

Activity-Based Costing (ABC)

Learning Objectives

After reading this chapter, you should be able to:

1. explain Activity-Based Costing (ABC) — definition, its stages and flow of costs, its advantages and disadvantages and its utility in service organisations;
2. discuss the classification of activities in manufacturing organisations for ABC;
3. discuss the concepts of cost driver, target costing, Kaizen costing, Life cycle costing, Activity-based management (ABM) and the differences between traditional costing system and activity-based costing system.

MEANING OF ACTIVITY-BASED COSTING (ABC)

Activity-based Costing (ABC) is that costing in which costs are first traced to activities and then to products. The ABC is a costing system which focuses on activities performed to produce products. Activities become the focal points for cost accumulation. This costing system assumes that activities are responsible for the incurrence of costs and products create the demands for activities. Costs are charged to products based on individual product's use of each activity. In traditional product costing system, costs are, first, traced not to activities but to an organisational unit, such as department or plant and then to products. It means under both ABC and traditional costing system, the second and final stage consists of tracing costs to the product. By emphasising activities, ABC tries to ascertain the factors that cause each major activity, cost of such activities and the relationship between activities and products produced. The relationship between activities and products has been shown in the Figure 8.1.

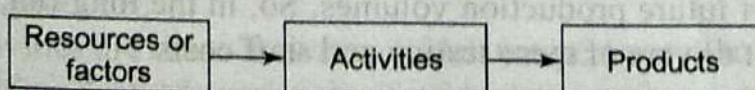


Fig. 8.1 ABC Process

STAGES AND FLOW OF COSTS IN ABC

There are two primary stages in ABC—first, tracing costs to activities; second, tracing activities to products. The different steps in the two stages of ABC are explained below:

Step 1 Identify the main activities in the organisation.

Examples include: materials handling, purchasing, receipt, despatch, machining assembly and so on.

Step 2 Identify the factors which determine the costs of an activity. These are known as cost drivers.

Examples include: number of purchase orders, number of orders delivered, number of setups and so on.

Step 3 Collect the costs of each activity. These are known as cost pools and are directly equivalent to conventional cost centres.

Step 4 Charge support overheads to products on the basis of their usage of the activity, expressed in terms of the chosen cost driver(s). For example, if the total costs of purchasing were ₹2,00,000 and there were 1,000 purchase orders (the chosen cost driver), products would be charged ₹200 per purchase order. Thus a batch generating 3 purchase orders would be charged $3 \times ₹200 = ₹600$ for purchasing overheads.

COST DRIVERS

A cost driver also known as cost primer, is an activity which generates cost. A cost driver is a factor, such as the level of activity or volume, that casually affects costs (over a given time span). That is, a cause-and-effect relationship exists between a change in the level of activity or volume and a change in the level of the total costs of that cost object. Thus, cost drivers signify factors, forces or events that determine the costs of activities. Thus, the factors (costdrivers) that influence the cost of a particular activity should be identified. It should be understood that direct costs do not need cost drivers as they can be traced directly to a product. Direct costs are themselves cost drivers. However, all other factory or manufacturing costs need cost drivers. Cost drivers are the links and they can link a pool of costs in an activity centre to the product. Therefore, in order to trace overhead costs to products, appropriate cost drivers should be identified. Figure 8.2 gives examples of some cost drivers in activity based costing system.

In traditional product costing, the number of cost drivers used are few such as direct labour hours, machine hours, direct labour cost, units produced. But ABC may use a multitude of cost drivers that relate costs more closely to the resources consumed and activities occurring.

Costs that are fixed in the short run have no cost drivers in the short run but may have cost drivers in the long run. For instance, costs of testing personal computers (which comprise costs of testing department equipment and staff costs) may not change with changes in the volume of production. Therefore, these costs would be fixed in the short run. In the long run, however, an organisation may need to increase/decrease testing department's equipment and staff to the levels needed to support future production volumes. So, in the long-run, volume of production or activity becomes cost drivers of these testing and staff costs.

Classification of Activities in Manufacturing Organisations

In manufacturing organisations, activities are identified and classified into different categories or segments of the production process. The grouping of activities is preferably done using the different levels at which activities are performed. Broadly, activities are classified into one of four activity categories:

1. Unit-level Activities.
2. Batch-level Activities.
3. Product-level Activities.
4. Facility-level Activities.

Cost Drivers	
1. Number of receiving orders for the receiving department.	Receiving level
2. Number of purchase orders for the cost of operating the purchase department.	Purchasing level
3. Number of despatch orders for the despatch department.	Despatch level
4. Number of units.	Unit level
5. Number of setups.	Setup level
6. Amount of labour cost incurred.	Direct labour level
7. Value of materials in a product.	Materials level
8. Number of materials handling hours.	Materials handling level
9. Number of inspections.	Inspection level
10. Number of schedule changes.	Scheduling level
11. Number of parts received per month.	Part level
12. Number of machine hours used on a product.	Machine level
13. Number of set up hours.	Setup level
14. Number of direct labour hours.	Direct labour level
15. Number of sub-assemblies.	Sub-assembly level
16. Number of vendors.	Vendor level
17. Number of purchasing and ordering hours.	Purchasing and ordering level
18. Number of units scrapped.	Scrap level
19. Number of labour transactions.	Labor transaction level
20. Number of parts.	Part level
21. Number of customer orders processed.	Customer order processing level
22. Number of employees.	Facility level

Fig. 8.2 Cost Drivers

Unit level activities are those activities which are performed each time a unit is produced. They are repetitive activities. For example, direct labour hours, machine hours, power are used each time a unit is produced. Direct materials and direct labour activities are also unit level activities, although they are not overhead costs. Costs of unit level activities vary with the number of units produced.

Batch level activities are those activities which are performed each time a batch of goods or products is produced. The costs of batch level activities vary with the number of batches but are fixed with respect to the number of units in each batch. Machine setups, inspections, production scheduling, materials handling are examples of batch level activities which are related to batches but not to individual products.

Product level activities are those activities which are performed to support the production of each different type of product. Maintenance of equipment, engineering charges, testing routines, maintaining bills of materials, handling materials are some examples of product-level activities.

