical, tabular or narrative) for formal reporting;
4. other information sources employed;
5. information, currently unavailable, which would aid decision-making; and
6. non-financial indicators used in performance appraisal.

However, formal reports were generally perceived as having four positive features. They were seen as useful in :

- highlighting and reinforcing the existence of large variances, especially when close to the budget setting period;
- reporting unanticipated items associated with unexpected and late accruals, end of month 'adjustments', and misallocations to inappropriate accounts;
- providing information which might change priorities, and
- communicating a degree of analysis not available through on-lines systems.

However, a number of criticisms of content were widespread. The reports were considered to:

- place too much emphasis on the reporting of unfavourable variances constituting insignificantly small monetary amounts rather than focusing on an explanation of large expenditures actually incurred;
- expend too much energy chasing inconsequential items representing minor out-of-budget fluctuations, rather than focusing on wrongly trended items (even where in-budget);
- show an unrealistic concern with comparison of actual versus budgeted outcomes where unfavourable variances were in fact inevitable and symptomatic of inflexible budgeting and time shifts; and
- report too many items for their own sake rather than to satisfy particular objectives or meet the requirements of particular individuals.

Unsatisfied needs embraced three major areas :

1. Ease of access to labour information to facilitate :
  - (a) the quantification and explanation of severe downturns in maintenance productivity;
  - (b) the distinction between normal and overtime hours on maintenance jobs, replacing inadequate composite hourly rates;
  - (c) accounting for non-productive hours per worker resulting from the adoption of a more participatory style of management;

2. predictive models concerning :
  - (a) early warning of massive deteriorations;
  - (b) forecasts of monthly maintenance expenditures;
  - (c) relationships between breakdown and scheduled maintenance expenditures;
  - (d) the impact of performance of safety training;
  - (e) probability-based analysis of risk to facilitate the management of maintenance expenditure; and
3. trend information, ideally weekly and on-line, covering :
  - (a) downtime and cost of breakdowns;
  - (b) operating supplies;
  - (c) maintenance materials;
  - (d) purchased services; and
  - (e) statistical process control.

**Stage 7 & 8 :The Identification of improvement opportunity and implementation of Quality Improvement Process.**

The outcomes of the customer survey, benchmarking and internal analysis, provides the raw material for stage 7 and 8 of the review process : the identification of improvement opportunities and the implementation of a formal improvement process. Table 1 depicts the framework for the six-step analysis, identified by the acronym ‘PRAISE’.

The successful adoption of this sequence of steps demands discipline and commitment. The goal of quality improvement is paramount and guides the actions of the change team throughout

**Table 1. The PRAISE six-step quality improvement process**

Step	Activity	Elements
1	<b>Problem identification</b>	Areas of customer dissatisfaction Absence of competitive advantage Complacency regarding present arrangements
2	<b>Ranking</b>	Prioritise problems and opportunities by ✓ perceived importance, and ✓ ease of measurement and solution

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<b>3</b>	<b>Analysis</b>	<p>Ask ‘Why?’ to identify possible causes            Keep asking ‘Why?’ to move beyond the symptoms and to avoid jumping to premature conclusions            Ask ‘What?’ to consider potential implications            Ask ‘How much?’ to quantify cause and effect</p>
<b>4</b>	<b>Innovation</b>	<p>Use creative thinking to generate potential solutions</p> <ul style="list-style-type: none"> <li>✓ Barriers to implementation</li> <li>✓ available enablers, and</li> <li>✓ people whole co-operation must be sought</li> </ul>
<b>5</b>	<b>Solution</b>	<ul style="list-style-type: none"> <li>• Implement the preferred solution</li> <li>• Take appropriate action to bring about required changes</li> <li>• Reinforce with training and documentation back-up.</li> </ul>
<b>6</b>	<b>Evaluation</b>	<ul style="list-style-type: none"> <li>• Monitor the effectiveness of actions Establish and interpret performance indicators to track progress towards objectives</li> <li>• Identify the potential for further improvements and return to step 1</li> </ul>

**Difficulties experienced at each step:**

<b>Step</b>	<b>Activity</b>	<b>Difficulties</b>	<b>Remedies</b>
1	Problem Identification	<ul style="list-style-type: none"> <li>• Effects of a problem are apparent but problem themselves are difficult to identify</li> <li>• Problem may be identifiable, but it is difficult to identify a measurable improvement opportunity</li> </ul>	<ul style="list-style-type: none"> <li>• Participative approaches like brainstorming, multi-voting, panel discussion</li> <li>• Quantification and precise definition of problem</li> </ul>
2	Ranking	<ul style="list-style-type: none"> <li>• Difference in perception of individuals in ranking</li> <li>• Difference in preferences based on functions e.g. production, finance, marketing etc</li> <li>• Lack of consensus between individuals</li> </ul>	<ul style="list-style-type: none"> <li>• Participative approach</li> <li>• Subordination of individual to group interest</li> </ul>

3	Analysis	Adoption of adhoc approaches and quick fix solutions	Lateral thinking brainstorming
4	Innovation	<ul style="list-style-type: none"> <li>• Lack of creativity or expertise</li> <li>• Inability to operationalise ideas, i.e. convert thoughts into action points</li> </ul>	Systematic evaluation of all aspects of each strategy
5	Solution	Resistance from middle managers	<ul style="list-style-type: none"> <li>• Effective internal communication</li> <li>• Training of personnel and managers</li> <li>• Participative approach</li> </ul>
6	Evaluation	<ul style="list-style-type: none"> <li>• Problem in implementation</li> <li>• Lack of measurable data for comparison of expectations with actual</li> </ul>	Effective control system to track actual feedback system

**1.2.5 Six C's of TQM**

**1.2.5.1 Commitment :**

If a TQM culture is to be developed, so that quality improvement becomes a normal part of everyone's job, a clear commitment, from the top must be provided. Without this all else fails. It is not sufficient to delegate 'quality' issues to a single person since this will not provide an environment for changing attitudes and breaking down the barriers to quality improvement. Such expectations must be made clear, together with the support and training necessary to their achievement.

**1.2.5.2 Culture :**

Training lies at the centre of effecting a change in culture and attitudes. Management accountants, too often associate 'creativity' with 'creative accounting' and associated negative perceptions. This must be changed to encourage individual contributions and to make 'quality' a normal part of everyone's job.

**1.2.5.3 Continuous improvement :**

Recognition that TQM is a 'process' not a 'programme' necessitates that we are committed in the long term to the never-ending search for ways to do the job better. There will always be room for improvement, however small.

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### **1.2.5.4 Co-operation :**

The application of Total Employee Involvement (TEI) principles is paramount. The on-the-job experience of all employees must be fully utilised and their involvement and co-operation sought in the development of improvement strategies and associated performance measures.

### **1.2.5.5 Customer focus :**

The needs of the customer are the major driving thrust; not just the external customer (in receipt of the final product or service) but the internal customer's (colleagues who receive and supply goods, services or information). Perfect service with zero defects in all that is acceptable at either internal or external levels. Too frequently, in practice, TQM implementations focus entirely on the external customer to the exclusion of internal relationships; they will not survive in the short term unless they foster the mutual respect necessary to preserve morale and employee participation.

### **1.2.5.6 Control :**

Documentation, procedures and awareness of current best practice are essential if TQM implementation are to function appropriately. The need for control mechanisms is frequently overlooked, in practice, in the euphoria of customer service and employee empowerment. Unless procedures are in place improvements cannot be monitored and measured nor deficiencies corrected.

Difficulties will undoubtedly be experienced in the implementation of quality improvement and it is worthwhile expounding procedure that might be adopted to minimise them in detail.

## **1.2.6 Overcoming Total Quality Paralysis**

Little attention has so far been paid to the practical problems of overcoming the inertia of organisations and the reluctance of some individuals to adopt the new tools of management accounting. This section argues for a systematic approach to overcome the apparent paralysis besetting many companies in implementing a quality policy.

A quality improvement process like the PRAISE system restricts the adoption of sub-optimum quick-fix solutions and increases the participants' awareness of barriers to change. However, it does not overcome completely some of the behavioural difficulties associated with individual motivation and group dynamics. The problem is not one of an awareness of the usefulness of TQM but rather the ability to do something about it – the inertia associated with total quality paralysis. Some fundamental requirements in getting started are :

1. A clear commitment, from the top, to TQM ideals. Without this, all else fails. It is not sufficient to delegate 'quality' issues to a single person, since this will not provide an appropriate environment for changing attitudes and behaviour and breaking down the barriers to quality improvement. The aim is to develop a TQM culture so that quality improvement becomes a normal part of everyone's job. This expectation must be made clear, and whatever support and training is necessary to its achievement must be provided.

2. Managers must be provided with the skills, tools and techniques to pursue systematic improvement. Training should be practical, avoiding unnecessary abstractions and keeping management jargon to a minimum. It may even be necessary to avoid the acronym 'TQM'

itself, because of the barriers associated with buzzwords, reverting to reference instead to the phrase 'quality improvement process'.

3. The general awareness of improvement opportunities must be improved through the creation of a database documenting the *status quo* and covering those things that the organisation currently does well, as well as its deficiencies. Such a database should contain answers to questions like these :

- (a) Where do we make errors ?
- (b) Where do we create waste ?
- (c) What should we do that we currently make no attempt to do ?

Ideally; the quality improvement process should be a vehicle for positive and constructive movement within an organisation. We must, however, be aware of the destructive potential of the process. Failure to observe the fundamental principles associated with the 'four Ps' of quality improvement may so severely damage motivation that the organisation is unable to recover fully. Those four Ps are :

- **People.** It will quickly become apparent that some individuals are not ideally suited to the participatory process. Lack of enthusiasm will be apparent from a generally negative approach and a tendency to have pre-arranged meeting which coincide with the meetings of TQM teams! Where these individuals are charged with the responsibility for driving group success then progress will be slow or negligible. Quality improvement teams may have to be abandoned largely for associated reasons before they are allowed to grind to a halt.
- **Process.** The rhetoric and inflexibility of a strict Deming approach will often have a demotivating effect on group activity. It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such it will provide a means to facilitate the generation of alternatives while ensuring that important discussion stages are not omitted.
- **Problem.** Experience suggests that the least successful groups are those approaching problems that are deemed to be too large to provide meaningful solutions within a finite time period. Problems need to be approached in bite-sized chunks, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with a recognition of the contribution made by individual participants. For example, while 'communications' and 'morale' are frequently cited as key problem areas, they are too broad to provide successful quality improvement targets. Smaller aspects of these issues must be identified.
- **Preparation.** A training in the workings of Deming-like processes is an inadequate preparation for the efficient implementation of a quality improvement process. Additional courses on creative thinking and statistical processes are needed in order to give participants a greater appreciation of the diversity of the process. This training must quickly be extended beyond the immediate accounting circle to include employees at supervisory levels and below who are involved at the data input stage.

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A three-point action plan for the choice of projects and the implementation process is as follows :

1. **Bite-sized chunks.** It is tempting to seek a large cherry to pluck, but big improvement opportunities are inevitably complex and require extensive inter-departmental co-operation. The choice of a relatively small problem in the first instance provides a greater chance of success.

2. **A solvable problem.** The problem selected should not be trivial, but it should be one with a potential impact and a clear improvement opportunity. Measurable progress towards implementation should be accomplished within three or four months (or less if possible) in order to maintain the motivation of participants and advertise the success of the improvement process itself.

3. **Recognition of participants.** The successful projects and team members should receive appropriate recognition throughout the enterprise. Prominent individuals should be rewarded for their efforts both as personal recognition and as encouragement to others. The precise nature of the reward may be recognition itself, although in some situations material, but usually non-monetary, prizes may also be appropriate.

The implementation of TQM processes can provide long-lasting benefits as long as the achievement of quality goals is not in conflict with other objectives. This might be the case, where, for instance,

- bonuses are based on the volume of output alone; or
- retrenchments result from the increased efficiency associated with the quality improvement process.

By overcoming the initial obstacles, a TQM process can provide us with an additional tool to improve competitiveness and ensure long-term survival.

### 1.2.7 Control : The Missing Link of TQM

The fundamental principles of TQM focus on a process of continuous improvement which enhances the satisfaction of customer requirements by changing the attitude of the workforce. The reduction of waste is made implicit in each worker's task. This suggests the elimination of all non-value-adding processes, processes which include all control functions – monitoring, inspecting, progress chasing, even auditing – which would now be replaced by self-auditing as part of the change in corporate culture. Such extreme expectations are unrealistic. A control function, properly defined, is essential and can contribute to the achievement of TQM objectives.

The development of TQM provides a vehicle for the accounting function to achieve control, continuous improvement and maximum efficiency by ensuring that all of the processes carried out by that function are both in control and capable. Such movements will have a dramatic effect on the accounting function and may well redefine the audit function.

The basic requirement of accounting control is that a process is capable of meeting customer requirements, whether they are those of the directors, the shareholders, or the law.



Techniques which have historically been used to achieve this control include procedures and audit, but these have major flaws. If we are not appropriately focused, it is possible that the process is *never* going to be capable of meeting customer requirements, no matter how complex the levels of audit or procedure adopted. Further, there will be no focus for the documentation of flaws and their subsequent reversal.

Qualitative and non-financial data, vital for control, may not be subject to the same strict standards of measurement as financial and technical data. Their role in the quality programme may, therefore, be underestimated.

Documentation of the *activities* to be performed in the accounting function is an essential first step in identifying the dimensions of processes and the interrelationships between tasks, Table 2 details eight basic processes which may be identified in the accounting function, each covering multiple activities and crossing task boundaries.

A narrow control function is apparent in each process, but this is effectively just the checking or audit component of controllership. The controllership function interacts with the TQM process to impact upon the other six dimensions to provide timely and relevant information to decision-makers and to monitor compliance with corporate expectations where policies, procedures, ethical behaviour and professional conduct are concerned.

The quality manual is usually the major document controlling the implementation of the quality process. It defines the basic philosophy of the organisation, the structure and responsibilities of managers and departments and the relationship between them. It also contains the methods to be used to ensure quality, including the composition of teams, and the audit procedures to be adopted.

The definition of the process, inputs and outputs gives a framework for the writing of procedures and standard methods while also providing a focus for improvement opportunities. Underpinning both is a control and audit process, defining the way that the system is to be checked.

For every process within the accounting organisation, a policy and procedure is established in accordance with industry best practice and communicated throughout the organisation. Its objective is to satisfy customer requirements and to identify improvement opportunities which allow the continuous extension of the customer service provided.

The writing of procedures and standard methods is a fundamental step in pursuing excellence of process. Procedures are concerned with the properties of the system that we are trying to influence (controlled parameters). Standard working methods are concerned with the process variables that are being manipulated in order to influence the system (control points). Thus, if we want to control the water level in a bath, the level is the controlled parameter, and the tap and plug are the control points.

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	<i>Process</i>	<i>Activity</i>
1	Planning	Strategic planning Operating planning Forecasts
2	Book-keeping	Costing Inventory accounting Project accounting Fixed capital Maintenance system
3	Discharging liabilities	Payroll Accounts receivable Accounts payable Cashier Contracts administration
4	Reporting	Corporate reporting Statutory reporting Management reporting
5	Business support	Project or opportunity evaluation Cost improvement Tax advice or guidance Operating centres
6	Corporate services	Tax Insurance Legal
7	Functional administration	Technology management Personnel management Non-accounting procedures TQM Agreements
8	Controllership	Accounting guidelines Accounting procedures Accounting policy and standards Internal audits External audits

**Table 2. Dimensions of the accounting function**

By providing a sound control environment, which supports business decisions with appropriate measurement and analysis, the controllership function pursues complete customer satisfaction. The aim is to achieve acknowledged industry leadership for excellence of process, personnel and service. Underpinning this aim is an audit process that ensures that all of the above are in place and operating. The audit process is partly external, but largely internal, consisting of a control check system that monitors the critical processes of the system. Depending on the breakdown consequences and risk of failure, additional control points can be introduced into the process chain.

Thus, the system allows not only for control, but also for continuous improvement. The monitoring of the data around a process will allow modifications which make it in control and capable. As changes or improvements are made they are documented and the system updated so that everyone uses the *current best method*.

The clear definition and documentation of procedures facilitates job flexibility, making control easier and increasing the level of productivity in the accounting department. Thus, a good control system facilitates continuous improvement by focusing on customer needs, identifying priorities, and relating processes to one another. Variation and inaccuracy is caused by poor control and incompatible systems. A quality system is therefore essential to reduce these problems.

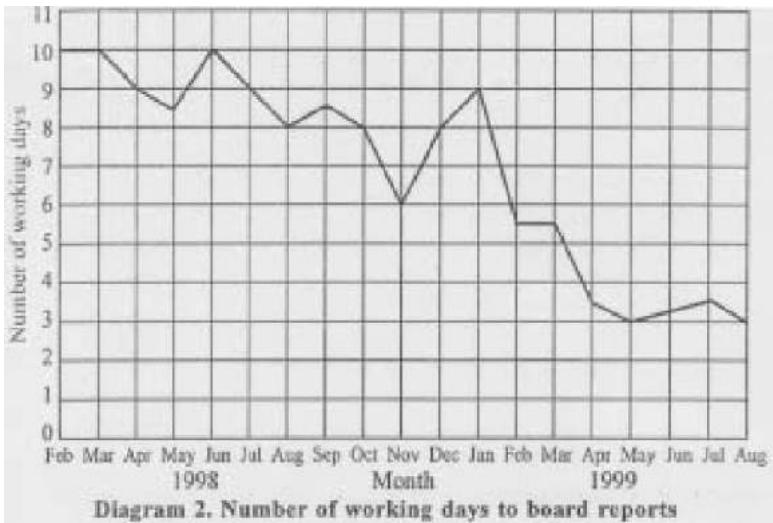
The application of the PRAISE quality improvement process to the timeliness problem provides an excellent example of service improvement, one which observes the fundamental quality principles of waste elimination and doing things right the first time.

Traditionally, a consolidated profit figure has been produced by midday on the fifth working day of the month. Ideally, month-end closing would always be completed on the first working day of the new month, providing more relevant information for decision-making at board level and allowing more efficient use of accounting resources.

By identifying the barriers which prevent the generation of on-time data, a procedure can be implemented to generate a substantial reduction in the completion time for the early-closing process. Careful documentation of the network of tasks allows performance information (embracing financial cost data, technical and non-financial data) to be available at the beginning of the second working day, allowing a full executive performance review to take place before the end of that day. By focusing on further small improvements in procedure, completion might eventually approach the first-day ideal.

Documentation of key data on processes is the first, and arguably the most important, step in the procedure. By charting processes for each activity, establishing time barriers, constraints, priorities, degrees of difficulty and expected improvement times, a critical database is established. Small, dedicated problem-solving teams are charged with developing solutions for task improvements, with the success of the process demonstrated by the dramatic daily improvement apparent at month end illustrated in Diagram 2.

## 1.20 Advanced Management Accounting



**Diagram 2. Number of working days to board reports**

Significant further improvements are also likely to follow :

- the elimination of double handling and manual data delays in day-to-day operations;
- the acceptance of the quality process for problem-solving; and
- the highlighting of opportunities for interdisciplinary teamwork.

The reasons for the success of the improvement process in the area of timeliness are firmly grounded in the principles of TQM, embracing total employee involvement and process measurement. These principles include :

- the clear exposition of the benefits of a project;
- the involvement of *all* customers and contributors;
- the elimination of non-relevant data;
- an understanding of the needs of the whole process;
- the use of graphical and pictorial techniques to achieve understanding;
- the establishment of performance specifications and targets;
- the use of errors to prompt continuous improvement; and
- the use of statistics to tell people how well they are doing.

The basic requirements of controllership are a practical reality and provide a springboard for the provision of accurate, timely data to manage and enhance a business. Control features are, therefore, essential constituents of the TQM process, facilitating the successful implementation of customer-focused improvements.

The quality improvement process should be a vehicle for positive and constructive movement within an organisation but we must also be aware of the destructive potential of the process. Failure to observe the fundamental principles of quality improvement may destroy motivation irrecoverably.

Some authors, notably Carlzon (1987), Albrecht (1985) and Albrecht and Zemke (1988) have criticised the direction that TQM implementations have tended to take in practice, in particular.

- the focus on documentation of process and ill-measurable outcomes;
- the emphasis on quality assurance rather than improvement; and
- an internal focus which is at odds with the alleged customer orientation.

Carlzon has revived the customer focus with an emphasis on total employee involvement (TEI) culminating in the empowerment of the 'front-line' of customer service troops. The main features of his empowerment thrust has been :

- loyalty to the vision of the company through the pursuit of tough, visible goals;
- recognition of satisfied customers and motivated employees as the true assets of a company;
- delegation of decision-making to the point of responsibility by eliminating hierarchical tiers of authority to allow direct and speedy response to customer needs; and
- decentralisation of management to make best use of the creative energy of the workforce.

Albrecht suggest that TQM may not be appropriate for service based industries, because the standards-based approach of 'industry best practice' ignores the culture of organisations. He recommends a move towards TQS (total quality service), which is more customer oriented and creates an environment to promote enthusiasm and commitment. Albrecht suggests that poor service is associated with sloppy procedures, errors, inaccuracies and oversights and poor co-ordination, all of which represents improvement opportunities which can be achieved through tighter controls.

### Illustration

Burdoy Ltd has a dedicated set of production facilities for component X. A just – in – time system is in place such that no stock of materials; work in progress or finished goods are held.

At the beginning of period 1, the planned information relating to the production of component X through the dedicated facilities is as follows:

- (i) Each unit of component X has input materials; 3 units of materials A at Rs. 18 per unit and 2 units of materials B at Rs. 9 per unit.
- (ii) Variable cost per unit of component X (excluding materials) is Rs. 15 per unit worked on.
- (iii) Fixed costs of the dedicated facilities for the period: Rs. 1,62,000.
- (iv) It is anticipated that 10% of the units of X worked on in the process will be defective and will be scrapped

## 1.22 Advanced Management Accounting

It is estimated that customers will require replacement (free of charge) of faulty units of component X at the rate of 2% of the quantity invoiced to them in fulfillment of orders.

Burdoy Ltd is pursuing a total quality management philosophy. Consequently all losses will be treated as abnormal in recognition of a zero defect policy and will be valued at variable cost of production.

Actual statistics for each periods 1 to 3 for component X are shown in Appendix 3.1. No changes have occurred from the planned price levels from materials, variable overhead or fixed overhead costs.

Required:

- (a) Prepare an analysis of the relevant figures provided in Appendix 3.1 to show that the period 1 actual results were achieved at the planned level in respect of (i) quantities and losses and (ii) units cost levels for material and variable costs.
- (b) Use your analysis from (a) in order to calculate the value of the planned level of each of internal and external failure costs for period 1
- (c) Actual free replacement of components X to customers were 170 units and 40 units in periods 2 and 3 respectively. Other data relating to periods 2 and 3 is shown in Appendix 3.1.

Burdoy Ltd authorized additional expenditure during period 2 and 3 as follows:

Period 2: Equipment accuracy checks of Rs. 10,000 and staff training of Rs. 5,000.

Period 3: Equipment accuracy checks of Rs. 10,000 plus Rs. 5,000 of inspection costs; also staff training costs of Rs. 3,000 on extra planned maintenance of equipment.

Required:

- (i) Prepare an analysis for EACH of periods 2 and 3 which reconciles the number of components invoiced to customers with those worked-on in the production process. The analysis should show the change from the planned quantity of process losses and changes from the planned quantity of replacement of faulty components in customer hands;  
(All relevant working notes should be shown)
- (ii) Prepare a cost analysis for EACH of periods 2 and 3 which shows actual internal failure costs, external failure costs, appraisal costs and prevention costs;
- (iii) Prepare a report, which explains the meaning and inter – relationship of figures in Appendix 3.1 and in the analysis in (a), (b) and (c) (i)/(ii). The report should also give examples of each cost type and comment on their use in the monitoring and progressing of the TQM policy being pursued by Burdoy plc.

### Appendix 3.1

#### Actual statistics for component X

	Period 1	Period 2	Period 3
Invoiced to customers (units)	5,400	5,500	5,450
Worked on in the process (units)	6,120	6,200	5,780
Total costs:			
Materials A and B (Rs.)	4,40,640	4,46,400	4,16,160
Variable costs of production (Rs) (excluding materials costs)	91,800	93,000	86,700
Fixed costs (Rs.)	1,62,000	1,77,000	1,85,000

**Solution**

	units
(a) (i) Components worked on in the process	6,120
Less: Planned defective units	612
Replacements to customers (2% × 5,400)	108
Components invoiced to customers	5,400

Therefore actual results agree with planned results

- (ii) Planned component cost = (3 × Rs.18 for materials A) + (2 × Rs. 9 for material B) + Rs. 15 variable cost = Rs. 87

Comparing with the data in the appendix:

Materials = Rs. 4,40,640/6,120 = Rs. 72

Variable overhead = Rs. 91,800/6,120 = Rs. 15

- (b) Internal failure costs = Rs. 53,244 (612 units × Rs. 87)

External failure costs = Rs. 9,396 (108 units × Rs. 87)

	Period 2 (units)	Period 3 (units)
Components invoiced to customers	5,500	5,450
Planned replacement (2%)	110	109
Unplanned replacement	69(170 – 110)	– 69(40 – 109)
Components delivered to customers	5,670	5,490

## 1.24 Advanced Management Accounting

Planned process defects (10% of worked on In the process)	620	578
Unplanned defects (difference to agree with Final row)	<u>-90</u>	<u>-288</u>
Components worked on in the process	<u>6,200</u>	<u>5,780</u>

(ii)	Period 2 (Rs.)	Period 3 (Rs.)
Internal failure costs	46,110 (620 – 90) × Rs.87	25,350 (578 – 288) × Rs.87
External failure costs	14,790 (110 + 60) × Rs. 87	3,480 (109 – 69) × Rs.87
Appraisal costs	10,000	15,000
Prevention costs	5,000	8,000

(iii) The following points should be included in the report:

1. Insufficient detail is provided in the statistics shown in the appendix thus resulting in the need to for an improvement in reporting.
2. The information presented in (c) (i) indicates that free replacements to customers were 60 greater than planned in period 2 but approximately 70 less than planned in period 3. In contrast, the in process defects were 90 less than planned (approximately 15%) in period 2 and 288 less than plan (approximately 50%) in period 3.
3. Internal failure costs show a downwards trend from periods 1–3 with a substantial decline in period 3. External failure costs increased in period 2 but declined significantly in period 3.
4. The cost savings arising in period 2 and 3 are as follows:

	Period 2 (Rs)	Period 3 (Rs.)
Increase/decrease from Previous period:		
Internal failure costs	- 7,134 (Rs. 53,244 – Rs. 46,110)	-20,880 (Rs. 46,110 – Rs. 25,230)
External failure costs	+ <u>5,394</u> (Rs. 9,396 – Rs. 14,790)	<u>-11,310</u> (Rs. 14,790 – Rs. 3,480)
Total Decrease	<u>- 1,740</u>	<u>-32,190</u>

The above savings should be compared against the investment of Rs. 10,000 appraisal costs and Rs. 5,000 prevention costs for period 2 and Rs. 15,000 and Rs. 8,000 respectively in period 3. It can be seen that the costs exceed the savings in period 2 but the savings exceeded the costs in period 3. There has also been an increase in the external failure costs from period 1 to period 2. Investigations should be made relating to the likely time lag from incurring prevention/ appraisal costs and their subsequent benefits.



5. The impact on customer goodwill from the reduction in replacements should also be examined.

**Illustration**

The budget estimates of a company using sophisticated high speed machines based on a normal working of 50,000 machine hours during 1986 are as under:—

	(Rs. lakhs)
Sales (1,00,000 units)	<u>100</u>
Raw materials	20
Direct Wages	20
Factory Overheads—Variable	10
Fixed	10
Selling and Distribution Overheads—Variable	5
Fixed	5
Administration Overheads—Fixed	<u>10</u>
Total Costs	<u>80</u>
Profit	<u>20</u>

Since the demand for the company product is high the possibilities of increasing the production are explored by the budget committee. The Technical Director stated that maintenance has not been given due importance in the budget and that if preventive maintenance is introduced, the breakdown repair costs and the hours lost due to breakdown can be reduced and consequently production can be increased.

In support of this, he presented the following data, showing how injection of more and more funds on preventive maintenance will bring down the break-down repair costs and reduce or eliminate stoppages due to breakdown :—

Proposed Expenditure on Preventive Maintenance	Expenditure Estimated to by Incurred on Breakdown Repairs	Machine Hours Saved
Rs.	Rs.	
19200	1,92,000	Nil
38,400	1,53,600	800
76,800	1,15,200	1,600
1,53,600	76,800	2,400
3,07,200	57,600	3,200
6,14,400	—	4,000

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Using the different cost and contribution concept, advise the management upto what level breakdown hours can be reduced to increase production and maximise profits of the company consistent with minimum costs.

### Solution

#### Workings:

Contribution per unit and per hour :	(Rs. lakhs)
Sales (1,00,000 units)	<u>100</u>
Raw materials	20
Direct wages	20
Factory overheads (Variable)	10
Selling & distribution overheads (Variable)	<u>5</u>
Total variable costs	<u>55</u>
Contribution	<u>45</u>

Contribution per unit :  $\frac{\text{Rs. } 45,00,000}{1,00,000} = \text{Rs. } 45$

Machine hours planned 50,000

Production units 1,00,000

In one machine hour 2 units will be produced

Hence contribution per hour :  $\text{Rs. } 45 \times 2 = \text{Rs. } 90$ .

