CHAPTER III

ACTIVITY BASED COSTING (ABC):

A CONCEPTUAL ANALYSIS

3.1 INTRODUCTION

Activity Based Costing (ABC) is considered as one of the most important topics in cost and management accounting which emerged at the end of the twentieth century. ABC has attracted the attention of most of the academicians and practitioner’s during the last two decades. However, the previous chapter contained a short review of the definition of cost accounting, its objectives, evolution and development of cost accounting in the nineteenth and twentieth centuries, including the impact of the scientific management, as well as, the first and second World Wars on the development cost accounting. The last chapter briefly introduced significant changes in the manufacturing and business environment and its impact on cost. The Traditional Cost Accounting (TCA) and its problems are discussed. This chapter sets out to briefly review the background of ABC as an advanced cost and management accounting system, and provides overview of the concept of the ABC and the cost allocation process. The development of ABC, hierarchy of costs and activity drivers of ABC are discussed. This chapter also involves the adoption and implementation of ABC. In addition this chapter reviews the nature of ABC and its impact on product cost and profitability, and how ABC provides more relevant information about product cost. Various benefits and limitations of ABC are covered at the end of the chapter.
3.2 HISTORY OF DEVELOPMENT OF ACTIVITY BASED COSTING

Historical changes in the manufacturing and production processes started with the industrial revolution. These changes created demand, for accounting systems that would provide cost information for control and planning purposes, as well as, for use in product costing application and management decision-making (Drennan and Ning). ABC was developed as a cost and management accounting tool for the managers to keep up with the environmental changes particularly to maintain a suitable relationship between market growth and technological innovation for achieving long term success. Indeed changes in manufacturing and business environment and beyond have been occurring at an increasingly faster rate in many businesses. Manufacturing process has become more complex and increasingly diverse range of products is manufactured, often with individual customer specification. Technology has been a major driver, leading to increased automation in the plants. Support functions have been expanded, not just in the production environment but also in all manufacturing industry areas, to meet the demands of more sophisticated customer, and the growing complexity and variety of business.

ABC is a novelty of the 1980’s with early examples of activity thinking dating back to the 1930’s (Holzer and Norreklit 1991). During its evolution, ABC can be observed under various names such as Activity Based Approach (Morrow 1992).

1 Drennan, L and Ning, Y. (undated), The Evolution of Cost Systems, Contingency Proposition about Accounting Change.
Activity Accounting Systems (Faster and Gupta 1990)\textsuperscript{4} Cost Driver Accounting and Transaction-Based Accounting.

Vatter (1945)\textsuperscript{5} suggested the use of a transaction based approach to cost allocation and Durcker (1963)\textsuperscript{6} noted that overhead cost vary with number of transaction, not the volume of units produced. Thereby, ABC is not really new to the public sector either. In the late 1940, Government performance budgeting was first introduced to the federal government; an idea based on Activity Based Resourcing Principles (ABRP). Combat activities within Department of Defiance (DOD) have been managing with cost-per unit measures, Air force unit that fly air craft manage in ‘cost per flying hours’, the Navy manages cost per steaming hour and the army in “cost per tank mile” (DoD, 1995)\textsuperscript{7}.

In the early 1960’s, the finance and control groups of General Electric (GE) were seeking improved information for managing increasing indirect cost (Foote and Wright 1994,\textsuperscript{8} Panda 1999\textsuperscript{9}). The original study isolated the lack of coordinated measurement systems and communication as key items in contributing to escalating cost. Decision made by upstream departments such as product design by the

\begin{itemize}
\item \textsuperscript{4} Faster, G and Gupta (1990), Manufacturing Overhead Cost Driver Analysis, Journal of Accounting and Economics 12, pp. 309-337.
\item \textsuperscript{5} Vatter, W. J. (1945), Limitations of Overhead Allocation, Accounting Review, 20, pp. 163–177.
\item \textsuperscript{7} The Department of DoD, (1995), ABC Guidebook, Guidebook for using understanding Activity Based Costing, Available at WWW. c3j osd, mil/bpr/ bpcd/020 htm.
\item \textsuperscript{8} Foote, P. S. and Wright, G W. (1994), Refining Activity Based Costing, American Institute of Certified Public Accountants (AICPA).
\item \textsuperscript{9} Panda, N. M. (1999), Activity-Based Costing for Indian Industries, Mittal Publications, New Delhi.
\end{itemize}
engineering department, would subsequently direct activities such as purchasing, warehousing, account payable and customer service. The existing system recorded and reported costs by department and did not include the effect of upstream decisions. For example, the design of the product was poor, expensive material being used. If the product had been designed properly upstream costs can be controlled during assembly.

GE developed a methodology to trace and measure each direct and indirect activity to a unit of output of each department. More importantly, linkages were made between outputs of one department that resulted in input of next department and led to its increased activity.

