# Indian Accounting Association

# Subject: Cost and Management Accounting

## Topic

### Activity Based Costing System

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# ACTIVITY BASED COSTING

**LEARNING OUTCOMES:**

- After studying this chapter, you would be able to understand
- Drawback of traditional costing system
- Usefulness of ABC
- Cost Allocation under ABC
- Stages, advantages, and limitations of ABC

**INTRODUCTION**

Firms need accounting systems for (i) cost allocation between cost of goods sold and inventories for financial reporting, and (ii) providing relevant decision-making information for distinguishing between profitable or unprofitable activities to stay afloat in the highly competitive business environment. In order to perform these functions, a cost accumulation system is required that assigns costs to cost objects (like, products, services, or customers) accurately. This cost assignment system is referred to as, job-order costing system.

The costs that are assigned to cost objects can be divided into – direct costs and indirect costs. Direct costs can be traced, accurately, to cost objects as they are specifically incurred for a particular cost object. Cost tracing cannot be applied to indirect costs because they are common to several cost objects. Therefore, indirect costs are assigned to cost objects using cost allocations. The basis that is used to allocate costs to cost objects is called an allocation base or cost driver. Figure 1 explains that direct costs are assigned to cost objects using cost tracing. Indirect costs are assigned using (i) cause-and-effect relationship, or (ii) arbitrarily allocated.
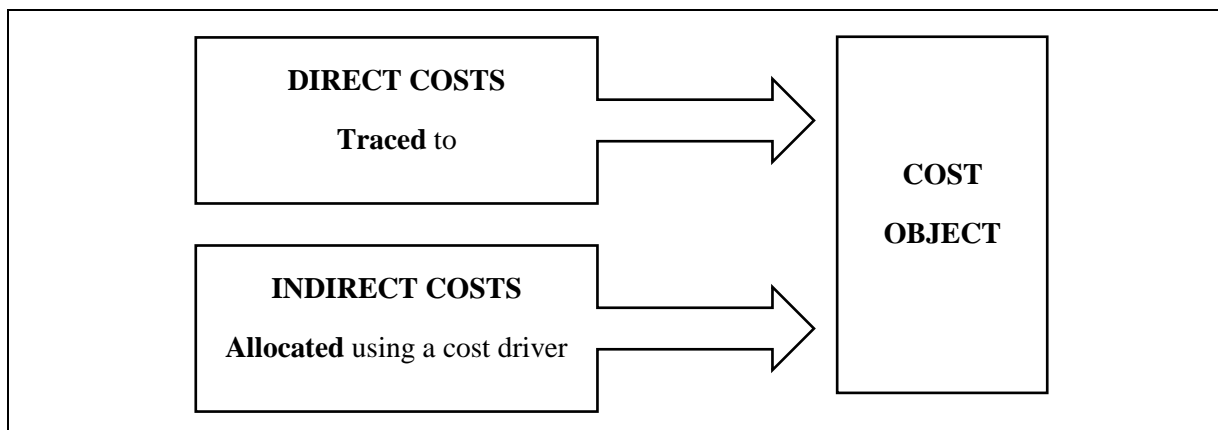


*Figure 1. Cost assignment methods*

**TYPES OF COST SYSTEM**

The cost accumulation system generates relevant cost information for decision-making and there are three ways in which this is done; (i) many indirect costs are relevant for decision-making and the costing system provides an estimate of resources consumed by cost objects using the cause-and-effect allocations to allocate indirect costs; (ii) an attention-directing information system is required that periodically identifies potentially unprofitable products that require more detailed analysis; and (iii) most product decisions are not independent and use joint resources that fluctuate over the longer term according to product demand and thus, should be assigned to product.

Costing systems can vary in terms of which costs are assigned to cost objects and their level of sophistication. Typically, such systems may be classified as, (i) direct, and (ii) absorption costing systems. A direct costing system (i.e., marginal costing system) assigns only direct costs to cost objects and indirect costs are subtracted from the reported contributions to get profit. The drawback of direct costing systems is, systems may not be in place to measure and assign indirect costs to cost objects and hence is only recommended where indirect costs are low proportion in proportion to the total costs of the organisation. In contrast, an absorption costing system assigns both direct and indirect costs to the cost objects. Absorption costing systems can be classified into (i) traditional costing systems and (ii) activity-based costing systems. Traditional costing systems were developed in the early 1900s and are still widely prevalent today. However, they tend to use arbitrary cost allocations. ABC systems emerged and began to be implemented only in the 1990s.

**DEFINITION**

Activity Based Costing (ABC) is an accounting methodology that **assigns costs to activities rather than products or services.** *Activities consist of the aggregation of many different tasks, events or units of work that cause the consumption of resources*. This enables resources and overhead costs to be more accurately assigned to products and services that consume them. ABC is a technique which involves identification of cost with each cost driving activity and making it as the basis for apportionment of costs over different cost objects (i.e., jobs/ products/ customers or services).

ABC is defined as follows:

*'An approach to the costing and monitoring of activities which involves tracing resource consumption and costing final outputs. Resources are assigned to activities, and activities to cost objects based on consumption estimates. The latter utilise cost drivers to attach activity costs to outputs.'*[1]

## EMERGENCE OF ACTIVITY BASED COSTING

The concept of ABC was first defined in the late 1980s by Robert Kaplan and William Burns[2]. ABC as a costing method that has been developed to deal with the perceived weaknesses of traditional absorption costing. Traditional absorption costing is based on the principle that production overheads are driven by the level of production (i.e., number of units produced). This was reflected in the choice of activity level in the overhead absorption rate calculation. They all increased as the production volume increased. This was true in the past, because companies only produced one product or a few similar products.

Absorption costing allocate indirect expenses or overhead to products (and to any cost object) based on characteristics of a single allocation factor that is possibly not causally related to the type and level of work consumed. The use of labour hours or machine hours required to manufacture a unit are broad averages that do not necessarily reflect causality for the indirect expenses. The problem is that use of these allocation methods results in allocations that vary with changes in the allocation basis leading to product cost distortions.

ABC recognises that individual products or customers do not consume indirect expenses in those proportions. Instead, they focus on the work activities of people and equipment required to produce each product or provide each service, and their consumption of each of those activities. ABC traces overhead costs to products (or services or customers) by identifying resource and their costs, the consumption of these resources by activities, and the performance of activities to produce output.