#### Statement showing differential cost and incremental contribution at different levels of machine hours saved.

Machine hours saved	0	800	1,600	2,400	6,200	4,000
Estimated breakdown						
Repair costs (Rs.)	1,92,000	1,53,600	1,15,600	1,15,200	76,800	57,600
Differential savings in						
Breakdown repair Costs (Rs.)	0	38,400	38,400	38,400	19,200	57,600
Incremental contribution						
(Rs.) (see note below)	0	72,000	72,000	72,000	72,000	72,000
Total differential						
Savings Rs. (A)	0	1,10,400	1,10,400	1,10,400	91,200	1,29,600
Expenditure on preventive						
maintenance	19,200	38,400	76,800	1,53,600	3,07,200	6,14,400

Differential expenditure on preventive

maintenance (Rs.) (B)	0	19,200	38,400	76,800	1,53,600	3,07,200
Incremental profit (Rs.) (A–B)	0	91,200	72,000	33,600	–62,400	–1,77,600

**Note :** Incremental contribution is calculated by multiplying differential hours saved by contribution per hour i.e.  $800 \times \text{Rs. } 90 = \text{Rs. } 72,000$

**Recommendation :** It may be observed from the above table that savings in machine hours upto 2,400 yields incremental profit. Beyond this level, the differential maintenance costs exceed the differential savings. Therefore, the management is advised to reduce the level of breakdown hours upto 1600 (4,000 – 2,000) or save 2,400 breakdown hours to increase production. At this level, the company will be able to maximise profits consistent with minimum costs.

**Illustration**

A Ltd. produces and markets a range of consumer durable appliances. It ensures after sales service through X Ltd. The big appliances are serviced at customer’s residence while small appliances are serviced at workshop of X Ltd.

The material supplied to X Ltd. is charged at cost at 10%. X Ltd. charges customers at 25% over the above price. For labour, the company receives 10% of the rate fixed for work done under the after-sales service agreement and 15% of the rate fixed in case of jobs not covered under the agreement from X Ltd. 60% by value of the total work undertaken by X Ltd. was for appliances and rest accounted for small appliances during the previous year.

The company decides to carry out all or some of the work itself and has chosen one area in the first instance. During the previous year the company earned a profit of Rs. 2,16,000 as detailed below from X Ltd. for the area chosen:

	Materials	Labour
	Rs.	Rs.
Under after –sales service agreement	60,000	1,00,000
For jobs not covered under the agreement	20,000	36,000

The company forecasts same value of work in that area for the ensuing period. The following three options are under consideration of the management:

- (1) To set up a local service Centre to provide service for small appliances only. The existing system is to continue for big appliances.
- (2) To set up a local services Centre to provide service for big appliances only. The existing system is to continue for small appliances.
- (3) To set up a local service Centre to provide service to all appliances. The existing system then stands withdrawn.

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The relevant costs for carrying out jobs under the above options are as under:

	Option -1	Option -2	(Rs.'000)
Heat, rent, light etc.	125	50	150
Management costs	108	83	150
Service staff costs	230	440	750
Transport costs	25	220	230

You are required to find out the most profitable option.

### Solution

Statement showing value of total work undertaken by X Ltd. at customer's price.

	(Rs. '000)
Material cost (for appliances covered under agreement)	825
[Refer to working note 1(i)]	
Material cost (for appliances not covered under agreement)	275
[Refer to working note 2(i)]	
Labour cost (for appliances covered under agreement)	1,000
Labour cost (for appliances not covered under agreement)	240
[Refer to working note 2(ii)]	
Total receipts	2,340
Break up of receipts:	
Big appliances	60% 1,404
Small appliances	40% 936

### Profitability Statement

	Option 1	Option 2	(Rs.'000)
Income:			
Big appliances	129.6	1,404	1,404
	(60%×Rs. 216)		
Small appliances	936 86.4	936	
	_____	(40%× Rs. 216)	_____
Total receipts: (A)	<u>1,065.6</u>	<u>1,490.4</u>	<u>2,340</u>

Costs:

Material	320	480	800
Heat, rent, light etc.,	125	50	150
Management costs	108	83	150
Service staff costs	230	440	750
Transport costs	<u>25</u>	<u>220</u>	<u>230</u>
Total costs: (B)	808	1,273	2,080
Profit: [(A-B)]	<u>157.6</u>	<u>217.4</u>	<u>260</u>

**Recommendation:**

**Option 3 is most profitable one.**

**Working Notes:**

1. Material and labour cost (for appliances under after sales agreement): Rs.
  - (i) Cost of Material per unit charged to customer's by X Ltd. 137.50  
 (Rs. 100 +10% (Rs. 100+25% 'Rs.110)  
 cost of material charged to customer's by X Ltd.  

$$\left( \frac{Rs.60,000}{Rs.10} \times Rs.137.50 \right)$$
8,25,000
  - (ii) Cost of labour charged to customers by X Ltd.  

$$\left( \frac{Rs.1,00,000}{Rs.10} \times 100 \right)$$
10,00,000
  
2. Material and labour cost (for appliances not covered under sales agreement): Rs.
  - (i) Cost of material charged to customers by X Ltd.  

$$\left( \frac{Rs.20,000}{Rs.10} \times Rs.137.50 \right)$$
2,75,000
  - (ii) Cost of labour charged to customers by X Ltd.  

$$\left( \frac{Rs.36,000}{Rs.15} \times 100 \right)$$
2,40,000

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### 1.3 ACTIVITY BASED COST MANAGEMENT

#### 1.3.1 Introduction

Contrary to what might be imagined, many organisations do not wish to know how much it costs to make a product with precise accuracy. This is because pricing is based on what the market will bear, competitors' moves, etc. Others however fix their price on cost and need to be able to determine it with reasonable accuracy. The latter organisations have been greatly benefitted from the development of activity based costing (ABC), which is a modern absorption costing method,

It should not be assumed that all traditional absorption costing systems are not accurate enough to give adequate information for pricing purposes or other, long-run management decision purposes. Some traditional systems treat overheads in a detailed way and relate them to service cost centres as well as production cost centres. The service centre overheads are then spread over the production cost centres before absorption rates are calculated. The main cause of inaccuracy is in the calculation of the overhead rate itself, which is usually based on direct labour hours or machine hours. These rates assume that products that take longer to make, generate more overheads. Thus traditional cost system overcosted high volume products and undercost low volume products.

#### ***Factors prompting the development of ABC system include :***

1. Growing overhead costs because of increasingly automated production
2. Increasing market competition which necessitated more accurate product costs.
3. Increasing product diversity to secure economies of scope & increased market share.
4. Decreasing costs of information processing because of continual improvements and increasing application of information technology

#### 1.3.2 Meaning of ABC

Activity Based Costing is an accounting methodology that assign costs to activities rather than products or services. This enables resources & overhead costs to be more accurately assigned to products & services that consume them.

ABC assign cost to activities based on their use of resources. It then assign cost to cost objects, such as products or customers, based on their use of activities. ABC can track the flow of activities in organization by creating a link between the activity (resource consumption) and the cost object. The flow is characterized through four core areas :

- Cost object.
- Cost drivers.
- Resource Cost drivers.
- Activity Cost drivers.

In order to understand *how ABC operates it is necessary to understand the meaning of above terms.*

**1.3.3 Definitions**

**A Cost Object**—It is an item for which cost measurement is required e.g. a product or a customer.

**A Cost Driver**—It is a factor that causes a change in the cost of an activity. There are two categories of cost driver :

**A Resource Cost Driver**—It is a measure of the quantity of resources consumed by an activity. It is used to assign the cost of a resource to an activity or cost pool.

**An Activity Cost Driver**—It is a measure of the frequency and intensity of demand, placed on activities by cost objects. It is used to assign activity costs to cost objects.

The cost driver for business functions viz., Research & Development and Customer Service are as below :

Business functions :	Cost Driver
Research & Development	Number of research products
	Personnel hours on a project
	Technical complexities of projects
Customer Service	Number of service calls
	Number of products serviced
	Hours spent on servicing products.

In traditional costing overheads are first related to cost centres (Production & Service Centres) and then to cost objects, i.e., products. In ABC overheads are related to activities or grouped into cost pools (depending on the terminology preferred). Then they are related to the cost objects, e.g., products. The two processes are, therefore, very similar, but the first stage is different as ABC uses activities instead of functional departments (cost centres). The problem with functional departments is that they tend to include a series of different activities, which incur a number of different costs that behave in different ways. Activities also tend to run across functions; for instance, procurement of materials often includes raising a requisition note in a manufacturing department or stores. It is not raised in the purchasing department where most procurement costs are incurred. Therefore, ABC gives a more realistic picture of the way in which costs behave.

As with traditional absorption costing ABC rates are calculated in advance, normally for a year ahead, and so the same rates are used for a year at a time. The advantage of this is that any seasonal variations will be spread giving an average cost. If this was not done and actual rates were used the absorption rates would vary monthly. This would mean that when output was high the overhead rate would be low and vice versa; if pricing were based on cost the prices quoted would be higher when the business was slack.

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### 1.3.4 Stages in Activity Based Costing

The different stages in activity based costing are listed below and are shown in Figure (A)

**(1) Identification of the activities that may take place in an organisation : The first stage is to identify the major activities in the organization. There can be machine related activities, direct labour related activities and various support activities such as ordering, receiving, material parts handling etc.** Usually the number of cost centres that a traditional overhead system uses are quite small, say upto fifteen. In ABC the number of activities will be much more, say 200; the exact number will depend on how the management subdivides the organisation's activities. It is possible to break the organisation down into many very small activities. But if ABC is to be acceptable as practical system it is necessary to use larger groupings, so that, say, 40 activities may be used in practice. The activities may be listed as follows:-Production schedule changes

- Customer liaison
- Purchasing
- Production process set up
- Quality control
- Material handling
- Maintenance

**(2) Assigning costs to cost pool for each activity** both support and primary activities, that caused them. This creates 'cost pools' or 'cost buckets'. This will be done using resource cost drivers that reflect causality.

**(3) Support activities are then spread across the primary activities** on some suitable base, which reflects the use of the support activity. The base is the cost driver that is the measure of how the support activities are used.

**(4) Determine the cost drivers for each activity** that will be used to relate the overheads collected in the cost pools to the cost objects/products. A cost Driver is a variable, which determines the work volume or work load of a particular activity. This is based on the factor that drives the consumption of the activity. The question to ask is – what causes the activity to incur costs ? In production scheduling, for example, the driver will probably be the number of batches ordered. Some questions which are aimed at bringing out the cost drivers are given below:-

- What is the number of staff working on a particular activity?
- Why is overtime worked?
- Why does the idle time occurs?
- What is it, that determines the amount of timew spent on a particular activity?



The end result of this type of questioning will be a typical set of cost drivers for each sub-activity.

**(5) Assigning the costs of activities to products according to product demand for activities :** This step involves tracing the cost of the activities to products according to products demand for these activities during the production process. This requires to calculate cost driver rate for each activity, just as an overhead absorption rate would be calculated in the traditional system.

$$\text{Activity cost driver rate} = \frac{\text{Total cost activity}}{\text{Activitydriver}}$$

The activity driver rate can be used to cost products, as in traditional absorption costing, but it can also cost other cost objects such as customers/customer segments and distribution channels. The possibility of costing objects other than products is part of the benefit of ABC. The activity cost driver rates will be multiplied by the different amounts of each activity that each product/other cost object consumes.

**Cost flow in activity based costing**

<b>Resources :</b> (resource cost drivers)	Staff wages	Electricity	Advertising
<b>Support activities :</b>	i	ii	iii
<b>Primary activities :</b> (activity cost drivers)	i	ii	iii
<b>Cost objects :</b>	Products/ services	Customer segments	Distribution channels

Activities basically fall into four different categories, known as the manufacturing cost hierarchy. These categories are generally accepted today but were first identified by Cooper (1990). The categories of activities help to determine the type of activity cost driver required.

*The categories of activities are :*

**1. Unit level activities.** The costs of some activities (mainly primary activities) are strongly correlated to the number of units produced. For example, the use of indirect materials/consumables tends to increase in proportion to the number of units produced. Another example of a unit level activity is the inspection or testing of every item produced, if this was deemed necessary or, perhaps more likely, every 100th item produced.

**2. Batch level activities.** The cost of some activities (mainly manufacturing support activities) are driven by the number of batches of units produced. Examples of this are :

- Material ordering—where an order is placed for every batch of production

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- Machine set-up costs—where machines need resetting between each different batch of production.
- Inspection of products—where the first item in every batch is inspected rather than every 100th item quoted above.

**3. Product level activities.** The costs of some activities (often once only activities) are driven by the creation of a new product line and its maintenance, for example, designing the product, producing parts specifications and keeping technical drawings of products up to date. Advertising costs fall into this category if individual products are advertised rather than the company's name.

**4. Facility level activities.** Some costs cannot be related to a particular product line, instead they are related to maintaining the buildings and facilities. Examples are the maintenance of buildings, plant security, business rates, etc. Also included in this category are salaries, such as the production manager's. Advertising campaigns that promote the organisation would also be included.

The first and last categories above are the same as those in traditional absorption costing and so if an organisation costs are mainly made up of these two categories ABC, will not improve the overhead analysis greatly. But if the organisation's costs fall mainly in the second and third categories an ABC analysis will provide a different and more accurate analysis.

#### Illustration

A company produces three products A, B and C for which the standard costs and quantities per unit are as follows :

<i>Products</i>	<i>A</i>	<i>B</i>	<i>C</i>
Quantity produced	10,000	20,000	30,000
Direct material/p.u. (Rs.)	50	40	30
Direct labour/p.u. (Rs.)	30	40	50
Labour hours/p.u.	3	4	5
Machine hours/p.u.	4	4	7
No. of purchase requisitions	1,200	1,800	2,000
No. of set ups	240	260	300

Production overhead split by departments — Department 1 = Rs. 11,00,000  
— Department 2 = Rs. 15,00,000

Department 1 is labour intensive and Department 2 is machine intensive

Total labour hours in Department 1 = 1,83,333

Total machine hours in Department 2 = 5,00,000

Production overhead split by activity— Receiving/inspecting	Rs.14,00,000
— Production scheduling/machine set up	Rs. <u>12,00,000</u>
	Rs. <u>26,00,000</u>

Number of batches received/inspected = 5,000

Number of batches for scheduling and set-up = 800

You are required to:

- (i) Prepare Product Cost Statement under traditional absorption costing and Activity Based Costing method.
- (ii) Compare the results under two methods.

**Solution**

**Traditional absorption costing**

Absorption rates :

$$\text{Department 1} = \frac{\text{Rs. 11,00,000}}{1,83,333 \text{ labour hours}} = \text{Rs. 6 per labour hour}$$

$$\text{Department 2} = \frac{\text{Rs. 15,00,000}}{5,00,000 \text{ machine hours}} = \text{Rs. 3 per machine hour}$$

**Product cost statement**

Products	A	B	C
	Rs.	Rs.	Rs.
Direct materials	50	40	30
Direct labour	30	40	50
<i>Overhead :</i>			
Department 1	18	24	30
(3 hrs. × Rs. 6)	(4 hrs. × Rs. 6)	(5 hrs. × Rs. 6)	
Department 2	12	12	21
(4 hrs. × Rs. 3)	(4 hrs. × Rs. 3)	(4 hrs. × Rs. 7)	
<b>Total cost p.u.</b>	<b>110</b>	<b>116</b>	<b>131</b>

**Activity based costing**

Cost driver rates :

$$\text{Receiving/inspecting} = \frac{\text{Rs. 14,00,000}}{5,000 \text{ (No. of batches received/inspected)}}$$

$$= \text{Rs. 280 per requisition}$$

$$\text{Production scheduling/Machine set ups} = \text{Rs. 1,500 per set up}$$

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#### Product cost statement (per unit)

Products	A	B	C
	Rs.	Rs.	Rs.
Direct materials (Rs. )	50	40	30
Direct labour (Rs.)	30	40	50
<i>Overhead :</i>			
Receiving	34*	25	19
Production scheduling	36**	20	15
<b>Total cost per unit</b>	<b>150</b>	<b>125</b>	<b>114</b>

{Rs. 280 × 1,200} ÷ 10,000 units = Rs. 34\*; similarly Rs. 25 and Rs.19

(Rs. 1,500 × 240) ÷ 10,000 units = Rs. 36\*\*; similarly Rs. 20 and Rs. 15

The two absorption methods produce different results. Product C appears to be much more expensive using the traditional method than it does with ABC, while product A is the opposite. If it is assumed that ABC is more accurate, which it may or may not be, then product C would be overpriced on the traditional method and sales would presumably be poor as a consequence—assuming competitors supply more cheaply. Product A would be the opposite : sales would be high and it is possible that the company would unknowingly make a loss per unit on product A.

#### Illustration

The following information provides details of costs, volume & cost drivers for a particular period in respect of ABC. Ltd. for product X, Y and Z

	Product X	Product Y	Product Z	Total
1. Production and sales (units)	30,000	20,000	8,000	
2. Raw material usage (units)	5	5	11	
3. Direct material cost (Rs.)	25	20	11	12,38,000
4. Direct labour hours	1.33	2	1	88,000
5. Machine hours	1.33	1	2	76,000
6. Direct labour cost (Rs.)	8	12	6	
7. Number of production runs	3	7	20	30
8. Number of deliveries	9	3	20	32
9. Number of receipts (2 × 7)*	15	35	220	270
10. Number of production orders	15	10	25	50

## 11. Overhead costs:

Set-up	30,000
Machines	7,60,000
Receiving	4,35,000
Packing	2,50,000
Engineering	<u>3,73,000</u>

Rs. 18,48,000

\*The company operates a just-in-time inventory policy, and receives each component once per production run.

In the past the company has allocated overheads to products on the basis of direct labour hours. However, the majority of overheads are related to machine hours rather than direct labour hours. The company has recently redesigned its cost system by recovering overheads using two volume related bases : machine hours and a materials handling overhead rate for recovering overheads of the receiving department. Both the current and the previous cost system reported low profit margins for product X, which is the company's highest-selling product. The management accountant has recently attended a conference on activity-based costing, and the overhead costs for the last period have been analysed by the major activities in order to compute activity-based costs.

From the above information you are required to:

- (a) Compute the product costs using a traditional volume-related costing system based on the assumption that :
  - (i) all overheads are recovered on the basis of direct labour hours (i.e. the company's past product costing system);
  - (ii) the overheads of the receiving department are recovered by a materials handling overhead rate and the remaining overheads are recovered using a machine hour rate (i.e. the company current costing system).
- (b) Compute product costs using an activity-based costing system.

**Solution**

- (a) **Computation of the product cost using a traditional volume related costing system based on assumption that :**
  - (i) *all overheads are recovered on the basis of direct labour hours (i.e. the company product costing system)*

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#### Statement showing the product cost

Products	X	Y	Z
Rs.	Rs.	Rs.	
Direct labour	8	12	6
Direct materials	25	20	11
Overhead	28	42	21
(Refer to working note)	(1.33 hrs. × Rs. 21)	(2 hrs. × Rs. 21)	(1 hr. × Rs. 21)
<b>Total</b>	<b>61</b>	<b>74</b>	<b>38</b>

#### Working note :

#### Overheads to be charged to products

$$\begin{aligned} \text{Direct labour overhead rate} &= \frac{\text{Total OH}}{\text{Total DLH}} \\ &= \text{Rs. 21 per direct labour hour.} \end{aligned}$$

(ii) *The overheads of the receiving department are recovered by a material handling overhead rate & the remaining overheads are recovered by using a machine hour rate (i.e. the company current costing system)*

Products	X	Y	Z
	Rs.	Rs.	Rs.
Direct labour	8	12	6
Direct materials	25	20	11
Material handling overhead	8.78	7.03	3.87
(Refer to working note)	(Rs. 25 × 35.14%)	(Rs. 20 × 35.14%)	(Rs. 11 × 35.14%)
Other overheads	24.79	18.59	37.18
(machine hour basis)			

#### Refer to Working note :

#### Overheads to be charged to products :

$$\begin{aligned} \text{Material handling overhead rate} &= \frac{\text{Receiving Dept. OH}}{\text{Direct material cost}} \\ &= 35.14\% \text{ of direct material cost.} \end{aligned}$$

$$\begin{aligned} \text{Machine hour overhead rate} &= \frac{\text{Other OH}}{\text{Machine Hrs.}} \\ &= 18.59 \text{ per machine hours.} \end{aligned}$$

**(b) Statement showing the product costs using an activity based costing system.**

Products	X	Y	Z
	Rs.	Rs.	Rs.
Direct labour	8	12	6
Direct materials	25	20	11
Machine overheads	13.33	10	20
(Refer to working note 1)	(1 hrs.× Rs. 10)	(1 hr.× Rs.10)	(2 hrs.×Rs. 10)
Set-up costs	0.10	0.35	2.50
<i>(Refer to working note 2(i))</i>			
Receiving	0.81	2.82	44.30
<i>(Refer to working note 2(ii))</i>			
Packing	2.34	1.17	19.53
<i>(Refer to working note 2(iii))</i>			
Engineering	3.73	3.73	23.31
<i>(Refer to working note 2(iv))</i>			
<b>Total manufacturing cost</b>	<b>53.31</b>	<b>50.07</b>	<b>126.64</b>

**Working note :**

1. Machine overhead rate per hour =  $\frac{\text{Rs. 7,60,000}}{76,000 \text{ hrs.}} = \text{Rs. 10}$
  
2. The cost per transaction or activity for each of the cost centres is as follows :
  - (i) *Set-up cost*  
 Cost per setup =  $\frac{\text{Rs. 30,000}}{30} = \text{Rs. 1000}$
  
  - (ii) *Receiving Cost*  
 Cost per receiving order =  $\frac{\text{Rs. 4,35,000}}{270} = \text{Rs. 1611}$
  
  - (iii) *Packing Cost*  
 Cost per packing order =  $\frac{\text{Rs. 2,50,000}}{32} = \text{Rs. 7812}$
  
  - (iv) *Engineering*  
 Cost per production order =  $\frac{\text{Rs. 3,73,000}}{50} = \text{Rs. 7460}$

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### 1.3.5 Purposes and benefits of Activity Based Costing

Initially companies switched from traditional absorption costing to ABC in order to produce more accurate cost information for products, as shown above. The managers in some of these companies were surprised by the information revealed which indicated inordinately high cost., This led them to adjust their pricing policies and to develop different product strategies, as they found that previously high volume, long production run products had been over-costed and low volume, short production run products under-costed.

To summarise, ABC is particularly needed by organisations for product costing where:

- Production overheads are high in relation to direct costs
- There is a great diversity in the product range
- Products use very different amounts of the overhead resources
- Consumption of overhead resources is not primarily driven by volume.

But if ABC is only considered to be a more detailed and accurate overhead absorption costing system many organisations may decide to do without it. Advocates of using ABC for a accurate overhead apportionment usually compare the ABC technique with the most basic traditional absorption costing system where one blanket overhead rate is applied.

### 1.3.6 Activity Based Cost system installation and operation

The motives for pursuing an ABC implementation, or at least of investigating its feasibility, must be established at the outset. Most commonly these will be :

1. To improve product costing especially in those situations where existing methods under cost some products and over cost others; or
2. To identify non-value-adding activities in the production process which might be a suitable focus for attention or elimination.

In practice, the former is the most quoted goal, even though the latter may be more appropriate. This is especially so for firms which are highly labour intensive and which do not have a great diversity of products in their range, and where allocation of overhead based on direct labour hours may already function efficiently.

Direct costs, like materials and direct labour, are easily assigned directly to products. Some indirect costs, particularly those selling costs which are product specific (e.g., advertising), may be directly assigned to the product too. The remaining indirect costs are those which are problematical and provide the focus for ABC, with resource costs indirectly assigned to the cost object via cost pools and activity drivers.

*A number of distinct practical stages in the ABC implementation are as follows :*

1. **Staff training** : The co-operation of the workforce is critical to the successful implementation of ABC. They are closest to the process and most aware of the problems. Staff training should be, as far as possible, jargon-free, and create an awareness of the purpose of ABC. It should be non-threatening in nature, stressing that increased



efficiencies resulting from a successful implementation will mean rewards not redundancies. The need for the co-operation of staff in the concerted team effort, for mutual benefit, must be emphasised throughout the training activity.

2. **Process specification** : Informal, but structured, interviews with key members of personnel will identify the different stages of the production process, the commitment of resources to each, processing times and bottlenecks. The interviews will yield a list of transactions which may, or may not, be defined as 'activities' at a subsequent stage, but in any case provide a feel for the scope of the process in the entirety.
3. **Activity definition** : The problem must be kept manageable at this stage, despite the possibility of information overload from new data, much of which is in need of codification. The listed transactions must be rationalised in order to aggregate those in similar categories and eliminate those deemed immaterial. The resultant cost pools will likely have a number of different events, or drivers, associated with their incurrence.
4. **Activity driver selection** : A single driver covering all of the transactions grouped together in an 'activity' probably does not exist. Multiple driver models could be developed if the data were available, but cost-benefit analysis has rarely shown these to be desirable. The intercorrelation of potential activity drivers will probably be so strong as to suggest that it really does not matter which one is selected. This argument might be employed to avoid the costly collection of data items otherwise not monitored, nor easily accessible.
5. **Costing** : A single representative activity driver can be used to assign costs from the activity pools to the cost objects. If, for example, the number of engineering set-ups has been identified as a driver of process costs and the total set-up cost is Rs. 40,000 for a company producing four products (A, B, C, D) then the number of set-ups per product can be used to assign these costs. If product A requires 2 set-ups; B4 set-ups ; C24 and D10, then the average cost per set-up of Rs. 40,000/40 set ups = Rs. 1,000, a misleading figure taken at face value, which does not imply the different demands of the set up resource made by the different products. However, total set-up costs can be distributed to product groups in proportion to use, i.e., A : Rs. 2,000, B : Rs. 4,000, C : Rs. 24,000 and D : Rs. 10,000 and then assigned to individual units of product in proportion to the total level of output.

This procedure can then be repeated for all material activities.

### 1.3.7 Activity Based Cost Management (ABM)

Empirical studies of ABC implementation have frequently shown that the greater benefit derived from its adoption is in Cost Management rather in providing accurate product cost. The term Activity based management (ABM) is used to describe the cost management application of ABC. The use of ABC as a costing tool to manage costs at activity level is known as Activity Based Cost Management (ABM). ABM is a discipline that focuses on the efficient and effective management of activities as the route to continuously improving the value received by customers. ABM utilizes cost information gathered through ABC. Through various analysis, ABM manages activities rather than resources. It determines what drives the

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activities of the organization and how these activities can be improved to increase the profitability.

**1.3.7.1 Stages in Activity Based Cost Management :** We have already discussed the various stages involved in activity based product costing. These stages are :

1. Identification of the activities that have taken place in the organisation.
2. Assigning costs to cost pool for each activity.
3. Spreading of support activities across the primary activities.
4. Determining cost driver for each activity.
5. Assigning the costs of activities to products according to product demand for activities.

The application of ABC as a costing tool to manage cost requires the firm to omit the final stage of assigning costs to products and adopt activity based costing without activity based product costing. Alternatively, organisation can design an activity based system and incorporates both ABM and Activity Based Product Costing.

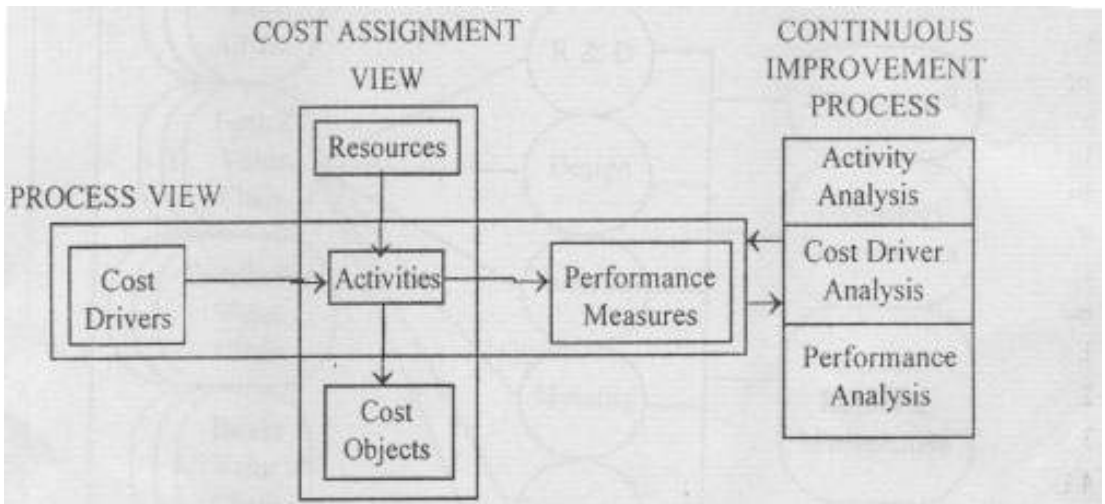
**1.3.7.2 Activity Based Management Model :** Consortium for Advanced Management International (CAM) defines ABM as “adds a dynamic, continuous improvement dimension to the more static ABC model.” Interestingly, it has been observed that Japanese accountants began exploring activity-based techniques in the early 1990s following movement in the United States toward the ABM model.

**CAM-1 defines ABM as :** “A discipline that focuses on the management of activities as the route to improving the value received by the customer and the profit achieved by providing this value. This discipline includes cost driver analysis, activity analysis, and performance measurement. Activity-Based Management draws on Activity-Based Costing as its major source of information.”

The fig.- 1 pictorially represents ABM model in a chart developed for CAM-1. In commenting on this model, one of its co-developers stated, “ABC supplies the information, and ABM uses this information in various analyses designed to yield continuous improvement.”

**(a) Cost Driver Analysis :** The factors that cause activities to be performed need to be identified in order to manage activity costs. Cost driver analysis identifies these causal factors.

For example, a cost driver analysis study might determine that slow processing of customer invoices results largely from lack of training of the customer invoice associates. This lack of training is thus a cost driver of the customer invoice processing activity. It is one of the factors causing this activity to take place (in this case, inefficiently). Managers have to address this cost driver to correct the root cause of the slow processing problem. To accomplish this task, managers might decide that an internal training program for customer invoice associates should be designed and implemented to increase the speed of customer invoice processing.