Facility-level activities are those which are needed to sustain a factory's general manufacturing process. These activities are common to a variety of products and are most difficult to link to product specific activities. Examples of facility-level activities are factory management, maintenance, security, plant depreciation.

In ABC system, facility level activities and costs are treated as period cost as they are found difficult to assign to different products. The costs associated with the first three categories—unit level, batch level, product level—are assigned to products, using cost drivers that reflect the cause and effect relationship between activity consumption and cost.

Several additional examples of the costs driven by activities at each above level are presented in Fig. 8.3.

Activity Level	Reason for Activity	Examples of Activity Cost
1. Unit level	Performed for each unit of product produced or sold	<ul style="list-style-type: none"> • Cost of raw materials • Cost of inserting a component • Utilities cost of operating equipment • Some costs of packaging • Sales commissions
2. Batch level	Performed for each batch of product produced or sold	<ul style="list-style-type: none"> • Cost of processing sales order • Cost of issuing and tracking work order • Cost of equipment setup • Cost of moving batch between workstations • Cost of inspection (assuming same number of units inspected in each batch)
3. Product level	Performed to support each different product that can be produced	<ul style="list-style-type: none"> • Cost of product development • Cost of product marketing such as advertising • Cost of specialised equipment • Cost of maintaining specialised equipment
4. Facility level	Performed to maintain general manufacturing capabilities	<ul style="list-style-type: none"> • Cost of maintaining general facilities such as buildings and grounds • Cost of nonspecialised equipment • Cost of maintaining nonspecialised equipment • Cost of real property taxes • Cost of general advertising • Cost of general administration such as the plant manager's salary

Fig. 8.3 Activity Levels and Associated Activity Costs

Source: Wayne J. Morse, James R. Davis, Al. L. Hartgraves, Management accounting, A Strategic Approach, South Western College Publishing, 2000, p.54.

Comparing ABC with Traditional Costing System

In traditional costing system, overhead costs are assumed to be influenced by only units produced. It means, in traditional costing system, costs of batch level, product level and facility level activities are fixed costs, that is, costs of these do not vary as production volume changes. Unit-based cost systems apportion fixed overhead to individual products and variable overhead are directly assigned to products using the base of number of units produced.

When fixed overheads are apportioned on the basis of units made, as in traditional costing, such apportionment is likely to be arbitrary and also may not reflect activities and cost actually consumed by the products. ABC improves product costing procedure (as compared to traditional

costing) because it recognises that many so-called fixed overhead costs vary in proportion to changes other than production units. It means, under ABC, the other two level activities—batch level and product level—are assumed to influence fixed overhead costs and batch level and product level, thus, are accepted as non unit-based cost drivers. By establishing the link between these cost drivers and fixed overhead costs, they are finally traced to individual products. Figure 8.4 presents an overview of product cost determination under traditional costing and ABC system.

Traditional Costing and Activity-based Costing System

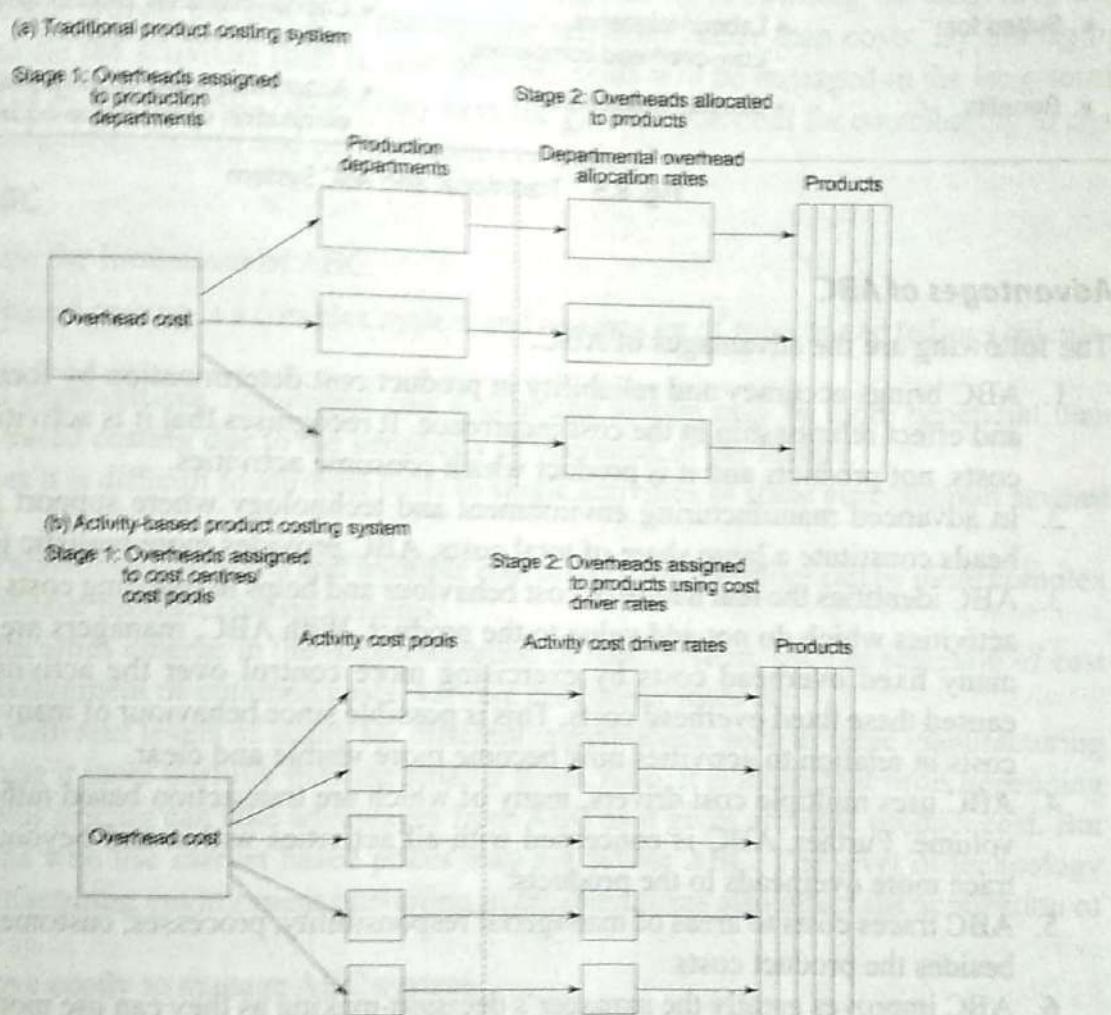


Fig. 8.4 Comparison of Traditional and Activity-based Costing System

Source: J. Innes and F. Mitchell, *Activity-Based Costing: A Review with Case Studies*, 1990, CIMA, U.K.