Estimated percentages were assigned to each indirect activity allowing the identification and measurement of each activity driver. Costs were estimated for each activity by using average rates for labour and machinery; estimates for other appropriate costs were also included. Statistical information for each activity was collected for the same period; this provided an estimated cost per unit of each activity driver. Subsequent calculations were also made for all the indirect activities required to support the upstream output and “cradle to grave” average cost per unit of output was arrived at.

GE used this information to manage their indirect costs through a better understanding of the effects of activities and their resultant related costs. Indirect costs were now known and could be controlled by either reducing the activities causing the subsequent activities, or reducing the related activities. The goal of this analysis was to determine the approximate percentage of time each employee would spent in a month or year in that indirect activity and to trace the primary cause of
each activity to the output of that department. This analysis provided the management with cost data to manage and control indirect cost of every activity.

ABC was originally developed in the late 1970's and early 1980s to supplement traditional cost accounting methods in the management of operation. Accounting professionals and operations manager were slowly realizing that the existing cost systems were providing information that was not useful in decision making because of its lack of predictive value, feedback value and timeline (Foote and Wright 1994). Cost accounting system was developed to achieve many objectives in a significant manufacturing and business environment. In this manner, costing systems must do more than recording, analyzing, verifying and reporting cost; they must be able to provide information to allow for cost management, performance measurement and strategic decisions. The primary objective of these early costing systems was to provide proper inventory valuation and to facilitate financial reporting by doing the monthly books (Foote and Wright 1994).

US manufacturers observed the development of factory automotive by Japanese manufacturers during the 1970s (Johnson and Kaplan 1987) and attempted to introduce similar technological practices during the 1980s to cope with the changing demand from the recently empowered market. In order to survive, they had to adopt competitive strategies such as focused organization, new technologies for manufacturing, product diversification and superior customer relationship. As a response to these strategic interventions, the operational activities had to undergo radical changes. By 1980s, obvious changes in the US manufacturing methods

---

10 Foote, P. S. and Wright, G. W. (1994), ibid

11 Foote, P. S. and Wright, G. W. (1994), ibid

responding to competitive pressures, such as diversified product offering, improvement of product quality and service were introduced. They began adopting advanced management techniques such as Total Quality Management (TQM), Just in Time (JIT) in manufacturing and distribution process.

The traditional cost and management accounting became obsolete to deal with these changes and thus there arose a need to devise new accounting techniques to suit the changed environment. Under this situation cost structures have changed as a consequence. Direct labour have declined and been replaced by an increasing indirect (overhead) costs in all areas of business. Managerial costing information, based on product contribution to much greater fixed costs, has become less appropriate and useful. ABC was developed to facilitate manager's decision making regarding mix, control and planning in new environment. ABC was the cost system which responded to the needs of production managers for information that realistically qualified the benefit of advanced technology and support the overhead incurring activities that were not a function of volume (Morrow 1992)\(^\text{13}\).

ABC is a modern development in cost accounting which attempts to absorb overhead into product costs on a more realistic basis. The advanced manufacturing technology that has been adopted in many companies created increase in overhead and decrease in labour cost. However, the allocations of overhead on the basis of direct labour cost is not relevant in the advanced manufacturing technology environment. The basic idea of ABC is that costs are grouped depending on the causes that necessitate their incurrence. Then, the cost drivers are used as an absorption base.

\(^{13}\) Morrow, M. (Ed) (1992), ibid
During 1987-1992, Robin Cooper and Robert S. Kaplan ventured into a series of “innovation action research cycle” (Kaplan 1988) in which ABC was developed. The ABC has been developed, literature in the field of cost and management accounting have numerous articles about the techniques, Cooper (1987, 1988a, 1989a, 1989b, 1989c), Cooper and Kaplan (1987, 1988). ABC is enjoying increasing popularity not only in the USA/UK but also in the developed countries such as Canada, Australia, Germany, and Japan. ABC also received a great deal of attention in many developing countries over the last years. Its origin is still a controversial issue. However, despite the controversy, in the academic world, many companies particularly in the western world have switched over to this new system and reportedly gained favorable results.