**Fig. 1 : Activity-Based Management Model. Source : From the *CAM-I Glossary of Activity-Based Management*, Edited by Norm Raffish and Peter B. B. Turney, (Arlington : CAM-I, 1991).**

The time saving from the improved training may lead to a reduction in the number of customer invoice associated and, thus, to lower costs for the “customer invoice processing” activity. Of course, real salary cost savings occur only if the number of jobs in the organisation actually decreases (e.g., through attrition) or if displaced customer invoice associates are redeployed to VA activities, thus canceling the need to hire new employees from outside. The tangible cost savings and intangible benefits from the customer invoice processing improvements should be compared with both the tangible and intangible costs of the new training program in a cost-benefit analysis.

The hypothetical customer invoice processing example shows that the identification and analysis of cost drivers (causal factors) is a necessary first step toward improving the cost-effectiveness of activities and cost management through ABM.

**(b) Activity Analysis :** Activity analysis, defined in section (a), identifies the activities of an organisation and the activity centres (or activity cost pools) that should be used in an ABC system. Activity analysis also identifies VA and NVA activities. The degree to which activities are grouped together into activity centres depends on the costs and benefits of the alternatives. The number of activity centres is likely to change over time as organisational needs for activity information evolve.

For example, only a few activity centres may be used in an initial ABC pilot study. As managers become more accustomed to the initial ABC system and find the output useful, they may request a more detailed and refined ABC model.

**(c) Performance Analysis :** Performance analysis involves the identification of appropriate measures to report the performance of activity centres or other organisational units, consistent

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with each unit's goals and objectives. Performance analysis aims to identify the best ways to measure the performance of factors that are important to organisations in order to stimulate continuous improvement.

**1.3.7.3 Business application of ABM :** ABM views the business as a set of linked activities that ultimately add value to the customer. ABM is based on the premise that activities consume costs. Therefore, by managing activities costs will be managed in long term. Activities may be grouped in such a way as to describe the total process. For example, serving a particular customer involves a number of discrete activities, but the sum total of these activities represents the process by which the client is serviced. ABM classifies each activity within a process as value-added activities or non-value added activities.

**Value-added activities (VA) :** The value-added activities are those activities which are necessary for the performance of the process. Such activities represents work that is valued by the external or internal customer. The customers are usually willing to pay (in some way) for the service. For example polishing a furniture by a manufacturer dealing in furniture is value added activity.

**Non-value-added activities (NVA) :** The NVA activity represents work that is not valued by the external or internal customer. NVA activities do not improve the quality or function of a product or service, but they can adversely affect costs and prices. Non-value added activities create waste, result in delay of some sort, add costs to the products or services and for which the customer is not willing to pay. Moving materials and machine set up for a production run are examples of NVA activities. For example, in the Internal Revenue Service department, rerouting documents and the wait or delay time in completing a case are examples of NVA activities in the "installment agreements" area.

The preparation of tax returns and other compliance work by organisations do not directly benefit the customers of their products and services, but because they are required by law. They are not considered NVA activities.

By measuring activities rather than traditional departmental costs, business can focus on cross functional processes in order to identify non-value adding activities and pinpoint the time drives of cost at each stage. The goal of the ABCM is to make customer needs to be satisfied while making fewer demands for resources. Current research suggests that customers have perceived needs in four areas, all of which must be satisfied simultaneously.

The customers require:

- (i) Lower costs
- (ii) Higher quality
- (iii) Faster response time
- (iv) Greater innovation.

To satisfy these needs ABM currently being used for a variety of business applications. Such as:

- (i) **Cost reduction** : ABCM helps the organisation to identify costs against activities and to find opportunities to streamline or reduce the costs or eliminate the entire activity, especially if there is no value added. It is particularly useful in identifying and quantifying process waste and providing vehicle for continuous process improvement through continuous cost reduction.
- (ii) **Activity Based Budgeting** : Activity based budgeting analyse the resource input or cost for each activity. It provides a framework for estimating the amount of resources required in accordance with the budgeted level of activity. Actual results can be compared with budgeted results to highlight both in financial and non-financial terms those activities with major discrepancies from budget for potential reduction in supply of resources. It is a planning and control system which seeks to support the objectives of continuous improvement. It means planning and controlling the expected activities of the organization to derive a cost-effective budget, that meet forecast workload and agreed strategic goals. The three key elements of activity based budgeting are as follows:-
  - Type of work to be done
  - Quantity of work to be done
  - Cost of work to be done
- (iii) **Business process re-engineering** : Business process re-engineering involves examining business processes and making substantial changes to how organisation currently operates. ABCM is a powerful tool for measuring business performance, determining the cost of business output and is used as a means of identifying opportunities to improve process efficiency and effectiveness. A business process consist of linked set of activities. For example purchasing of materials might be considered as business process consist of activities such as receiving a purchase request, identifying supplies, preparing purchase orders, mailing purchase orders and performing follow up. The process might be reengineered by sending the production schedule direct to the suppliers and to enter into contractual agreement to deliver materials according to the production schedule. The end result might be permanent reduction or elimination of some activities.
- (iv) **Benchmarking** : This aspect has been discussed later in chapter 14 of this book.
- (v) **Performance measurement** :Many organisations are now focussing on activity performance as a means of facing competitors and managing costs. To monitor efficiency and effectiveness of activities performance measures are required. Activity performance measures consist of measures relating to costs, time, quality and innovation. For instance, now-a days in the globalisation the overall goal which is significant for a company is to produce a quality product at a price that will be competitive in world market. But the quality is not something which one can apply somewhere in the production process or assume will happen automatically. Product quality starts with the

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correct design. The next stages are high quality raw material inputs, quality processing and work, and proper handling and packaging etc. The various performance measures of quality are :

Area	Measures
quality of purchased component	zero defects
quality of output	% yield
customer awareness	orders; number of complaints

### 1.3.7.4 Benefits of Activity Based Cost Management

- (i) Provision of excellent basis and focus for cost reduction.
- (ii) Provides operational management with a clear view of HOW to implement an Activity Based budget.
- (iii) Provision of clear understanding of the underlying causes of business processing costs.
- (iv) Provision of excellent basis for effectiveness of management decision making.
- (v) Identification of key process waste elements permit management prioritisation and leverage of key resources

### 1.3.8. Difference between ABC and ABM

The ABC refers to the technique for determining the cost of activities and the output that those activities produce. It is the logical distribution of overhead i.e. overhead should be distributed on the consumption of resources consumed by goods and services. The aim of ABC is to generate improved cost data for use in managing a company's activities.

The ABM is a much broader concept. It refers to the management philosophy that focuses on the planning, execution and measurement of activities as the key to competitive advantage.

### 1.3.9. ABC : A Decision Making Tool

It is a useful tool for many of the management decisions facing companies today. It can bring a picture of the operation to light that may not be obvious through other analysis tools. Specifically, ABC is useful in analyzing specific segments of an organization. This might include a market line, a group of products (even a single product), a customer, or an employee. The ABC is implemented in following decisions:

1. ABC is a complement to total quality management (TQM). It provides quantitative data that can track the financial impact of improvements implemented as part of the TQM initiative. Some have even suggested that ABC is the most important concept introduced since TQM. Amoco Performance Products, Transparent Container Co. and Fellowes Manufacturing Co. are a few companies that have utilized the ABC/TQM modeling concept to improve performance and profitability.
2. Wholesale distributors can gain significant advantage in the decision-making process through implementation of ABC concepts. The expansion of line offerings has brought

about difficult decisions for the distributor. Using traditional financial data, overhead burden is distributed equally across the product line.

Introduction of new products or vendors might also introduce variance to the overhead. For instance, the need to support a special storage area for control or environmental reasons, or the need of new handling equipment will increase overall operational costs. These costs will be spread over the product line, reducing margin on existing products and reducing the cost impact of the new items. ABC models the costs back to the activity. The burden created by the new product is correctly reflected. This allows the existing merits while leaving the new line to justify itself.

3. Other decisions that can be assisted by ABC include facility and resource expansion. Often the basis for relocation or opening of a new distribution center is based on cost associations. Reduction in freight or other logistics costs can offset the expense of the new facility, staff or equipment. When the numbers used are enterprise-based, the return might not develop as expected. The ABC model can identify the specific cost elements being targeted, providing a much clearer picture from which management can act.
4. Decision support for human resources can be augmented by ABC. Where activity, and therefore cost, can be associated to an individual, new levels of financial performance can be determined. This might be appropriate in cases of branch management or sales. Adding or deleting resource slots can be determined based on costs of activities as well. The added data provided through ABC can present a number of options, including outsourcing, productivity improvements through automation, and a determination of employee/revenue ratios.

In summary, activity-based costing is a management decision-making tool. It provides financial support data structured in a fashion fundamentally different from accounting data provided in the general ledger. By associating cost to the activity, a clear relationship can be established between sources of activity demand and the related costs. This association can benefit the distributor in determining where costs are being incurred, what is initiating the costs and where to apply efforts to curb inflationary costs. This can be of particular value in tracking new products or customers. It can also provide tracking of logistics costs, one of the fastest growing areas of expense to the distribution operation.

### **1.3.10 Activity Based Budgeting (ABB)**

Activity-based budgeting is a process of planning and controlling the expected activities for the organisation to derive a cost-effective budget that meets forecast workload and agreed strategic goals. An activity-based budget is a quantitative expression of the expected activities of the firm, reflecting management's forecast of workload and financial and non-financial requirements to meet agreed strategic goals and planned changes to improve performance.

Thus, the key elements of ABB are:

- type of work/activity to be performed;
- quantity of work/activity to be performed; and
- cost of work/activity to be performed.

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ABB focuses on the activity/business processes. Resources required are determined on the expected activities and workload. The objective is to bring in efficiency into the system. So, in the process of budget preparation, many key questions, need to be addressed and properly answered

### Illustration

Having attended a CIMA course on activity-based costing (ABC) you decide to experiment by applying the principles to the four products currently made and sold by your company. Details of the four products and relevant information are given below for one period:

Product	A	B	C	D
Output in units	120	100	80	120
Costs per unit	Rs.	Rs.	Rs.	Rs.
Direct material	40	50	30	60
Direct labour	28	21	14	21
Machine hours (per unit)	4	3	2	3

The four products are similar and are usually produced in production runs of 20 units and sold in batches of 10 units.

The production overhead is currently absorbed by using a machine hour rate, and the total of the production over head has been analysed as follows:

	Rs.
Machine department costs (rent, Business, rates, depreciation and Supervision)	10,430
Set-up costs	5,250
Stores receiving	3,600
Inspection/quality control	2,100
Material handling and dispatch	4,620

You have identified 'cost drivers' to be used are as listed below for the overhead costs shown:

Cost	Cost
Set-up costs	Number of production runs
Stores receiving	Requisitions raised
Inspection/quality control	Number of production runs
Materials handling and dispatch	Orders executed

The number of requisitions raised on the stores was 20 for each product and the number of orders executed was 42, each order being for a batch of 10 of a product.



**Requirements**

- (a) Calculate the total costs for each product if all overhead costs are absorbed on a machine hour basis.
- (b) Calculate the total cost of each product, using activity-based costing.
- (c) Calculate and list the unit product costs from your fingers in (a) and (b) above, to show the differences and comment briefly on any conclusions which may be drawn which could have pricing and profit implications.

**Solution**

(a) Overheads absorbed on machine hour basis

$$\text{Machine hour absorption rate} = \frac{\text{Total Overheads}}{\text{Total machine hours}}$$

$$= \frac{\text{Rs. } 10,430 + \text{Rs. } 5,250 + \text{Rs. } 3,600 + \text{Rs. } 2,100 + \text{Rs. } 4,620}{(120 \times 4) + (100 \times 3) + (80 \times 2) + (120 \times 3)}$$

$$= \frac{\text{Rs. } 26,000}{1,300} = \text{Rs. } 20 \text{ per machine hour}$$

Total costs based on machine hour basis

	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Direct material	40	50	30	60
Direct labour	28	21	14	21
Production overhead	<u>80</u>	<u>60</u>	<u>40</u>	<u>60</u>
Production cost/unit	<u>148</u>	<u>131</u>	<u>84</u>	<u>141</u>
Out put in units	120	100	80	120
Total production cost	Rs.17,760	Rs.13,100	Rs.6,720	Rs.16,920

(b) Overheads absorbed based on ABC

Overhead costs	Level of activity	Cost/activity	Rs.
Machine department costs	10,430	1,300	8.02/hour
Set-up costs	5,250	21*	250.0/run
Stores receiving costs	3,600	80**	45.00/requisition
Inspection/quality costs	2,100	21*	100.00/run
Material handling and dispatch	4,620	42	110.00/order

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### Workings

\*No. of production runs = output in units/20

$$\frac{120+100+80}{20} = 21$$

$$\frac{420}{20} = 21$$

	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Direct materials	40.00	50.00	30.00	60.00
Direct labour	28.00	21.00	14.00	21.00
Machine dept costs	32.09	24.07	16.05	24.07
Set-up costs	12.50	12.50	12.50	12.50
Stores receiving	7.50	9.00	11.25	7.50
Inspection	5.00	5.00	5.00	5.00
Material handling	<u>11.00</u>	<u>11.00</u>	<u>11.00</u>	<u>11.00</u>
Production cost/unit	136.09	132.57	99.80	141.07
Output in units	120	100	80	120
Total production costs	Rs.16,331	Rs.13257	Rs.7,984	Rs.16,928

(c) Comparison of the two unit costs calculated in (a) and (b) above,

	A	B	C	D
Product	Rs.	Rs.	Rs.	Rs.
Based on machine				
Hour rate	148.00	131.00	84.00	141.00
ABC method	<u>136.09</u>	<u>132.57</u>	<u>99.80</u>	<u>141.07</u>
Difference	11.91	(1.57)	(15.80)	(0.07)

### Illustration

ABC Electronics Ltd makes audio player model AB 100. This model has 80 components. ABC sells 10,000 units each month at Rs. 3,000 per unit. The cost of manufacturing is Rs. 2,000 per unit or Rs. 200 lakhs per month for the production of 10,000 units. Monthly manufacturing costs incurred (in Rs. Lakhs) are as follows:

Direct materials costs	100.00
Direct manufacturing labour costs	20.00
Machining costs	20.00
Testing costs	25.00
Rework costs	15.00
Ordering costs	0.20
Engineering costs	19.80

Labour is paid on piece rate basis, therefore, ABC considers, direct manufacturing labour costs as variable cost.

The following additional information is available for AB 100:

- Testing and inspection time per unit is 2 hours
- 10 per cent of AB 100 manufactured are reworked
- It currently takes 1 hour to manufacture each unit of AB 100.

ABC places two orders per month for each component, each component being supplied by a different supplier.. ABC has identified activity cost pools and cost drivers for each activity. The cost per unit of the driver for each activity cost pool is as follows:

<b>Manufacturing</b>	<b>Description of activity</b>	<b>cost driver</b>	<b>cost per unit cost driver</b>
Machining costs	Machining components	Machine hours of Capacity	Rs. 200
Testing costs	Testing components and finished Products. (each unit of AB 100 is Tested individually)	Testing hours	Rs. 125
Rework costs	Correcting and fixing errors	Units reworked	Rs. 1,500
Ordering costs	Ordering of components	Number of orders	Rs. 125
Engineering costs	Designing and managing of Products and processes	Engineering hrs.	Rs. 198

Over a long – run horizon, each of the overhead costs described above varies with chosen cost drivers.

In response to competitive pressure ABC must reduce the price of its product to Rs. 2,600 and to reduce the cost by at least Rs. 400 per unit. ABC does not anticipate increase in sales due to price reduction. However, if it does not reduce price it will not be able to maintain the current sales level.

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Cost reduction on the existing model is almost impossible. Therefore, ABC has decided to replace AB 100 by a new model AB 200, which is a modified version of AB 100. the expected effect of design changes are:

- The number of components will be reduced to 50.
- Direct materials costs to be lower by Rs. 200 per unit.
- Machining time labour costs to be lower by 20%.
- Direct Manufacturing labour costs to be lower by Rs. 20 per unit.
- Testing time required to be low by 20%.
- Rework to decline to 5%
- Machining capacity and engineering hours capacity to remain the same.

ABC currently outsource the rework on defective units.

### Required:

- Compare the manufacturing cost per unit of AB 100 and AB 200.
- Determine the immediate effect of design change and pricing decision on the operating income of ABC.

Ignore income tax. Assume that the cost per unit of each cost driver for AB 100' continues to apply to 'AB 200.

### Solution

Units	AB-100	AB-200
	10,000	10,000
	Rs./unit	Rs./unit
Material 100 lakhs/10,000	1,000	800
Direct wages 20 L,10,000	200	180
MC cost	200	160
Test cost	250	200
Rework cost	150	75
Ordering cost	2	1.25
Engineering cost	198	198
Total cost	2,000	1,614.25
Revised SP	2,600	2,600
Profit p.u	600	985.75
Total profit (Rs. In lakhs)	60	98.75

If the current products AB-100 is not replaced by new products AB-200 then profit will reduce by 38.75 lakhs. So, it is recommended to introduce AB-200.

## 1.4 TARGET COSTING

### 1.4.1 Introduction

Target costing has been described as a process that occurs in a competitive environment, in which cost minimization is an important component of profitability. This newer approach of product costing may take into account initial design and engineering costs, as well as manufacturing costs, plus the costs of distribution, sales and services.

**1.4.3.2 Definitions of Target Costing :** It can be defined as “a structured approach to determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price”. A critical aspect of this definition is that it emphasizes that target costing is much more than a management accounting technique. Rather, it is an important part of a comprehensive management process aimed at helping an organization to survive in an increasingly competitive environment. In this sense the term “target costing” is a misnomer: it is not a product costing system, but rather a management technique aimed at reducing a product’s life-cycle costs.

### 1.4.2 Advantages of Target Costing

1. It reinforces top-to-bottom commitment to process and product innovation, and is aimed at identifying issues to be resolved, in order to achieve some competitive advantage.
2. It helps to create a company’s competitive future with market-driven management for designing and manufacturing products that meet the price required for market success.
3. It uses management control systems to support and reinforce manufacturing strategies; and to identify market opportunities that can be converted into real savings to achieve the best value rather than simply the lowest cost.

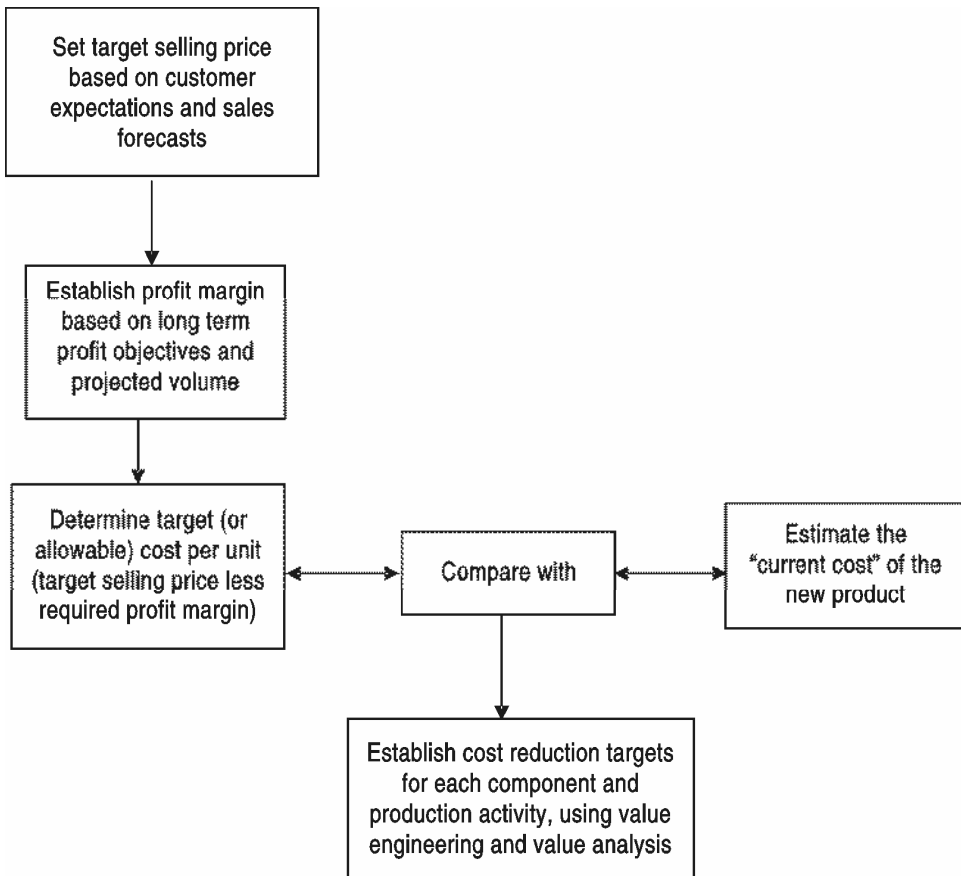
### 1.4.3 Main features of Target Costing System

The main features or practices followed in different Japanese companies can be understood by going through the following points :

1. **Target costing is viewed as an integral part of the design and introduction of new products.** As such, it is part of an overall profit management process, rather than simply a tool for cost reduction and cost management. Diagram 1 summarizes the steps in the target costing process. The first part of the process is driven by customer, market and profitability considerations. Given that profitability is critical for survival, a target profit margin is established for all new product offerings. The target profit margin is derived from the company’s long-term business plan, which incorporates its long-term strategic intent and profit margins. Each product or product line is required to earn at least the target profit margin.

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- For any given product, a target selling price is determined using various sales forecasting techniques.** Critical to setting the target selling price are the design specifications (reflecting certain levels of functionality and quality) of the new product. These specifications are based on customer requirements and expectations and are often influenced by the offerings of competitors. Importantly, while setting the target selling price, competitive conditions and customers' demands for increased functionality and higher quality, without significant increases in price, are clearly recognized, as charging a price premium may not be sustainable. Hence, the target selling price is market-driven and should encompass a realistic reflection of the competitive environment.
- Integral to setting the target selling price is the establishment of target production volumes, given the relationship between price and volume.** The expected target volumes are also critical to computing unit costs, especially with respect to capacity-related costs (such as tooling costs), as product costs are dependent upon the production levels over the life cycle of the product. Once the target selling price and required profit margin have been determined, the difference between these two figures indicates the allowable cost for the product. Ideally, the allowable cost becomes the target cost for the product. However, in many cases the target cost agreed upon will exceed the allowable cost, given the realities associated with existing capacities and capabilities.



4. The next stage of the target costing process is to determine cost reduction targets. Some firms will do this by estimating the “current cost” of the new product. The current cost is based on existing technologies and components, but encompasses the functionalities and quality requirements of the new product. The difference between the current cost and the target cost indicates the required cost reduction that is needed. This amount may be divided into a target cost-reduction objective and a strategic cost-reduction challenge. The former is viewed as being achievable (yet still a very challenging target), while the latter acknowledges current inherent limitations. After analysing the cost reduction objective, a product-level target cost is set which is the difference between the current cost and the target cost-reduction objective.
5. It should be noted that a fair degree of judgement is needed where the allowable cost and the target cost differ. As the ideal is to produce at the allowable cost, it is important that the difference is not too great. Once the product-level target cost is set, however, it generally cannot be changed, and the challenge for those involved is to meet this target.
6. Having achieved consensus about the product-level target cost, a series of intense activities commence to translate the cost challenge into reality. These activities continue throughout the design stage up until the point when the new product goes into production. Typically, the total target is broken down into its various components, each component is studied and opportunities for cost reductions are identified. These activities are often referred to as *value engineering* (VE) and *value analysis* (VA). Value engineering involves searching for opportunities to modify the design of each component or part of a product to reduce cost, but without reducing functionality or quality of the product. Value analysis entails studying the activities that are involved in producing the product to detect non-value-adding activities that may be eliminated or minimized to save costs, but without reducing the functionality or quality of the product. Where components are sourced from suppliers (which is often the case in the automotive industry), target prices are established for each part and the company’s employees work with the suppliers to ensure that the targets are achieved. Overall, the aim of the process is to ensure that when production commences, the total cost will meet the target, and profit goals will be achieved. There is also an ongoing continuous improvement program, known as *kaizen costing*, that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase.

While the above description captures the essential features of the target costing process, it should be emphasized that successful, target costing requires careful planning, attention to detail and a strong degree of commitment from those involved. The description, however, does not provide any insights into what is entailed in implementing a target costing approach in an organization.

*Here are some of the issues that are dealt with during a value engineering review :*

1. **Can we eliminate functions from the production process ?** This involves a detailed review of the entire manufacturing process to see if there are any steps, such as interim quality reviews, that add no value to the product. By eliminating them, one can take their associated direct or overhead costs out of the product cost. However, these functions

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were originally put in for a reason, so the engineering team must be careful to develop work-around steps that eliminate one or more activities from the original set of functions.

2. **Can we eliminate some durability or reliability ?** It is possible to design an excessive degree of sturdiness into a product. For example, a vacuum cleaner can be designed to withstand a 1-ton impact, although there is only the most vanishing chance that such an impact will ever occur; designing it to withstand an impact of 100 pounds may account for 99.999% of all probable impacts, while also eliminating a great deal of structural material from the design. However, this concept can be taken too far, resulting in a visible reduction in durability or reliability, so any designs that have had their structural integrity reduced must be thoroughly tested to ensure that they meet all design standards.
3. **Can we minimize the design ?** This involves the creation of a design that uses fewer parts or has fewer features. This approach is based on the assumption that a minimal design is easier to manufacture and assemble. Also, with fewer parts to purchase, less procurement overhead is associated with the product. However, reducing a product to extremes, perhaps from dozens of components to just a few molded or prefabricated parts, can result in excessively high costs for these few remaining parts, since they may be so complex or custom made in nature that it would be less expensive to settle for a few extra standard parts that are more easily and cheaply obtained.
4. **Can we design the product better for the manufacturing process ?** Also known as design for manufacture and assembly (DFMA), this involve the creation of a product design that can be created in only a specific manner. For example, a toner cartridge for a laser printer is designed so that it can be successfully inserted into the printer only when the sides of the cartridge are correctly aligned with the printer opening; all other attempts to insert the cartridge will fail. When used for the assembly of an entire product, this approach ensures that a product is not incorrectly manufactured or assembled, which would call for a costly disassembly or (even worse) product recalls from customers who have already received defective goods.
5. **Can we substitute parts ?** This approach encourages the search for less expensive components or materials that can replace more expensive parts currently used in a product design. It is becoming an increasingly valid approach since new materials are being developed every year. However, sometimes the use of a different material impacts the types of materials that can be used elsewhere in the product, which may result in cost increases in these other areas, for a net increase in costs. Thus, any parts substitution must be accompanied by a review of related changes elsewhere in the design. This step is also known as component parts analysis and involves one extra activity—tracking the intentions of suppliers to continue producing parts in the future; if parts will not be available, they must be eliminated from the product design.
6. **Can we combine steps ?** A detailed review of all the processes associated with a product sometimes reveals that some steps can be consolidated, which may mean that one can be eliminated (as noted earlier) or that several can be accomplished by one person, rather than having people in widely disparate parts of the production process perform them. This is also known as process centering. By combining steps in this



manner, we can eliminate some of the transfer and queue time from the production process, which in turn reduces the chance that parts will be damaged during these transfers.

7. ***Is there a better way ?*** Though this step sounds rather vague, it really strikes at the core of the cost reduction issue—the other value engineering steps previously mentioned focus on incremental improvements to the existing design or production process, whereas this one is a more general attempt to start from scratch and build a new product or process that is not based in any way on preexisting ideas. Improvements resulting from this step tend to have the largest favourable impact on cost reductions but can also be the most difficult for the organization to adopt, especially if it has used other designs or systems for the production of earlier models.

*Another approach to value engineering* is to call on the services of a company's suppliers to assist in the cost reduction effort. These organizations are particularly suited to contribute information concerning enhanced types of technology or materials, since they may specialize in areas that a company has no information about. They may have also conducted extensive value engineering for the components they manufacture, resulting in advanced designs that a company may be able to incorporate into its new products. Suppliers may have also redesigned their production processes, or can be assisted by a company's engineers in doing so, producing cost reductions or decreased production waste that can be translated into lower component costs for the company.

A mix of all the value engineering steps noted above must be applied to each product design to ensure that the maximum permissible cost is safely reached. Also, even if a minimal amount of value engineering is needed to reach a cost goal, one should conduct the full range of value engineering analysis anyway, since this can result in further cost reductions that improve the margin of the product or allow management the option of reducing the product's price, thereby creating a problem for competitors who sell higher-priced products.

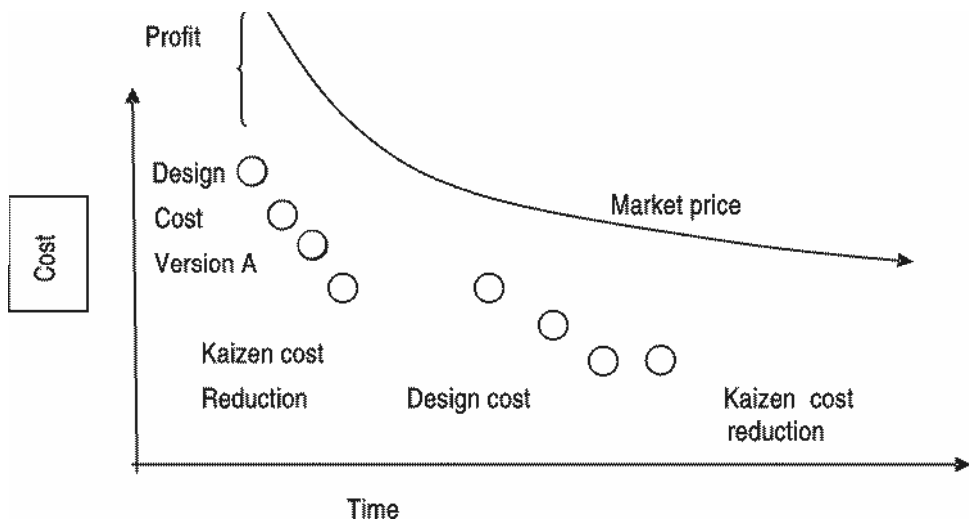
Another term mentioned in the earlier explanation of the target costing process is "kaizen costing." This is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor. Some of the activities in the kaizen costing methodology include the elimination of waste in the production, assembly, and distribution processes, as well as the elimination of work steps in any of these areas. Though these points are also covered in the value engineering phase of target costing, the initial value engineering may not uncover all possible cost savings. Thus, kaizen costing is really designed to repeat many of the value engineering steps for as long as a product is produced, constantly refining the process and thereby stripping out extra costs. The cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering but are still worth the effort since competitive pressures are likely to force down the price of a product over time, and any possible cost savings allow a company to still attain its targeted profit margins while continuing to reduce cost. This concept is illustrated in Exhibit 1.