Figure 8.4 displays that both the costing systems follow a two-stage allocation procedure. In traditional costing, in the first stage, overhead costs are allocated to production departments. But in ABC, in the first stage, overhead costs are assigned to each major activity and not to departments. In traditional costing, overheads are pooled/collected department-wise. But, in ABC, many activity-based cost pools or cost centres are created. In traditional costing, overhead costs of service departments are allocated/reapportioned to production department and therefore in this costing system finally only fewer cost pools exist. But ABC creates separate cost pools for service activities as well and overhead costs of these service activities (service departments) are

assigned directly to specific products through applying cost driver rates. Thus, in ABC, there is no need to allocate/reapportion overheads of service departments.

The fundamental differences in the conventional and ABC cost system are summarised in Fig. 8.5.

	<i>Traditional</i>	<i>ABC</i>
• Cost pools	• One or a limited number	• Many, to reflect different activities
• Applied rate	• Volume-based, financial	• Activity-based, non-financial
• Suited for	• Labour-intensive, Low-overhead companies	• Capital-intensive, product-diverse, high-overhead companies
• Benefits	• Simple, inexpensive	• Accurate product costing, possible elimination of non-value-added activities

Fig. 8.5 Traditional and ABC System

Advantages of ABC

The following are the advantages of ABC.

1. ABC brings accuracy and reliability in product cost determination by focussing on cause and effect relationship in the cost incurrence. It recognises that it is activities which cause costs, not products and it is product which consume activities.
2. In advanced manufacturing environment and technology where support functions overheads constitute a large share of total costs, ABC provides more realistic product costs.
3. ABC identifies the real nature of cost behaviour and helps in reducing costs and identifying activities which do not add value to the product. With ABC, managers are able to control many fixed overhead costs by exercising more control over the activities which have caused these fixed overhead costs. This is possible since behaviour of many fixed overhead costs in relation to activities now become more visible and clear.
4. ABC uses multiple cost drivers, many of which are transaction based rather than product volume. Further, ABC is concerned with all activities within and beyond the factory to trace more overheads to the products.
5. ABC traces costs to areas of managerial responsibility, processes, customers, departments besides the product costs.
6. ABC improves greatly the manager's decision-making as they can use more reliable product cost data. ABC helps usefully in fixing selling prices of products as more correct data of product cost is now readily available.
7. ABC produces reliable and correct product cost data in case of greater diversity among the products manufactured such as low-volume products, high-volume products. Traditional costing system is likely to bring errors and approximation in product cost determination due to using arbitrary apportionment and absorption methods.
8. ABC provides cost driver rates and information on transaction volumes which are very useful to management for cost management and performance appraisal of responsibility centres. Cost driver rates can be used advantageously for the design of new products or existing products as they indicate overhead costs that are likely to be applied in costing the product.

Colin Drury¹ observes:

"ABC provides not only a base for calculating more accurate product costs but also a mechanism for managing costs. An ABC system focuses management attention on the underlying causes of costs. It assumes that resource-consuming activities cause costs and that products incur costs through the activities they require for designing, engineering, manufacturing, marketing, delivery, invoicing and servicing. By collecting and reporting on the significant activities in which a business engages, it is possible to understand and manage costs more effectively."

With an ABC system, costs are managed in the long run by controlling the activities that drive them. In other words, the aim is to manage the activities rather than costs. By managing the forces that cause the activities (that is, cost drivers), costs will be managed in the long-term. The application of activity-based systems may have the greatest potential for contributing to cost management, budgeting, control and performance evaluation."

Demerits of ABC

The following are the limitations of ABC.

1. Activity-based costing is a complex system and requires lot of records and tedious calculations.
2. For small organisations, traditional cost accounting system may be more beneficial than Activity-based costing due to the simplicity of operation of the former.
3. Sometimes it is difficult to attribute costs to single activities as some costs support several activities.
4. ABC has numerous cost pools and multiple cost drivers and therefore can be more complex than traditional product costing systems.
5. Some difficulties emerge in the implementation of ABC system, such as selection of cost drivers, assignment of common costs, varying cost driver rates etc.
6. ABC has different levels of utility for different organisations such as large manufacturing firm can use it more usefully than the smaller firms. Also, it is likely that firms depending on cost-plus pricing can take advantages from ABC as it gives accurate product cost. But those firms who use market based prices may not favour ABC. The level of technology and manufacturing environment prevailing in different firms also affect the application of ABC.
7. It can prove costly to manage ABC system.
8. ABC system can only be successful if there is a total support from top management.

The decision to use ABC is comparing costs and benefits relating to this system. The advantages to a company of ABC system depends on many factors such as level of competition, number of products manufactured and product diversity. It can be claimed that those companies who operate in a more competitive environment, are in dire need of correct product cost data for taking sound decisions with regard to determination of selling prices and taking better cost management measures. Whether a company manufactures and sells smaller number or large number of products, it influences the operation of ABC system and the degree of sophistication in the system.

¹. Colin Drury, *Management and Cost Accounting*, Thomas Learning, 2000, p. 285.