Gossiline in 2007\textsuperscript{22} identified the evolution of ABC in number of papers (1477) published from 1988 to 2004 which can be of considerable interest for ABC. These papers introduced the definition of ABC, its process, development, theoretical concepts and practical application. Advantages and limitations of ABC are also discussed. The papers also provide evidence about adoption and implementation of ABC in some countries, most of them in developed countries. Gossiline in 1997\textsuperscript{23} considered ABC as a part of management innovation called Activity Management (AM). AM was divided into four levels—Activity Analysis (AA), Activity Cost Analysis (ACA), Pilot ABC and Full ABC. According to Gossiline, the last decade of the last century witnessed some attention by the practitioners and academicians to design ABC software to facilitate its implementation. Also they linked ABC with other techniques like Capital Budgeting (Cooks \textit{et al.} 2000)\textsuperscript{24}, Change Process (Brewer \textit{et al.} 2003)\textsuperscript{25}, or linked ABC with new innovation such as Balanced Scorecard (Maiga and Jacobs 2003)\textsuperscript{26}, Customer Accounts (Foster \textit{et al.} 1997),\textsuperscript{27}


\textsuperscript{26} Maiga, A. S, and Jacobs, F.A (2003), Balanced Scorecard, Activity-Based Costing and Company Performance: an Empirical Analysis. Journal of Managerial Issues, 5, pp. 238-301.


Because of changes in the business and manufacturing environment the academicians, practitioners, and consultations, argued that traditional cost accounting allocation practices are simplistic and arbitrary, and the allocations do not reflect the actual cost in the firms using advanced manufacturing technologies (Kaplan, Johnson and Kaplan 1987). So the allocation of overhead to production or service based on the labour cost/hours used becomes illogical, as well as, less appropriate, due to the reduction of direct labour which is less than 4-6 per cent of product cost in many industrial companies. Thus, the traditional volume-based cost allocation practices

---

34 Emblemsvag, J. (2001), Activity-Based Life-Cycle Costing, Managerial Auditing Journal, 6, pp. 17–27.
distort cost and profit and mislead management (Miller and Vollmann 1985\textsuperscript{36}, Cooper and Kaplan 1998\textsuperscript{37}). ABC was proposed to overcome such deficiencies and to provide more accurate information for management planning and control, as well as, decision making.

### 3.3 ACTIVITY BASED COSTING CONCEPTS

ABC is a methodology that measures the cost and performance of activities, resources, and cost objects (Turney 1996\textsuperscript{38}). Resources are allocated to activities, then activities are assigned to cost object based on their use. ABC recognizes the causal relationship of cost drivers to activities. In other words, the essential concepts in ABC are activities, resources, and cost drivers. According to Cooper (1988a)\textsuperscript{39}, Johnson and Kaplan (1987)\textsuperscript{40}, ABC is a costing methodology used to trace overhead cost directly to cost objects, i.e. Products, processes, services or customers and help managers to make the right decision regarding product mix and competitive strategies. The ABC system is based on the premise that the products consume activities, activities consume resources and resource consumes cost (Kaplan 1984)\textsuperscript{41}. The concept of ABC can be summarized as follows:

---


\textsuperscript{39} Cooper, R. (1988a),ibid

\textsuperscript{40} Johnson, H. T and Kaplan R. S. (1987),ibid

The concept of ABC

ABC is the assignment of cost from resources to activities and then from activities to cost objects. The general ledger groups the resources into various resource pools such as salaries, rent, and depreciation. Then the costs are allocated from the resource pools to each activity according to the percentage of the resource pool consumed, such as time spent, floor area occupied, and head count. However, in the above concepts, ABC does not change the way material or direct labour cost is assigned to manufacturing products. It is used to trace overhead cost (indirect). So, ABC is to break out indirect activities into meaningful pools which can then be assigned to processes in a manner which reflects in a better manner, the way costs are actually incurred. ABC recognizes the resources which are consumed by processes or products in different proportions for each activity. With ABC, all costs reside in resources, which are material, labour, space, equipment, and services. Resources are consumed by activities which have no inherent cost; the cost associated with activities represents the amount of resources consumed.
they consume per unit of activity. Finally, resources and activities are applied to cost objects, that is, the purpose for which the resource is consumed and the activity is performed.

In ABC, the cost of assigning is done in at least three different phases: cost factors are assigned to the activities by the resource drivers, and the activities are assigned to the cost objects by the activities driver. ABC techniques have been promoted as necessary tools for management decision making activities in a turbulent and volatile environment faced by most organizations. ABC was originally conceived as a means of controlling rapidly growing overhead costs (Miller and Vollmann 1985).42

According to Kaplan and Cooper (1998),43 cost should be classified as long-term variable costs and short-term variable costs. Traditionally short-term variable costs are known as variable costs and long-term are known as fixed costs. However, under ABC system, product cost is determined by obtaining a greater understanding of cost behavior and using new measures to quantify resources consumed by each product.

ABC focuses on accurate information (financial and non-financial) regarding the true costs of products, services, operations, processes, activities, distribution channels, customer’s profitability, contracts and projects. ABC provides management with useful information for costing processes. It is an effective method of exercising

42 Miller, J. G. and Vollmann, T. E. (1985), ibid
cost control and can be used in designing either a job cost system or process costing. (Horn gren et al. 2005)\textsuperscript{44}.