ABC originated in the manufacturing sector where technological developments and productivity improvements had substantially reduced the proportion of direct labour and

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[1] Chartered Institute of Management Accountants (CIMA Official Terminology, 2005)

[2] Kaplan, Robert S. and William J. Bruns, eds. Accounting and Management: Field Study Perspectives. Boston: Harvard Business School Press, 1987.

material costs, but increased the proportion of indirect or overhead costs. Subsequent implementations by organizations in virtually every sector of the economy have demonstrated its universal applicability. Governmental companies, services industry, now use ABC systems to determine profitability.

## FACTORS LEADING TO THE DEVELOPMENT OF ACTIVITY BASED COSTING

1. **Nature of manufacturing has changed over time**

Traditionally, overhead costs used to be less in proportion to total product costs. This was because manufacturing was more labour intensive and, as a result, direct costs would have been much higher than indirect costs. Thus, a rough estimate of the overhead cost per unit was appropriate. Over the years machines started replacing humans on the shop floor. Manufacturing has become more machine intensive and, as a result, the proportion of overheads, compared to direct costs, increased. Today production processes are highly automated with huge overhead costs. Therefore, it is important that an accurate estimate is made of the production overhead cost per unit.

## 2. Competitive environment and product diversity

Companies today operate in a highly competitive environment wherein product diversity and complexity has increased manifold. Firms prefer product diversity to secure economies of scale and increased market share. Many companies offer product customisation to differentiate themselves and to enable them to earn higher margins. Dell computers, for example, allows customers to build their own PC in terms of memory size, capacity, and processor speed. That information is then fed into their automated production system and the specified PC is built. Maruti Suzuki, offer an extensive range of products with individual product customisation packages hoping that one product from the range will match the requirements of a particular market segment.

## 3. Single overhead cost allocation factor leads to cost distortion

Using a single overhead cost allocation factor leads to cost distortion and increasing competition necessitated more accurate product costs. ABC facilitates in reducing cost by identifying non-value adding activities in the production process that might attention or elimination.

**4. Increasing presence of non-volume related activities in the production process**

The presence of non-volume related activities (like, material handling, inspection set-up) has assumed greater proportion today. When non-volume related activities are present, traditional system cannot be applied, ABC provides for better cost ascertainment.

**5. Role of information technology**

Continuous improvements and increasing application of information technology in cost accounting led to decreasing costs of information processing and better cost ascertainment.

**COMPARISON OF TRADITIONAL COSTING AND ACTIVITY BASED COSTING**

The traditional approach to cost allocation and product costing is a two steps procedure.

**Step 1.** Accumulate costs within a production or service departments. Thereafter, the non-production costs are allocated to production departments.

**Step 2.** Allocate the resulting production department costs to various products, services or customers.

Cost allocation was based on a single volume measure, such as direct labour hours or machine hours. While using such a simplistic volume measure to allocate overheads as an overall cost driver, this approach seldom met the cause-and-effect criteria desired in accurate cost allocation.

Conventional costing distinguishes between variable and fixed costs. It is assumed that variable costs vary with volume (number of units of output and are proportional to the output level) whereas fixed costs do not vary with volume or output. This is often an over-simplification of how costs actually behave. Fixed costs are usually fixed only over certain ranges of activity, often stepping up as additional manufacturing resources are employed to allow high volumes to be produced. Making an additional unit does not cause more fixed costs, yet production cannot take place without these costs being incurred.

Thus, the traditional approach of costing became increasingly inaccurate as the relative proportion of overhead costs has risen substantially. It relied on the arbitrary addition of a proportion of overhead costs on to direct costs to attain a total product cost. This led to

distortion of costs and inappropriate decision making. However, it has the merit of being relatively quick and easy.

ABC is an alternative approach to the traditional method. ABC systems first accumulate overheads for each organisational activity or grouped into cost pools. They then assign the costs of these activities to products, services or customers (referred to as cost objects) causing that activity. The traditional approach and ABC are, therefore, very similar, but the first stage is different, as ABC uses activities instead of functional departments as 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 in an organisation. Activity costs tend to behave in a similar way to each other when they have the same cost driver. In effect, ABC focuses on accumulating costs via activities, whereas traditional cost allocation focuses on accumulating costs within functional areas. Therefore, ABC uses a more realistic way in which costs behave.

The main advantage of ABC is that it minimises or avoids distortions on product costs that might occur from arbitrary allocation of overhead costs. However, the initial activity analysis is clearly the most difficult aspect of ABC. Activity analysis is the process of identifying appropriate output measures of activities and resources (i.e., cost drivers) and their effects on the costs of making a product or providing a service. ABC systems surely have the flexibility to provide special reports so that management can take decisions about the costs of designing, selling and delivering a product or service.

Figure 2 illustrates the allocation process for traditional and activity-based costing systems. Note, both use a two-stage allocation process. In the first stage, a traditional system allocates overheads to production and service departments and then reallocates service departments' costs to the production departments. An ABC system assigns overheads to each major activity (rather than departments). Under ABC system many activity-based cost centres (or activity cost pools) are established, whereas with traditional systems overheads are pooled by departments. ABC systems use many different types of second stage cost drivers, including non-volume-based drivers (like, number of productions runs for production scheduling and the number of purchase orders for the purchasing activity). The distinguishing features of ABC systems include. (i) a greater number of cost centres; and (ii) a greater number and