Of particular interest in Exhibit 1 is the use of multiple generations of products to meet the challenge of gradually reducing costs. In the example the market price continues to drop over time, which forces a company to use both target and kaizen costing to reduce costs and retain

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its profit margin. However, prices eventually drop to the point where margins are reduced, which forces the company to develop a new product with lower initial costs (Version B in the example) and for which kaizen costing can again be used to further reduce costs. This pattern may be repeated many times as a company forces its costs down through successive generations of products. The exact timing of a switch to a new product is easy to determine well in advance since the returns from kaizen costing follow a trend line of gradually shrinking savings and prices also follow a predictable downward track, plotting these two trend lines into the future reveals when a new generation of product must be ready for production.

The type of cost reduction program used for target costing has an impact on the extent of cost reduction, as well as on the nature of the components used in a product. When a design team elects to set cost reduction goals by allocating specific cost reduction amounts to major components of an existing product, it tends to focus on finding ways to make incremental cost reductions rather than focusing on entirely new product configurations that might both radically alter the product's design and lower its cost. This approach is most commonly used during the redesign of products already in the market. Another cost reduction approach is to allocate cost reductions based on the presence of certain product features in a product design. This method focuses the attention of the design team away from using the same components that were used in the past, which tends to produce more radical design changes that yield greater cost savings. However, the latter approach is also a riskier one, since the resulting product concepts may not work, and also requires so much extra design work that the new design may not be completed for a long time. Therefore, the second method is generally reserved for situations where a company is trying to create products at a radically lower cost than previously.



All the changes noted in this section that are necessary for the implementation and use of the target costing methodology represent a massive change in mind-set for the product design personnel of any company because they require the constant cooperation of many departments and rapid, voluminous communications between them, not to mention heightened

levels of trust in dealing with suppliers. All these concepts run counter to the traditional approach.

It is no coincidence that the traditional design process defines each of the departments that take part in the process. These departments tend to guard their turf jealously, which is a major impediment to realizing a smoothly functioning set of product development teams. Only the most active support from senior management can enforce the new approach of drawing product design team members from all these castles and having them work together amicably.

#### **1.4.6 Problems with Target Costing**

Though the target costing system results in clear, substantial benefits in most cases, it has a few problems that one should be aware of and guard against. These problems are as follows :

1. the development process can be lengthened to a considerable extent since the design team may require a number of design iterations before it can devise a sufficiently low-cost product that meets the target cost and margin criteria. This occurrence is most common when the project manager is unwilling to “pull the plug” on a design project that cannot meet its costing goals within a reasonable time frame. Usually, if there is no evidence of rapid progress toward a specific target cost within a relatively short period of time, it is better to either ditch a project or at least shelve it for a short time and then try again, on the assumption that new cost reduction methods or less expensive materials will be available in the near future that will make the target cost an achievable one.
2. a large amount of mandatory cost cutting can result in finger-pointing in various parts of the company, especially if employees in one area feel they are being called on to provide a disproportionately large part of the savings. For example, the industrial engineering staff will not be happy if it is required to completely alter the production layout in order to generate cost savings, while the purchase staff is not required to make any cost reductions through supplier negotiations. Avoiding this problem requires strong interpersonal and negotiation skills on the part of the project manager.
3. representatives from number of departments on the design team can sometimes make it more difficult to reach a consensus on the proper design because there are too many opinions regarding design issues. This is a major problem when there are particularly stubborn people on the design team who are holding out for specific product features. Resolving out is difficult and requires a strong team manager, as well as a long-term commitment on the part of a company to weed out those who are not willing to act in the best interests of the team.

For every problem area outlined have the dominant solution is retaining strong control over the design teams, which calls for a good team leader. This person must have an exceptional knowledge of the design process, good interpersonal skills, and a commitment to staying within both time and cost budgets for a design project.

#### **1.4.6 Cost Accountant’s Role in a Target Costing Environment**

1. The cost accountant should be able to provide for the other members of the design team a running series of cost estimates based on initial designs sketch, activities based

## **1.60 Advanced Management Accounting**

costing reviews of production processes, and “best guess” costing information from suppliers based on estimated production volumes. Essentially in the earliest stages of a design, the cost accountant works with vague costing information and so must be able to provide estimates within a high-low range costs, gradually tightening this estimated cost range as more information becomes available.

2. The cost accountant should also be responsible for any capital budgeting requests generated by the design team since he or she has the knowledge of the capital budgeting process, how to fill out the required forms, and precisely what types of equipment are needed for the anticipated product design. The cost accountant also becomes the key contact on the design team for answers to any questions from the finance staff regarding issues or uncertainties in the capital budgeting proposal.
3. The cost accountant should work with the design team to help it understand the nature of various costs (such as cost allocations based on an activity-based costing system), as well as the cost-benefit trade-offs of using different design or cost operations in the new product.
4. In addition, the cost accountant is responsible for tracking the gap between the current cost of a product design and the target cost that is the design team’s goal, providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress.
5. Finally, the cost accountant must continue to compare a product’s actual cost to the target cost after the design is completed, and for as long as the company sells the product. This is a necessary step because management must know immediately if costs are increasing beyond budgeted levels and why these increases are occurring.

There are particular qualifications that a cost accountant must have to be assigned to a target costing team. Certainly, one is having a good knowledge of company products as well as their features and components. Also, the cost accountant must know how to create an activity based costing system to evaluate related production costs, or at least interpret such costing data developed by someone else. Further, he or she must work well in a team environment, proactively assisting other members of the team in constantly evaluating the costs of new design concepts. In addition, he or she should have good analytical and presentation skills, since the ongoing costing results must be continually presented not only to other members of the team but also to the members of the milestone review committee. Thus, the best cost accountant for this position is an outgoing person with several years of experience within a company or industry.

### **1.4.7 Impact of Target Costing on Profitability**

Target costing can have a startlingly large positive impact on profitability, depending on the commitment of management to its use, the constant involvement of cost accountants in all phases of a product’s life cycle, and the type of strategy a company follows.

Target costing improves profitability in two ways.

1. It places such a detailed continuing emphasis on product costs throughout the life cycle of every product that it is unlikely that a company will experience runaway costs; also, the management team is completely aware of costing issues since it receives regular reports from the cost accounting members of all design teams.
2. It improves profitability through precise targeting of the correct prices at which the company feels it can field a profitable product in the marketplace that will sell in a robust manner. This is opposed to the more common cost-plus approach under which a company builds a product, determines its cost, tacks on a profit and then does not understand why its resoundingly high price does not attract buyers. Thus, target costing results not only in better cost control but also in better price control.

Target costing is really part of a larger concept called concurrent engineering, which requires participants from many departments to work together on project teams rather than having separate departments handle new product design only after they have been handed off from the preceding department in the design chain. Clustering representatives from many departments together on a single design team can be quite a struggle, especially for older companies that have a history of conflict between departments. Consequently, only the most involved, prolonged support by all members of the senior management group can ensure that target costing and the greater concept of concurrent engineering, will result in significant profitability improvements.

The review of product costs under the target costing methodology is not reserved just for the period up to the completion of design work on a new product. On the contrary, there are always opportunities to control costs after the design phase is completed, though these opportunities are fewer than during the design phase. Therefore, cost accountants should not be pulled from a design team once the final drawings have left the engineering department. Instead, they should regularly monitor actual component costs and compare them to planned costs, warning management whenever significant adverse variances arise. Also, cost accountants should take a lead role in the continuing review of supplier costs to see if they can be reduced, perhaps by visiting supplier facilities, as well as constantly reviewing existing product designs to see if they can be improved, and by targeting for elimination waste or spoilage on the production floor. Therefore, the cost accounting staff must be involved in all phases of a product's life cycle if a company is to realize profitability improvements from target costing to the fullest extent.

A company's strategy can also have its impact on profitability. If it constantly issues a stream of new products, or if its existing product lines is subject to severe pricing pressure, it must make target costing a central part of its strategy so that the correct price points are used for products and actual costs match those originally planned. However, there are other strategies, such as growth by geographical expansion of the current product line (as is practised by retail stores) or growth by acquisition, where there is no particular need for target costing—these companies make their money in other ways than by a focused concentration on product features and costs. For them, there may still be a role for target costing, but it is strictly limited by the reduced need for new products.

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If the issues presented here are properly dealt with by a management team, it should find that target costing is one of the best accounting methods available for improving profitability. It is indeed one of the most pro-active systems found in the entire range of accounting knowledge.

### 1.4.9 Target Costing Data Flow

1. Data can be obtained from central accounting data base carefully stocked from such a variety of sources as accounts payable, billing, bills of materials and inventory records.
2. In initial stages of product design, the cost accountant must make the best possible guesses regarding the cost of proposed designs.
3. The cost accountant may include the best estimate and an additional estimate of the highest possible cost that will be encountered. This additional information lets management know whether there is a significant degree of risk that the project may not achieve its desired cost target.
4. Data can also be obtained from competitors information collected by the marketing staff or an outside research agency. This database contains information about the prices at which competitors are selling their products, as well as the prices of ancillary products and perhaps also the discounts given at various price points. It can also include market share data for individual products or by firm, the opinion of customers regarding the offerings of various companies, and the financial condition of competitors. This information is mostly used to determine the range of price points at which a company should sell its existing or anticipated products,
5. Sometimes information is compiled by a combined effort of the marketing and engineering staffs through a process called reverse engineering. This source can also serve as a data base for the project team.
6. Engineering staff also compiles their own cost data relating to different designs/components. This data is collected over the years and can be useful for target costing.
7. The final database available to the cost accounting member of a design team contains information regarding the previous quality, cost and on-time delivery performance of all key suppliers, as well as the production capacity of each one.

### 1.4.10 Most Useful Situations for Target Costing

Target costing is most useful in situations where the majority of product costs are locked in during the product design phase. This is the case for most manufactured products, but few services. In the services area, such as consulting, the bulk of all activities can be reconfigured for cost reduction during the "production" phase, which is when services are being provided directly to the customer. In the services environment the "design team" is still present but is more commonly concerned with streamlining the activities conducted by the employees providing the service, which can continue to be enhanced at any time, not just when the initial services process is being laid out.

**For example**

1. Design team can lay out the floor plan of a fast-food restaurant, with the objective of creating an arrangement that allows employees to cover the shortest possible distances while preparing food and serving customers; this is similar to the design of a new product. However, unlike a product design, this layout can be readily altered at any time if the design team can arrive at a better layout, so that the restaurant staff can continue to experience high levels of productivity improvement even after the initial design and layout of the facility. In this situation costs are not locked in during the design phase, so there is less need for target costing.
2. Another situation where target costing results in less value is the production of raw materials, such as chemicals. In this case there are no design features for a design team to labour over; instead, the industrial engineering staff tries to create the most efficient possible production process, which has little to do with cost reduction through the improvement of customer value by creating a product with a high ratio of features to costs.

**1.4.11 Target Costing Control Points****Control Points which should be taken care of in all target costing projects:**

1. **Identification of Principal control point:** Experience shows that there always comes a point, where the cost of maintaining the design team exceeds the savings garnered from additional iterations. It is also necessary that most products should be launched within a reasonably short time or they will miss the appropriate market, where they will beat the delivery of competing products to the market. This emphasis that the principal control points over the course of target costing programme should be properly taken care of.
2. **Point of Go/No Go decision:** If target costing is not reached, management retains power to abandon the design project. There comes a point, when actual performance is very close to expected performance in matter of cost incurrence.
3. **Milestone can be in terms of timer or points:** A milestone can be in terms of time, say one month. It can also be on the points in design process, at which specific activities are completed.

**1.4.12 Implementing a Target Costing System**

A target costing initiative requires the participation of several departments. Because there are so many participants in the process from so many departments, some of whom have different agendas in regard to what they want the program to produce. Design projects can be delayed by squabbling or by an inability to drive down design or production costs in a reasonably efficient manner. This delay may lead to serious cost overruns in the cost of the design team itself, which can lead to abrupt termination of the entire target costing system by the management team. However, these problems can be mitigated or completely eliminated by ensuring that the steps listed here are completed when the target costing system is first installed :

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1. **Create a project charter:** The target costing effort should begin with a document, approved by senior management, that describes its goals and what it is authorized to do. This document, known as the project charter, is essentially a subset of the corporate mission statement and related goals as they pertain to the target costing initiative. Written approval of this document by the senior management group provides the target costing effort with a strong basis of support and direction in all subsequent efforts.
2. **Obtain a management sponsor:** The next step is to obtain the strongest possible support from a management sponsor. This should be an individual who is well positioned near the top of the corporate hierarchy, believes strongly in the goals of target costing, and will support the initiative in all respects—obtaining funding, lobbying other members of top management, working to eliminate road blocks, and ensuring that other problems are overcome in a timely manner. This person is central to the success of target costing.
3. **Obtain a budget:** The target costing program requires funds to ensure that one or more well-staffed design teams can complete target costing tasks. The funding should be based on a formal allocation of money through the corporate budget, rather than a parsimonious suballocation grudgingly granted by one or more departments. In the first case the funds are unreservedly given to the target costing effort, whereas in the latter case, they can be suddenly withdrawn by a department manager who is not fully persuaded of the need for target costing or who suddenly finds a need for the money elsewhere.
4. **Assign a strong team manager:** Because the typical target costing program involves so many people with different backgrounds and represents so many parts of a company, it can be difficult to weld the group together into a smoothly functioning team focused on key objectives. The best way to ensure that the team functions properly is to assign to the effort a strong team manager skilled in dealing with management, the use of project tools, and working with a diverse group of people. This manager should be a full-time employee, so that his or her complete attention can be directed toward the welfare of the project.
5. **Enroll full-time participants:** A target costing team member puts the greatest effort into the program when he or she is focused only on target costing. Thus, it is essential that as many members of the team as possible be devoted to it full-time rather than also trying to fulfill other commitments elsewhere in the company at the same time. This may call for the replacement of these individuals in the departments they are leaving so that there are no emergencies requiring their sudden withdrawal back to their “home” departments to deal with other work problems. It may even be necessary to permanently assign them to a target costing program, providing them with a single focus on ensuring the success of the target costing program because their livelihoods are now tied to it.
6. **Use project management tools:** Target costing can be a highly complex effort especially for high-cost products with many features and components. To ensure that the project stays on track, the team should use all available project management tools, such as Microsoft Project (for tracking the completion of specific tasks), a company database containing various types of costing information, and a variety of product design tools. All



these items require assured access to many corporate database, as well as a budget for whatever computing equipment is needed to access this data.

The main focus of the step described in this section is to ensure the fullest possible support for target costing by all available means—management, money and staff. Only when all these elements are in place and concentrated on the goals at hand does a target costing program have the greatest chance for success.

**Illustration**

A company has the capacity of production of 80,000 units and presently sells 20,000 units at Rs.100 each. The demand is sensitive to selling price and it has been observed that every reduction of Rs.10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?

What should be the cost reduction scheme if at present 40% of cost is variable with same % of profit? If Rate of Returned is 15%, what will be maximum investment at full capacity?

**Solution**

Maximum capacity 80,000 units

Presented sales 20,000 units @ Rs. 100 p.u.

Selling price/unit	Demand
100	20,000
90	40,000
80	80,000 = Full capacity

Target cost/unit = 80 - 25% of sales  
 = 80 - 20 = 60 p.u.

**(b) At present**

Variable cost/unit = 40% of cost i.e. 75 = Rs. 30

□ Fixed cost/unit = 100 - 25% = 75

COS 75

Less: Variable cost/unit 30

Fixed cost 45 p.u.

Total fixed cost 45 ' 80,000 = 36 lakhs

□ Add full capacity target cost = Rs. 60/unit ' 80,000 units

= Rs. 48 lakhs

Total estimate cost

Fixed cost 36 lakhs

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Variable cost (80,000'40)	<u>24 lakhs</u>
	60 lakhs

Required. Cost reduction following value engineering is Rs. 12 lakhs.

(e) Rate of return 15%      Profit p.u. 25% of 80 = 20/unit

Profit before tax = 20'80,000 = 16 lakhs

ROCE = (PBI, Investment)

Investment = (PBI, ROCE) = 16 lakhs'15% = Rs. 106 Tl.

### Illustration

***Sterling Enterprises has prepared a draft budget for the next year as follows:***

Quantity	10,000 units
Sales price per unit	30
Variable costs per unit: Direct Materials	8
Direct Labour	6
Variable overhead (2 hrs × Re. 0.50)	1
Contribution per unit	15
Budgeted Contribution	1,50,000
Budgeted Fixed costs	1,40,000
Budgeted Profit	10,000

The Board of Directors is dissatisfied with this budget, and asks a working party to come up with an alternate budget with higher target profit figures.

The working party reports back with the following suggestions that will lead to a budgeted profit of Rs. 25,000. The company should spend Rs. 28,500 on advertising, & ut the target sales price up to Rs. 32 per unit. It is expected that the sales volume will also rise, inspite of the price rise, to 12,000 units.

In order to achieve the extra production capacity, however, the work force must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wage rate per hour in increased to Rs. 4. The hourly rate for variable overhead will be unaffected.

Ascertain the target labour time required to achieve the target profit.

**Solution**

Target profit	25,000
Add: Fixed cost	1,40,000
Add: Additional Advertisement	<u>28,500</u>
(a) Total contribution	1,93,500
(b) Required. Sales volume	12,000
contribution/unit (a,b)	16.125
Target Selling price/unit	32
Less: Contribution/unit	<u>16.125</u>
Target variable cost p.u.	15.875
Less: material cost p.u.	<u>8.000</u>
Labour + Variable overhead	7.875
Labour: x hr. @ 4	
Variable overhead x hr. @ 0.5	
4.5x =	7.875
x (hr.)	1.75
Time/unit	1.75
Present	<u>2.00</u>
Time reduced	0.25 hr.

**Illustration**

IBM Ltd. Manufactures and sells computers peripherals to several retail outlets throughout the country. Amar is the manager of the printer division. Its two largest-selling printers are P1 & P2.

The manufacturing cost of each printer is calculated using IBM's activity based costing system. IBM has one direct manufacturing cost category (direct materials) and the following five indirect manufacturing cost pools.

Indirect manufacturing cost pool	Allocation Base	Allocation Rate (Rs.)
1. Materials handling	No. of parts	Rs. 1.20 per part
2. Assembly management	Hours of assembly time	Rs. 40 per
hour of assembly time		
3. Machine insertion of parts	No. of machine inserted	Rs. 0.70 per
machine inserted part	parts.	

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4. Manual insertion of parts manually inserted part	No. of manually inserted parts	Rs. 2.10 per
5. Quality testing testing hour.	Hours of quality testing time	Rs. 25 per

Product characteristics of P1 and P2 are as follows:

Product	P1	P2
Direct materials costs	Rs. 407.50	Rs. 292.10
Number of parts	85	46
Hours of assembly time	3.2	1.9
Number of machine – inserted parts	48	31
Number of manually inserted parts	36	15
Hours of quality testing time	1.4	1.1

A foreign competitor has introduced products very similar to P1 and P2. Given their announced selling prices, to maintain the company's market share and profits. Amar estimated the P1 to have manufacturing cost of approximately Rs. 680 and P2 to have a manufacturing cost of approximately Rs. 390. he calls a meeting of product designers and manufacturing personnel at the printer division. They all agreed to have the Rs. 680 and Rs. 390 figures become target costs for designed version of P1 and P2 respectively. Product designers examine alternative ways of designing printer with comparable performance but lower costs. They come up with the following revised designs for P1 and P2 (termed P1 – REV and P2 – REV, respectively)

Particulars	P1 – REV	P2 – REV
Direct materials cost	Rs. 381.20	Rs. 263.10
Number of parts	71	39
Hours of assembly time	2.1	1.6
Number of machine – inserted parts	59	29
Number of manually – inserted parts	12	10
Hours of quality testing time	1.2	0.9

### Required:

- Compute the present costs of products P1 and P2 using ABC system.
- Compute the manufacturing costs of P1 – REV and P2 – REV. How do they compare with the Rs. 680 and Rs. 390 target costs?

- If the allocation rate in the assembly management activity area can be reduced from Rs. 40 to Rs. 28 per assembly hours, how will this activity area cost reduction affect the manufacturing costs of P1 – REV and P2 – REV? Comment on the results.

**Solution**

	P1 Rs./unit	P2 Rs./unit
Material	407.5	292.1
Overhead-Material handling	$85 \times 1.2 = 102$	$46 \times 1.2 = 55.2$
Assembly Management	$40 \times 3.2 = 128$	$40 \times 1.9 = 76$
Machine insertion	$48 \times 0.7 = 33.6$	$31 \times 0.7 = 21.7$
Manual insertion	$36 \times 2.1 = 75.6$	$25 \times 2.1 = 52.5$
Quality testing	$1.4 \times 25 = 35$	$1.1 \times 25 = 27.5$
Present cost	781.70	504.00
Target cost	680.00	390.00
	Revised P1 Rs./unit	Revised P2 Rs./unit
Direct material	381.20	263.10
Overhead:		
Material handling	$(71 \times 1.2) = 85.2$	$(39 \times 1.2) = 46.8$
Assembly hour	$(21 \times 40) = 84.0$	$(1.6 \times 40) = 64.0$
Machine inspection	$(59 \times 0.7) = 41.3$	$(29 \times 0.7) = 20.30$
Manual inspection	$(12 \times 2.10) = 25.2$	$(10 \times 2.10) = 21.00$
Electronics	$(1.2 \times 25) = 30.00$	$(0.9 \times 25) = 22.50$
Estimated cost	646.90	437.70
Target cost	680.00	390.00
Achieved	not achieved	

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### 1.5 LIFE CYCLE COSTING -INTRODUCTION

CIMA defines life cycle costing as the practice of obtaining over their life time, the best use of physical asset at the lowest cost of entity.

Life cycle costing is different to traditional cost accounting system which report cost object profitability on a calendar basis i.e. monthly, quarterly and annually. In contrast life cycle costing involves tracing cost and revenues on a product by product bases over several calendar periods. Costs and revenue can be analysed by time period, but the emphasis is on cost revenue accumulation over the entire life cycle of each product. Now, we will discuss life cycle costing for products.

#### 1.5.1 Product life cycle

Each product has a life cycle. The life cycle of a product vary from a few months to several years.. Product life cycle is thus a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range.

#### 1.5.2 Phases of product life cycle

The life cycle of a product consists of four phases viz., Introduction; Growth; Maturity; Saturation and Decline.

**Introduction** : During introductory phase, a product is launched into the market. Its customers are innovators. Competition is almost negligible and profits are non-existent.

**Growth** : Under growth phase, sales and profits rise, at a rapid pace. Competitors enter the market often in large numbers. As a result of competition, profits starts declining near the end of the growth phase.

**Maturity** : During the phase of maturity sales continue to increase, but at a decreasing rate. When sales level off, profits of both producers and middlemen decline. The main reason is intense price competition, some firms extend their product lines with new models.

**Saturation and decline** : At last a point comes, when it starts appearing that market has bought enough of the product. Decline in sales volume characterizes this last phase of the product life cycle. The need or demand for product disappears. Availability of better and less costly substitutes in the market accounts for the arrival of this phase.

#### 1.5.3 Characteristics of product life cycle

The major characteristics of product life-cycle concept are as follows :

- (i) The products have finite lives and pass through the cycle of development, introduction, growth, maturity, decline and deletion at varying speeds.
- (ii) Product cost, revenue and profit patterns tend to follow predictable courses through the product life cycle. Profits first appear during the growth phase and after stabilising during the maturity phase, decline thereafter to the point of deletion.
- (iii) Profit per unit varies as products move through their life cycles.

- (iv) Each phase of the product life-cycle poses different threats and opportunities that give rise to different strategic actions.
- (v) Products require different functional emphasis in each phase-such as an R&D emphasis in the development phase and a cost control emphasis in the decline phase.
- (vi) Finding new uses or new users or getting the present users to increase their consumption may extend the life of the product.

#### 1.5.4 Various stages of product life cycle

Typically the life cycle of a manufactured product will consist of the following stages :

- (i) **Market research** : Before any investment is made the investor must believe that what the company proposes to make can be sold at a price which will permit a profit to be made. This usually means that market research will establish what product the customer wants, how much he is prepared to pay for it and how many he will buy.
- (ii) **Specification** : When market research has established what is to be made, it will be necessary to turn the general statement of requirements into a detailed specification which will tell the designer and manufacturing engineer precisely what is required. The design specification will give such details as required life, maximum permissible maintenance costs, maximum permissible manufacturing cost, the number required, the delivery date, the required performance of the product.
- (iii) **Design** : With a precise specification, the designers can produce the drawings and process schedules which define the geometry of the product and some of the manufacturing processes.
- (iv) **Prototype manufacture** : From the drawings it will be possible to manufacture a small number of the product. These prototypes will be used to develop the product and eventually to demonstrate that it meets the requirements of the specification.
- (v) **Development** : When a product has been made for the first time, it is necessary to prove that it meets the requirements of the specification. In fact, when a product is first made it rarely meets the requirements of the specification and changes have to be made until it does. This period of testing and changing is 'development'. Development can be very expensive and often generates a large negative cash flow before any products have been sold and hence, before any positive cash flows have been generated.
- (vi) **Tooling** : When a product is shown to meet the requirements of the specification and if calculations suggest that it will be profitable, the decision will be made to make it to sell. This is not a decision that will be taken lightly because, in many cases, the decision to make a product for sale is commitment to tool up for production. Tooling up for production can mean building a production line costing several lakhs of rupees, building expensive jigs, buying special purpose machine tools or, in some other say, making a very large initial investment.

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- (vii) **Manufacture** : The manufacture of a product involves the purchase of the raw materials, the purchase of bought out components, the use of labour to make and assemble the product, and the use of supervisory labour.
- (viii) **Selling** : When the product is fit to sell and available, it may be necessary to spend money on a campaign to sell the product.
- (ix) **Distribution** : In the process of selling the product, it must be distributed to the sales outlets and to the customers.
- (x) **Product support** : When the product has been bought, the customer will expect it to be supported. The manufacturer or supplier will have to make sure that spares and expert servicing are available for the life of the product. The manufacturer or the supplier may even have to offer free servicing and parts replacement during the early life of the product.
- (xi) **Decommissioning or Replacement** : When a manufacturing product comes to an end, the plant used to build the product must be re-used, sold, scrapped, or decommissioned in a way that is acceptable to society.

### 1.5.5 Product life cycle costing

It is an approach used to provide a long term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc. It is also considered as a way to enhance the control of manufacturing costs. The thrust of product life cycle costing is on the distribution of costs among categories changes over the life of the product, as does the potential profitability of a product. Hence it is important to track and measure costs during each stage of a product's life cycle.

### 1.5.6 Features of product life cycle costing

Product life cycle costing is important due to the following features :

- (i) Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Costs and revenues can be analysed by time periods, but the emphasis is on cost and revenue accumulation over the entire life cycle for each product.
- (ii) Product life cycle costing traces research and design and development costs etc., incurred to individual products over their entire life cycles, so that the total magnitude of these costs for each individual product can be reported and compared with product revenues generated in later periods.

Life cycle costing therefore ensures that costs for each individual product can be reported and compared with product revenues generated in later periods. Hence the costs are made more visible.



**1.5.7 Benefits of product life cycle costing**

The benefits of product life cycle costing are summarized as follows :

- (i) The product life cycle costing results in earlier actions to generate revenue or to lower costs than otherwise might be considered. There are a number of factors that need to be managed in order to maximise return on a product.
- (ii) Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
- (iii) Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding.
- (iv) It provides an overall framework for considering total incremental costs over the entire life span of a product, which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.

**Illustration**

A company is considering the purchase of a new machine for Rs. 3,50,000. It feels quite confident that it can sell the goods produced by the machine so as to yield an annual cash surplus of Rs. 1,00,000. There is however some uncertainty as to the machine's working life. A recently published Trade Association Survey shows that members of the Association have between them owned 250 of these machines and have found the lives of the machines vary as under:

No. of year of Machine life	3	4	5	6	7	Total
No. of machines having given life	20	50	100	70	10	250

Assuming a discount rate of 10%, net present value for each different machine life is as follows :

Machine life	3	4	5	6	7
NPV (Rs.)	(1,01,000)	(33,000)	29,000	86,000	1,37,000

You are required to advise whether the company should purchase a new machine or not.

**Solution**

Computation of NPV of an asset considering the prob. of life of machine.

Year	Probability	NPV Rs.	Expected value Rs.
3	20/250	(-1,01,000)	(8,080)
4	50/250	(-33,000)	(6,600)
5	100/250	(29,000)	11,600
6	70/250	(86,000)	24,080
7	10/250	(1,37,000)	<u>5,480</u>
			<b>26,480</b>

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### 1.6 VALUE CHAIN ANALYSIS

#### 1.6.1 Introduction

Competitive advantage for a company means not just matching or surpassing their competitors, but discovering what the customers want and then profitably satisfying, and even exceeding, their expectations. As barriers to inter-regional and international trade are diminishing and as access to goods and services are growing, customers can locate after identification and acquire the best of what they want, at an acceptable price, wherever it is in the world. Under growing competition and, hence, rising customer expectations, a company's penalty for complacency becomes even greater.