3.4 \textbf{ACTIVITY BASED COSTING PROCESSES}

The most important decision of ABC designers are concerned with activities and how these activities will be measured and provide more benefits at the lowest possible cost. To achieve these objectives Cooper (1990b)\textsuperscript{45} Cooper and Kaplan (1991a\textsuperscript{46}, b\textsuperscript{47}) have described the following steps.

Cost Classification

The major difference between Traditional Costing Systems (TCS) and ABC system is their classification of costs that occur in the production process. To calculate overhead cost, there are two major steps. The first, support department costs are allocated by using one or more allocation bases. Second step, the expenses in the cost centre are accumulated and then assigned to product or services based on direct labour hours or machine hours. All costs are assigned in proportion to the production volume in unit-based systems. Overhead cost are assigned linearly proportional to any changes in production output.

\textsuperscript{44} Horngren, Charle T., et al. (11th Ed) (2005), Cost Accounting: A Managerial Emphasis, Prentice, Hall of India, New Delhi.

\textsuperscript{45} Cooper, R. (1990b), Five Steps to ABC System Design, Accountancy UK, November, pp. 79-81.


According to Cooper (1990b) Cooper and Kaplan (1991 a, b) the activities performed in a production process can be classified into:

1- Unit-level activities- each time a unit is produced.
2- Batch-level activities -each time a unit is produced.
3- Product-level activities-support is needed to produce different types.
4- Facility-level activities-sustaining facilities general manifesting process.

**Aggregating Activities**

The number of actions performed is typically so vast that it is economically unfeasible to use a different cost driver for each action. Ordinarily therefore, many actions must be aggregated into each activity. A single driver is then used to trace the cost of activities to products treating collection of actions to measure and track the performance of individual actions. The actions are sometimes referred as micro-activities (Turney and Stratton 1992) quoted by Panda (1999). Unfortunately, as more and more actions are aggregated into activity, the ability of a cost driver to trace accurately the resources consumed by products decreases.

**Reporting the Cost of Activities**

In ABC system activities are aggregated and the resources consumed by each activity are reported. For example: The system might report set-up cost for product X of Rs.1,00,000 which includes both set-up and material movement cost. Alternatively,

---

48 Cooper, R.(1990b),ibid
49 Cooper, R. and Kaplan R. S. (1991a),ibid
50 Cooper, R. and Kaplan R. S. (1991b),ibid
51 Turney, P. B and Stratton (1992), Using ABC to Support Continuous Improvement, Management Accounting US September pp 46-50
52 Panda. N. M. (1999),ibid
the system might break the cost down and report a machine set-up of Rs.75,000 and a separate material movement cost of Rs.25,000. Sometimes, the information provided is very detailed and unnecessary for interpretation (Miller 1996).\(^53\)

**Selecting the First Stage Allocation Bases**

In this stage, the cost system traces cost of resources consumed by the different activities. The cost of each kind of activity are traced to separate cost pool containing the total cost of performing that kind of activity for all the products. The cost drivers used to trace costs to cost pools determine the amount of costs traced to each pool and, therefore, the accuracy of the cost reported. For example in an activity center that uses inspection hours as the cost driver, the inspection related cost will be traced proportionally to the hours used in various centers. According to Panda, 1999 tracing can be done directly or indirectly, accuracy is the guiding factor. For example, tracing set-up cost on the allocation base of set-up number, assumes all set-ups to have consumed the same quantity of resources irrespective of duration and machine type. Or tracing on the basic of set-up hours assumes each machine to have consumed same quantity of resources per set-up hour. Hence, indirect tracing of the allocation base used, determine the degree of accuracy of the product costs (Panda 1999)\(^54\). The primary cost drivers are the linked between the resources and the activities. The accuracy of a product cost depends on these cost drivers because cost of activity is an aggregation of cost of primary drivers and product cost is an aggregation of the cost of activities. These cost drivers actually show how specific resources are consumed by an activity.

---


\(^54\) Panda, N. M. (1999), ibid
Identifying Activity Center

In this stage of the process it is necessary to identify the responsible activity centers. An activity center is that segment of the production process for which management wants to report the cost of the activity performed separately. Thus the management can control the individual activities of their company effectively.

Selecting Second Stage Cost Drivers

These drivers are used for assigning the cost of activities to the cost object. Once the costs of all the activities in various cost centers are traced to activity cost pools, then the second stage costs drivers can be selected to the cost objects. When switching to ABC, the selection of second stage cost drivers is the most affected by that the switch. However, it is essential to note that, the complexities of the most modern manufacturing processes are enormous. Therefore, one has to try to develop a cost system that is economical to maintain and which does not introduce excessive distortion. During the implementing of ABC system, second stage cost drivers have to be selected carefully and it can be done by the following decision:

1- Desired accuracy. The accuracy of product costs increase when more cost drivers are used. The level of accuracy of the product cost required depends on the company’s strategic objectives.