variety of second stage cost drivers. These factors lead to accurate measurement of the resources consumed by cost objects. However, the traditional cost systems tend to be less accurate because they use cost drivers where no cause-and-effect relationships exist to assign indirect costs to cost objects.
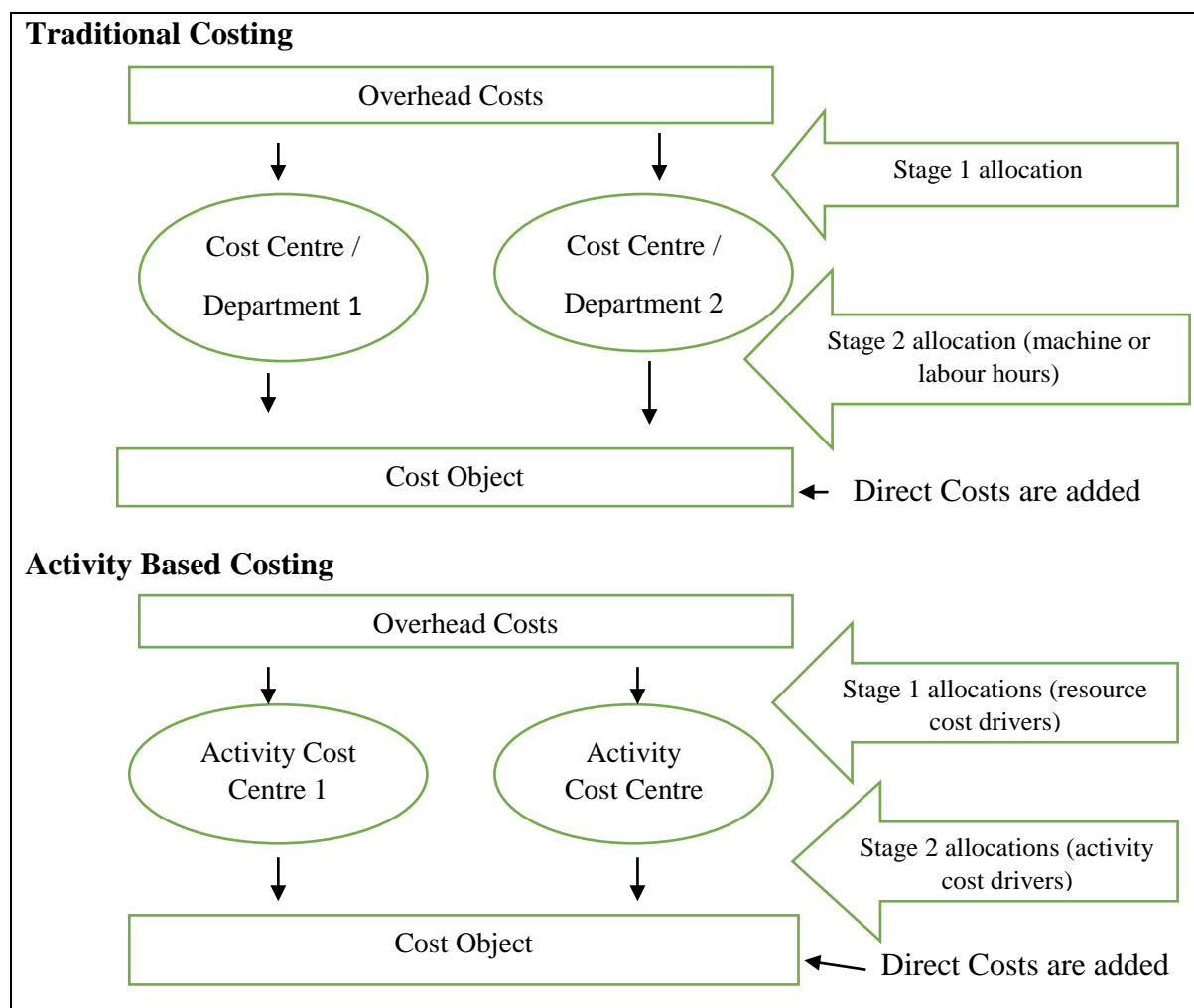
**Traditional Costing**

Overhead Costs → Cost Centre / Department 1, Cost Centre / Department 2

Stage 1 allocation

Stage 2 allocation (machine or labour hours)

Cost Object ← Direct Costs are added

**Activity Based Costing**

Overhead Costs → Activity Cost Centre 1, Activity Cost Centre

Stage 1 allocations (resource cost drivers)

Stage 2 allocations (activity cost drivers)

Cost Object ← Direct Costs are added

*Figure 2. Allocation process for traditional and activity-based costing systems*

| Table 1. Comparison of Traditional Costing and Activity Based Costing | |
|---|---|
| **Traditional Absorption Costing** | **Activity Based Costing** |
| Overheads are related to functional cost centers. | Overheads are related to activities and grouped into activity cost pools. |
| Costs are related to cost centers and thus unrealistic of cost behaviour. | Costs are related to activities and hence are more realistic. |
| Time is assumed to be the only cost driver governing costs in all departments. | Activity wisecost drivers are determined. |

| We use single or multiple overhead recovery rates (for each department) in absorbing overheads. | Activity wise recovery rates are determined. The use of a single overhead recovery rate is not possible. |
|---|---|
| Costs are assigned to cost units i.e., to products, or jobs or hours. | Costs are assigned to cost objects, i.e., customers, products, services, departments. |
| Cost Centers cannot be eliminated. Hence, not suitable for cost control. | Essential activities can be simplified and unnecessary activities can be eliminated. Thus, the corresponding costs are also reduced or minimized aiding cost control. |

## ACTIVITY BASED COSTING MODEL

The ABC approach differs from the traditional approach because of its fundamental concentration on activities. ABC system uses both financial and non-financial variables as bases for cost allocation. The ABC approach utilizes more indirect cost pools than the traditional approach and uses a greater number of cost drivers as cost allocation bases. As shown in Figure 3, there are two views of ABC - a cost assignment view and a process view. The cost assignment view assigns costs to the significant activities of an organization. Activities are then assigned to a cost object that uses the activities such as a product or customer. The cost assignment view is comprised of three building blocks: resources, activities, and cost objects. Resources are economic elements that are the sources of cost. Activities are the processes or procedures that produce work. Since activities use resources, they are connected to activities via resource drivers that approximate the use of resources by activities. Each resource that is traced to an activity becomes a cost element in an activity cost pool that measures the total cost associated with an activity. This provides a better understanding of why resources are used. The information provided can help identify which activities consume the most resources and where cost reduction opportunities may exist. The next step after assigning resources to activities is to trace the activities to cost objects. A cost object is typically a product, product line, or customer, so it is the reason why work is performed. Activity drivers measure the use of activities by the cost object, thus linking activities to cost objects. The total cost of the cost object is the sum of all the activity costs used by the cost object. This process provides economic information to help in analysing decisions such as pricing, product mix, sourcing, product design, and improvement efforts.