ABC in Service Organisations

The discussion of ABC so far has focussed on manufacturing companies where important cost components like direct material and direct labour can be traced to individual products. Therefore indirect costs are likely to be a much smaller proportional of total costs in such manufacturing companies. In service organisations, most of the costs are treated fixed and indirect, and therefore irrelevant for most decisions. No attempt is made to make profitability analysis in service organisations. There is a greater need of using ABC in service companies. Kaplan and Cooper² suggest that service companies are ideal candidates for ABC, even more than manufacturing companies. Earlier, service organisations were government-owned or operated in highly regulated, protected and non-competitive environment. Thus, service organisations were not under any pressure to improve profitability by eliminating non-value added or non-profit activities. The prices of services were simply increased to cover cost increases. No efforts was made to design a cost system that accurately measures the costs and profitability of individual services.

However, due to privatisation, deregulation and increasing competition, the service organisations need to have cost and management accounting systems which can help them to accurately measure cost and resulting profitability for their services, customers and markets. Therefore, ABC would prove advantageous to service organisations to understand their cost base and to make decisions on value-added/non-value added activities.

TARGET COSTING

Target costing implies developing product cost in terms of what the market will pay for a product with specific characteristics.

Target costing is a systematic approach to establishing product cost goals based on market driven standards. It is a strategic management process for reducing costs at the early stages of product planning and design. Target costing begins with identifying customer needs and calculating an acceptable target sales price for the product. Working backward from the sales price, companies establish an acceptable target profit and calculate the target cost as follows:

$$\text{Target Cost} = \text{Target Price} - \text{Target Profit}$$

Target costing is different from standard costing. While target costs are determined by market driven standards ($\text{target sales price} - \text{target profit} = \text{target cost}$), standard costs are determined by design – driven standards with less emphasis on what the market will pay (engineered costs + desired markup = desired sales price).

Since the early 1970s target costing has been used by some companies, especially Japanese companies which aim to ascertain cost in a different manner. Target costing is a common practice where markets are extremely competitive. The market determines the price of products and there is a little opportunity for the individual organisations to set prices. Therefore, controlling cost is extremely important.

KAIZEN COSTING

Kaizen Costing, also referred as continuous improvement costing, is a mechanism for reducing and managing costs. Kaizen is the Japanese term for making continuous improvements in relatively

²R.S. Kaplan and R. Cooker, *Cost and Effect: Using Integrated Systems to Drive Profitability and Performance*, Harvard Business School, Press, 1998.

small activities rather than major innovative improvement. The major difference between target and Kaizen costing is that target costing is applied during the design stage whereas Kaizen costing is applied during the manufacturing stage of the product life cycle.

The objective of Kaizen costing is to reduce actual costs to manufacture a product below the standard cost. Standard cost system generally aim to achieve the cost standards set by management while Kaizen costing systems are more concerned with reducing actual costs below standard costs. The potential cost reductions are smaller with Kaizen costing because the products are already in the manufacturing stage of their life cycles and a significant proportion of costs will have become locked-in.

Barfield, Raiborn and Kinney³ have stated the following differences between target costing and Kaizen costing.

	<i>Target Costing</i>	<i>Kaizen Costing</i>
What?	A procedural approach to determining a maximum allowable cost for an identifiable, proposed product assuming a given target profit margin	A mandate to reduce costs, increase product quality, and/or improve production processes through continuous improvement efforts
Used for?	New products	Existing products
When?	Development stage (includes design)	Primary production stages (introduction and growth; possibly, but not probably, maturity)
How?	Works best through aiming at a specified cost reduction objective; used to get original production standards	Works best through aiming at a specified cost reduction objective; reductions are integrated into original production standards to sustain improvements and provide new challenges
Why?	Extremely large potential for cost reduction because 80% to 90% of a product's lifelong costs are embedded in the product during the design and development stages	Limited potential for reducing cost of existing products, but may provide useful information for future target costing efforts
Focus?	All product inputs (material, labour, and overhead elements) as well as production processes and supplier components	Depends on where efforts will be most effective in reducing production costs; generally begins with the most costly component and (in the more mature companies) ends with overhead components

LIFE-CYCLE COSTING

Life-Cycle Costs are all the costs associated with the product for its entire life cycle. They include development (planning, design and testing), production (conversion activities), and logistics support (advertising, distribution, warranty and so on). Identifying costs during the different phases of a product's life cycle helps to develop understanding of costs and subsequently in managing the costs incurred throughout its life cycle. Life-cycle costs provide important information for pricing.

³ Jesse T. Barfield, Cecily A. Raiborn and Michael R. Kinney, *Cost Accounting, Traditions and Innovations*, 5th Ed, Thomson, 2003, p.721.

ACTIVITY-BASED MANAGEMENT (ABM)

As stated earlier in this chapter, Activity-Based Costing (ABC) is concerned with ascertainment of costs. In ABC, resources are assigned to activities based upon consumption and activities are assigned to cost objects (products, jobs, services) based on consumption. ABC assumes and gives due importance to causal relationship of cost drivers to activities.

Activity-based management (ABM) emphasises on management of activities with the objectives of improving the value received by the customer and the profit achieved by business enterprise by providing this value. It includes cost driver analysis, activity analysis and performance measurement and depends on ABC for its major source of data. Holst and Savage⁴ observe:

"ABC is used to answer the question what do things cost? while ABM, employing a process view, is concerned with what factors cause costs to occur. Using ABC data, ABM focuses on how to redirect and improve the use of resources to increase the value created for customers and other stakeholders".

Through focusing on activity analysis, cost driver analysis and activity-based costing, ABM helps companies to produce more efficiently, determine costs more accurately and control and evaluate performance more effectively. ABM through activity analysis analyses activities, classifies them into value-added and non-value added activities and finally develops means and methods of minimising or eliminating non-value added activities.

Example 8.1

A company manufactures two products, A and B, using common facilities. The following cost data for a month are presented to you:

	A	B
Units produced	1,000	2,000
Direct labour hours per unit	2	3
Machine hours per unit	6	1.5
Set-up of machines	15	50
Orders	18	70
Machine activity expenses		₹3,00,000
Set-up related expenses		₹30,000
Expenses relating to orders		₹35,000

Calculate the overheads per unit absorbed using activity-based costing approach.