2- Complexity of the production mix. The product mix also influences the desired amount of cost drivers. Sometimes, problems occur if a single cost driver is used for different cost centers. In order to determine whether a single cost driver is acceptable, three factors have to be examined. These factors that are to be examined are presented below:
❖ Product diversity. Product will be diversified if it consumes activities in different proportions. Therefore, using a single cost driver in wider product diversity will largely lead to greater distortion more than that in case of narrow product diversity.

❖ The relative cost of the activities when aggregated determines the relative cost of the various activity centers compared with the total cost of production process. The higher the relative cost of an activity, the larger will be the distortion, when an imperfectly correlated cost driver is used to trace the cost of activities to the respective product. If the relative cost is higher, more attention should be given to the decision concerning those cost drivers.

❖ Batch-size diversity. For example, the batch size influences greatly the cost involved in treating the order and transport costs. Therefore, high level distortion in the reported cost could occur when choosing inappropriate cost drivers.

3.5 ACTIVITY BASED COSTING HIERARCHICAL MODEL

The cost of some activities are not always related to a unit of a product, but are attached to higher level such as to a batch of products or to a certain product directly (Cooper and Kaplan 1991a,55 b).56 A cost hierarchy categorizes costs into different cost pools on the basis of the different types of cost drivers (or cost allocation bases) or different degree of difficulty in determining cause-and effect (or benefit received) relationship” (Horngren et al. 199757). In such cases, assigning the cost to each unit of product will give erroneous information. Cooper and Kaplan

55 Cooper, R. and Kaplan R. S. (1991a),ibid
56 Cooper, R. and Kaplan R. S. (1991b),ibid
(1991a\textsuperscript{58}, b\textsuperscript{59}, Cooper (1990a), Horngren et al. (1997\textsuperscript{60}), categorize activities into four levels according to the types of cost assigned to the product:

1- Unit-Level Activities

Unit level activities are assigned to every unit of products produced using unit level cost driver. Therefore, as the volume of production increases, the cost of this kind of activities increases. For example, material, direct labour, power and maintenance, etc.

2-Batch-Level Activities

Batch level activities are performed every time a batch of products is processed. The cost drivers used in batch related activities are called “batch drivers”. A batch driver assigns the cost of an activity to a batch. In this kind of activity, resources consumption is proportional to the number of batches processed such as setup, purchase orders, inspection, etc.

3-Product-Sustaining Activities

Product-sustaining activities are performed in order to continue to produce and sell individual products. The cost of these activities can be traced to each product but should not be allocated based on the number of units or batch produced, because they are not affected by the level of production volume. The cost of this activity is incurred to support specific product such as engineering changes, process improvement, etc.

4-Facility-Sustaining Activities

\textsuperscript{58} Cooper, R. and Kaplan R. S. (1991a),ibid
\textsuperscript{59} Cooper, R. and Kaplan R. S. (1991b),ibid
\textsuperscript{60} Horngren, C.T., et al (9\textsuperscript{th} Ed) (1997), ibid
Facility-sustaining activities are the activities necessary for a plant to continue production such as heating, lighting, plant management, etc. The cost of these activities is not related to the production volume or product mix. Since these activities are common to each product produced in the plant, their cost must be considered as common to all products.

CHART 3.2C

MANUFACTURING COST HIERARCHY

Output-Unit Level Costs

Batch-Level Costs

Product Sustaining Costs

Facility Sustaining Costs

Total Manufacturing Costs

Source: Horngren et al. 1997\textsuperscript{61}, p.150

\textsuperscript{61} Horngren, C.T., et al (9th Ed) (1997), ibid
3.6 ACTIVITY COST DRIVERS

In ABC, activity costs are assigned to cost objects using activity cost drivers that measure activity use. On the other hand, the activity cost drivers simply determine how the activity cost should be assigned to the cost objects. Choosing the proper activity cost drivers is one of the most critical phases in ABC implementation because the activity drivers in particular, are used when activity costs are assigned to cost objects. "A cost driver is defined as the factor or event which cause a change in the cost of an activity" (Raffish and Turney 1991).\(^2\) Cooper (1988a) defines a cost driver as a measure of the manner in which products consume activities. However, due to modern manufacturing operations, cost structure has been changed according to the degree of automation, as well as the cost drivers.