The process view provides operational intelligence about the processes of an organization. A process is a series of activities that are linked together to achieve an objective. The process view provides information about cost drivers and performance measures for each activity or series of activities in a process.
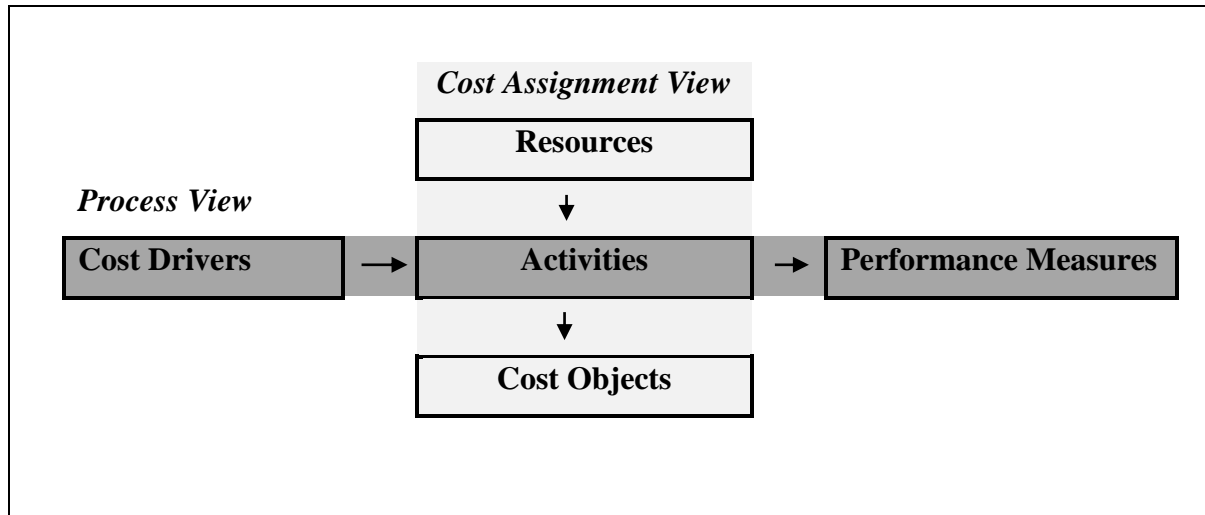


*Figure 3. The ABC Model[3]*

As shown in Figure 3, three main building blocks comprise the process view: cost drivers, activities, and performance. Cost drivers determine why and how much work is required to perform an activity or a chain of activities. A customer order, for example, initiates the order processing chain of activities - the "why". The size of the customer order determines how much work is required - the "effort". Cost drivers include both internal factors related to a specific activity and factors related to prior activities. Each activity in a series is a customer of a prior activity. Activities work together in an internal customer chain to provide value to the external customer. Cost drivers are important because they reveal opportunities for improvement. For example, a defect part received from a supplier will require correction activity to correct the problem, thereby expending more effort and resources. A quality certification program could help reduce a supplier's defect rate and thus reduce total costs of both the buyer and supplier. Performance measures identify how well an activity is performed. Typical performance measures include activity efficiency, time required to complete an activity, and quality of work. Generally, the longer it takes to perform an activity, the greater the resources used and overall costs. Likewise, poor quality usually

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[3] Turney, Peter B.B., (1991), Common Cents: The ABC Performance Breakthrough, Hillsboro: Cost Technology

results in the use of more resources (e.g., scrap and rework in manufacturing organizations) and higher overall costs. The objective is to use this information to help improve performance and increase the value of products and services.

**Surveys of company practice**

Industry practice surveys indicate that service companies readily implement ABC systems than manufacturing companies because most of the costs in service organizations are indirect. Further, in manufacturing companies' important elements of costs, like direct materials and direct labour, can be traced to the individual products and indirect costs are likely to be a much smaller proportion of total costs.

An international survey by the Chartered Institute of Management (2009)[4] reported that approximately 28% of the respondents used ABC and a higher rate of adoption in larger companies compared with smaller companies. In another study the authors surveyed 348 manufacturing and service companies worldwide and results indicate that ABC continues to offer organizations significant value from strategic and operational perspectives[5].

Al-Sayed and Dugdale (2016)[6] adopted a wider definition of ABC and focused on activity-based innovations (ABI) in U.K. firms. They reported that 32% were serious users of ABI and that 72% had experience or interest in ABI. The authors concluded that ABI can now be regarded as mainstream management accounting practice.

**COST HIERARCHY**

In ABC system, costs are categorized on the basis of the different types of cost drivers that are utilized. ABC systems commonly use a cost hierarchy having four levels. These categories were first identified by Cooper and Kaplan[7]. The categories of activities help to determine the type of activity cost driver required. These cost drivers differ in their

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[4] Management accounting tools for today and tomorrow, CIMA

[5] Stratton, W.O., Desroches, D., Lawson, R.A., & Hatch, T. (2009). Activity-Based Costing: Is It Still Relevant? Management Accounting Quarterly, 10, 31.

[6] Al-Sayed, Mahmoud and Dugdale, David (2016) Activity-based innovations in the UK manufacturing sector: extent, adoption process patterns and contingency factors. British Accounting Review, 48 (1), pp. 38-58.

[7] Cooper, R. and Kaplan, R. S., (1992), Activity-Based Systems: Measuring the Costs of Resource Usage, Accounting Horizons, September.

relationship between the indirect cost and the product or service. The categories of activities are explained in Table 2.

| Table 2. Cost Hierarchy | | |
|---|---|---|
| **Level of Activities** | **Meaning** | **Examples** |
| 1. Unit-level costs | These are the costs of activities performed on each individual unit of a product or service. These costs increase as the number of units produced increases. | The use of indirect materials/consumables tends to increase in proportion to the number of units produced. |
| 2. Batch-level costs | These are the costs of activities related to a group of units of products or services rather than the individual unit. The cost of batch related activities varies with number of batches made, but is common (or fixed) for all units within the batch. | (i) Material ordering costs - where an order is placed for every batch of production. (ii) Set-up costs are an example of batch level costs, as this cost is incurred once for each batch, regardless of the size of the batch. |
| 3. Product (Service) sustaining costs | These are the costs of activities undertaken to support individual products or services regardless of the number of units or batches produced. | (i) Design costs, (ii) Producing parts to a certain specification, and (iii) Advertising costs, if advertisement is for individual products |
| 4. Facility sustaining costs | These are the costs of activities that cannot be traced to individual products or services but support the organization as a whole. These costs usually lack a cause-and-effect relationship between the cost and the allocation base. | General administration, rent, and building security. |

## STAGES IN ACTIVITY BASED COSTING

**1. Identify the products that are the chosen cost objects**

**2. Identify the direct costs of the products**

**3. Select the activities and cost-allocation bases to use for allocating indirect costs to the products**

Unlike in traditional costing the number of activities in ABC systems are much more and the exact number will depend on how the management subdivides the organisation's activities. If ABC systems is to be acceptable as practical system it is necessary to use larger groupings. The additional number of activities over cost centres means that ABC should be more accurate than the traditional method. Some of the common activities are - Production schedule changes, Purchasing, Production process set up, Quality control, Maintenance.