A strategic tool to measure the importance of the customer's perceived value is value chain analysis. By enabling companies to determine the strategic advantages and disadvantages of their activities and value-creating processes in the marketplace, value chain analysis becomes essential for assessing competitive advantage.

#### 1.6.2 Scope

The aspect of value chain analysis is addressed to managers, and more specifically to management accountants, who may lead efforts to implement value chain analysis in their organisations.

The concepts, tools and techniques of value chain analysis apply to all those organisations which produce and sell a product or provide a service.

#### 1.6.3 Definitions of Value Chain

**1.6.3.1 Porter's Definition :** He described the value chain as the internal processes or activities a company performs "to design, produce, market, deliver and support its product." He further stated that "a firm's value chain and the way it performs individual activities are a reflection of its history, its strategy, its approach of implementing its strategy, and the underlying economics of the activities themselves."

#### **Classification of business activities for Value Chain Analysis:**

Porter classified business activities under two heads .

1. **Primary activities** are directly involved in transforming inputs into outputs and delivery and after-sales support to output. In other words they include :
  - material handling and warehousing
  - transforming inputs into final product
  - order processing and distribution
  - communication, pricing and channel management, and
  - installation, repair and parts replacement.

2. **Support activities** are the activities which support primary activities. They are handled by the organisation's staff functions and include the following :
1. **Procurement** — purchasing of raw materials, supplies and other consumable items as well as assets.
  2. **Technology Development** — know-how, procedures and technological inputs needed in every value chain activity.
  3. **Human resource management** — selection, promotion and placement, appraisal, rewards; management development; and labour/employee relations.
  4. **Firm infrastructure** — general management, planning, finance, accounting, legal, government affairs and quality management.

**1.6.3.2 Definition of John Shank and V. Govindarajan :** They described the value chain in broader terms. According to them “the value chain for any firm is the value-creating activities all the way from basic raw material sources from component suppliers through to the ultimate end-use product delivered into the final consumers' hands.” This description views the firm as part of an overall chain of value-creating processes.

**1.6.3.3 Industry Value Chain:** Industry Value Chain refers to the series of activities, which add value to the product supplied to the industry. The industry value chain starts with the value-creating processes of suppliers, who provide the basic raw materials and components. It continues with the value creating processes of different classes of buyers or end-use consumers, and culminates in the disposal and recycling of materials.

The industry value chain and the value chain activities within the firm are compared in diagram 1.

#### **1.6.4 COMPETITIVE ADVANTAGE AND CUSTOMER VALUE**

1. In order to survive and prosper in an industry, firms must meet two criteria viz.,
  - they must supply what customers want to buy
  - they must survive competition.
2. A firm's overall competitive advantage derives from the difference between the value it offers to customers and its cost of creating that customer value.
3. Competitive advantage with regard to products and services takes two possible forms.
  - an offering or differentiation advantage. If customers perceive a product or service as superior, they become more willing to pay a premium price relative to the price they will have to pay for competing offerings.
  - relative low-cost advantage, under which customers gain when a company's total costs undercut those of its average competitor.

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### THE VALUE CHAIN

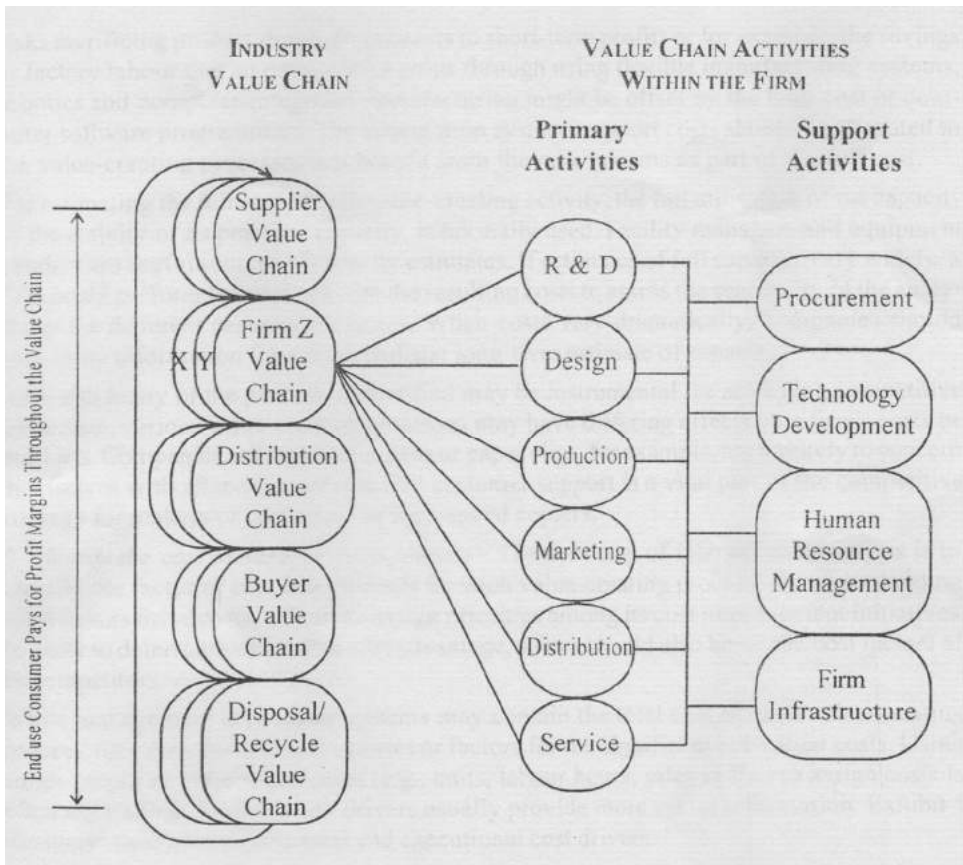


Diagram – 1

**1.6.4.1 Differentiation Advantage :** It occurs when customers perceive that a business unit's product offering (defined to include all attributes relevant to the buying decision) is of higher quality, involves less risks and/or outperforms competing product offerings. For example, differentiation may include a firm's ability to deliver goods and services in a timely manner, to produce better quality, to offer the customer a wider range of goods and services, and other factors that provide unique customer value.

Once a company has successfully differentiated its offering, management may exploit the advantage in one of two ways viz., either; increase price until it just offsets the improvement in customer benefits, thus maintaining current market share; or price below the "full premium" level in order to build market share.

**1.6.4.2 Low-Cost Advantage :** A firm enjoys a relative cost advantage if its total costs are lower than the market average. This relative cost advantage enables a business to do one of the two things ; price its product or services lower than its competitors' in order to gain market share and still maintain current profitability; or match with the price of competing products or services and increase its profitability.

Many sources of cost advantage exist; access to low-cost raw materials; innovative process technology; low-cost access to distribution channels or customers; and superior operating management. A company might also gain a relative cost advantage by exploiting economies of scale in some markets.

The relationship between low-cost advantage and differentiation advantage has been illustrated in Diagram 2.

**COMPETITIVE ADVANTAGE THROUGH LOW COST AND/OR DIFFERENTIATION**

	Superior		Differentiation
		Differentiation	with Cost
Relative		Advantage	Advantage
Differentiation			
Position		Stuck-in-the-	Low-Cost
	Inferior	Middle	Advantage
		Inferior	Superior

**Relative Cost Position**

**Diagram – 2**

Superior relative cost position offers equivalent customer value for a lower price. Superior relative differentiation position offers better customer value for an equivalent price.

Organisations which fails to gain competitive advantage through low cost or superior differentiation, or both, are “stuck-in-the-middle.” For instance, several American bicycle makers, found themselves in this position during 1980s. These companies lacked a cost advantage and failed to foresee the emerging mountain bike market. By contrast, Cannondale captured market share after introducing its large-diameter frame bicycle.

**1.6.5 The Role of the Management Accountant**

The management accountant in the past were considered an expert on cost analysis; cost estimation; cost behaviour; standard costing; profitability analysis by product, customer or distribution channel; profit variance analysis; and financial analysis.

Today, management accountants are expected to make use of activity-based costing, benchmarking, re-engineering, target costing, life-cycle costing, economic value analysis, total quality management and value chain analysis for decision making.

Value chain analysis requires a team effort. Management accountants of today has to collaborate with engineering, production, marketing, distribution and service professionals to focus on the strengths, weaknesses, opportunities and threats identified in the value chain analysis results.

By championing the use of value chain analysis, the management accountant enhances the firm’s value and demonstrates the value of the finance staff to the firm’s growth and survival.

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### 1.6.6 The Value Chain Approach for Assessing Competitive Advantage

Most corporations define their mission as one of creating products or services. For these organisations, the products or services generated are more important than any single step within their value chain. In contrast, other companies are acutely aware of the strategic importance of individual activities within their value chain. They thrive by concentrating on those activities that allow them to capture maximum value for their customers and themselves.

These firms use the value chain approach to better understand which segments, distribution channels, price points, product differentiation, selling propositions and value chain configurations will yield them the greatest competitive advantage.

The way the value chain approach helps these organisations to assess competitive advantage includes the use of following steps of analysis :

- (i) **Internal cost analysis** — to determine the sources of profitability and the relative cost positions of internal value-creating processes;
- (ii) **Internal differentiation analysis** — to understand the sources of differentiation (including the cost) within internal value-creating processes; and
- (iii) **Vertical linkage analysis** — to understand the relationships and associated costs among external suppliers and customers in order to maximise the value delivered to customers and to minimise cost.

#### Features of analysis :

1. **Not mutually exclusive** – These types of analysis are not mutually exclusive. Rather, firms begin by focusing on their internal operations and gradually widening their focus to consider their competitive position within their industry.
2. **Part of Strategic Planning** - The value chain approach used for assessing competitive advantage is an integral part of the strategic planning process.
3. **Continuous** - Like strategic planning, value chain analysis is a continuous process of gathering, evaluating and communicating information for business decision-making. By stimulating strategic thinking, the analysis helps managers envision the company's future and implement decisions to gain competitive advantage.

**Internal Cost Analysis** : Organisations use the value chain approach to identify sources of profitability and to understand the cost of their internal processes or activities. The principal steps of internal cost analysis are :

1. Identify the firm's value-creating processes.
2. Determine the portion of the total cost of the product or services attributable to each value-creating process.
3. Identify the cost drivers for each process.
4. Identify the links between processes.

5. Evaluate the opportunities for achieving relative cost advantage.

Now we shall discuss each step :

**1. Identify the firm's value-creating processes** : To identify a firm's value-creating processes, the firm must de-emphasise its functional structure. Most large businesses still organise themselves as cost, revenue, profit and investment centres. These and other organisational sub-units, such as departments, functions, divisions or separate companies, that are frequently used for control purposes are not very useful for identifying value-creating processes. Adopting a process perspective requires a horizontal view of the organisation, beginning with product inputs and ending with outputs and customers.

Processes are structured and measured sets of activities designed to produce a specified output for a particular customer or market. Emphasising process means focusing not on *what* work is done but on *how* work is done within the organisation.

While an organisation's hierarchical structure typically lays out responsibilities and reporting relationships, its process structure shows how the organization delivers customer value. While it is not possible to measure or improve hierarchical structure in any absolute sense, processes lend themselves to such measures as cost, time, output quality and customer satisfaction.

Because processes normally cut across functional areas, defining process boundaries is not always a straightforward task. People associated with a particular business process may view it in different ways. For example, the new product development process could start with marketing surveys or with delivery of product requirements from marketing to development engineering. The process could end with the release of product specifications or with shipment of the first order. Process boundaries should be defined independently of the way in which activities are organised.

Selecting the appropriate activity category may be anything but straightforward. The key is to classify value activities according to their true contribution to the firm's competitive advantage. For example, if order processing is important to a firm's customer interactions, then this activity should be classified under marketing.

Management at American Airlines, for example, handed its marketing unit the task of developing and implementing the carrier's SABRE computerised reservation system. The result; a significant competitive advantage that left the other airlines scrambling to copy the system. Even mighty United Airlines has failed to match American's installed base of terminals in travel agencies.

**2. Determine the portion of the total cost of the product or service attributable to each value creating process** : The next step is to trace or assign costs and assets to each value-creating process identified. Although firms maintain internal reports and cost accounting information, this information may not align with their processes. Companies might have to reclassify their data or conduct cost studies to assign costs and assets to each process. However, instead of a detailed cost study, rough estimates to assign costs to their value-creating processes may be useful.

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A full-cost approach provides the best estimate of life-cycle costs for evaluating the strategic cost advantage of a firm's value-creating process. Without adopting this approach, a firm risks sacrificing product development costs to short-term profits or for example, the savings in factory labour that an organisation gains through using flexible manufacturing systems, robotics and computer-integrated manufacturing might be offset by the high cost of computer software programmers. The information systems support costs should be allocated to the value-creating processes that benefit from the new systems as part of the full cost.

For estimating the full cost of each value-creating activity, the full utilisation of the capacity of the activity or its practical capacity, is normally used. Facility managers and equipment vendors are useful sources of capacity estimates. If estimates of full capacity vary widely, a firm could perform the analysis with the resulting costs to assess the sensitivity of the analysis to the different capacity measures. When costs vary dramatically, companies should seek more information for a more realistic long-term estimate of capacity.

Although many of the processes identified may be instrumental for achieving competitive advantage, various value-creating processes may have differing effects on a firm's costs or products. Companies selling pencils, pens or paper clips, for example, are unlikely to concern themselves with after-sales service. But customer support is a vital part of the competitive strategy for makers of computers or high-speed copiers.

**3. Identify the cost drivers for each process :** The next step of internal cost analysis is to identify the factor or cost determinants for each value-creating process. By understanding what factors drive costs, a firm can assign priorities among its cost improvement initiatives. In order to determine its relative cost advantage, a firm should also know the cost factors of its competitors.

While management accounting systems may contain the total cost of each value-creating process, they may not reveal the causes or factors for the significant individual costs. Using single output or volume measures (e.g., units, labour hours, sales in Rs.) to assign costs is often misleading. Multiple cost drivers usually provide more useful information. Exhibit 1 illustrates examples of structural and executional cost drivers.

### EXHIBIT 1

#### PROCESS COST DRIVERS

##### STRUCTURAL COST DRIVERS

- |       |   |                                                                                                  |
|-------|---|--------------------------------------------------------------------------------------------------|
| Scale | - | How big an investment to make in manufacturing, R&D, marketing and other resources ?             |
| Scope | - | What is the degree of vertical integration —<br>horizontal integration is more related to scale? |



- Experience or learning - How often has the firm already done this ?
- Technology - What process technologies are used within each step of the firm's value chain ?
- Complexity - How wide a line of products or services to offer to customers?

**EXECUTIONAL COST DRIVERS**

- Work force involvement or - Is the workforce involved in decisions and participation improvements in performance?
- Total quality management - Are the workforce and managers committed to total quality in processes and products ?
- Capacity utilisation - What are the scale choices on maximum plant construction?
- Plant layout efficiency - How efficient, against current norms, is the plant's layout?
- Product configuration - Is the design or formulation of the product effective?
- Linkages with suppliers and - Is the linkage with suppliers and customers exploited, according to the firm's value chain?

*Structural cost drivers* consist of organisational factors that determine the economic structure driving the cost of a firm's products. These cost drivers reflect a firm's long-term decisions, which position the firm in its industry and marketplace. Structural cost drivers may change. For example, large pharmaceutical companies enjoy economies of scale that lower their unit costs for expensive R&D.

*Executional cost drivers* capture a firm's operational decisions on how best to employ its resources to achieve its goals and objectives. These cost drivers are determined by management policy, style and culture. How well a firm executes its use of human and physical resources will determine its level of success or failure. For example, worker empowerment and flattened organisations are helping many firms in their continuous improvement efforts.

Few structural and executional cost drivers can be operationalised under existing management accounting systems in the cost analysis of the value chain. However, these cost drivers do offer an important reminder of the strategic decisions that firms need to make, or at least acknowledge, in designing their value-generating systems. Increasingly, companies are using activity-based costing to understand the resources/costs consumed by the activities and processes used in delivering their products and services.

**4. Identify the links between processes** : While individual value activities are considered separate and discrete, they are not necessarily independent. Most activities within a value

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chain are interdependent. Firms must not overlook value chain linkages among interdependent activities that may impact their total cost.

For example, cost improvement programs in one value chain process may lower or increase costs and/or revenues in other processes. Transfers of goods and services from one value chain process to another increases cost. Eliminating these transfers reduces the costs of purchasing, invoicing and other record keeping functions.

Tandem Computers eliminated its costs of purchase orders, invoicing and other functions by jointly developing a detailed bar code process with its suppliers. By improving its upstream design and engineering processes for the Taurus, Ford saved on downstream production and customer service costs. Using fewer floppy drives and motherboards in its PCs has enabled IBM to halve its delivered cost in two years.

As sources of competitive advantage, these relationships or linkages among activities can be as important as the activities themselves. Such linkages may also offer sustainable competitive advantage, because their subtle, complex nature makes them difficult for competitors to imitate.

**5. Evaluate the opportunities for achieving relative cost advantage :** In many organisations, cost reductions are made across the board (e.g., “eliminate 10 per cent from every department”). Because these firms do not reduce their costs strategically, this effort usually fails. More often than not, across-the-board cost reduction misconstrues the underlying problem. The point is not to become more efficient at insignificant activities, but to better meet customer demands.

Using the value chain approach, a company goes beyond simple across-the-board cuts and attempts to lower cost and improve efficiency within each value-creating process. For instance, a company might negotiate lower costs of process inputs such as wages or purchases, or evaluate make-or-buy options.

Reducing process input costs often means negotiating lower wages or moving production to countries with cheaper labour costs. Suppliers might be willing to drop their prices if the company negotiates long-term contracts. Companies also use buyer-seller partnerships to gain advantages in cost, quality, time, flexibility, delivery and technology.

Some processes may offer more opportunities for improvement than others. In order to get the most out of its cost reduction programs, a company should prioritise its value-creating process. Under the 80:20 rule, 20 per cent of the value-creating processes often account for 80 per cent of total costs.

**Internal Differentiation Analysis :** The value chain approach is also used by organisations to identify opportunities for creating and sustaining superior differentiation. In this situation, the primary focus is on the customer’s perceived value of the products and services.

As with internal cost analysis, internal differentiation analysis requires firms to first identify their value-creating processes and primary cost drivers. They are then ready to perform a differentiation analysis using the following guidelines :

**1. Identify the customers' value-creating processes :** To pursue a superior differentiation strategy, a firm's processes must enhance those of its customers. Thus, a firm should carefully study the value-creating processes of its customers. Exhibit 2 presents such an analysis for Crown, Cork and Seal Company (CCS), a metal can maker, and its customers in the late 1970s. The metal container industry was characterised by low growth, low profits and intense competition. The CCS succeeded with a differentiation strategy, which is usually very difficult to accomplish in a commodity-type business. Two different groups of customers—food and beverage canners—accounted for 80 per cent of the metal containers produced.

**2. Evaluate differentiation strategies for enhancing customer value :** The key to successful differentiation under the value-chain approach is to identify the value creating processes that distinguish a firm's products or services from those of its competitors. In making this distinction, customer value is emphasised.

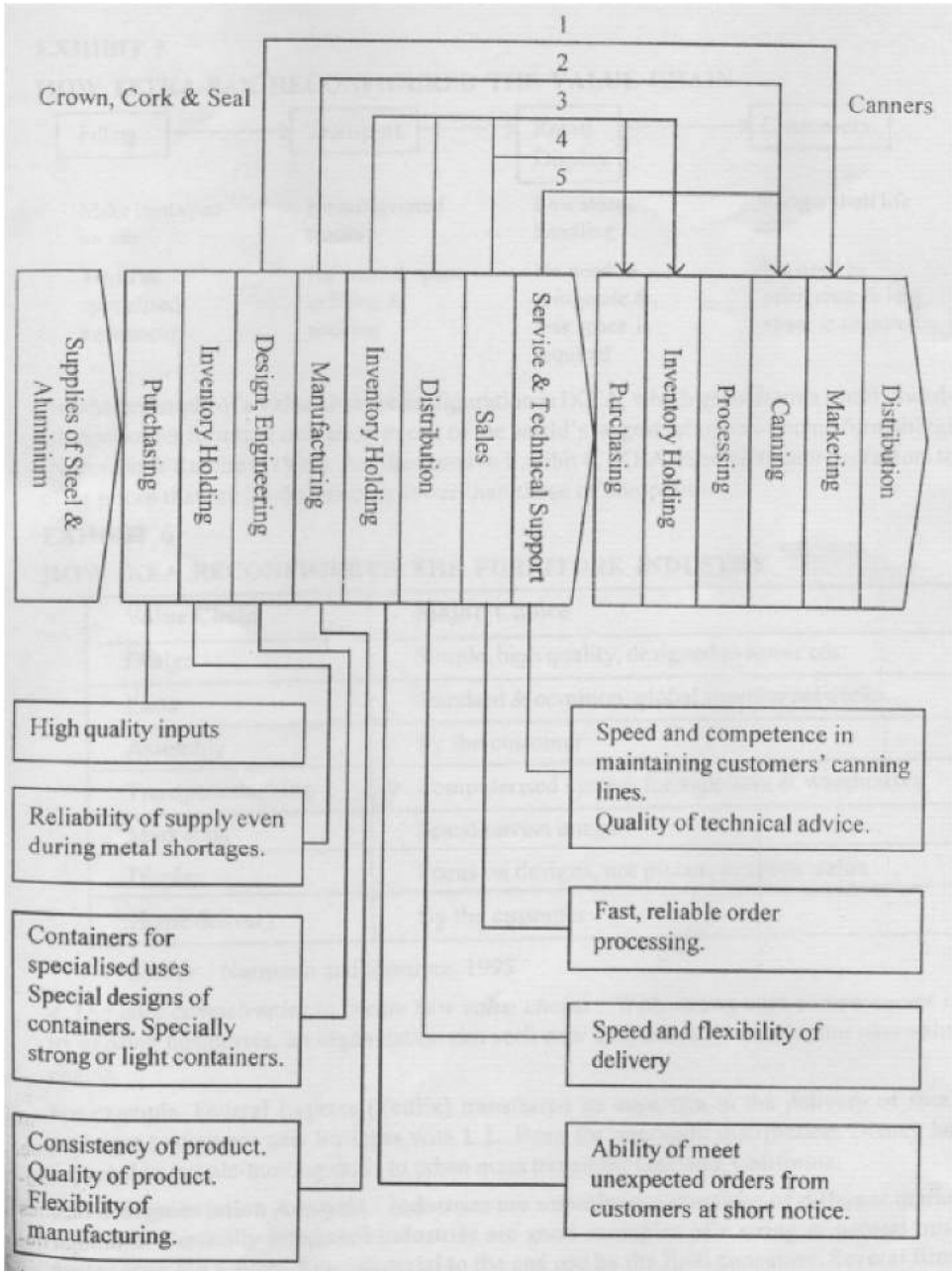
The ways customer value can be enhanced through differentiation include :

- *product features*—that are esthetically appealing or functionally superior. For example, the Mercedes-Benz automobile accomplished this feat so well for years that its name became synonymous with the highest level of quality—people would describe a product as the “Mercedes-Benz” of its category :
- marketing channels—that provide desired levels of responsiveness, convenience, variety and information for example :
  1. Designing distinctive cans for customers may assist their own marketing activities.
  2. Consistent can quality lowers customers canning costs by avoiding breakdowns and holdups on their canning lines.
  3. By maintaining high stocks and offering speedy delivery, customers can economise on their own stock-holding (they may even be able to move to a just-in-time system of can supply).
  4. Efficient order processing can reduce customers ordering costs.
  5. Capable and fast technical support can reduce the costs of breakdowns on canning lines.
    - *service and support*—tailored to end-user and channel member sophistication and urgency of need.
    - *brand or image positioning*—that lends greater appeal to the company's offerings on critical selection criteria. For many years, this quality image has allowed the American Express Co. to command a significant price premium in the highly competitive financial services market.
    - *price*—including both net purchase price and cost savings available to the customer through the use of the product and service.

**3. Determine the best sustainable differentiation strategies :** For a firm to achieve superior differentiation, it must utilise the best mix of resources in creating value for its customers. In

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order to prioritise its processes as sources of differentiation, a company must determine what attributes of each process enhance customer value.



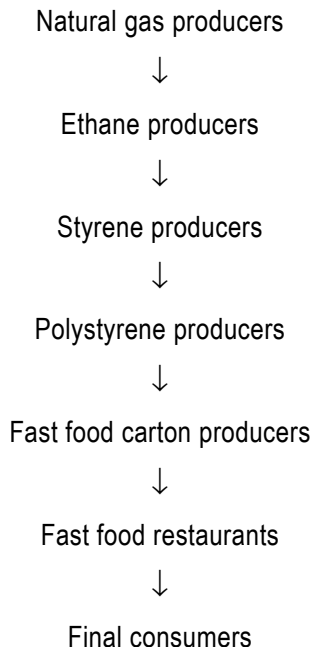
The more unique a firm's resources and skills, the more sustainable is its differentiation advantage over competitors.

**Vertical Linkage Analysis :** Linkages among value-creating processes do not end with the activities within a firm. The greatest competitive advantage may come out of linkages between a firm's value-creating activities and those of its suppliers, channels or users.

Vertical linkage analysis is a much broader application of internal cost and differentiation analysis that includes all upstream and downstream value-creating processes throughout the industry. Vertical linkage analysis considers all links from the source of raw materials to the disposal and/or recycling of the product. Exhibit 3 outlines the vertical links involved in the production of "fast food" containers.

### EXHIBIT 3

#### VERTICAL LINKAGES IN THE PRODUCTION OF PLASTIC FOOD CONTAINERS



Vertical linkage can reveal which activities are the most (and least) critical to competitive advantage (or disadvantage). For example, Swiss watchmakers succeeded for years as relatively small, labour-intensive assemblers. Then came the 1970s and the advent of low-cost, mass-produced watches. The Swiss responded by restructuring their industry to gain economies of scale similar to those enjoyed by their new global competitors.

*Vertical linkage analysis includes the following steps;*

**1. Identify the industry's value chain and assign costs, revenues and assets to value-creating processes :** Because vertical linkages can be complex and intangible, they are often overlooked by organisations. For example, the petroleum industry consists of numerous value-creating processes or activities, including exploration, production, refining, marketing and distribution. These processes define the value chain for this industry. One company may participate in all parts of this value chain; another firm may participate in only a few. This

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diversity of operations and organisations makes it difficult to adopt a standard approach for identifying industry value chain processes.

Few firms have information systems that can identify and analyse these subtle relationships. For example, profitability and return on assets are key measures of competitive advantage throughout an industry's value chain. It can be extremely difficult to obtain pertinent information for these measures, including operating costs, revenues and assets for each process throughout the industry's value chain. However, this information is necessary to calculate a rate of return on assets for each value chain process.

Obtaining the replacement or current cost of physical assets used by a value-creating activity is a necessary but often-complex undertaking. Historical or book values usually provide inadequate measures of current investment. Plant engineers, equipment vendors and independent appraisal professionals may be consulted to help establish current asset values. Likewise, establishing prices for transferring goods and services along value chain processes requires an understanding of market or competitive-based rates. If at least one firm competes in each stage of value creation, then competitive market prices are available. If not, then a company must use judgement in determining a transfer price that incorporates a normal profit margin on full costs. For long-term strategic decision-making, companies should use full cost under conditions of full capacity for the value activity. While several measures of capacity exist, the best measure should represent the long-term utilisation of the value activity's assets (sometimes called "practical capacity").

Publicly available financial reports produced by firms throughout the industry value chain can provide key financial information. Typically, this information is neither in the proper format nor disaggregated enough to accommodate vertical linkage analysis. Significant analysis, data manipulation and judgement may be necessary to obtain the appropriate information for each value chain process.

For intermediate transfers between processes, competitive market prices, if available, should be substituted for the internal transfer prices. For example, competitive market prices for a single link in the value chain may be obtained from individual firms that operate only in that link of the chain. For long-term cost estimation, full costs should be used rather than marginal, variable or incremental costs.

**2. Diagnose the cost drivers for each value-creating process** : Traditional management or cost accounting systems often assign costs by using a single output measure of operating activity, such as output volume. For vertical linkage analysis, a single measure is inadequate to capture the underlying cost categories. Direct labour-based measures may be appropriate for labour-intensive activities; operating hours may be appropriate for machine-based activities.

**3. Evaluate the opportunities for sustainable competitive advantage** : By nature, competitive advantage is relative. In an ideal world, a firm can gauge its competitive position by knowing its competitor's value chains and the rates of return on each. In reality, however, this may be rather difficult; the competitor's internal cost, revenue and asset data for its processes are generally unavailable. Sufficient qualitative information usually exists on a

firm's major value-creating processes and the strategies for each. By understanding how other companies compete in each process of the industry value chain, a firm can use the qualitative analysis to seek out competitive niches even if financial data are unavailable.

Value chains for three competitors in the rapidly changing telecommunications industry—AT&T, NYNEX and IBM—are listed in Exhibit 4, along with the strategic differences for each firm (Hax and Majluf, 1991). The strategic differences reflect varying structural and executional cost drivers. In marketing, for instance, AT&T started with no organisation but with significant name recognition. The regional marketing scale of NYNEX and the worldwide marketing scale of IBM are important cost advantages.