The quality of the accounting information depends on the selection of proper activity cost drivers. The activity driver selection has to be kept in mind when defining activities because by defining the activity taking into account the assignment perspective, the assignment itself can be facilitated significantly. The cost driver is at the heart of ABC. A cost driver in ABC is defined more specifically as an allocation base of costs to activities (Horngren et al. 1997)\(^3\). The major distinction between traditional cost accounting and ABC is that ABC uses non-single unit production volume or multiple cost drivers to assign activity costs to products or services (Cokins 1996).\(^4\)

---


\(^3\) Horngren, C.T., et al (9th Ed) (1997), ibid

However, there are several types of activity cost drivers each with some special characteristics. Cooper 1988a\(^6\), Cooper and Kaplan 1991a\(^6\), Kaplan and Atkinson 1998\(^6\), Atkinson \textit{et al.} 2003\(^8\) and Kaplan, R. S and Anderson, S. R. (2004)\(^9\), divided cost activity drivers into three different types as follows:

**Transaction Drivers**

Transaction drivers are typically used because they concretize the problem related to traditional assignment method based on direct labour and overhead cost increments. With a transaction driver, the annual cost of the activity is divided by the number of activity output, i.e. the driver amount, which will result in the unit such as the number of setup, receipt and products supported, number of times an activity is performed.

Transaction drivers can be used when all outputs make essentially the same demands on the activity. For example, production runs, maintaining unique part and number of purchase orders. ABC is also called transaction-based accounting/costing because transaction drivers are often used for assigning cost of activities to cost objectives.

---

\(^{65}\) Cooper, R. (1988a), ibid

\(^{66}\) Cooper, R. and Kaplan R. S. (1991a), ibid

\(^{67}\) Kaplan, R. S. and Atkinson, A. (3\textsuperscript{rd} Ed) (1998), Advanced Management Accounting.

\(^{68}\) Atkinson, A. A., \textit{et al.} (3\textsuperscript{rd} Ed) (2003), Management Accounting, Prentice Hall of India, New Delhi.

Duration Drivers

Duration drivers represent the amount of time required to perform an activity. They should be used when significant variation exists in the amount of activity required for different output. ABC designers use duration like set-up hours, to assign the cost of set-up driver to individual products.

Duration drivers include set-up hours, inspection hours, and direct labour, for material movement distance moved can be considered as duration drivers. Distance is a proxy for the time taken from one place to another. In general, duration drivers are more accurate than transaction drivers, but they are more expensive.

Both the duration drivers and the transaction drivers involve the assumption that the hourly rate of the activity is always constant. That is not always true either. The cost of an activity can also vary; this depends on the resources which are required for performing the activity. The choice between a duration and transaction driver is as always, one of economics, balancing the benefits of increased accuracy against the costs of increased measurement (Atkinson et al. 2003)\(^7\).

Intensity Drivers

Intensity drivers are direct charge of the cost of resources for performing the activity to the cost objects. As an example of intensity drivers, Kaplan and Cooper (1998) used the set-up activity. A set-up activity does not always require the same amount of time as the transaction driver assumes, nor the same resources, as the duration drivers assumes. Rather a certain product might require a special set-up and quality control people, as well as, special ganging and testing equipment time for the machine to be set-up. Intensity drivers are the most accurate activity cost drivers but

\(^7\) Atkinson, A. A., et al. (3\(^{rd}\) Ed) (2003), ibid
the most expensive to implement, in effect they require direct charging via a job order costing system to track all the resources used each time an activity is performed (Atkinson et al. 2003).71

3.7 THE IMPACT OF ACTIVITY BASED COSTING ON PRODUCT COST AND PROFITABILITY

ABC was developed as a result of changes in current production environment and marketplace requirements. This was also as a practical solution to traditional costing and management accounting problems that related to allocation of costs. ABC was developed as a response to modern technologies in manufacturing processes, production techniques, increased diversity in products, and greater importance of marketing and distribution activities in new business environment. Under this circumstances the proportion of direct costs are decreasing and on other side overhead (indirect) costs are increasing as components of total product costs.

TCA assumes that products consume the resources, while ABC assumes that activities consumed resources and then costs are allocated to products according to their demand for these activities. There is difference between two systems (TCA and ABC). TCA traces overhead costs to the products using a single cost driver (volume based cost driver) such as direct labour hours/cost, machine hours while ABC utilizes multiple cost drivers both volume related cost drivers and non-volume related cost drivers such as set up hours, number of purchase orders, maintenance, and inspection hours etc. In the increased competition, companies are in need of an accurate product cost system because they can not efficiently compete through higher prices. Higher accuracy can be achieved in product cost by using different and multiple cost drivers.

71 Atkinson, A. A., et al. (3rd Ed) (2003),ibid
However, ABC provides a company with an accurate product cost with an insight into opportunities for cost reduction and performance improvement.

Accurate and detailed information on the activities of production cost is vital in pricing, vendor selection, make or buy, design cost, and similar decisions. Perhaps, knowing the exact product cost is very important for companies because this give companies information about waste, scrap, and cost reduction and performance improvement opportunities to enable management to increase competitiveness.