**4. Identify the indirect costs associated with each cost allocation base (activity).**

The overheads costs are related to the activities (both support and primary) that caused them. This helps in the creation of '**cost pools' or 'cost buckets.**' This is done using resource cost drivers that reflect causality. 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.

**5. Compute the rate per unit of each cost-allocation base (activity) using the Cost Driver**

a. **Determine the activity cost drivers that will be used to relate the overheads collected in the cost pools to the cost objects/products.**

This is based on the factor that drives the consumption of the activity, i.e., what causes the activity to incur costs? In production scheduling the driver will probably be the number of batches ordered.

**b. Calculate activity cost driver rates for each activity.**

$$\text{Activity Cost Driver Rate} = \frac{\text{Total Activity Cost}}{\text{Cost Driver}}$$

The activity driver rate can be used not only to identify cost of products but it can also be used for costing other cost objects such as customers/customer segments and distribution channels. The activity cost driver rates will be multiplied by the different amounts of each activity that each product/other cost object consumes.
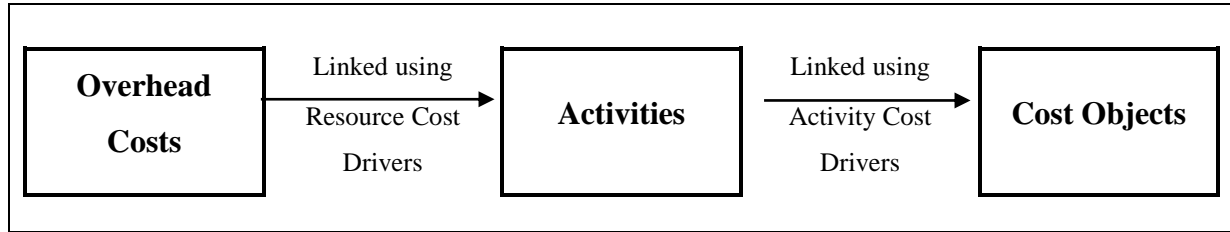
*Figure 3. Cost allocation under ABC*

**6. Compute the indirect costs allocated to the products and the total costs of the products by adding all direct to the products.**

**Example 1.** Given below are the budgeted variable cost for two products – Ordinary and Dlux manufactured by a company. Labour is paid at Rs. 12 per hour and total fixed overheads are Rs. 224,000. Fixed overheads are absorbed on a labour hour basis.

| Product | Ordinary | Dlux |
|---|---|---|
| Budgeted production (units) | 20,000 | 2,000 |
| Cost details per unit | Rs. | Rs. |
| Material | 10 | 12 |
| Labour | 60 | 72 |
| Variable Overhead | 5 | 6 |
| Total variable costs | 75 | 90 |

Based on the details, the budgeted labour hours must be 1,12,000 hours.

| Product | Ordinary | Dlux |
|---|---|---|
| Budgeted production (units) | 20,000 | 2,000 |
| Labour cost per unit (Rs.) | 60 | 72 |
| Labour hour rate as given (Rs.) | 12 | 12 |
| Labour hours per unit | 5 | 6 |
| Total labour hours | (20,000 x 5 =) 1,00,000 | (2,000 x 6 =) 12,000 |

The fixed overhead absorption rate per labour hour = (2,24,000/1,12,000) = Rs.2 per hour.

The fixed overheads to be absorbed for both products are as follows:

| Ordinary | (5 labour hours x Rs. 2) | Rs. 10 |
| Dlux | (6 labour hours x Rs. 2) | Rs. 12 |

| Statement showing computation of Total Production Cost under Absorption Costing | | |
| --- | --- | --- |
| **Product** | **Ordinary** | **Dlux** |
| Budgeted production (units) | 20,000 | 2,000 |
| **Cost details per unit** | Rs. | Rs. |
| Material | 10 | 12 |
| Labour | 60 | 72 |
| Variable Overhead | 5 | 6 |
| Total variable costs | 75 | 90 |
| Fixed overheads | 10 | 12 |
| Total production costs | 85 | 102 |
| Total production cost under absorption costing | 17,00,000 | 2,04,000 |

The traditional absorption costing approach outlined above is satisfactory only if the following conditions apply: (i) fixed costs are relatively immaterial compared to material and labour costs as in the case of conventional manufacturing environments which do not rely on expensive facilities like automation, (ii) most fixed costs accrue with time, and (iii) there are long production runs of identical products with little customisation.

**Let us now assume the manufacturing process relies on highly automated and expensive manufacturing plants.**

The total fixed overheads of Rs. 2,24,000 can be split into cost pools and cost driver data for the Ordinary and Dlux products can be collated.

| **Product** | **Ordinary** | **Dlux** |
| --- | --- | --- |
| **Cost driver data** | | |
| Batch size | 2,000 | 100 |
| Number of components per unit | 20 | 30 |
| **Cost Pool** | **Rs.** | |
| Batch setup costs | 90,000 | |

| | |
|---|---|
| Stores and material handling | 92,000 |
| Rent | 42,000 |
| Total fixed costs | 2,24,000 |

Calculation of product cost applying the ABC process requires the following steps: (i) We need to identify the cost driver for each cost pool and calculate a cost per unit of cost driver, and (ii) Allocate costs to the product based on how much the product uses of the cost driver.

| Cost Driver | Ordinary | Dlux | Total |
|---|---|---|---|
| Number of set-ups required | (20,000/2,000) = 10 | (2,000/100) = 20 | (10+20) =30 |
| Number of components | (20,000 units x 20) = 4,00,000 | (2,000 units x 30) = 60,000 | (4,00,000+60,000) =4,60,000 |
| Other overheads | To be absorbed on labour hour basis because there is no other information provided which would allow a better approach. | | 1,12,000 |

We need to calculate a cost per unit of cost driver or the cost driver rate.

| Cost Driver | Total Activity Cost/ Cost Driver | Cost Driver Rate (Rs.) |
|---|---|---|
| Batch set-ups | (90,000/30) | 3,000/set-up |
| Stores and material handling | (92,000/460) | 0.20/component |
| Other overheads | (42,000/1,12,000) | 0.375/labour hour |

We now compute the absorbed costs into each product based on how much the product uses of the driver.