(B.Com (Hons), Delhi University, 2012)

⁴. Randolph Holst and Robert J., *Savage, Tools and Techniques for Implementing Activity-Based Management* in Steve Player et al (Eds.) Arthur Anderson's Global Lesions on Activity-Based Management, John Wiley and Sons, New York, 1999, p 4.

Solution**Calculation of Rate per Cost Driver**

<i>Activity</i>	<i>Activity Cost (₹)</i>	<i>Cost Driver</i>	<i>Rate per Cost Driver (₹)</i>
(i) Machine related	3,00,000	Machine hours $(1000 \times 6 + 2000 \times 1.5)$	$3,00,000/9000 = 33.3333$
(ii) Set up related	30,000	No. of set ups (15 + 50)	$30,000/65 = 461.538$
(iii) Orders related	35,000	No. of orders (18 + 70)	$35,000/88 = 397.73$

<i>Product</i>	<i>A</i>		<i>B</i>	
	<i>Output unit</i>	1000		2000
<i>Activity</i>	<i>Cost (₹)</i>	<i>Rate p.u. (₹)</i>	<i>Cost (₹)</i>	<i>Rate p.u. (₹)</i>
(i) Machine related	600×33.33 = 2,00,000	200.000	3000×33.3333 = 1,00,000	50.000
(ii) Set up related	15×461.538 = 6923	6.923	50×461.538 = 23,076.90	11.538
(iii) Orders related	18×397.73 = 7159	7.159	70×397.73 = 27,841.10	13.921
	2,14,082	214.082	1,50,918	75.458

Example 8.2

ABC Manufacturing Co. has been using a cost system that allocates all factory overhead costs to products based on 350 per cent of direct labour cost. The company has just decided to use Activity-Based Cost (ABC) system that traces indirect costs to products based on consumption of major activities as indicated below.

<i>Activity</i>	<i>Annual Cost</i>	<i>Cost</i>	<i>Product's cost</i>
	<i>Driver Quantity</i>	<i>(₹)</i>	<i>Driver Consumption</i>
Labour	₹3,00,000	30,000	₹10,000
Machining	20,000 hours	5,00,000	800 hours
Setup	10,000 hours	1,00,000	100 hours
Production order	2000 orders	2,00,000	12 orders
Material handling	1000 requisitions	20,000	5 requisitions
Parts administration	12,000 parts	4,80,000	18 parts

Required:

Compare the total annual costs of the product using both the traditional volume-based and new ABC system.

Solution

Cost system	Pool rate	Cost Driver Consumption	Cost Assignment (\$)
Traditional cost system	350%	£10,000	£35,000
ABC System:			
(i) Labour	10%	£10,000	£1,000
(ii) Machining	£25 per hour	800 hours	20,000
(iii) Set up	£10 per hour	100 hours	1,000
(iv) Production order	£100 per order	12 orders	1,200
(v) Material handling	£20 per requisition	5 requisitions	100
(vi) Parts administration	£40 per part	18 parts	720
			£24,920

Conclusion: The total cost of product under ABC is £24,920 whereas under traditional cost system it is £35,000.

Example 8.3

ABC manufacturing company has three accounts clerks responsible for processing purchase invoices. Each clerk is paid a salary of £3,00,000 p.a. and is capable of processing 5000 invoices per year (working efficiently). In addition to the salary, the company spends £90,000 per year for forms, postage etc. (assuming that 15,000 invoices are processed). During the year, 12,500 invoices were processed.

Required:

- Calculate the activity rate for the purchase order activity. Break the activity into fixed and variable components.
- Compute the total activity availability and break this into activity usage and unused activity.
- Calculate the total cost of resources supplied and break this into activity usage and unused activity.

Solution

1. Activity rate	$= [(3 \times £3,00,000) + £90,000]/15,000$ = £66 per invoice
Fixed activity rate	$= £9,00,000/15,000$ = £60 per invoice
Variable activity rate	$= £90,000/15,000$ = £6 per invoice
2. Activity availability	= Activity usage + Unused activity
15000 invoices	= 12,500 invoices + 2500 invoices
3. Cost of resources supplied	= Cost of activity used + Cost of unused activity
$£9,00,000 + (£6 \times 12,500)$	$= (£66 \times 12,500) + (£60 \times 2500)$
£9,75,000	= £825,000 + £15,000

Example 8.4

A company manufacturing two products furnishes the following data for a year:

Product	Annual output (units)	Total machine hours	Total number of purchase orders	Total number of set-ups
A	5,000	20,000	160	20
B	60,000	1,20,000	384	44

The annual overheads are as under:

Volume related activity costs:

Set-up related costs

Purchase related costs

You are required to calculate the cost per unit of each product A and B based on:

- Traditional method of charging overheads.
- Activity based costing method

(B.Com.(Hons), Delhi, 2006, CA, PE, Exam II, Group II, Nov. 2002)

Solution**(a) Traditional method of charging overheads:**

Volume related activity costs	₹ 5,50,000
Set-up related costs	8,20,000
Purchase related costs	6,18,000
Total costs	₹ 19,88,000
Total machine hours (20,000 + 1,20,000)	= 1,40,000
Total cost per hour (₹19,88,000/1,40,000)	= ₹14.20
Cost per unit of A = (20,000 × ₹14.20)/5,000	= ₹56.80
Cost per unit of B = (1,20,000 × ₹14.20)/60,000	= ₹28.40

(b) Activity based costing method of charging overheads:

Volume related activity cost per machine hour: ₹5,50,000/1,40,000	= ₹3.9286
Set-up costs per set-up: ₹8,20,000/64	= ₹12,812.50
Purchase related costs per purchase order: ₹6,18,000/544	= ₹1136.029

Cost per unit of product

Particulars	Cost driver	A	B
Volume related costs	Machine hours	₹78,572	₹4,71,432
Set-up costs	Number of set-ups	2,56,240	5,63,728
Purchase related costs	Number of purchase orders	1,81,765	4,36,235
	Total costs	₹5,16,577	₹14,71,395
Cost per unit		₹103.32	₹24.52

Example 8.5

A company manufacturing two products L and M, furnishes the ahead data for the year —

Product	Annual output (units)	Machine hours (per unit)	Direct Labour hours (per unit)	Total number of orders handled	Total number of setups
L	5,000	3	1	15	
M	7,000	1	2	60	10
					40
Annual overhead costs:					
Relating to machine activity					2,20,000
Relating to production run set-ups					20,000
Relating to handling of orders					45,000
					2,85,000

Required

Calculate the production overhead to be absorbed by one unit of each of the products L and M using the following costing methods.