The management needs more accurate information, which was the main reason for emergence of ABC. Most organizations formulate their pricing strategies on the basis of their product costs and the shift from labour-based technologies to machine based technologies without changing the cost algorithm invited criticism as to the inappropriateness of single cost driver based overhead allocation techniques.

Product cost computed on the basis of direct labour, machine hours, or material cost overhead allocation distort product cost because it erroneously assumes that the usage of other factors of production are proportional to the direct factors (Brimson 1991). In the other words, ABC allocates resource costs to product or customers based on activities which are the factors causing work and incurring cost used by products or customer (Turney 1996). According to Turney, ABC assigns cost to products according to the activities and resource consumed in producing, marketing, selling, delivering and servicing the product.

---


73 Turney, P. B (1996), ibid
ABC assumed that activities originate cost and their output built the demand for activities (Turney 1996). An ABC system is designed to eliminate boundaries among departments, Morrow (1992) and to create more exact cost information or to disclose the hidden profit and the hidden losses (Argyris and Kaplan 1994, quoted by Chongruksut, W 2002).

A major advantage of using ABC is that it avoids or minimizes distortions in product costing that result from arbitrary allocation of indirect costs. Literature evidence, both articles and textbook based often present examples in which the overhead cost component exceeds 45 per cent of total product cost. Under these circumstances a different method of overhead allocations produces convincing results for consideration of such new method e.g. ABC costing methods. ABC overhead allocation, a method popularized by academicians and consultants as an alternative to traditionally based allocation methods, lacks the universality of application as it is dependent largely on product diversity and product level overhead cost pools (Cooper 1998a).

According to the Innes and Mitchell (1991), traditional cost accounting, as well as, ABC have same framework while they have differences in indirect cost

---

74 Turney, P. B (1996), ibid
75 Morrow, M. (Ed) (1992), ibid
78 Cooper, R. (1998a), ibid
allocations. Indirect cost such as rent of building, machinery depreciation, machine maintenance, management salaries, and so on are incurred for the benefit of a number of cost centers or cost units and that cannot be easily identified with individual products. In the traditional cost system the indirect costs and support costs are allocated to cost centers (pools) and, that costs of centers (pools) are allocated to the products or customer by using a few basis that are proportional to the volume of product-units produced. Many indirect and support resources such as set-up cost, process engineering cost etc. are not employed in proportion to the volume of product unit produced. Thus product costs in traditional cost systems are misrepresented.

ABC uses two stage cost assignment approach. In the first stage, resource costs are assigned to activities based on the amount of resources consumed in performing the activity. An activity cost would equal the sum of all the resources consumed in performing that activity. In the second stage, activity costs are traced to the products or customer based on how frequently that activity is performed in support of these cost objects. In addition, the ABC logic is that resources generate cost, activities consume resources and products consume activities. Thus organization’s activities are identified, then costs are traced to the activities (or activity cost pools) based on the resources that they require.

Charts 3.3 and 3.4 show the difference between traditional costing systems and ABC in the nature of allocation basis, as well as, in the number of allocation basis utilized to assign costs in the second stage. The traditional costing system employs three common allocation basis, such as Direct Labour Hours (DLH), Machine Hours (MII) and Material Costs (MC), whereas ABC utilities many allocation basis, such as set-up hours, number of times of purchase orders, number of times materials handled
and other transaction-related basis (Cooper 1988a)\textsuperscript{80}, Kaplan 1988\textsuperscript{81}, Cooper 1988\textsuperscript{82}, Turney 1996\textsuperscript{83} showed that, ABC system has more accuracy in cost of production than those of the traditional cost systems.

Traditional cost systems allocate overhead cost to production cost center and then to product.

\textsuperscript{80} Cooper, R. (1988a), ibid
\textsuperscript{81} Kaplan, R.S (1988), ibid
\textsuperscript{82} Cooper, R. (1988a), ibid
\textsuperscript{83} Turney, P. B (1996), ibid
CHART 3.3C

ALLOCATION OF OVERHEADS IN TRADITIONAL COST ACCOUNTING

Source: Kaplan and Cooper (1998)\textsuperscript{84}.

MH-machine hour, DLH-Direct labour hour, DMC-Direct material cost,

DLC-Direct labour cost

From the above Exhibit, the TCA had two stage allocation processes in the flow of overhead costs to products, where in the first stage overhead costs are assigned to production cost centers and then these accumulated costs in the cost centers are allocated to products using unit-based drivers. However, because of using arbitrary basis, such as direct labour hours or machine hours ,traditional cost systems

\textsuperscript{84} Kaplan, R. S. and Cooper, R. (1998),ibid
fail in the allocation of overhead expenses to production cost centers. Direct Material Cost (MC) and Direct Labour Cost (DLC) are allocated directly to Products.