| Cost Driver | Cost Driver Rate (Rs.) | Ordinary (Rs.) | Dlux (Rs.) | Total (Rs.) |
|---|---|---|---|---|
| Batch set-ups | 3,000/set-up | (3,000x10) = 30,000 | (3,000x20) = 60,000 | (30,000+60,000) =90,000 |
| Stores & material handling | 0.20/component | (4,00,000x0.20) = 80,000 | (60,000x0.20) =12,000 | (80,000+12,000) =92,000 |

| Other overheads | 0.375/labour hour | (1,00,000x0.375) =37,500 | (12,000x0.375) = 4,500 | (37,500+4,500) = 42,000 |
|---|---|---|---|---|
| Total Overhead Costs | | **1,47,500** | **76,500** | **2,24,000** |

| Statement showing computation of Total Production Cost under ABC | | |
|---|---|---|
| **Product** | **Ordinary** | **Dlux** |
| Budgeted production (units) | 20,000 | 2,000 |
| | Rs. | |
| Total variable costs/unit | 75 | 90 |
| Total variable costs | 15,00,000 | 1,80,000 |
| Fixed overheads | 1,47,500 | 76,500 |
| Total production costs under ABC Systems | **16,47,500** | **2,56,500** |
| Total production cost under Absorption Costing | 17,00,000 | 2,04,000 |

The comparison of the full cost shows the ABC approach substantially increases the cost of making Dlux. This is primarily because Dlux are made in small batches. Each batch causes an expensive set-up, but that cost is then spread over all the units produced in that batch – whether few units of Dlux or many units of Ordinary. In addition to estimating more accurately the true cost of production, ABC systems will also give a better indication of where cost savings can be made. Working on the principle that large cost savings are likely to be found in large cost elements, management's attention will start to focus on how this cost could be reduced. The traditional approach to fixed overhead absorption has the merit of being simple to calculate and apply but the simplicity does not justify the use of information that might be wrong or misleading.

**ADVANTAGES OF ACTIVITY BASED COSTING**

(i)  Allows more accurate costing of products and services as overhead allocation is done on logical basis.

(ii)  It enables better pricing policies by supplying accurate cost information.

(iii) The system utilizes unit cost rather than total cost unlike absorption costing system.

(iv) Help to identify non-value-added activities which facilitates cost reduction.

(v)  It is helpful in case of multi products company.

(vi) It highlights problem areas which require attention of the management.

(vii) Makes visible waste and non-value added.

(viii) Supports performance management and scorecards.

(ix) ABC system integrates well with Six Sigma and other continuous improvement programs.

(x) Enables costing of processes, supply chains, value streams and facilitates benchmarking.

## LIMITATIONS OF ACTIVITY BASED COSTING

(i) It is more expensive to implement in comparison with traditional costing system.

(ii) It is not helpful to the small organizations.

(iii) It may not be applied to organizations with limited products.

(iv) Selection of the most suitable cost driver may not be easy/ may be difficult or complicated.

## KEY TERMS

**Activity -** Activity refers to an event that incurs cost.

**Cost Object -** It is an item for which cost measurement is required (like, a product or a customer).

**Cost Pool -** It represents a group of various individual cost items consisting of costs that have same cause and effect relationship (like, machine set-up).

**Cost Driver -** A factor that causes a change in the cost of an activity. There are two categories of cost driver - Resource Cost Driver and Activity Cost Driver.

**Activity Cost Driver** - 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.

**Resource Cost Driver -** 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.

| Tables showing examples of activity cost pools and drivers | |
|---|---|
| **Activity Cost Pools** | **Activity Cost Drivers** |
| Production | a) Number of units |
| | b) Number of set-ups |
| | c) Number electricity units consumed |

| | |
|---|---|
| Marketing | a) Number of sales personnel |
| | b) Number of sales orders |
| Research and Development | a) Number of research projects |
| | b) Personnel hours spend on projects |
| | c) Technical complexities of the projects |
| Customer Service | a) Number of service calls |
| | b) Number of products serviced |
| | c) Hours spend on servicing products |
| Purchasing | Number of purchase orders |
| Material Handling | Number of material requisitions |

## REVIEW QUESTIONS

1. Define the following terms: (i) Cost driver, (ii) Cost pool.

2. Explain the problems of traditional costing where overhead costs are allocated based on volume.

3. What is Activity based costing? How are product costs determined in ABC?

4. Point out the differences between activity based costing and traditional absorption costing.

5. Describe various levels of activities under ABC.

6. Explain the benefits and limitations of ABC.

## SOLVED PROBLEMS

**Example 2.** PQR Ltd. manufactures three types of products namely P, Q and R. The data relating to a period are as under:

| Particulars | P | Q | R |
|---|---|---|---|
| Machine hours per unit | 10 | 18 | 14 |
| Direct Labour hours per unit | 4 | 12 | 8 |

| | | | |
|---|---|---|---|
| Direct Material per unit (Rs.) | 90 | 80 | 120 |
| Production (units) | 3,000 | 5,000 | 20,000 |

Currently the company uses traditional costing method and absorbs all production overheads on the basis of machine hours. The machine hour rate of overheads is Rs. 6 per hour. Direct labour hour rate is Rs. 20 per hour. The company proposes to use ABC system and the activity analysis is as under:

| Particulars | P | Q | R |
|---|---|---|---|
| Batch size (units) | 150 | 500 | 1,000 |
| Number of purchase orders per batch | 3 | 10 | 8 |
| Number of inspections per batch | 5 | 4 | 3 |

The total production overheads are analysed as under:

| | |
|---|---|
| Machine set up costs | 20% |
| Machine operation costs | 30% |
| Inspection costs | 40% |
| Material procurement related costs | 10% |

Calculate (i) the cost per unit of each product using traditional method. Absorption of all production overheads on the basis of machine hours is to be used, and (ii) the cost per unit of each product using ABC principles.