- A traditional costing approach using a direct labour hour rate to absorb overheads.
- An activity based costing approach, using suitable cost drivers to trace overheads to products.

(B. Com. (Hons), Delhi University, 2008)

Solution**(i) Traditional Costing Method**

$$\text{Direct labour hour rate} = \frac{\text{Total cost}}{\text{Direct labour hours}}$$

$$= \frac{2,85,000}{5,000 \times 1 + 7000 \times 2} = ₹15 \text{ per labour hour}$$

Cost Per Unit

	Labour Hours	Rate per hour	Total Cost	Per Unit
L	$5,000 \times 1$	15	75,000	15 per unit
M	$7,000 \times 2$	15	2,10,000	30 per unit
			2,85,000	

(ii)

$$\text{Cost per setup} = \frac{\text{Set ups cost}}{\text{Number of set ups}} = \frac{20,000}{50} = 400 \text{ per set up}$$

$$\text{Machine hour rate} = \frac{2,20,000}{5,000 \times 3 + 7,000 \times 1} = \frac{2,20,000}{15,000 + 7,000} = ₹10.$$

$$\text{Cost per order} = \frac{\text{Cost related to order}}{\text{Number of orders}} = \frac{45,000}{75} = ₹600 \text{ per order}$$

Activity Based costing

<i>Output</i>	<i>Machine Hour Rate</i>	<i>Order Cost</i>	<i>Setups</i>	<i>Total</i>	<i>Cost per Unit</i>
L 5,000	$5,000 \times 3 \times 10 = 1,50,000$	$15 \times 600 = 9,000$	$10 \times 400 = 4,000$	1,63,000	1,63,000 5,000 = 32.60
M 7,000	$7,000 \times 1 \times 10 = 70,000$	$60 \times 600 = 36,000$	$40 \times 400 = 16,000$	1,22,000 7,000 = 17.43	1,22,000 7,000 = 17.43

Example 8.6

A company manufacturing two products furnishes the following data for a year:

<i>Product</i>	<i>Annual Output (Units)</i>	<i>Total Machine hours</i>	<i>Total number of purchase orders</i>	<i>Total number of set-ups</i>
A	5,000	20,000	160	20
B	60,000	1,20,000	384	44

The annual overheads are as under:

Volume related activity costs	₹ 5,50,000
Set up related costs	8,20,000
Purchase related costs	6,18,000

You are required to calculate the cost per unit of each product A and B based on:

- (i) Traditional method of costing using machine hour rate method; and
- (ii) Activity based costing method; and comment on the result.

(B. Com. (Hons), Delhi University, 2011)

Solution**Traditional Method**

$$\begin{aligned}
 \text{(i) Machine hour rate} &= \frac{\text{Total cost}}{\text{Total machine hours}} \\
 &= \frac{5,50,000 + 8,20,000 + 6,18,000}{20,000 + 1,20,000} \\
 &= \frac{1,98,000}{14,000} = ₹14.20 \text{ per hr.}
 \end{aligned}$$

Traditional Costing Statement

<i>Product</i>	<i>Output</i>	<i>Overhead</i>	<i>Machine Hours</i>	<i>Cost Allocated</i>	<i>Overhead Cost per Unit</i>
A	5000	14.20	20,000	$20,000 \times 14.2 = 2,84,000$	$28,400 \div 5000 = 56.80$
B	60000	14.20	1,20,000	$1,20,000 \times 14.20 = 17,04,400$	$17,04,000 \div 60000 = 28.40$

(ii) Activity based Costing

Calculating of Activity cost-rates

Type of Cost	Amount (₹)	No. of events	Cost per activity
Volume	5,50,000	1,40,000 machine hour	3.9285 per hour
Set-up related	8,20,000	64 set-ups	12812.50 per set-up
Purchase	6,18,000	160 + 384 = 544 Purchase orders	1136.029 per purchase
Related			

Statement of Overhead per Unit under ABC

Product	Units	Volume related cost	Set-up related cost	Purchase Order related cost	5	6 = 3 + 4 + 5	7 = 6 ÷ 2
						Total cost	Cost per unit
A	5000	20000×3.93 = 78,600	12812.50×20 = 2,56,250	1136.03×160 = 1,81,764.80		5,16,614.80	103.22 (App.)
B	60000	120000×3.94 = 4,71,600	12812.50×44 = 5,63,750	1136.03×384 = 4,36,235.52		14,71,585.52	24.53 (App.)

Comparative Statement of Overhead Cost per Unit

Product	Overhead cost per unit under Traditional costing	Cost per unit under Activity based Costing
A	56.80	103.32
B	28.40	24.53

Traditional costing results in under costing of the low volume product and over costing of the high volume product.

Low volume product A

A firm following traditional costing will keep selling price low (as cost is low) → this will lead to high sales and yet increasing losses in the books of account.

High volume product B

There will be overcosting of high volume product in case of a firm following traditional costing. So a higher selling price will be fixed → leading to lower sales volume and hence piling inventories.

The more accurate alternative is ABC.

Example 8.7

ABC Ltd. is following Activity Based Costing. Budgeted overheads and cost driver volumes are as follows:

Cost Pool	Budgeted/Overheads (₹)	Cost Driver	Budgeted Volume
Material procurement	11.60 lakh	No. of orders	2,200
Material handling	5.00 lakh	No. of movement	1,360

(Contd.)