**EXHIBIT 4**

**VALUE CHAIN DIFFERENCES : THE TELECOMMUNICATIONS INDUSTRY**

Value Chain	Strategic Differences		
Processes	AT & T	NYNEX	IBM
Procurement	Owns manufacturing branch (Western Electric)	Free to use any Supplier it wants	Owns Rolm, CPE manufacturer
Technology development	Technological leadership through Bell Labs	Focus on software products	Strong R & D in computer hardware and software technologies
Operations	National presence High quality of equipment through heavy capital expenditure	Regional monopoly Innovative equipment from outside suppliers High-quality regional	Global presence Leading computer technology Partnership with
MCI	Similar communications standards nationwide Strongest national telecommunications network.	network through investment	
Marketing and sales	New emphasis on marketing (still weak) High name recognition Long-term relationship	Use of Bell logo Focus on top 1,000 corporate customers Sales and distribution	Strong reputation for marketing excellence Already sells to
most	with clients Recruits computer	centres close to customers executives	major corporations Experienced sales force

Source : Hax and Majluf. 1991

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Finding innovative ways to perform value-creating activities helps firms to improve their overall performance and achieve competitive advantage. In order to thrive in the mature, highly competitive meat packing industry, for example, Iowa Beef Processors built its plants near cattle ranches, thus eliminating the high cost of shipping cattle to northern processing plants. In order to lower its costs, Tropicana froze slabs of orange juice concentrate near the orange groves in Florida and shipped the slabs to its large markets in the Northeastern U. S. Only then did the company mix the concentrate with water, thus avoiding the lengthy and costly shipment of water.

Increased global competition forces firms to focus on worldwide sustainable competitive advantage. Global competition, cites following four major factors that influences national competitive advantage :

- **factor conditions** : The nation's position in factors of production, such as skilled labour or infrastructure, necessary to compete in a given industry;
- **demand conditions** : The nature of domestic demand for the industry's product or service;
- **related and supporting industries**: The presence or absence in the nation of supplier industries and related industries that are internationally competitive; and
- **firm strategy, structure and rivalry** : The conditions in the nation governing how companies are created, organised and managed and the nature of domestic rivalry.

Geographic scope can allow firms to gain substantial competitive advantages by sharing or co-ordinating similar value activities in different places. The importance of this advantage is illustrated by the recent success of firms with a global scope, such as Canon (Japan), Caterpillar (U.S.), N. V. Philips (Netherlands) and Siemens (West Germany). These firms sell and service their products in practically every corner of the globe.

### 1.6.7 Strategic Frameworks for Value Chain Analysis

Value chain analysis requires a strategic framework or focus for organising internal and external information, for analysing information, and for summarising findings and recommendations. Because value chain analysis is still evolving, no uniform practices have yet been established. However, borrowing recent concepts from strategists and organisation experts, three useful strategic frameworks for value chain analysis are :

**1.6.7.1 Industry Structure Analysis** : Michael Porter developed a *five factors model* as a way to organise information about an industry structure to evaluate its potential attractiveness.

Under this model, the profitability of an industry or market — measured by the long-term return on investment of the average firm — depends largely on five factors that influence profitability.

*Factors which influence profitability are:*

1. **Bargaining power of buyers** : The degree of buyer power generally depends on :
  - customer concentration (the higher the concentration of customers, the greater is their negotiation leverage);



- the propensity for customers to integrate backward (the higher the propensity for backward integration, the greater the bargaining leverage);
- costs of switching suppliers (the lower the switching costs, the greater the buyer's leverage); and
- the number of alternative suppliers (the greater the number, the greater the customer's leverage).

2. **Bargaining power of suppliers** : Just as powerful buyers can squeeze profits by putting downward pressure on prices, suppliers squeeze profits by increasing input costs. The same factors that determine the power of buyers also determine the power of suppliers. The bargaining power of suppliers and buyers relative to the firm depends on the relationships between their value chains. Bargaining power will be a function of relative strengths, in particular, value activities that depend on one another.

Identifying the specific activities involved and the nature of their strengths and relationships can give important insights into the power balance between buyer and seller, and how it may be altered for the firm's benefit.

3. **Threat of substitute products or services** : The potential for profit in an industry is determined by the maximum price that customers are willing to pay. This depends primarily on the availability of substitutes. When few substitutes exist for a product — e.g., gasoline — consumers are willing to pay a potentially high price. If close substitutes for a product exist, then there is a limit to what price customers are willing to pay. Any price increase will then cause some customers to switch to substitutes. A thorough understanding of the value chains of buyers as they relate to the firm's product can help in assessing (and combating) the threat of substitution.

4. **Threat of new entrants** : If an industry is earning a return on invested capital above the cost of capital, that industry will act as a magnet to firms outside the industry. Unless the entry of new firms is barred, the rate of profit must fall to the competitive level. Even the mere threat of entry may be sufficient to ensure that established firms constrain their prices to the competitive level.

5. **Intensity of competition** : Markets experiencing rapid growth typically see less intense competition. Rival companies can usually satisfy profitability and growth without having to take market shares from their competitors.

The variety and nature of the value chains of competitors shape many of the characteristics of an industry. The relative importance of economies of scale versus economies of scope, for example, depends on the kind(s) of technology employed in competitors' value chains. The stability of the industry and of its competitive situation also relates to what happens to the value chains of firms in the industry. The effectiveness of low cost versus differentiation strategies depends on the nature of users' value chains, and on how competitors value chains interact with those of both sellers and users.

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Since these five forces are ever-changing, Porter's framework needs to be employed as a *dynamic* analytical tool. This is because competition is a dynamic process; equilibrium is never reached and industry structures are constantly being reformed.

A major difficulty in industry structure analysis lies in defining the specific industry. No industry has clear boundaries either in terms of products or geographical areas. For example, does one analyse the industry environment of Ford as the "transportation equipment" industry, the "motor vehicles and equipment" industry or the "automobile" industry ?

To overcome the difficulty of defining an industry, the concept of *substitutability* can be applied to a firm's supply and demand chains. On the demand side, if buyers are willing to substitute one product for another — e.g., Toyotas for Fords — then the manufacturers belong in a single industry. However, this guideline does not always hold. For example, customers may be unwilling to substitute Apple Macintosh computers for H.P. computers, even though both manufacturers belong to the same industry. On the supply side, if two manufacturers can make each other's products, then they belong to a single industry.

**1.6.7.2 Core Competencies Analysis :** Industry structure analysis is well suited to describing the what of competitiveness, i.e., what makes one firm or one industry more profitable than another. But understanding the particulars of such advantages as low cost, quality, customer service and time to market may still leave the question of why largely unanswered. For example, why do some companies seem able to continually create new forms of competitive advantage while others seem able only to observe and follow ? Why are some firms net advantage creators and others net advantage imitators ? For assessing competitive advantage it is necessary not only to keep score of existing advantages — what they are and who has them — but also to discover what it is that drives the process of advantage creation. Industry structure analysis is much better suited to the first task than to the second.

Thus, industry structure analysis must be supplemented by an equally explicit core competence focus. Organisations need to be viewed not only as a portfolio of products or services, but also as a portfolio of core competencies.

Core competencies are created by superior integration of technological, physical and human resources. They represent distinctive skills as well as intangible, invisible, intellectual assets and cultural capabilities. Cultural capabilities refer to the ability to manage change, the ability to learn and teamworking. Organisations should be viewed as a bundle of a few core competencies, each supported by several individual skills.

Core competencies are the connective tissue that holds together a portfolio of seemingly diverse businesses. They are the *lingua franca* that allows managers to translate insights and experience from one business setting into another. Core competence-based diversification reduces risk and investment and increases the opportunities for transferring learning and best practice across business units.

For instance, Microsoft's only factory asset is its human imagination. This company has excelled in inventing new ways of using information technology for a wide variety of end users. In contrast, using its core competence in information processing, Xerox developed icons, pull-down menus and the computer mouse, but failed to exploit the marketplace.

A core competence is identified by the following tests :

- *Can it be leveraged?*—does it provide potential access to a wide variety of markets?
- *Does it enhance customer value?* — does it make a significant contribution to the perceived customer benefits of the end product?
- *Can it be imitated?*—does it reduce the threat of imitation by competitors?

Applying the value chain approach to core competencies for competitive advantage includes the following steps:

**1. Validate core competencies in current businesses** : Core competencies should tie together the portfolio of end products and help a firm excel in dominating its industry. For example, Corning Glass's core competence is its ability to melt specialty glass. Pyrex, television bulbs, headlamps and optical wave guides are just a few of the products of this successful producer. Procter & Gamble's R&D expertise and marketing/distribution skills provide a significant competitive advantage in a wide range of mass consumer products (e.g., Ivory, Tide, Folgers, Crisco, Pampers).

Core competencies need to be continually validated. In the early 1970s, Timex held half of the global market for watches with its core competence in low-cost management of precision manufacturing. By the mid-1970, the watch industry moved to digital technology, making Timex's core competence irrelevant.

**2. Export or leverage competencies to the value chains of other existing businesses** : The same set of core competencies can be exploited in multiple businesses by exporting core competencies to the value chains of other existing businesses.

**For example**

1. one of Honda's core competencies is designing and producing small engines. By exporting this core competence to a wide variety of business lines, the company seeks to have six Hondas in every garage : autos, motorcycles, snowmobiles, lawnmowers, snow blowers, chain saws and power tools. Other Honda core competencies are dealership management and shorter product development cycles.
2. Marriott Corp. has core competencies in food service and hospitality skills, standardised hotel operating procedures, and a shared procurement and distribution system. Besides employing these core competencies in hotels, the company uses them in its other businesses, including institutional food service, consumer food and restaurants, cruise ships and theme parks.
3. AT&T extended its core competence as an efficient processor of customer accounts by entering the credit card business. Kimberly Clark's entry into disposable diapers extended its core competence in the design of paper products.

**3. Use core competencies to reconfigure the value chains of existing businesses** : While firms

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may manage their existing value chains better than their competitors, sophisticated firms work harder on using their core competencies to reconfigure the value chain to improve payoffs. Otherwise, competitors may exploit opportunities.

### For example,

1. Japanese watchmakers side-stepped traditional distribution channels in favour of mass merchandisers such as department store chains. By efficiently consolidating freight, Emery Freight dominated the air freight industry and was consistently a leader in profitability in U. S. industry. Federal Express reconfigured the air freight business by focusing on the overnight delivery of small packages.
2. Tetra-Pak is an excellent example of a firm that reconfigured the value chain in the packaging industry for dairy products and orange juice. Tetra-Pak designed filling machine for its aseptic packages and changed the packaging industry. Exhibit 5 illustrates Tetra-Pak's changes to the value chain.

### EXHIBIT 5

#### HOW TETRA-PAK RECONFIGURED THE VALUE CHAIN

Filling	Transport	Retail Display	Customers
Make container on site	No refrigerated trucks	Low store handling	Longer shelf life
Tetra Pak specialised equipment	No wasted space in filling & packing required	No need to refrigerate & less space is	No need to refrigerate & less space is required

Another example of a value chain reconfiguration is IKEA, which grew from a small, Swedish mail-order furniture operation to one of the world's largest retailers of home furnishings (Normann & Ramirez, 1993). As illustrated in Exhibit 6, IKEA selected numerous factors to offer prices that are 25-50 per cent lower than those of competitors.

### EXHIBIT 6

#### HOW IKEA RECONFIGURED THE FURNITURE INDUSTRY

Value Chain	Major Choice
Design	Simple, high quality, designed to lower cost
Parts	Standard & common, global supplier network
Assembly	By the customer
Transport/stocking	Computerised system for suppliers & warehouses
Marketing	Scandinavian image
Display	Focus on designs, not pieces, to create value
Home delivery	By the customer

Source : Normann and Ramirez, 1993

3. **Use core competencies to create new value chains** : With strong core competencies in its existing businesses, an organisation can seek new customers by developing new value chains.

**For example**, Federal Express (FedEx) transferred its expertise in the delivery of small packages to contract new business with L.L. Bean for overnight distribution. Disney has exported its people-moving skills to urban mass transit for Oakland, California.

**1.6.7.3 Segmentation Analysis** : Industries are sometimes collections of different market segments. Vertically integrated industries are good examples of a string of natural businesses from the source of raw material to the end use by the final consumer. Several firms in the paper and steel industries are vertically integrated. Not all firms in an industry participate in all segments.

If the nature and intensity of Porter's five forces or the core competencies vary for various segments of an industry, then the structural characteristics of different industry segments need to be examined. This analysis will reveal the competitive advantages or disadvantages of different segments. A firm may use this information to decide to exit the segment, to enter a segment, reconfigure one or more segments, or embark on cost reduction/differentiation programs.

Differences in structure and competition among segments may also mean differences in key success factors among segments.

*Using the value chain approach for segmentation analysis, Grant (1991) recommended five steps :*

1. Identify segmentation variables and categories;
2. Construct a segmentation matrix;
3. Analyse segment attractiveness;
4. Identify key success factors for each segment; and
5. Analyse attractiveness of broad versus narrow segment scope.

**1. Identify segmentation variables and categories** : There may be literally millions of ways to divide up the market into segments. Typically, an analysis considers between five to ten segmentation variables. These variables are evaluated on the basis of their ability to identify segments for which different competitive strategies are (or should be) pursued.

The selection of the most useful segment-defining variables is rarely obvious. Industries may be subdivided by product lines, type of customer, channels of distribution and region/geography. The most common segmentation variables considered are type of customer and product related, as illustrated in Exhibit 7.

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**EXHIBIT 7**

**APPROACHES TO DEFINING SEGMENTATION VARIABLES CUSTOMER CHARACTERISTICS**

Geographic	Small communities as markets for discount stores
Type of organisation	Computer needs of restaurants versus manufacturing firms versus banks versus retailers
Size of firm	Large hospital versus medium versus small
Life-style	Jaguar buyers tend to be more adventurous, less conservative than buyers of Mercedes-Benz and BMW
Sex	The Virginia Slims cigarettes for women
Age	Cereals for children versus adults
Occupation	The paper copier needs of lawyers versus bankers versus dentists

**PRODUCT-RELATED APPROACHES**

Use type	Appliance buyer-home builder, remodeler, homeowner
Usage	The heavy potato user - the fast-food outlets
Benefits sought	Dessert caters - those who are calorie-conscious versus those who are more concerned with convenience
Price sensitivity	Price-sensitive Honda Civic buyer versus the luxury Mercedes-Benz buyer
Competitor	Those computer users now committed to IBM
Application	Professional users of chain saws versus the homeowner
Brand loyalty	Those committed to IBM versus others

The first set of variables describes segments in terms of general characteristics unrelated to the product involved. Thus, a bakery might be concerned with geographic segments, focusing on one or more regions or even neighbourhoods. It might also divide its market into organisational types such as at-home customers, restaurants, dining operations in schools, hospitals and so on. Demographics can define segments representing strategic opportunities such as single parents, professional women and elderly people.

The second category of segment variables includes those that are related to the product. One of the most frequently employed is usage. A bakery may employ a very different strategy in serving restaurants that are heavy users of bakery products than restaurants that use fewer bakery products. Zenith made a niche for itself in the very competitive personal computer industry by focusing on government, which is the largest computer user.

Segmenting by competitor is useful because it frequently leads to a well-defined strategy and a strong positioning statement. Thus, a target customer group for the Toyota Cressida consists of buyers of high-performance European cars such as the BMW. The Cressida is positioned against the BMW as offering comparable performance for a substantially lower cost.

2. **Construct a segmentation matrix** : After customer and product related variables have been selected for identifying different segments, a segmentation matrix can be developed. Two or more dimensions may be used to partition an industry.

For example, restaurants could be divided into four dimensions; types of cuisine, price range, type of service (e.g., sit-down, buffet, cafeteria, take-out, fast food) and location. A segmentation matrix for the British frozen foods industry is presented in Exhibit 8. Five types of product and five channels of distribution are used to construct the two-dimensional segmentation matrix consisting of 25 potential segments. However, not every cell in the matrix may be relevant. Empty cells may represent future opportunities for products or services.

**EXHIBIT 8**

**SEGMENTING THE BRITISH FROZEN FOOD INDUSTRY**

Distribution Channels

	Specialist	Supermarkets		Independent		
		Producers' Brands	Retailers' Brands	Grocery Retailers	Freezer Stores	Caterers
P						
R	Vegetables					
O						
D	Fruits					
U						
C	Meat					
T	Products					
T	Desserts					
Y						
P						
E	Convenience					
S	Ready Meals					

**Note** : The above matrix identifies five categories of frozen food, and five distribution channels. While the basic distinction of customers is between retail and catering, within retailing there are three distinct categories of outlet; supermarkets, independent grocery stores, and specialist retailers of frozen foods (“home freezer centres”). In addition, different market conditions exist for processors supplying frozen foods for sale under their own brand names as opposed to those supplying frozen foods for sale under the brand name of the retailer.

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3. **Analyse segment attractiveness** : Competitive assessments using industry structure analysis or core competencies analysis can also be used to evaluate the profitability of different segments. However, the competitive focus shifts to an analysis of the different segments.

For example, in the frozen foods industry segmentation, independent grocers and caterers may be willing to substitute fresh fruits and vegetables for frozen goods. Therefore, the threat of substitutes within the segments and from outside sources must be carefully examined.

In addition, the interrelationship among segments must be carefully considered. For example, caterers may purchase frozen food items from supermarkets at bargain prices. Segments may be natural buyers, sellers or substitutes for one another.

In the automobile industry, the luxury car and sports car segments were high-priced, high-margin products with less intense competition than other automobile segments. The introduction of high-quality, lower-priced Acura, Lexus and Infiniti autos changed the competitive structure of these high-priced segments.

4. **Identify key success factors for each segment** : Quality, delivery, customer satisfaction, market share, profitability and return on investment are common measures of corporate success. In this regard, each segment must be assessed using the most appropriate key success factors. Cost and differentiation advantages should be highlighted by these measures.

Examination of differences among segments in buyers' purchase criteria can reveal clear differences in key success factors.

5. **Analyse attractiveness of broad versus narrow segment scope** : A wide choice of segments for an industry requires careful matching of a firm's resources with the market. The competitive advantage of each segment may be identified in terms of low cost and/or differentiation.

Sharing costs across different market segments may provide a competitive advantage. For example, Gillette broadened its shaving systems to include electric shavers through its 1970 acquisition of Braun. Lipdon recently entered the bottled iced-tea market.

On the other hand, when the Toro Company broadened its distribution channels for its snow blowers and lawnmowers to include discount chains, it almost went bankrupt. Felling betrayed, a number of Toro's dealers dropped its products.

Taking a narrow segment focus may leave a firm vulnerable to competitors. For instance, by relying solely on its lemon-lime soft drink, 7-Up left itself at a competitive disadvantage to Coca-Cola and Pepsi.



In many industries, aggressive firms are moving toward multiple-segment strategies. Campbell Soup, for example, makes its nacho cheese soup spicier for Texas and California customers and offers a Creole soup for Southern markets and a red-bean soup for Hispanic areas. In New York, Campbell uses promotions linking Swanson frozen dinners with the New York Giants football team; in the Sierra mountains, skiers are treated to hot soup samples. Developing multiple strategies is costly and often must be justified by an enhanced aggregate impact.

Some firms decide to avoid or abandon segments because of limited resources or because of uncertain attractiveness. For example, in the 1960s, IBM decided not to enter the mini-computer segment. This allowed upstart Digital Equipment Corp. to dominate this segment of the computer industry.

A segment justifying a unique strategy must be of worthwhile size to support a business strategy. Furthermore, that business strategy needs to be effective with respect to the target segment in order to be cost effective. In general, it is costly to develop a strategy for a segment. The question usually is whether or not the effectiveness of the strategy will compensate for this added cost.

#### 1.6.8. Limitations of Value Chain Analysis

1. **Non-availability of data :** Internal data on costs, revenues and assets used for value chain analysis are derived from financial information of a single period. For long term strategic decision making, changes in cost structures, market prices and capital investments etc. may not be readily available.
2. **Identification of stages:** Identifying stages in an industry's value chain is limited by the ability to locate atleast one firm that participates in a specific stage. breaking a value stage into two or more stages when an outside firm does not complete in these stages is strictly judgment.
3. **Ascertainment of cost, revenues and assets:** Finding the costs revenues and assets for each value chain activity poses/gives rise to serious difficulties. There is no scientific approach and much depends upon trial and error and experimentation methods.
4. **Identification of cost drivers:** Isolating cost drivers for each value-creating activity, identifying value chain linkages across activities and computing supplier and customer profit margins present serious challenges.
5. **Resistance from employees:** Value chain analysis is not easily understandable to all employees and hence may face resistance from employees as well as managers.
6. **Science vs. Art:** Value chain analysis is not exact science. It is more "art" than preparing precise accounting reports. Certain judgments and factors of analysis are purely subjective and differ from person to person.

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### **1.6.9 Organisational and Managerial Accounting Challenges**

Value chain analysis offers an excellent opportunity to integrate strategic planning with management accounting to guide the firm to growth and survival. This change in focus for management accounting is necessary to maintain its critical role as the information profession.

The most significant challenge for senior management and management accountants is to recognise that the traditional, functional, internally oriented information system is inadequate for the firm engaged in global competition.

Another challenge for management accountants is to bring the importance of customer value to the forefront of managements strategic thinking. For many managers and firms, this requires a great deal of education and awareness. Management accountants should take the initiative to bring the value chain message to major players in the firm. Seminars, articles, value chain examples and company-specific applications are useful to illustrate the advantages of value chain analysis.

Although value chain analysis requires expertise in internal operations and information, it demands a great deal of external information. Management accountants must seek relevant financial and non-financial information from sources outside the organisation.

Management accountants must integrate databases and potential sources of timely information on competitive forces confronting the business. This calls for innovation and creativity in gathering and analysing information for management decisions.

Designing internal and external information systems to assist managers in planning, monitoring and improving value-creating processes is another challenge facing management accountants.

Information technology is improving daily but existing information systems are slow to change. Management accountants should solicit support from all senior managers for allocating resources to develop and improve value chain-oriented information systems.

Value chain analysis requires the cooperation of all managers involved in value chain processes, including engineers, designers, production managers, marketing managers and distribution managers. Leadership from the CEO is vital to successful cooperation of managers. The management accountant should ensure that the CEO is committed to value chain analysis and the organisational changes necessary for its successful implementation.

For many service companies, Porter's value chain model emphasising manufacturing firms may appear inappropriate. However, every organisation (banks, hospitals, airlines, professional firms) has a variety of primary and support value-creating activities to which value chain analysis applies. For example, a publishing company might have the following primary activities; information acquisition, editorial, production, distribution, sales and service. Support activities include new product and business development, technology assessment and development, human resource management and firm infrastructure. If strategy is seen as the pursuit of competitive advantage, the link between the formulation of service strategy and operational service delivery is vital.

**1.6.10 Value Chain Analysis Vs. Conventional Management Accounting**

Information generated from the traditional management accounting systems, including cost accounting, is generally unsuitable for value chain analysis for a variety of reasons. Exhibit 9 provides a comparison of value chain analysis and traditional management accounting.

Generally, traditional management accounting focuses on internal information. It often places excessive emphasis on manufacturing costs. It also assumes that cost reduction must be found in the “value-added” process, i.e., selling price less the cost of raw material.

Using a value added approach can be misleading, since there are many other purchased inputs such as engineering, maintenance, distribution and service. The value-added process starts too late because it ignores linkages with suppliers, and stops too early because it ignores linkages with customers.

The value chain approach encompasses external and internal data, uses appropriate cost drivers for all major value-creating processes, exploits linkages throughout the value chain, and provides continuous monitoring of a firm’s strategic competitive advantage.

**VALUE CHAIN VS. CONVENTIONAL MANAGEMENT ACCOUNTING**

	Traditional Management Accounting	Value Chain Analysis in the Strategic Framework
Focus	Internal	External
Perspective	Value Added	Entire set of linked activities from suppliers to end-use customers
Cost Driver Concept	Single cost driver (cost is function of volume) Application at the overall firm level (cost-volume-profit analysis)	Multiple cost drivers- Structural drivers (e.g. scale, scope, experience, technology and complexity)- Executional drivers (e.g. participative management and plant layout)A set of unique cost drivers for each value activity.
Cost Containment Philosophy	“Across the board” cost reductions	View cost containment as a function of the cost drivers regulating each value activity. Exploit linkages with suppliers Exploit linkages with customers Exploit process linkages within the firm to save”.
“Spend		
Insights for Strategic Decisions	Somewhat limited	Identify cost drivers at the individual activity level, and develop cost/ differentiation advantage either by controlling those drivers better than competitors by reconfiguring the value chain( e.g. Federal Express in mail

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delivery, and MCI in long distance telephone) For each value activity, ask strategic questions pertaining to-Make versus by-Forward / backward integration Quantity and assess “supplier power” and “buyer power”, and exploit linkages with suppliers and buyers.

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### 1.7 COST CONTROL AND COST REDUCTION

Cost control implies guidance a reputation of cost by executive action. For this purpose, the executives are provided with some yard stick such as standards or budgets with which the actual costs and performances are compared to ascertain the degree of achievement made. Therefore Cost Control involves continuous comparisons of actual with the standards or budgets to regulate the former. Standards or budgets once set up are not attended during the period or until some mistakes are discovered in standards.

Cost reduction is the achievement of real and permanent reduction in unit cost of products manufactured. It, therefore, continuously attempts to achieve genuine savings in cost of production distributing, selling and administration. It does not accept a standard or budget as or fined. It rather challenges the standards/budgets continuously to make improvement in them. It attempts to excavate, the potential savings buried in the standards by continuous and planned efforts. Cost control relax that dynamic approach, it usually dealt with variances leaving the standards intact.

#### Application of cost control in material cost

Materials Cost is the price paid and the cost incurred by an organization in procuring materials for production. If material cost is effectively controlled we must have a proper system of material control and the following are the fundamental requirement of such a control :-

- (a) Definite responsibility in respect of every function of material control should be specified and allocated.
- (b) Proper co-ordination between the various sections/departments responsible for different function should be achieved.
- (c) Purchasing function should be centralised as far as possible and entrusted to a competent person conversant with purchasing function.
- (d) Controlled procedure should be standardised ad uniform forms and documents should be used all over the organisation.
- (e) To facilitate the control procedures materials requirements budget and materials purchased budget should be prepared.
- (f) Adequate provision for proper storage facilities and suitable arrangements for storing materials should be made.

(g) A proper system of stock control should be introduced and maintained.

**Difference between cost control and cost reduction :-**

Cost Control is defined as the “the guidance and regulations by executives action of the cost of operating and undertaking while cost reduction is defined as and achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended.”

Thus the cost control represents the efforts where cost reduction represents achievement. Cost reduction is a continuous attempt towards improvement.

Cost Control implies that cost should not exceed the budgeted or standard limits. If it exceeds, investigation is necessary. Cost reduction means waste reduction, expenses reduction and increased production.

The process of cost control is to set a target ascertain actual performance and compare it with the target, investigate the variances and take remedial measures. Cost reduction is not concerned with maintenance of performance according to the standards. Cost control assumes existence of standards or which are not challenged. Cost reduction assumes the existence of concealed potential savings in the standards or norms which are, therefore subjected to a constant challenge with a view to improvement by bringing out the saving.

Cost control is a preventive function; costs are optimised before they are incurred. Cost reduction is a corrective functions. It operates even when an efficient cost control system exists. There is room for reduction in the achieved cost under controlled conditions.

**Programme For Cost Reduction:-**

The possibilities of reducing the cost of a product in the applications of cost reduction methods. The lines of approach in laying out a cost reduction plan are suggested below :

(a) Product Design:- Cost reduction starts with the design of the product. Product design being first step in manufacturing of a product, the impact of any economy or cost reduction effected their stage will be felt through out the manufacturing life of the product. Design is therefore the most important field where cost reduction may be attempted.

Efficient designing for a new product or improving the design for an existing product, reduces cost in the following manner :-

- (i) Material Cost:- Cheaper substitute, higher yield and less quantity and varieties of materials, cause reduction in cost.
- (ii) Labour Cost :- Reduced time of operation and increased productivity reduce cost.
- (iii) Cost of gigs, tools and fixtures are to be minimised.
- (iv) Standardisation and simplification in variety increases productivity and reduces costs.

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(b) Organisation :- It is not possible to measure the extent of cost reduction resulting from an improvement in organisation nevertheless, economies are bound to be achieved if the following considerations are looked into :-

- (i) Definition of each function and responsibility.
- (ii) Proper assignment of task and delegation of responsibility to avoid overlapping
- (iii) A suitable channel of communication between various management level.
- (iv) Co-operation and closed relationship between the various executives.
- (v) Removal of doubts and fiction.
- (vi) Encouragement to employees for cost reduction suggestion.

(c) Factory Lay Out Equipment :-

A cost reduction programme should study the factory layout and the utilisation of the existing equipment to determine whether there is any scope of cost reduction by elimination of wastage of men, materials and maximum utilisation of the facilities available.

The necessity for replacement of Plants, introduction of new techniques or expansion of facilities should be considered and various alternative explored with a view to reducing costs.

(d) Production Plan Programme and Method:-

Production control ensures proper planning of work by installing an efficient procedure and programme ordering correct machine and proper utilisation of materials, manpower and resources so that there is no waste of time and money due to wait for components, men, material etc. An efficient cost reduction programme should examine the following points relating to production control.

- (i) Whether wastage of manpower and material is kept to the minimum
- (ii) Whether there is any scope for reducing idle capacity.
- (iii) Whether the procedures for the control of stores and maintenance services are efficient.
- (iv) Whether labour wastage may be reduced and productivity increased by eliminating faulty production method, plant layout and designs or introducing incentive schemes.
- (v) Whether there is scope for reduction of over head, whether a budgetary control system is in operation to ensure the control over overhead costs.

### Cost reduction techniques

It may be extended to administrative, selling and distribution methods, personnel management, purchase and material control, financial management and other miscellaneous services. Tools and techniques for cost reduction :-

1. Budgetary control and standard cost.
2. Work study and organisation and method of procedure.

3. Value analysis.
4. Standardisation.
5. Simplification and variety reduction .
6. Economic batch quantity (E. B. Q.)
7. Coding and classification.
8. Improvement in design.
9. Substitute material utilisation.
10. Automation.
11. Operational Research.
12. Quality Control.
13. Production Planning and Control.
14. Inventory Control.
15. Purchase Scheduling .
16. Job evaluation and merit voting.
17. Training and development.
18. Business forecast.
19. Market Research .