**Solution: (i) Statement showing computation of cost per unit under Traditional Method**

| Particulars of Costs | P | Q | R |
|---|---|---|---|
| | | Rs. | |
| Direct Materials | 90 | 80 | 120 |
| Direct Labour [(4, 12, 8 hours) @ Rs. 20] | 80 | 240 | 160 |
| Production Overheads [(10, 18, 14 hours) @ Rs. 6] | 60 | 108 | 84 |
| Cost *per unit* | 230 | 428 | 364 |

**(ii) Statement Showing computation of cost per unit under ABC method**

| Products | P | Q | R |
|---|---|---|---|
| Production (units) | 3,000 | 5,000 | 20,000 |
| | Rs. | | |
| Direct Materials @ Rs. (P 90, Q 80, R 120) | 2,70,000 | 4,00,000 | 24,00,000 |
| Direct Labour @ Rs. (P 80, Q 240, R 160) | 2,40,000 | 12,00,000 | 32,00,000 |
| Machine Related Costs @ Rs. 1.80 per hour (P 30,000, Q 90,000, R 2,80,000) | 54,000 | 1,62,000 | 5,04,000 |
| Setup Costs @ Rs. 9,600 per setup (P 20, Q 10, R 20) | 1,92,000 | 96,000 | 1,92,000 |
| Inspection Costs @ Rs. 4,800 per inspection (P 100, Q 40, R 60) | 4,80,000 | 1,92,000 | 2,88,000 |
| Purchase Related Costs @ Rs. 750 per purchase (P 60, Q 100, R 160) | 45,000 | 75,000 | 1,20,000 |
| Total Costs | 12,81,000 | 21,25,000 | 67,04,000 |
| Cost per unit (Total Cost/Units) | 427.00 | 425.00 | 335.20 |

**Working Notes**

**1. Number of Batches, Purchase Orders, and Inspections**

| | Particulars | P | Q | R | Total |
|---|---|---|---|---|---|
| A. | Production (units) | 3,000 | 5,000 | 20,000 | |
| B. | Batch Size (units) | 150 | 500 | 1,000 | |
| C. | Number of Batches (A/B) | 20 | 10 | 20 | 50 |
| D. | Number of Purchase Order *per batch* | 3 | 10 | 8 | |
| E. | Total Purchase Orders [C x D] | 60 | 100 | 160 | 320 |
| F. | Number of Inspections *per batch* | 5 | 4 | 3 | |
| G. | Total Inspections [C x F] | 100 | 40 | 60 | 200 |

**2. Total Machine Hours**

| | Particulars | P | Q | R |
|---|---|---|---|---|
| A. | Machine Hours *per unit* | 10 | 18 | 14 |
| B. | Production (units) | 3,000 | 5,000 | 20,000 |
| C. | Total Machine Hours    [A x B] | 30,000 | 90,000 | 2,80,000 |

Total Machine Hours = 4,00,000 and

Total Production Overheads = 4,00,000 hrs. x Rs. 6 = Rs. 24,00,000

## 3. Cost Driver Rates

| Cost Pool | % | Overheads (Rs.) | Cost Driver Basis | Cost Driver (Units) | Cost Driver Rate (Rs.) |
|---|---|---|---|---|---|
| Setup | 20% | 4,80,000 | Number of batches | 50 | 9,600 per Setup |
| Inspection | 40% | 9,60,000 | Number of inspections | 200 | 4,800 per Inspection |
| Purchases | 10% | 2,40,000 | Number of purchases | 320 | 750 per Purchase |
| Machine Hours | 30% | 7,20,000 | Machine Hours | 4,00,000 | 1.80 per Machine Hour |

**Example 3.** PQR Limited manufactures three products P, Q and R which are similar in nature and are usually produced in production runs of 100 units. Product P and R require both machine hours and assembly hours, whereas product Q requires only machine hours. The overheads incurred by the company during the first quarter are provided:

|  | Rs. |
|---|---|
| Machine Department expenses | 18,48,000 |
| Assembly Department expenses | 6,72,000 |
| Setup costs | 90,000 |
| Stores receiving cost | 1,20,000 |
| Order processing and dispatch | 1,80,000 |
| Inspect and Quality control cost | 36,000 |

The data related to the three products during the period are given below;

|  | P | Q | R |
|---|---|---|---|
| Units produced and sold | 15,000 | 12,000 | 18,000 |
| Machine hours worked | 30,000 hrs. | 48,000 hrs. | 54,000 hrs. |
| Assembly hours worked (direct labour hours) | 15,000 hrs. | - | 27,000 hrs. |
| Customers' orders executed (in numbers) | 1,250 | 1,000 | 1,500 |
| Number of requisitions raised on the stores | 40 | 30 | 50 |

Prepare a statement showing details of overhead costs allocated to each product using ABC.

**Solution:**

| Statement showing calculation of Cost Driver Rate | | | |
|---|---|---|---|
| Cost Pool | Cost (Rs.) [A] | Cost Driver [B] | Cost Driver Rate (Rs.) [C= A/B] |
| Machine Department Expenses | 18,48,000 | Machine Hours (1,32,000 hrs.) | 14 |
| Assembly Department Expenses | 6,72,000 | Assembly Hours (42,000 hrs.) | 16 |
| Setup Cost | 90,000 | No. of Production Runs (450*) | 200 |

| | | | |
|---|---|---|---|
| Stores Receiving Cost | 1,20,000 | No. of Requisitions Raised on the Stores (120) | 1,000 |
| Order Processing and Dispatch | 1,80,000 | No. of Customers Orders Executed (3,750) | 48 |
| Inspection and Quality Control Cost | 36,000 | No. of Production Runs (450*) | 80 |
| Total | 29,46,000 | | |

*Note: Number of Production Run is 450 (=150 + 120 + 180)

| Statement showing Overheads Allocation using ABC | | | | | |
|---|---|---|---|---|---|
| **Particulars** | **Cost Driver** | **P** | **Q** | **R** | **Total (Rs.)** |
| Machine Department Expenses | Machine Hours | 4,20,000 (30,000 × Rs.14) | 6,72,000 (48,000 × Rs.14) | 7,56,000 (54,000 × Rs.14) | 18,48,000 |
| Assembly Department Expenses | Assembly Hours | 2,40,000 (15,000 × Rs.16) | x | 4,32,000 (27,000 × Rs.16) | 6,72,000 |
| Setup Cost | No. of Production Runs | 30,000 (150 × Rs.200) | 24,000 (120 × Rs.200) | 36,000 (180 × Rs.200) | 90,000 |
| Stores Receiving Cost | No. of Requisitions Raised on the Stores | 40,000 (40 × Rs.1,000) | 30,000 (30 ×Rs.1,000) | 50,000 (50 × Rs.1,000) | 1,20,000 |
| Order Processing and Dispatch | No. of Customers Orders Executed | 60,000 (1,250 × Rs.48) | 48,000 (1,000 × Rs.48) | 72,000 (1,500 × Rs.48) | 1,80,000 |
| Inspection and Quality Control Cost | No. of Production Runs | 12,000 (150 × Rs.80) | 9,600 (120 × Rs.80) | 14,400 (180 × Rs.80) | 36,000 |
| **Overhead** | | **8,02,000** | **7,83,600** | **13,60,400** | **29,46,000** |