<i>Cost Pool</i>	<i>Budgeted/Overheads (₹)</i>	<i>Cost Driver</i>	<i>Budgeted Volume</i>
Maintenance	19.40 lakh	Maintenance hours	16,800
Set-up	8.30 lakh	No. of set-ups	1,040
Quality Control	3.52 lakh	No. of inspection	1,800
Machinery	14.40 lakhs	No. of machine hours	48,000

The company has produced a batch of 5,200 components, its material cost was ₹2.60 lakhs and labour cost ₹4.90 lakh. Usage activities of the said batch are as follows:

Material orders – 52, Material movements – 36, Maintenance hours – 1,380, Set-ups – 50, Quality Control inspection – 56 and Machine hours – 3,600

Calculate:

- (i) Cost driver rates that are used for tracing appropriate amount of overheads to the said batch.
(ii) The cost of batch of component. (I.C.W.A. Inter, June 2011)

Solution

- (i) Cost driver rates are calculated as under:

Material procurement	₹ 11,60,000 ÷ 2,200	= ₹527
Material handling	₹ 5,00,000 ÷ 1,360	= ₹368
Set-up	₹ 8,30,000 ÷ 1,040	= ₹798
Maintenance	₹ 19,40,000 ÷ 16,800	= ₹115
Quality control	₹ 3,52,000 ÷ 18,00	= ₹195
Machinery	₹ 14,40,000 ÷ 48,000	= ₹ 30

- (ii) Calculation of price cost of a batch of 5,200 components

- (iii) Overhead are charged to the batch as below:

	₹
Material procurement	$52 \times 527 = 27,404$
Material handling	$36 \times 368 = 13,248$
Set-up	$50 \times 798 = 39,900$
Maintenance	$1,380 \times 115 = 1,58,700$
Quality control	$56 \times 195 = 10,920$
Machines	$3,600 \times 30 = \underline{1,08,000}$
Total overhead absorbed	$= \underline{3,58,172}$

Total cost of production of the batch of 5,200 components:

	₹
Prime cost	7,50,000
Overhead as per activity based costing	<u>3,58,172</u>
	<u>11,08,172</u>

Example 8.8

The Caesar Company manufactures picnic tables. The company's southeastern plant has changed from a labour-intensive operation to a robotics environment. As a result, management is considering changing from a direct-labour based overhead rate to an activity-based cost method. The controller has chosen the following activity cost pools and cost drivers for the factory overhead:

	Expected		
	Overhead Cost	Cost Driver	Annual Cost Driver
Purchase orders	₹200,000	Number of orders	10,000 orders
Set-up costs	₹ 25,000	Number of set-ups	5,000 set-ups
Testing costs	₹ 48,000	Number of tests	6,000 tests
Machine maintenance	₹250,000	Machine hours	10,000 hours

Required:

- Compute the overhead rate for each cost driver.
- An order for 10 large picnic tables had the following requirements:

Number of purchase orders	6
Number of set-ups	25
Number of product tests	8
Machine hours	150

 How much overhead would be assigned to this order?
- What could management do to reduce the overhead costs assigned to these tables? What would be the impact on company net income of reducing overhead assigned to the tables?

Solution

- Purchasing orders:

$$\text{₹}200,000/10,000 = \text{₹}20 \text{ per order}$$

Set-up costs:

$$\text{₹}25,000/5,000 = \text{₹}5 \text{ per set-up}$$

Product testing:

$$\text{₹}48,000/6,000 = \text{₹}8 \text{ per product test}$$

Machine costs:

$$\text{₹}250,000/10,000 = \text{₹}25 \text{ per machine hour}$$

- Purchasing costs (6 orders × ₹20 per order)

₹120

$$\text{Set-up costs } (25 \text{ set-ups} \times \text{₹}5 \text{ per set-up})$$

125

$$\text{Product testing } (8 \text{ tests} \times \text{₹}8 \text{ per test})$$

64

$$\text{Machine costs } (150 \text{ hours} \times 25 \text{ per machine hr})$$

₹3,750

Total overhead assigned using ABC

₹4,059

(c) Since machine costs are the most significant components of the overhead costs, management could design the product to reduce the number of machine hours assigned to this product. Alternatively, management could reduce the costs associated with the machine. It would have no effect on the total net income; the cost reduction on one product will be shifted to another product or to period costs.

Example 8.9

FOAMSTAR LTD. makes three main products using broadly the same production method and equipment for each. A conventional product costing system is used at present although an ABC, system is being considered. Details of the three products for a typical period are:

	Hours per Unit		Material per Unit	Volume Units
	Labour Hours	Machine Hours	₹	
Product P	0.50	1.50	20	750
Product Q	1.50	1.00	12	1250
Product R	1.00	3.00	25	7000

Direct labour costs ₹6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹28 per machine hour.

Further analysis shows that the total of production overheads can be divided as follows:

	%
Cost relating to set-ups	35
Cost relating to machinery	20
Cost relating to materials handling	15
Cost relating to inspection	30
Total production overhead	100

The following activity volumes are associated with the product line for the period as a whole. Total activities for the period:

	Number of set-ups	Number of movements of materials	Number of inspection activities
Product P	75	12	150
Product Q	115	21	180
Product R	480	87	670
	670	120	1000

Required:

- Calculate the cost per unit for each product using conventional methods.
- Calculate the cost per unit for each product using ABC principles.
- Comment on the reasons for any differences in the costs in your answers to (i) and (ii):

(I.C.W.A. Stage 2, June 2005)

Solution**FOAMSTAR LTD.**

- (i) Statement showing product cost per unit (conventional method):

	Product P	Product Q	Product R
Direct labour @ ₹6	3.00	9.00	6.00
Material	20.00	12.00	25.00
Production overhead @ ₹28 (Machine hours – 1.5, 1, 3)	42.00 65.00	28.00 49.00	84.00 115.00

- (ii) ABC Principles – Total production overhead based on machine hours weightage
 $(750 \times 1.50 + 1250 \times 1 + 7000 \times 3) \text{ ₹}28 = \text{₹}6,54,500$

		₹
Set-up costs	35%	2,29,075
Machining	20%	1,30,900
Material handling	15%	98,175
Inspection	30%	1,96,350
		<u>6,54,500</u>