### **Illustration**

Even Forward Ltd. is manufacturing and selling two products: Splash and Flash at selling price of Rs 3 and Rs. 4 respectively. The following sales strategy has been outlined for the year :—

- (i) Sales planned for year will be Rs. 7.20 lakhs in the case of Splash and Rs. 3.50 lakhs in the case of Flash.
- (ii) To meet competition, the selling price of Splash will be reduced by 20% and that of Flash by  $12\frac{1}{2}\%$  .
- (iii) Break- even is planned at 60% of the total sale of each product.
- (iv) Profit for the year to be achieved is planned as Rs 69,120 in the case of Splash and Rs 17,500 in the case of Flash. This would be possible by launching a cost reduction programme and reducing the present annual fixed expenses of Rs. 1,35,000 allocated as Rs. 1,08,000 to Splash and Rs. 27,000 to Flash.

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You are required to present the proposal in financial terms giving clearly the following information:

Number of units to be sold of Splash and Flash to break-even as well as the total number of units of Splash and Flash to be sold during the year.

Reduction in fixed expenses product-wise that is envisaged by the Cost Reduction Programme.

### Solution

	Splash	Flash
(a) Sales (Rs.)	7,20,000	3,50,000
(b) Sp/u (Revised)	2.4	3.5
	(80% of 3)	(87.5% of 4)
(c) S. units (a/b)	3,00,000	1,00,000
(d) BEP	60%	60%
(e) BEP (c×d)	1,80,000	60,000
	Splash	flash
(a) MOS	40%	40%
	2,88,000	1,40,000
	(1,20,000÷2.4)	(40,000÷3.5)
(b) Profit	69,120	17,500
(c) Previous Fixed cost	10,8,000	27,000
(d) New P/V ratio (b/a×100)	24%	12.5%
(e) Revised fixed cost (BES×P/V)	1,03,680	26,250
(f) Reduction in fixed cost (c-e)	4,320	750

## 1.8 COMPUTER-AIDED MANUFACTURING

The manufacturing process is carried out by a range of machinery that, together with its concomitant software, comes under the collective heading of computer-aided manufacturing (CAM).

Maximum elements of CAM are computer numerical control (CNC) and robotics.

CNC machines are programmable machine tools. These are capable of performing a number of machining tasks, e.g. cutting, grinding, moulding, bending etc.

A program stores all the existing manufacturing activities and set-up instructions for a particular machine or bank of machines, providing facility of changing its configuration in a



matter of seconds via the keyboard; changes to existing configurations and new configurations are easily accommodated. CNC therefore offers great flexibility, and reduces set-up times.

Human operators will tire and are error prone. CNC machines are able to repeat the same operation continuously in identical manner, with high accuracy level.

For Example the car producer, found that the time taken to completely retool car body panel jigs in their intelligent body assembly system (IBAS) fell from 12 months to less than 3 months by reprogramming the process machinery by computer and using computerised jig robots.

## **1.9 JUST IN TIME**

A just in time approach is a collection of ideas that streamline a company's production process activities to such an extent that wastage of all kinds viz., of time, material, and labour is systematically driven out of the process. JIT has a decisive, positive impact on product costs. In this chapter we would review the various components of the JIT system and then discuss how its use affects different variety of costs, capital investments, and measurements.

### **1.9.1 Description of JUsT-in-Time Systems**

A JIT system comprises of a number of subcomponents, which are discussed in this chapter. A complete JIT system begins with production, includes deliveries to a company's production facilities, continues through the manufacturing plant, and even includes the types of transactions processed by the accounting system.

(i) To begin with, a company must ensure that it receives products/spare parts/materials from its suppliers on the exact date and at the exact time when they are needed. For this reason the purchasing staff must investigate and evaluate every supplier, eliminate those which could not keep up with the delivery dates. In addition, deliveries should be sent straight to the production floor for immediate use in manufactured products, so that there is no time to inspect incoming parts for defects. Instead, the engineering staff must visit supplier sites and examine their processes, not only to see if they can reliably ship high-quality parts but also to provide them with engineering assistance to bring them up to a higher standard of product.

(ii) As soon as suppliers certify for their delivery and quality, the concern must install a system, which may be as simplistic as a fax machine or as advanced as an electronic data interchange system or linked computer systems, that tells suppliers exactly how much of which parts are to be sent to the company. Drivers then bring small deliveries of product to the company, possibly going to the extreme of dropping them off at the specific machines that will use them first. So far, we have discussed a process that vastly reduces the amount of raw materials inventory and improves the quality of received parts.

(iii) Next, we shorten the setup times for concern's machinery. In most of the factories equipment is changed over to new configurations as rarely as possible because the conversion is both lengthy and expensive. When setups take a long time, company management authorises long production runs, which spreads the cost of the setup over far more units, thereby reducing the setup cost on a per-unit basis. However with this approach too many products are frequently made at one time, resulting in product obsolescence,

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inventory carrying costs, and many defective products (because problems may not be discovered until a large number of items have already been completed). But under JIT system a different approach to the setup issue is followed which focusses on making a video tape of a typical set up, instead of reducing the length of equipments setups and thereby eliminating the need for long production runs to reduce per unit costs. A team of industrial engineers and machine users examines this tape, spotting and gradually eliminating steps that contribute to a lengthy setup. It is not unusual, after a number of iterations, to achieve setup times of minutes or seconds when the previous setup times were well into hours. By taking this step a company reduces the amount of work-in-process, while also shrinking the number of products that can be produced before defects are identified and fixed, thereby reducing scrap costs.

(iv) It is not sufficient to reduce machine setup times because there are still problems with machines not being coordinated properly so that there is a smooth, streamlined flow of parts from machine to machine. In most of the companies there is such a large difference between the operating speeds of different machines that work-in-process inventory builds up in front of the slowest ones. Not only does this create an excessive quantity of work-in-process inventory, but defective parts produced by an upstream machine may not be discovered until the next downstream machine operator works his way through a pile of work-in-process and finds them. By the time this happens the upstream machine may have created more defective parts, all of which must now be destroyed or reworked. There are two ways to resolve both problems. The first involves a “kanban card,” which is a notification card that a downstream machine sends to each machine that feeds it parts, authorizing the production of just enough components to fulfill the production requirements being authorized in turn by the next machine further downstream. This is also known as a “pull” system, since kanbans are initiated at the *end* of the production process, pulling work authorizations through the production system. With this approach, there is no way for work-in-process inventory to build up in the production system, since it can be created only with a kanban authorization.

The second way to reduce excessive work-in-process inventory and defective parts, is to, group machines into working cells. A working cell is a small cluster of machines which can be run by a single machine operator. This individual machine operator takes each output part from machine to machine within the cell; and thus there is no way for work-in-process to build up between machines. Also, this operator can immediately identify defective output which otherwise is difficult for each machine of the cell. This configuration has the additional benefit of lower maintenance costs since the smaller machines used in a machine cell are generally much simpler than the large, automated machinery they replace. Also, because the new machines are so small, it is much easier to reconfigure the production facility when it is necessary to produce different products, avoiding the large expense of carefully repositioning and aligning equipment.

Both kanbans and machine cells should be used together—they are not mutually exclusive. By doing so a company can achieve extremely low product defect rates, as well as vanishingly small investments in work-in-process inventory.

Before the preceding steps are completed, it becomes apparent that a major change must also be made in the work force. The traditional approach is to have one employee maintaining one

machine, which is so monotonous that workers quickly lapse into apathy and develop a complete disregard for the quality of their work. Now, with full responsibility for a number of machines, as well as product quality, workers become much more interested in what they are doing. To enhance this situation the human resource development department of organisation must prepare and organise training classes to teach to employees how to operate a multitude of different machines, perform limited maintenance on the machines without having to call in the maintenance staff, spot product errors, understand how the entire system flows, and when to halt the production process to fix problems. In short, the workforce must be completely retrained and focused on a wide range of activities. This usually results in a reconfiguration of the compensation system as well, because the focus of attention shifts away from performance based to high production volumes and in the direction of performance based to high product quality.

A major result of having an empowered workforce is that employees are allowed to stop their machines when they see a problem, and either fix it on the spot or immediately call in a repair team. In either case the result is immediate resolution of the bulk of performance problems. This one step has a profound impact on much of the manufacturing variance analysis. Historically, cost accountants compile all kinds of variance information at the end of each month, investigate problems in detail, and then present a formal problem analysis report to management a few weeks after the end of the month. However, because the production staff resolved the underlying issues within a few minutes of their occurrence, the variance report becomes a complete waste of time. Management no longer cares what happened a month in the past because it is presently dealing with current problems that will not appear on cost accountant reports for weeks to come. In short, the quick response capabilities of a JIT system allows the cost accountant to omit a large amount of the variance reporting that was previously an important central job function.

Finally, the massive changes caused by a JIT system also requires several alterations in the supporting accounting systems. Because of the large number of daily supplier shipments, the accounting staff faces the prospect of going through a large pile of accounts payable paperwork. To make the problem worse there is no receiving paperwork, because the suppliers deliver parts directly to the production operation, so there is no way to determine if deliveries have been made. To avoid the first problem, accountants can switch to making a single consolidated monthly payment to each supplier. The second problem requires a more advanced solution. To prove that a supplier has delivered the part quantities which it claims it has, the accounting system that can determine the amount of finished products created during the period and then multiply these quantities by the parts listed on the bill of materials for each product, obtaining a total quantity for each part used. The accountants then pay suppliers based on this theoretical production quantity, which is also adjusted for scrap during the production process (otherwise suppliers—unfairly—will not be paid for their parts that are scrapped during the company's production process). This approach also means that there is no need for suppliers to send invoices, since the company relies solely on its internal production records to complete payments.

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Clearly, the changes imposed by a JIT system are profound and can greatly improve company operations when installed and operated correctly. They can also have a profound effect on product costs.

### 1.9.2 Impact of JIT System

A characteristic of the jit system is its continuous focus on eliminating all waste from a system. This can be a waste of assets, excessive inventory. It can also be a waste of time, in the case of assets it may include unused assets for long periods of time (e.g., work-in-process inventory held in a production queue). It can also be a waste of materials, such as unnecessary levels of obsolete inventory, defective products, rework, and the like. When fully installed, a jit system vastly reduce all these types of waste. When this happens, there is a sharp drop in several aspects of a product's costs.

For example, by reducing the amount of work in process, machine operators can make out immediately, if an incoming part from another workstation is defective and can notify the preceding workstation of the problem before it makes any more parts, which reduces the quantity of rework that must be done. Since a standard quantity of rework labour is frequently included in a product's labour routing, a reduction here lowers the amount of labour cost charged to a product. Similarly, any material that would have been scrapped because of improper rework is no longer lost, so the standard amount of scarp noted on a product's bill of materials can now be reduced. This also decreases a product's cost.

Overhead costs charged to a product also reduces as other types of waste decline. For example, by clustering machines into cells, the materials handling costs previously incurred in shifting materials between widely scattered machines can be eliminated. This reduces the amount of materials handling costs that used to be charged to overhead. Also, machine cells tend to reduce the amount of floor space needed since there is no longer a need for large aisles for the materials handling people to drive their forklifts through; by reducing floor space, one can also reduce facility costs, which no longer appear in the overhead cost pool. Another form of waste is the quality inspections once performed on many machines. Under the JIT system machine operators conduct their own quality checks, so there is less need for a separate group of supervisors/inspectors; accordingly, the cost of their pay can be eliminated from overhead costs. All these costs (and more) do not directly add value to a product, so they are wasteful costs that are subject to elimination. By doing so with a JIT system, there are fewer costs left to be charged to a product.

*key focus of jit systems* : a key focus of any jit system is on reducing various kinds of wastage of time, so that the entire production process is concentrated on the time spent in actually producing products. For example, all inspection time is eliminated from the system as operators conduct their own quality checks. Similarly, all movement, which involves shifting inventory and work in process throughout various parts of the plant, can be eliminated by clustering machines together in logical groupings. Third, queue time is eliminated by not allowing inventory to build up in front of machines. Finally, one can eliminate storage time by clearing out excessive stocks of inventory and having suppliers deliver parts only as and when needed. By shrinking the amount of wastage time out of the manufacturing process, a

company effectively eliminates activities that do not contribute to the value of a product, which in turn reduces the costs associated with them.

Another way in which waste is eliminated in a JIT system is to charge cost drivers to wasteful activities that accumulate costs. For example, overhead costs can be charged out based on the number of components in a product (since more parts require more purchasing activity and materials handling), the number of material moves (which is not a value-added activity), or the number of units scrapped. In this way the cost of these activities becomes apparent to management, and as a result, there will be considerable focus on reducing these cost drivers since the accounting system places so much emphasis on their total burdened costs. Then, when these cost drivers have been reduced to significant levels, the cost accountants can find other wasteful cost drivers and shift the allocation system to place the most emphasis on them. This directs management's attention toward their elimination, too. And so on. In this way the cost accounting system can be continually altered so that it has a direct, active role in reducing wasteful activities.

**1.9.2.1 impact of jit on overhead costs:** the costs of material handling, facilities, and quality inspection decline when a jit system is installed. In addition, the reduction of all types of inventory results in a massive reduction in the amount of space required for the warehouse facility. Since all costs associated with the warehouse are assigned to the overhead cost pool, the amount of overhead is reduced when the costs of staff, equipment, fixed assets, facilities, and rent associated with the warehouse are sharply cut back.

There is also a shift of costs from the overhead cost pool to direct costs when machine cells are introduced. The reason for this change is that a machine cell generally produces only a small range of products, making it easy to assign the entire cost of each machine cell to these items. This means that the depreciation, maintenance, labour and utility costs of each cell can be charged straight to a product, which is preferable to the traditional approach of sending these costs to an overhead cost pool from which they are assigned to products in much less identified manner. Though this change does not represent a cost increase or reduction, it *does* increase the reliability of allocation for many more costs than that was previously the case.

Despite the shift of many overhead costs to direct costs, there is still an overhead cost pool left over that must be allocated to products. However, given the large number of changes implemented as part of the JIT system, cost accountants may find that there are now better allocation bases available than the traditional direct labour allocation. For example, the amount of time a product takes in each work cell may be a better measure for allocating costs, instead of amount of space occupied in the work cells that create each product. No matter what allocation system is used, it is somewhat different from the old system, so there is a shift in the allocation of costs between different products.

In short, overhead costs decline as some costs are eliminated, while other costs shift between products as more costs are charged directly to products and the remaining overhead costs are charged out using different allocation methods.

**1.9.2.2 impact of jit on other costs:** When a jit system is created, the amount of inventory retained in a company drops continuously. Raw materials inventory is reduced because

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suppliers deliver only small quantities of parts as and when they are needed. Work-in-process inventory drops because the conversion to machine cells and the use of kanban cards greatly reduces the need to pile up inventory between machines. Finally, finished goods inventory drops because inventory is produced only when there are orders in hand from customers (though finished goods inventories are also allowed to build if a company experiences high seasonal sales). Consequently, the cost of maintaining inventory declines, which in turn reduces the overhead costs associated with inventories that are charged to products. Some of these inventory-related costs are:

- Interest cost related to the debt that funds the inventory investment
- Cost of inventory that becomes obsolete over time
- Cost of rent for inventory storage facilities
- Cost of all equipment used in the warehouse
- Cost of warehouse utilities
- Cost of warehouse employees
- Cost of insurance needed to cover the possible loss of inventory
- Cost of taxes on the inventory

According to several estimates the annual cost of inventory is 25% of the total inventory investment. By eliminating excessive storage of inventory a company experiences not only a decline in its inventory investment but also the elimination of all associated costs.

Besides a reduction in the level of working capital and inventory-related costs, a company can also reduce its investment in capital assets. This occurs when a company with a few large machines replaces them with a larger number of much smaller, more easily configured machines. Then, equipment setup times become shorter, which in turn makes it profitable to have shorter production runs, thereby eliminating an excessive investment in inventory that would have been created by excessively long production runs. There is frequently a saving when such a change occurs, which releases cash for other uses while also reducing the amount of depreciation charged to overhead.

A potentially significant one-time cost that many companies do not consider involves the cost layers in their inventory costing systems. When a JIT system is installed, there is an immediate focus on eliminating inventory of all types. If a company uses some kind of layering method to track the cost of its inventory, such as last-in-first-out or first-in-first-out, it will find itself burrowing down into costing layers that may have been undistributed for many years. Then, some unusually high or low costs may be charged off to the cost of goods sold when these inventory items are finally used up. For example, if the current market cost of a piston is Rs. 5,000/- but a company has some old (but serviceable) ones in stock from 20 years ago that cost Rs. 2,000, then only the Rs. 2,000 unit cost is charged to the cost of goods sold when these units are finally used as a result of clearing out the inventory. Because of the unusually low cost of goods sold, the gross margin is higher than usual until these early cost layers are eliminated. Because of the lower-of-cost-or-market rule (under which the cost of

excessively expensive inventory must be reduced until it is not higher than the current market value), this problem tends to be less of an issue when early cost layers are *too high*, though the costs charged are still somewhat different from those for newer layers of inventory. Once all cost layers have been used up, the only costs the management sees being charged to the cost of goods sold are those currently charged by suppliers.

Thus, the cost reductions and reduced capital requirement of JIT systems have a significant impact on the levels of fixed assets, working capital, and inventory needed to run a business, which in turn reduces the associated overhead costs charged to products.

**1.9.2.3 impact of JIT on product prices:** when a company achieves a higher level of product quality, along with ability to deliver products on the dates required, customers may be willing to pay a premium. This is particularly true in industries where quality or delivery reliability is low. If customers are highly sensitive to these two factors, it may be possible to increase prices substantially. Alternatively, if these factors are not of great importance, or if customers place a higher degree of importance on other factors, then there will be no opportunity for a price increase.

In industries where many companies are adopting JIT systems at the same time or have already installed them, an improvement in product quality and delivery times does not differentiate a company from its peers. Instead, since everyone else is offering the same level of quality and service, it just keeps a company from losing sales to its competitors. In such a situation it is more likely that all companies remaining in the industry will use their new-found lower costs to initiate a price war that will result in a drop in prices.

Consequently, the impact of a JIT system on product pricing is primarily driven by customers' perceived need for higher product quality and reliable delivery times, as well as the presence of competitors with JIT system, the same installation, and operational base.

**1.9.2.4 JIT cost allocation differences:** the chief difference between the types of cost allocations under jit and traditional environment is that of converting most of the overhead costs to direct costs. The primary reason for this change is the machine cell. Because a machine cell is designed to produce either a single product or a single component that goes into a similar product line. Therefore all the costs generated by the machine cell can be charged directly to the only product it produces. When a company completely change over to the use of machine cells in all locations, the costs related to all the cells can now be charged directly to products, which leaves few costs of any kind to be allocated through a more traditional overhead cost pool. the result of this change results in more accurate product costs.

Specifically, the costs that can now be charged directly to product are:

- **Depreciation.** The depreciation cost of each machine in a machine cell can be charged directly to a product. It may be possible to depreciate a machine based on its actual use, rather than charging off a specific amount per month, since this allocation variation shifts costs to a product more accurately.
- **Electricity.** The power used by the machine in a cell can be separately metered and then charged directly to the products that pass through the cell. Any excess electricity cost

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charged to the facility as a whole still has to be charged to an overhead cost pool for allocation.

- **Material handling.** Most materials handling costs in a JIT system are eliminated since machine operators move parts around within their machine cells. Only costs for materials handling between cells should be charged to an overhead cost pool for allocation.
- **Operating supplies.** Supplies are used mostly within the machine cells, so the majority of items in this expense category can be separately tracked by individual cell and charged to products.
- **Repairs and maintenance.** Nearly all the maintenance costs a company incurs are for machinery and they are all grouped into machine cells. By having the maintenance staff, charge their time and materials to these cells, these costs can be charged straight to products. Only maintenance work on the facility is still charged to an overhead cost pool.
- **Supervision.** If supervision is by machine cell, the cost of the supervisor can be split among the cells supervised. However, the cost of general facility management as well as of any support staff, must still be charged to an overhead cost pool.

As noted in several of the preceding items, a few remainder costs are still charged to an overhead cost pool for allocation. However, these represent a small percentage of the costs, with nearly everything now being allocable to machine cells. Only building occupancy costs, insurance, and taxes are still charged in full to an over-head cost pool. This is a vast improvement over the amount of money the traditional system allocates to products. A typical overhead allocation pool under the traditional system can easily include 75% of all costs incurred, whereas this figure can be dropped to less than 25% of total costs by switching to a JIT system. With such a higher proportion of direct costs associated with each product, managers then have much more relevant information about the true cost of each product manufactured.

### 1.9.3 Performance Measurements in a JIT System

Many of the performance measurement measures used under a traditional accounting system are not useful in a JIT environment, while new measures can be implemented that take advantage of the unique characteristics of this system.

(i) *One of the key measurements in a traditional system is machine utilization.* This is used to ensure that every asset a company purchases is being thoroughly utilized. It is particularly important in cases where there has been a large investment in automation or large, high-speed machinery, since these items are quite expensive and should be used to the utmost. However, making machine utilization a key measurement; forces production managers in the direction of manufacturing as much product as possible in order to show a high level of machine utilization, which can result in large amount of inventory piling up in the warehouse. This is not a desirable end result in a JIT environment, where producing only what is actually needed is the underlying rule. Also, machine cells in a JIT system tend to be smaller and less costly than the highly automated (and expensive) juggernauts used in more traditional systems, so there is less need to justify the investment in these smaller machines by proving



that they have been heavily used. In short, machine utilization measurements can be discarded under JIT environment.

(ii) *Another inappropriate measurement is any type of piece rate tracking for each employee.* This is a common measure in the textile industry, where employees are paid extra if they exceed certain production volume targets. However, a JIT system focuses on producing only what is needed, so an employee who has incentives to create vast piles of parts is producing contrary to the rules of the system. Accordingly, any piece rate system must be eliminated and replaced with measures that focus instead on the quality of output or the number of employee suggestions for improving the system, which are much more important outcomes in a JIT system.

(iii) *Any type of direct labour efficiency tracking is highly inappropriate in a JIT system.* It is a key measurement in more traditional systems, where employee time and productivity are closely monitored and measured. However, a JIT system does not focus on how fast an employee works—only on the quality of the products manufactured. Also, labour variance measurements require considerable employee time tracking, which forces workers to fill in a time sheet, punch a clock, or use a barcoding system to track what they are doing and what job they are working on. All this labour tracking is a non-value-added activity, which is something a JIT system strives to avoid as an unnecessary activity. Consequently, the cost accounting staff should advocate the complete elimination of all labour variance measurements.

(iv) *Installing a JIT system does not mean that there should be a complete elimination of variance or operational measures.* There are still several measures that are highly relevant to operations. Some of them are :

1. *Inventory turnover* : Those who have installed JIT systems emphasize the extraordinarily high inventory turnover that they now experience, which is the case in most instances. The turnover levels of such well-known JIT companies as Toyota have been known to exceed 70 per year, as opposed to the levels of 2 to 10 per year that are more common for companies with other types of manufacturing systems. This measure is best subdivided into smaller parts, so that one can determine the turnover levels for raw materials, work in process, and finished goods.

2. *Setup time reduction* : The average setup time per machine is of great importance as it can be measured periodically and plotted on a trend line. The shortest possible setup intervals are crucial for the success of short production runs, so this is a major JIT measurement. It is best to measure it by machine, rather than in the aggregate, since an aggregate measure does not reveal enough information about which equipments requires more setup time reduction work.

3. *Customer complaints* : A JIT system is partly based on the premise that product quality will be superb. Consequently, any hint from customers that there are product problems should be greeted with the gravest concern and investigated immediately. The accumulation of customer complaints and their dissemination to management should be considered a major JIT measure.

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4. *Scrap* : Little waste should be generated by a JIT system, which means that materials scrap should be driven down to exceedingly low levels. The cost of scrap (especially when supported by a detailed list of items that were scrapped) is of particular concern as a JIT system is being implemented, since it helps to identify problem areas requiring further management attention.

5. *Cost of quality* : One focus of JIT is on creating high-quality products, so it is reasonable to keep track of the full cost of quality (which comprises defect control costs, failure costs, and the cost of lost sales) on a trend line. Managers want to see the details behind this measure, so that they know where the largest quality costs still reside in the company and can then work to reduce them.

6. *Customer service* : This measure really has several components—delivering products on the dates required by customers, shipping full orders to customers, and not having products returned because of poor quality. This measure can be summarized in a variety of ways or reported at the component level, but the main issue is to measure and post the information for all to see, so that the company focuses strongly on providing the highest possible degree of customer service.

7. *Ideas generated* : A JIT system works best when employees pitch in with hundreds of suggestions for improvements that, when taken in total, result in a vastly improved, efficient operation. The amount of idea generation going on can be measured by the number of ideas per worker, the number of ideas suggested in total, the number of ideas implemented, or the proportion of ideas suggested that are implemented.

The common theme that unites all the JIT measures just listed is that they are not financial in nature (with the exception of the cost of quality)—they are operational measures that focus attention on the nuts-and-bolts details of creating and running a JIT system. A cost accountant involved in the calculation and reporting of these measures may feel that this is quite a departure from the more traditional cost variance measures, but the end result will be a much more efficient JIT process that churns out and delivers high-quality products.

### 1.9.4 Backflushing in a JIT System

Backflushing requires no data entry of any kind until a finished product is completed. At that time the total amount finished is entered into the computer system, which multiplies it by all the components listed in the bill of materials for each item produced. This yields a lengthy list of components that should have been used in the production process and which is subtracted from the beginning inventory balance to arrive at the amount of inventory that should now be left on hand. Back the entire production process. Given the large transaction volumes associated with JIT, this is an ideal solution to the problem.

However, there are some serious problems with backflushing that must be corrected before it will work properly. They are :

1. *Production reporting* : The total production figure entered into the system must be absolutely correct, or else the wrong component types and quantities will be subtracted from

stock. This is a particular problem when there is high turnover or a low level of training to the production staff that records this information, which leads to errors.

2. *Scrap reporting* : All abnormal scrap must be diligently tracked and recorded; otherwise these materials will fall outside the backflushing system and will not be charged to inventory. Since scrap can occur anywhere in a production process, a lack of attention by any of the production staff can result in an inaccurate inventory. Once again, high production turnover or a low level of employee training increases this problem.

3. *Lot tracing* : Lot tracing is impossible under the backflushing system. It is required when a manufacturer need to keep records of which production lots were used to create a product in case all the items in a lot must be recalled. Only a picking system can adequately record this information. Some computer system allow picking and backflushing system to coexist, so that pick transactions for lot tracing purpose can still be entered in the computer. Lot tracing may then still be possible if the right software is available; however, this feature is generally present only on high-end systems.

4. *Inventory accuracy* : The inventory balance may be too high at all times because the backflushing transaction that relieves inventory usually does so only once a day, during which time other inventory is sent to the production process; this makes it difficult to maintain an accurate set of inventory records in the warehouse.

Of all the issues noted here, the worst is a situation where the production staff is clearly incapable of providing sufficiently accurate scrap or production reporting for the backflushing system. If there is an easily traceable cause, such as less capable workers on a particular shift, moving a few reliable employees into these positions can provide immediate relief from the problem. It may even be possible to have an experienced shift supervisor to collect this information. However, where this is not possible for whatever reason, computer system users experience backflushing garbage in, garbage out (GIGO)—entering inaccurate information rapidly eliminates any degree of accuracy in the inventory records, requiring many physical inventory counts to correct the problem. Consequently, the success of a backflushing system is directly related to a company's willingness to invest in a well-paid, experienced well-educated production staff that undergoes little turnover.

## 1.10 MANUFACTURING RESOURCES PLANNING(MRP I&II)

It is a part of production operation system. Management has to develop a lot of strategies for production plan. In early 1960's a material acquisition plan was first introduced known as Material Requirement Plan ( MRP-I ). MRP-2 is latest all-round development of that plan.

A brief history of MRP –1

Material requirement planning is a computerized production scheduling system which takes the forward schedule of final product requirements (the master production schedule) and translates it progressively into the numbers of sub-assemblies, components and raw materials required at each stage of the manufacturing cycle.

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It is a management information system providing a basis for production decisions when what is manufactured has a composite structure and when lead items are important features. Obviously, the ability of the system to deliver what is required in the correct place at the correct time will be dependent on the quality of information which is put into the computer model.

### 1.10.1 Aims of material requirement planning:

1. Determine for final products namely, what should be produced and at what time.
2. Ascertaining the required units of production of sub-assemblies.
3. Determining the requirement for materials based on an up-to-date bill of materials file (BOM).
4. Computing inventories, WIP, batch sizes and manufacturing and packaging lead times.
5. Controlling inventory by ordering bought-in components and raw materials in relation to the orders received or forecast rather than the more usual practice of ordering from stock-level indicators.

**Benefits :** Detailed forecast of the inventory position is highlighted period by period.

### 1.10.2 Data requirements to operate material requirement planning system:

1. **The master Production schedule:** This schedule specifies the quantity of each finished unit of products to be produced, and the time at which each unit will be required.
2. **The Bill of material file:** The bill of material file specifies the sub-assemblies, components and materials required for each finished good.
3. **The inventory file:** This file maintains details of items in hand for each sub-assemblies, components and materials required for each finished goods.
4. **The routing file:** This file specifies the sequence of operations required to manufacture components, sub-assemblies and finished goods.
5. **The master parts file:** This file contains information on the production time of sub-assemblies and components produced internally and lead times for externally acquired items.

### 1.10.3 Method of operation of material requirement planning system:

A material requirements planning (MRP) system is a computer based inventory information system which is used to plan and control raw material and component parts inventories.