**Example 4.** ABC Ltd. is a manufacturer of a range of goods. The cost structure of its different products is as follows:

| Particulars | A | B | C |
|---|---|---|---|
| | Rs. Per unit | | |
| Direct Materials | 50 | 40 | 40 |
| Direct Labour @ Rs. 10/ hour | 30 | 40 | 50 |
| Production Overheads | 30 | 40 | 50 |
| Total Cost | 110 | 120 | 140 |
| | Units | | |
| Quantity Produced | 10,000 | 20,000 | 30,000 |

The company was absorbing overheads on the basis of direct labour hours. A newly appointed management accountant has suggested that the company should introduce ABC system and has identified cost drivers and cost pools as follows:

| Activity Cost Pool | Cost Driver | Associated Cost (Rs.) |
|---|---|---|
| Stores Receiving | Purchase Requisitions | 2,96,000 |
| Inspection | Number of Production Runs | 8,94,000 |
| Dispatch | Orders Executed | 2,10,000 |
| Machine Setup | Number of Setups | 12,00,000 |

The following information is also supplied:

| Details | A | B | C |
|---|---|---|---|
| No. of Setups | 360 | 390 | 450 |
| No. of Orders Executed | 180 | 270 | 300 |
| No. of Production Runs | 750 | 1,050 | 1,200 |
| No. of Purchase Requisitions | 300 | 450 | 500 |

Calculate activity-based production cost of all the three products.

**Solution:**

The total production overheads are Rs.26,00,000 computed as follows:

Product A: 10,000 × Rs. 30 = Rs. 3,00,000

Product B: 20,000 × Rs. 40 = Rs. 8,00,000

Product C: 30,000 × Rs. 50 = Rs. 15,00,000

Using ABC analysis this amount will be apportioned.

| Statement showing computation of Production Cost using ABC | | | | | | |
|---|---|---|---|---|---|---|
| Activity Cost Pool | Cost Driver | Ratio | Amount (Rs.) | A (Rs.) | B (Rs.) | C (Rs.) |
| Stores Receiving | Purchase Requisition | 6:9:10 | 2,96,000 | 71,040 | 1,06,560 | 1,18,400 |
| Inspection | Production Runs | 5:7:8 | 8,94,000 | 2,23,500 | 3,12,900 | 3,57,600 |
| Dispatch | Orders Executed | 6:9:10 | 2,10,000 | 50,400 | 75,600 | 84,000 |
| Machine Setups | Setups | 12:13:15 | 12,00,000 | 3,60,000 | 3,90,000 | 4,50,000 |
| Total Activity Cost | | | | 7,04,940 | 8,85,060 | 10,10,000 |
| Quantity Sold | | | | 10,000 | 20,000 | 30,000 |
| Unit Cost (Overheads) | | | | 70.49 | 44.25 | 33.67 |
| Add: Conversion Cost | | | | 80 | 80 | 90 |
| Total | | | | 150.49 | 124.25 | 123.67 |

**Example 5.** The following are Product A's data for next year budget:

| Activity | Cost Driver | Cost Driver Volume / Year | Cost Pool (Rs.) |
|---|---|---|---|
| Purchasing | Purchase orders | 1,500 | 75,000 |
| Setting | Batches produced | 2,800 | 1,12,000 |
| Materials handling | Materials movements | 8,000 | 96,000 |
| Inspection | Batches produced | 2,800 | 70,000 |
| Machining costs | Machine hours | 50,000 | 1,50,000 |
| **Total** | | | **5,03,000** |

The other details are as follows:

| Purchase order | 25 |
|---|---|
| Output | 15,000 units |
| Production batch size | 100 units |
| Materials movements per batch | 6 |
| Machine hours per unit… | 0.1 |

Calculate the budgeted overhead costs using absorption costing (absorb overhead using machine hours) and ABC.

**Solution:**

**Computation of Budgeted Overheads Costs using Absorption Costing**

Budgeted Overheads  = Rs. 5,03,000

Budgeted Absorption Cost per Machine Hour = (Rs.503,000 / 50,000 Hours) = Rs.10.06

Budgeted Machining Hours for Product Alpha = 1,500 hrs.

Budgeted Absorbed Overhead (1,500 hrs. × Rs. 10.06) = Rs.15,090

**Computation of Budgeted Overhead Costs using Activity Based Costing**

| Statement showing computation of Cost Driver Rate | | | | |
|---|---|---|---|---|
| Activity | Cost Driver | Cost Pool (Rs.) [a] | Cost Driver Volume/Year [b] | Cost Driver Rate (Rs.) [a/b] |
| Purchasing | Purchase Orders | 75,000 | 1,500 | 50 per Purchase Order |
| Setting | Batches Produced | 1,12,000 | 2,800 | 40 per Batch |
| Materials Handling | Material Movements | 96,000 | 8,000 | 12 per Movement |
| Inspection | Batches Produced | 70,000 | 2,800 | 25 per Batch |
| Machining | Machine Hours | 1,50,000 | 50,000 | 3 per Machine Hour |
| | | 5,03,000 | | |

**Computation of the Volume of Cost Drivers**

Purchase Orders (given) = 25

Batches (15,000 / 100) = 150

Materials Movement (150 batches × 6) = 900

Machine Hours (15,000 units × 0.1) = 1,500

| Statement showing computation of the Overheads Cost using ABC | | | |
|---|---|---|---|
| Activity | Cost Driver | Costing Rate/Cost Driver Unit (Rs.) | Overhead Cost (Rs.) |
| Purchasing | Purchase Orders | 50 | Rs.1,250 (25 Order × Rs.50) |
| Setting | Batches Produced | 40 | Rs.6,000 (150 Batches × Rs. 40) |
| Material Handling | Material Movements | 12 | Rs.10,800 (900 Movement × Rs.12) |
| Inspection | Batches Produced | 25 | Rs. 3,750 (150 Batches × Rs. 25) |
| Machining | Machine Hours | 3 | Rs. 4,500 (1,500 Hours × Rs. 3) |
| **Total** | | | **Rs. 26,300** |

**SUGGESTED ADDITIONAL READING**

Relevant chapter on ABC

- Banerjee, B. Cost Accounting. Prentice Hall of India.
- Blocher, Chen, Cokins, & Lin. Cost Management: A Strategic Emphasis. TMH.
- Drury, C. Management and Cost Accounting. Cengage.
- Horagren, Dabur, & Foster. Cost Accounting: A Managerial Emphasis. Peasons Education.
- Kishore, R. M. Cost Management. Taxmann.