	Total	Product P	Product Q	Product R
	₹	₹	₹	₹
Set-ups (75 : 115 : 480)	2,29,075	25,643	39,319	1,64,113
Machining (1125 : 1250 : 21000)	1,30,900	6,300	7,000	1,17,600
Materials handling (12 : 21 : 87)	98,175	9,817	17,181	71,177
Inspection (150 : 180 : 670)	1,96,350	29,452	35,343	1,31,555
	<u>6,54,500</u>	<u>71,212</u>	<u>98,843</u>	<u>4,84,445</u>
Number of units		750	1250	7000
Production overhead per unit (rounded)		95	79	69

Product Cost per Unit—ABC Principles

	Product P	Product Q	Product R
	₹	₹	₹
Direct labour	3.00	9.00	6.00
Materials	20.00	12.00	25.00
Production overhead	95.00	79.00	69.00
	<u>118.00</u>	<u>100.00</u>	<u>100.00</u>

- (iii) Reasons for difference:

- Set-up cost has been distributed based on number of set-ups, it is more logical than conventional approach.
- Material handling cost is logically distributed based on number of movements of materials.
- Inspection cost is also based on inspection activity.

Hence, Product P and Product Q have received proportionally more production overhead under ABC principle than conventional product costing methods.

Working Notes:

Costs of machining have been split in proportion to the total machine hours per product.

Product - P	750×1.50	= ₹ 1,125
Product - Q	1250×1.00	= ₹ 1,250
Product - R	7000×3.00	= ₹21,000
		<u>₹23,375</u>

Example 8.10

MST Limited has collected the following data for its two activities. It calculates activity cost rates based on cost driver capacity.

Activity	Cost Driver	Capacity	Cost
Power	Kilowatt hours	50,000 kilowatt hours	₹2,00,000
Quality Inspections	Number of Inspections	10,000 Inspections	₹3,00,000

The company makes three products M, S and T. For the year ended March 31, 2004, the following consumption of cost drivers was reported:

Product	Kilowatt hours	Quality Inspections
M	10,000	3,500
S	20,000	2,500
T	15,000	3,000

Required:

- Compute the costs allocated to each product from each activity.
- Calculate the cost of unused capacity for each activity.
- Discuss the factors the management considers in choosing a capacity level to compute the budgeted fixed overhead cost rate.

(CA, PE, Exam II, Group II, May 2004)

Solution

(i) **Statement of Cost Allocation to each Product from each Activity**

	Product			
	M		S	T
	₹	₹	₹	₹
Power	40,000	80,000	60,000	1,80,000
(Refer to Working Note)	(10,000 kWh × ₹4)	(20,000 kWh × ₹4)	(15,000 kWh × ₹4)	
Quality	1,05,000	75,000	90,000	2,70,000
Inspections (Refer to Working Note)	(3,500 inspections × ₹30)	(2,500 inspections × ₹30)	(3,000 inspections × ₹30)	

Working Notes:**Rate per unit of cost driver:**

Power : (₹2,00,000/50,000 kWh) = ₹4/kWh

Quality Inspection : (₹3,00,000/10,000 inspections) = ₹30 per inspection

(ii) Computation of cost of unused capacity for each activity:

Power
 $(₹2,00,000 - ₹1,80,000)$
 Quality Inspections
 $(₹3,00,000 - ₹2,70,000)$
 Total cost of unused capacity

20,000
 30,000
 50,000

(iii) Factors management consider in choosing a capacity level to compute the budgeted fixed overhead cost rate:

- Effect on product costing and capacity management
- Effect on pricing decisions.
- Effect on performance evaluation
- Effect on financial statements
- Regulatory requirements
- Difficulties in forecasting chosen capacity level concepts.

Self-Evaluation Questions

Mr. Ashok Kumar owns a company. He has to decide which activities to perform in-house and which to outsource. His father suggested his father should be the driver for each of the activities in the cost pool.

- (a) Placing orders
- (b) Checking out customers
- (c) Bagging groceries
- (d) Delivering groceries
- (e) Stocking shelves
- (f) Janitorial and Maintenance
- (g) Training employees
- (h) Administrative
- (i) Advertising and Marketing
- (j) Accounting and Finance

Ans: Cost drivers are

- (a) Number of orders placed
- (b) Number of customers
- (c) Number of delivery trips
- (d) Number of deliveries
- (e) Hours worked
- (f) Square feet occupied
- (g) Total number of employees
- (h) Sales volume
- (i) Number of advertising campaigns
- (j) Sales volume.

Theory Questions

1. What is Activity-based Costing? Why is it needed?
2. What is a cost driver? What is the role of cost driver in tracing costs to products?
3. Explain the steps in applying Activity-based Costing (ABC) in a manufacturing company.
4. How are activities grouped in a manufacturing company?
5. Distinguish between activity-based costing and traditional costing system.
6. What are the benefits of Activity-Based Costing?
7. Define unit level activities, batch level activities, product level activities and facility level activities.
8. "Overhead costs are source of product cost distortion." Do you agree, Explain.
9. Explain the concept of Activity-Based Costing and Cost Drivers.

(ICWA, Inter, Stage II, Dec. 2003)

10. Explain briefly each of the following categories in Activity-based Costing (ABC) by giving at least two examples:
 - (i) Unit level activities
 - (ii) Batch level activities
 - (iii) Product level activities
 - (iv) Facility level activities

(CA, PE, Exam II, Group II, May 2007)

11. Discuss the different stages in Activity-Based Costing.

(CA, PE, Exam II, Group II, Nov. 2003)

12. Distinguish between target costing and Kaizen costing.

13. What is life cycle costing?

14. Write short notes on:
 - (i) Target costing
 - (ii) Kaizen costing

15. Define Activity-Based Management (ABM). What is its importance?

16. Distinguish between Activity-Based Costing (ABC) and Activity-Based Management (ABM).

17. Write a short note on 'Activity-Based Costing'.

18. Explain the following terms in relation to Activity-Based Costing:
 - (a) Cost object
 - (b) Cost primer
 - (c) Cost pool

(B. Com (Hons), Delhi, 2010)

(B. Com (Hons), Delhi, 2009)

Problems

1. ABC Company

Activity Usage Measures

Units produced per year

Prime costs (₹)

Direct labour hours

Machine hours

Production runs

Number of moves