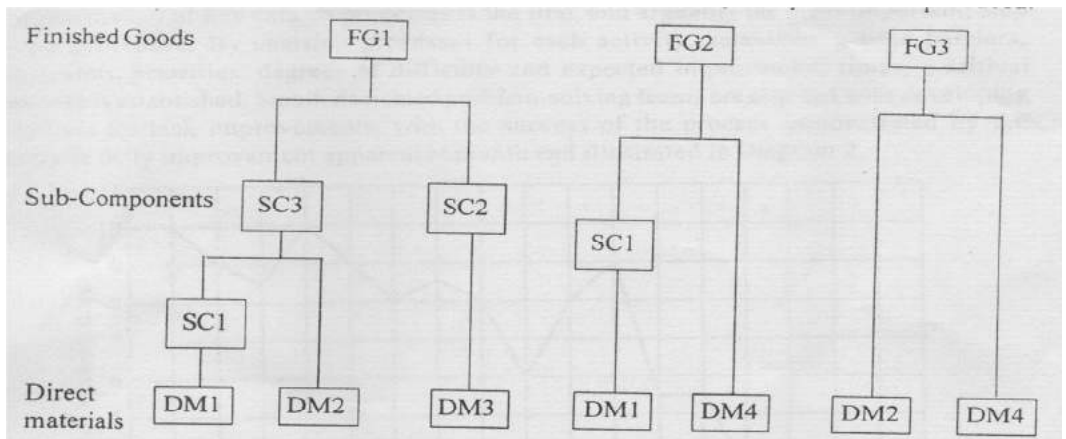
Like all computer-based information system, MRP systems can be divided into following:

- i) Pre-requisite information
- ii) System input
- iii) System processing,
- iv) System output.

### 1.10.4 Pre-requisite information and system input:

1. The master production schedule (MPS) file states the production goal, generally for a week time, in terms of desired units of production. MRP system first focuses on the forecasted units of production and timing of finished goods demand and the determines the demand for materials, components and sub-assemblies at each stages of production. This makes MRP a push system in which once the scheduled production starts, the output of each department is pushed through the system to the next department for processing or into inventory to be retrieved later.
2. The bill of materials (BOM) file contains information about how the production of the finished goods is undertaken. A bill of material structure is used:
  - a. To assess all of the raw materials and component parts required to complete a product and
  - b. to describe the multiple levels of assembly or manufacturing necessary to complete a unit of finished product.

In a figure given below a typical BOM structure file is presented for three and products FG1, FG2 and FG3. The MRP system breaks the requirements for each product by working into its primary sub-components (SC)/sub-assemblies (SA), and these in turn are further separated into second, third and so on levels of sub-components, until at the lower level in the hierarchy only purchased items (i.e. backward each end products direct material DM) exist. It is apparent from the figure below that four direct material (DM1, DM2, DM3 and DM4) are purchased for finished goods. For both FG1 and FG2 the materials are used to manufacture the components that are assembled into the end product. For FG3 no intermediary components are produced:



3. The inventory records files of the MRP system defines current levels of finished goods, raw materials, and component parts inventory at the beginning of some planning period. During the planning period, the organization may receive units of raw materials, components parts, sub-assemblies, and even finished goods inventory from suppliers, vendors, and subcontractors. These planned inventory receipts and delivery lead times are included in the inventory records file so that their addition can be appropriately considered in the time bucket of their arrival.

**1.10.5 Pre-requisites for successful operation of MRP:**

1. **Strict adherence to the schedule :** The successful operation of MRP system requires a strict adherence to the latest production and purchasing schedules. Workers must be

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educated to understand the importance of schedule adherence, and controls should be in place to ensure this adherence.

2. **Accurate data base** : Data accuracy is vital to the system. If a plan is based on inaccurate data it may be impossible to adhere to the schedule. For example, if the bill of materials file is not updated to reflect any changes in product composition it will be impossible to adhere to the schedule.

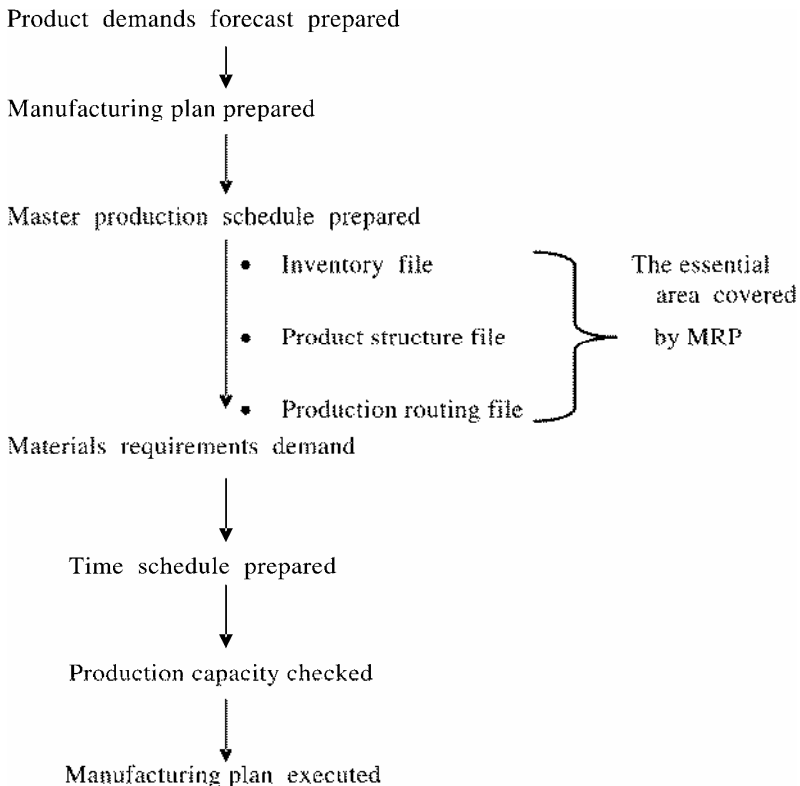
### 1.10.6 MRP- II

When the scope of MRP-1 is developed further which includes

1. Planning of raw material
2. planning of component & sub- assemblies
3. Compute the other resources e.g. machine or labour capacity
4. to create a full integrated plan for management

then it is known as Manufacturing resources planning ( MRP – 2)

MRPII (also written MRP-2 ) adds the MRP schedule into a capacity planning system and then builds the information into a production schedule. It is also seen as a link between strategic planning and manufacturing control. The sequence of events is as follows :



From that document, a manufacturing plan is developed based upon inputs from purchasing & production. Adjustments may be necessary to allow for production rates. Possible inventory levels in seasonal trades & the size of the workforce. The manufacturing plan leads into a detailed master production schedule which is akin to the original philosophy of MRP already outlined.

If correctly applied, MRP II provides a common data base for the different function units such as manufacturing, purchasing and finance within a firm.

### **1.11 SYNCHRONOUS MANUFACTURING**

This concept of 'synchronous manufacturing' was started in 1984. It has been defined as: an all-encompassing manufacturing management philosophy that includes a consistent set of principles, procedures, and techniques where every action is evaluated in terms of the common global goal of the organisation.

A set of seven 'principles' are associated with synchronous manufacturing:

1. Do not focus on balance idle capacities; focus on synchronizing the production flow.
2. The marginal value of time at a bottleneck resource is equal to the throughput rate of the products processed by the bottleneck.
3. The marginal value of time at a non-bottleneck resource is negligible.
4. The level of utilization of a non-bottleneck resource is controlled by other constraints within the system.
5. Resources must be utilized, not simply activated.
6. A transfer batch may not, and many times should not, be equal to the process batch.
7. A process batch should be variable both along its route and over time.

According to synchronous manufacturing principles 2 and 3, the return on improvements at a bottleneck resource is very high. But the return on improvement made at non-bottlenecks is marginal at best.

The synchronous manufacturing philosophy required managers to focus on those areas of operations where there exist potential global improvements.

### **1.12 BUSINESS PROCESS RE-ENGINEERING**

Business process re-engineering involves examining business processes and making substantial changes in the day to day operation of the organisation. It involves the redesign of work by changing the activities.

A business process consists of a collection of activities that are linked together in a co-ordinated & Sequential manner to achieve goal & objective.

For example, material handling might be classed as

- a. scheduling production,

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- b. storing materials,
- c. processing purchase orders,
- d. inspecting materials and
- e. paying suppliers.

The aim of business process re-engineering is to improve the key business process in an organisation by focusing on

- a. simplification,
- b. cost reduction,
- c. improved quality and
- d. enhanced customer satisfaction

## 1.13 THROUGHPUT ACCOUNTING

Throughput Accounting (TA) is a method of performance measurement which relates production and other costs to throughput. Throughput accounting product costs relate to usage of key resources by various products.

It assumes that a manager has a given set of resources available. These comprise the existing buildings, capital equipment and labour force. Using these resources, purchased materials and components must be processed to generate sales revenue. To achieve this, maximum amount of throughput is required with the financial definition.

### SALES REVENUE — DIRECT MATERIALS COST

The cost of all other is deemed at least time related rather than fixed.

Throughput is influenced by :

- Selling price
- Direct purchase price
- Usage of direct materials
- Volume of throughput.

Constraints on throughput might include :

- the existence of an uncompetitive selling price
- the need to deliver on time to particular customers
- the lack of product quality and reliability
- the lack of reliable materials suppliers
- the existence of shortage of production resources.



It becomes management's task to eliminate these constraints. Shortage of resources are usually termed bottlenecks, and their elimination often only moves a problem from one location to another. Thus the careful planning to minimize and eliminate all bottlenecks becomes very important.

Here labour & variable overhead are considered as fixed items as it is found in maximum organization now a day technique known, as "labour is not a unit variable cost". Therefore only variable cost in production is material. Throughput contribution = Sales –Material.

### Theory of Constraints

**Introduction:** During the 1980s Goldratt and Cox (1989) advocated a new approach to production management called optimized production technology (OPT). OPT is based on the principle that profits are expanded by increasing the throughput of the plant. The OPT approach determines what prevents throughput being higher by distinguishing between bottleneck and non-bottleneck resources. This approach advocates that bottleneck resources/activities should be fully utilized while non bottleneck resources/activities should not be utilized to 100% of their capacity since it would result in increase in inventory.

OPT is based on the principle that profits are expanded by increasing throughput of the plant i.e. rate at which raw material are turned into sales. The most widely recognized management accounting system developed for this purpose is known as throughput accounting (TA). The concept behind the system was first formulated and developed by Goldratt and Core (1986) in USA. Goldratt developed the concept and eventually gave it the name the Theory of Constraints (TOC). The theory was picked up and inducted into an accounting system in the UK where it is known as Throughput Accounting (TA).

**Concept and aim of theory of constraints:** The theory of constraint focuses its attention on constraints and bottlenecks within the organisation which hinder speedy production. The main concept is to maximize the rate of manufacturing output i.e. the throughput of the organisation. This requires to examine the bottlenecks and constraints which are defined was:

A bottleneck is an activity within the organisation where the demand for that resource is more than its capacity to supply. A constraint is a situational factor which makes the achievement of objectives/throughput more difficult than it would otherwise be. Constraints may take several forms such as lack of skilled employees, lack of customers orders or the need to achieve a high level of quality product output. Using above definition, therefore, a bottleneck is always a constraint but a constraints need not be a bottleneck. Let the customers due date performance i.e. meeting the delivery schedule for customers orders is the major constraint in the organisation. The bottleneck in such a case may be certain machine in the factory. Throughput thus related directly to the ability to cope with the constraint and to manage the bottleneck. This focus on throughput forced management to examine both the constraints and the bottleneck in order to increase throughput.

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### Idea of theory of constraints (TOC)

The idea behind TOC is that raw materials is the only variable cost. Labour & variable overhead are consider as fixed cost.

The theory of constraints (TOC) describes methods to maximize operating income under bottleneck situation.

The three measurements:

1. Calculate Throughput contribution = sale - direct materials cost of the goods sold.
2. Investments = Sum of materials costs in direct materials, work – in – process, and finished goods inventories; R & D costs; and costs of equipment and buildings.
3. Operating costs equal all costs of operations (other than direct materials) incurred to earn throughput contribution. Operating costs include salaries and wages, rent utilities, and depreciation.

The objective of TOC is to increase throughput contribution while decreasing investments and operating costs. TOC considers a short – run time and assumes that operating costs are fixed costs.

The important concept behind TOC is that the production rate of the entire factory is set at the pace of the bottleneck resource. Hence, in order to achieve the best result TOC emphasises the importance of removing bottlenecks or limiting factor.

### Procedure of TOC (Theory of Constraints)

#### Step-1

Find the total requirement of resources i.e. S of units ´ resource required per unit. Compute it for each department separately.

#### Step-2:

Throughput accounting Ratio (TA ratio) =  $(\text{Capacity required, capacity available}) \times 100$  for each department. (noting mention go by normal capacity)

#### Step-3:

The highest among the TA ratio will be considered as the bottleneck factor. So the problem is now converted into many product none limiting factor situation follow the procedure of case III now.

### Illustration

A company produces 3 products A, B and C. The following information is available for a period.

Production			
	A	B	C
Contribution (Sales – Direct Materials)	Rs. 24	Rs. 20	Rs. 12
Machine hours required per unit:			
Machine 1	12	4	2
Machine 2	18	6	3
Machine 3	6	2	1
Estimated sales demand	200	200	200

It is given that machine capacity is limited to 3,200 hours for each machine, you are required to analyze the above information and apply TOC process to remove the constraint.

**Solution**

**Note-1:**

Production						
	A	B	C	Total	Mach	TA
Demand (units)	200	200	200			
Hrs. required in Dept.						
Machine 1 2,400	800	400	3,600	3,200	112.5%	
2	3,600	1,200	600	5,400	3,200	168.75%
3	1,200	400	200	1,800	3,200	56.25%

\Machine 2 is the bottleneck

**Note-2:**

Through put contribution & rank

	A	B	C
(a) Throughput Contribution	24	20	12
(b) MR/unit in Machine 2	18	6	3
(c) Contribution/hr. Machine –2	1.33	3.33	4
Rank	III	II	I

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Identification of product mix.

	Hrs. in machine 2	units
Available	3,200	
Less: Rank I C	_600	200
		2,600
Less: Rank II B	1,200	200
Less: Rank III A	18	77.77

i.e. 77 units

### Illustration

The following data is to be used to answer questions (a), (b) and (c) below.

HG plc manufactures four products. The unit cost, selling price and bottleneck resource details per unit are as follows:

	Product W Rs.	Product X Rs.	Product Y Rs.	Product Z Rs.
Selling price	56	67	89	96
Materials	22	31	38	46
Labour	15	20	18	24
Variable overhead	12	15	18	15
Fixed overhead	4	2	8	7
	Minutes	Minutes	Minutes	Minutes
Bottleneck resource time	10	10	15	15

- (a) Assuming the labour is a unit variable cost, if the products are ranked according to their contribution, the most profitable product is
- (A) W                      (B) X                      (C) Y                      (D) Z
- (b) Assuming that labour is a unit variable cost, if budgeted unit sales are in the ratio W:2; X:3; Y:3; Z:4 and monthly fixed costs are budgeted to be Rs. 15,000, the number of units of W that would be sold at the budgeted breakeven point is nearest to
- (A) 106 units              (B) 142 units.              (C) 212 units              (D) 283 units
- (c) If the company adopted throughput accounting and the products were ranked according to 'product return per minute', the highest ranked product would be
- (A) W                      (B) X                      (C) Y                      (D) Z

**Solution**

	W	X	Y	Z
Sales price	56	67	89	96
Less: Material	22	31	38	46
Labour	15	20	18	24
Variable overhead	<u>12</u>	<u>15</u>	<u>18</u>	<u>15</u>
	7	1	15	11
Limiting Factor Min/unit	10	10	15	15 (Contribution/ bottleneck Resource time)
Contribution/unit	0.7	0.1	1.0	7.3
Factor (a/b)Rank	III	IV	I	II

**Answer.-c**

Product	Contribution/unit	Mix	Total
W	7	2	14
X	1	3	3
Y	15	3	45
Z	11	<u>4</u>	<u>44</u>
		12	106

Fixed cost = 15,000

BEP =  $15,000 / (106/12) = 1,698.11$  i.e. 1,699 units

Sales of W =  $1,699 \times 2/12 = 283$  units

Sales of X =  $1,699 \times (3/12) = 424.75$

Sales of Y =  $1,699 \times 3/12 = 424.75$

Sales of Z =  $1,699 \times 4/12 = 566.33$

**Answer. (D)**

	W	X	Y	Z
Sales	56	67	89	96
Less: Material	<u>22</u>	<u>31</u>	<u>38</u>	<u>46</u>
(a) Through put Contribution p.u.	34	36	51	50
(b) Minutes /unit	10	10	15	15
(c) Through Contribution/min (a/b)	3.4	3.6	3.4	3.33
Rank	II	I	II	III

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Answer. (B)

### 1.14 SHUT DOWN & DIVESTMENT

#### 1.14.1 Introduction

Very often it becomes necessary for a firm to temporarily close down the factory due to trade recession with a view to reopening it in the future. In such cases, the decision should be based on the marginal cost analysis. If the products are making a contribution towards fixed expenses or in other words if selling price is above the marginal cost, it is preferable to continue because the losses are minimized. By suspending the manufacture, certain fixed expenses can be avoided and certain extra fixed expenses may be incurred depending up on the nature of the industry, say, for example, extra cost incurred in protecting the machinery. So the decision is based on as to whether the contribution is more than the difference between the fixed expenses incurred in normal operation and the fixed expenses incurred when the plant is shut down. In other words, the shut down point is calculated by using the formula:

#### Decision Making in Relation to Shut Down

1. Shut down point =  $\{(Total\ fixed\ cost - Shut\ down\ costs) \div Contribution\ per\ unit\}$  *Decision Making in Relation to Shut Down Vs. Continue*

In case of decision rendering closure or shut down we consider the following points:

1. Current profit situation has to be maintained, So by analyzing the proposal of shut down or outsourcing if the current income is reduced then shut down will not be allowed unless the product or factory has reached at the end of its life cycle.
2. In case of outsourcing proposal we can also apply the differential cost concept i.e. saving in cost must be greater than or equal to out-sourcing fees payment. Here saving in cost i.e. cash inflow is computed from the concept of relevant cost i.e. by closing down we are saving variable cost of production, and discretionary fixed cost or shut down cost. This cash inflow further may be classified into two parts:
  1. Saving in variable cost per time period i.e. CIF per annum.
  2. One time cash inflow following shut down i.e. sale of machine, sale of current stock of material etc.

∴ Total CIF or saving following shut down = one time CIF + CIF p.a. × life span of the proposal of outsourcing.

If this total is greater than total outsourcing fees then shutdown will take place other production will be continue.

#### Illustration

Fixed expenses at 50% activity	Rs.15,000
Fixed expenses when the factory is shut down	10,000
Additional expenses in closing down	1,000

Production at 50% activity = 5,000 units

Contribution per unit Re. 1

**Solution**

	Rs.
A. If the plant is shut down the sunk costs or fixed expenses	11,000
B. If it is working at 50% activity the fixed expenses	15,000
C. Additional fixed expenses: [(B-A)]	4,000
D. Contribution (5,000 units 'Re. 1 p.u.)	5,000

By working at 50% activity the firm is able to recover the additional fixed expenses of Rs. 4,000 and earn an extra contribution of Rs. 1,000 towards shut down expenses. Hence it is advisable to continue production in the factory instead of closing it down. If, on the other hand, the contribution is Re. 0.75 per unit, the total contribution of Rs. 3,750 being less than the additional fixed expenses, it is not advisable to continue the operations. Hence in the latter case shut down is economically justified.

**Illustration**

Alfa Engineering Works Ltd. had the following annual budget for the year ending on 30<sup>th</sup> June

	60%	80%
Production capacity costs (Rs. In lakhs)		
Direct materials	9.60	12.80
Direct Labour	7.20	9.60
Factory expenses	7.56	8.04
Administrative expenses	3.72	3.88
Selling & distribution expenses	<u>4.08</u>	<u>4.32</u>
Total cost	32.16	38.64
Profit	<u>4.86</u>	<u>10.72</u>
Sales	<u>37.02</u>	<u>49.36</u>

Owing to adverse trading conditions, the company has been operating during July/September at 40% capacity, realizing budgeted selling prices.

Owing to acute competition, it has become inevitable to reduce prices by 35% even to maintain the sales at the existing level. The directors are considering whether or not their factory should be closed down until the trade recession has passed. A market research consultant has advised that in about a year's time there is every indication that sales will

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increase to 75% of normal capacity and that the revenues to be produced for the full year at that volume could be expected to Rs. 40 lakhs

If the directors decide to close down the factory for a year it is estimated that:

- (a) The present fixed costs would be reduced to Rs. 6 lakhs p.a.
- (b) Closing down costs (redundancy payments, etc.) would amount to Rs. 2 lakhs.
- (c) Necessary maintenance of plant would cost Rs. 50 p.a.; and
- (d) On re-opening the factory, the cost of overhauling the plant, training and engagement of new personal would amount to Rs. 80,000.

Prepare a report for the directors, making your recommendations.

### Solution

The Directors,

Alfa Engineering Works Ltd.

New Delhi

Date.....

Dear sir,

As desired, we have analysed the cost implications of the decision of temporary closure of the trade recession. We find that if the factory is run at 40% capacity and with reduced selling prices, the loss likely to be incurred in one full year (the estimated period of recession), would be around Rs. 7.17 lakhs as detailed below:

	Rs. In lakhs
Direct materials	6.40
Direct labour	4.80
Factory expenses	7.08
Administrative expenses	3.56
Selling & distribution expenses	<u>3.84</u>
	25.68
Loss	<u>7.17</u>
Sales $\left( Rs. 36.02 \text{ lakhs} \times \frac{40}{60} \times \frac{75}{100} \right)$	<u>8.51</u>

If the factory is closed, the following costs will be incurred:

	Rs. In lakhs
Fixed costs	6.00
Closing down costs	2.00



Maintenance costs	0.5
Cost of overhauling the plant, training and engagement of staff	<u>0.8</u>
	<u>9.3</u>

It is obvious from the above, that despite the fact that running at 40% capacity would imply a loss of Rs. 7.17 lakhs, it is better not to close down the factory since in that case the loss would be higher.

In our views, even if running the factory entailed a somewhat bigger loss as compared to the loss incurred by closing it down temporarily, it may be better to keep the factory in operation. This is because a closure, even if temporary, results in the loss of regular and old customers, suppliers and skilled personal. This, coupled with a loss of goodwill in the market, may give rise to substantial losses at the time of restarting the factory. We trust that the above analysis would be helpful to you in reaching an appropriate decision in the matter. We shall be glad to be of any further assistance that may be required in this regard.

Yours faithfully

X and Co.

Chartered Accountants.

**Working Note:**

		Factory Expenses (Rs. Lakhs)	Admn. expenses (Rs. Lakhs)	Selling expenses (Rs. Lakhs)
(i)	Amount at 60%	7.56	3.72	4.08
(ii)	Amount at 80%	8.04	3.88	4.32
(iii)	Change for 20%	0.48	0.16	0.24
(iv)	Amount at 40% (i)-(iii)	7.08	3.56	3.84

**Other considerations in shut down decisions:**

Cost is not the only criterion for deciding in favour of shut down. Non-cost factors worthy of consideration in this regard are:

1. Interest of the workers – If the workers are discharged it may become difficult to get skilled workers later, on reopening of the factory. Also shut down may create problem for the workers which may far exceed the cost benefits of the shut down.
2. Once the firm is closed down competitors may establish their products and thus it may be difficult to introduce the product in the market again.

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3. The plant may become obsolete or depreciate at a larger rate when not in operation. Thus, heavy capital expenditure may have to be incurred or re-opening.

#### Illustration

Universe Ltd. manufacture 20,000 units of 'X' in a year at its normal production capacity. The unit cost as to variable costs and fixed costs at this level are Rs. 13 and Rs. 4 respectively.

Due to trade depression, it is expected that only 2,000 units of 'X' can be sold during the next year. The management plans to shut-down the plant. The fixed costs for the next year then is expected to be reduced to Rs. 33,000. Additional costs of plant shut-down are expected at Rs. 12,000. should the plant be shut-down? What is the shut-down point?

#### Solution

**Note :** The decisions regarding the plant to shut-down and the calculation of shut-down point requires the figure of selling price per unit of the units sold. As the statement of the question fails to indicate the selling price (per unit) therefore one is free to assume it.

**Assumption:** let's assume the selling price per unit be Rs. 20

Statement of cost for taking a decision about shutdown of plant

	Plant is operated Rs.	plant is shut down Rs.
Variable cost	26,000 (2,000 units×Rs. 13)	—
Fixed costs	80,000 (20,000 units×Rs. 4)	33,000 (Inescapable cost)
Additional shut down cost	—	<u>12,000</u>
Total cost	<u>1,06,000</u>	<u>45,000</u>
State of loss:		
Sales	40,000 (2,000 units´Rs. 20)	...
Less: Total cost (as above)	<u>1,06,000</u>	<u>45,000</u>
Loss	(66,000)	(45,000)
	(if continued)	(if shut-down)

**1.14.3 Recommendation :** A comparison of loss figures indicated as above points out, that, loss is reduced if the plant is shut-down. In fact by doing so he concern's loss would be reduced by (Rs. 21,000).

Calculation of shut down point:

$$\begin{aligned} \text{Shut-down point} &= \frac{\text{Rs.80,000} - \text{Rs.45,000}}{\text{Rs.20} - \text{Rs.13}} \\ &= 5,000 \text{ units} \end{aligned}$$

### Divestment Strategy

Divestment involves a strategy of selling off or shedding business operations to divert the resources, so released, for other purposes. Selling off a business segment or product division is one of the frequent forms of divestment strategy. It may also include selling off or giving up the control over a subsidiary where by the wholly owned subsidiaries may be floated as independently quoted companies .

### Reason for Divestment Strategy

1. In case of a firm having an opportunity to get more profitable product or segment but have resource constrain, it may selling off it's unprofitable or less profitable division and utilised the recourse so released. Cost Benefit Analysis & Capita Budgeting Method are the useful tool for analysing this type of situation.
2. In case of purchase of new business, it may be found that some of the part of the acquired business is not upto the mark. In such type of situation disposal of the unwanted part of the business is more desirable than hold it.
3. In case where any business segment or product or subsidiary is pull down the profit of the whole organisation, it is better to cut down of that operation of the product or business segment or subsidiary.
4. If managing of the organisation is very constrained, it is good to dispose off the unwanted and undesirable activity of the organisation, which involve large management skill. So that it can concentrated on the core activities of the organisation.
5. In the situation where the firm suffering from loss, selling off or divestment policy is one suitable option to exit in the current position and to go for turn around strategy.

### SUMMARY

- Total Quality Management is a system in which a company initiates comprehensive total quality cost program.
- Commitment, Culture, Continuous improvement, Co-operation, Customer focus and Control Are the Six C's of TQM.
- Following are the four problem areas that are perceived in decision making process:-
  - ✓ Relevance.
  - ✓ Congruence.
  - ✓ Comprehensibility.
  - ✓ Linkage to non-financial indicators.

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- Activity Based Costing is an accounting methodology that assigns costs to activities rather than products or services.
- Cost Driver–It is a measure of the frequency and intensity of demand, placed on activities by cost objects.
- Activity Based Management (ABM) is used to describe the cost management application of ABC.
- Activity based Budgeting (ABB) is the process planning and controlling the expected activities of the organization to derive a cost effective budget.
- The three key elements of activity based budgeting are as follows:-
  - ✓ Type of work to be done
  - ✓ Quantity of work to be done
  - ✓ Cost of work to be done
- Value-added activities (VA) : these are those activities which are necessary for the performance of the process.
- Non-value-added activities (NVA) : These are those activities that represents work that is not valued by the external or internal customer.
- Business process re-engineering: It involves examining business processes and making substantial changes to how organisation currently operates.
- Target Costing has been described as a process that occurs in a competitive environment, in which cost minimization is an important component of profitability.
- CIMA defines life cycle costing as the practice of obtaining over their life time, the best use of physical asset at the lowest cost of entity.
- Value Chain:-Porter defined value chain as the internal processes or activities a company performs “to design, produce, market, deliver and support its product.”
- Factors which influence profitability are:
  - Bargaining power of buyers
  - Bargaining power of suppliers
  - Threat of substitute products or services
  - Threat of new entrants
  - Intensity of competition
- Core competencies are particular strengths relative to other organizations in the industry which provide the fundamental basis for the provision of added value.
- Cost Control is defined as the “the guidance executives of the cost of operating and undertaking while cost reduction is defined as and achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended.”

### SELF-EXAMINATION QUESTIONS

1. Define Total Quality Management (TQM). What are the core concepts of TQM.
2. What are the steps to be taken in the implementation of TQM.
3. Explain in brief the fundamental requirements for the implementation of quality improvement process.
4. Explain in brief fundamental principles associated with four P's of quality improvement.
5. 'Activity Based Costing is more useful in a TQM environment when compared with traditional costing techniques'. Discuss.
6. Define & explain the concept of Activity Based Costing (ABC)
7. Define the following terms :
  - (i) Cost driver
  - (ii) Activity cost pool
8. Explain the structuring of organisation into cost/activity cost centres.
9. Briefly mention the purposes of Activity Based Costing.
10. How will the overhead costs to be allocated to products/services under ABC system?
11. Define the Activity Based Cost Management (ABM). List business applications which have started using ABM information in recent years.
12. What is 'Product life cycle costing'? What are the characteristics of product life cycle.
13. Explain briefly the phases in product life cycle.
14. Explain briefly the importance of product life cycle costing.
15. Define The term 'value chain'. Explain briefly the role of Management Accountant in Value Chain analysis.
16. Discuss briefly the strategic framework required for a Value Chain analysis.
17. Differentiate between the traditional management accounting and Value Chain analysis in the strategic framework.
18. Differentiate between Cost Control and Cost Reduction.
19. Describe the just-in-time philosophy.
20. What role did the elimination of waste play in the development of JIT philosophy.
21. Explain in brief impact of JIT systems on :
  - (i) Overhead costs
  - (ii) Product Prices
  - (iii) Other costs.

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22. What are the performance measures in JIT system.
23. What do you mean by backflushing in JIT system. Explain in brief the problems with backflushing which must be corrected before it will work properly.
24. Differentiate between MRP 1 and MRP 11.
25. Write short notes on the following;
  1. Synchronous manufacturing.
  2. Business process re engineering.
  3. Throughput accounting.
  4. Shut down and Divestment.