ABC traces resource expenses to activities and use ABC drivers for tracing activity costs to object.

**CHART 3.4C**

**ALLOCATION OF OVERHEADS IN ACTIVITY BASED COSTING**

Source: Kaplan and Cooper (1998)\(^{85}\).

From the above chart, it can be observed that in the first stage of the two stage assignment process in an ABC system the resources expenses being assigned to the activity performed based on resource cost drivers that reflect the casual relationship between resource expenses and activities. In the second stage, expenses of each activity are then assigned to cost object (products, services and customer) based on

\(^{85}\) Kaplan, R. S. and Cooper, R. (1998), ibid
the activity cost drivers. Direct material and direct labour costs are allocated in the same way under both traditional costing systems and ABC. The main difference between both systems is in the allocation of overhead costs which is much more sophisticated under ABC since it allows multiple cost drivers to be used.

Cooper (1988a) discovered the effect of diverse volume and size of products on reported product costs by comparing the traditional cost system with the ABC system. He found that the TCA leads to distorted product costs, basically when engaged in product diversity in the form of size or volume. He explained these effects through Company A which produces four products: P1, P2, P3, and P4. The four products are made on the same equipment and by similar processes. The characteristics of each product are summarised in Table 3.1. Company A allocates costs to the products based on direct labour hours. The quantity and value in INR of each input by product, as well as, the allocation of overhead costs by both the traditional cost system and ABC, are presented in Table 3.3 Panel A, B, C and D.

---

86 Cooper, R. (1988a), ibid
Table 3.1

PRODUCT CHARACTERISTICS OF COMPANY A

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity Per Year</th>
<th>Material Per Unit</th>
<th>DLH Per Unit</th>
<th>MH Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>10</td>
<td>6</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>P2</td>
<td>100</td>
<td>6</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>P3</td>
<td>10</td>
<td>18</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>P4</td>
<td>100</td>
<td>18</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: Cooper 1988a

TABLE 3.2

SIZE AND VOLUME OF PRODUCTS

<table>
<thead>
<tr>
<th>Volume</th>
<th>Size of product</th>
<th>Size of product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Small</td>
<td>Large</td>
</tr>
<tr>
<td>High</td>
<td>P1</td>
<td>P3</td>
</tr>
<tr>
<td></td>
<td>P2</td>
<td>P4</td>
</tr>
</tbody>
</table>

Cooper, R. (1988a), ibid
In Table 3.2 panel (A) shows the annual input consumption patterns and value by products, while panel (B) illustrate the results of TCA which uses direct labour hours for allocation of overhead to the products. However, under TCA unit cost for products P1 and P2 are the same (22, 55), three times less than unit cost of P3 and P4 (67.66). The main reason for this is because large size of products P3 and P4 consumed three times the number of labour compare with small size of P1 and P2. On the other hand, the volume of products P2 and P4 are higher than of those of P1 and P3 by ten times. Thus, for products having the same unit cost in the same sizes but in varying volumes, when overhead is allocated using volume-related allocation basis, the results are misrepresented.

The panel (C) illustrates the allocation of overhead costs according to the ABC which used multiple cost drivers such as, number of set-up, number of purchase orders and number of times material handled. According to ABC, the cost of units P1, P2, P3 and P4 are not same as those in TCAs. The difference between two methods is mainly due to TCAs using only one cost driver (DLH) whereas ABC uses multiple cost drivers. Finally, Panel D shows the differences between TCA and ABC in amount and percentage which depicts that TCA distorts cost of product.
Table 3.3

PRODUCT COSTING DATA FOR COMPANY A

Panel A: Annual Input Consumption Patterns and Value by Product

<table>
<thead>
<tr>
<th>Product</th>
<th>M</th>
<th>DLH</th>
<th>MH</th>
<th>Time Set up</th>
<th>Orders</th>
<th>Time Handled</th>
<th>Part Numbers</th>
<th>Total Overhead Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>60</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>600</td>
<td>50</td>
<td>50</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>180</td>
<td>15</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>1800</td>
<td>150</td>
<td>150</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Units Consumed</td>
<td>2640</td>
<td>220</td>
<td>220</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>264</td>
<td>2200</td>
<td>3300</td>
<td>960</td>
<td>1000</td>
<td>200</td>
<td>2000</td>
<td>9924</td>
</tr>
</tbody>
</table>

Panel B: Overhead Costs Reported by a Volume-Based Cost System (VBCS)

**Overhead Consumption Intensity**

| Total Overhead Cost | 9924 |
| DLH (Units consumed) | 220 |
| Consumption intensity per DLH | 45.11 |
Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>DLH Consume by Product</th>
<th>Cost Traced = Total Overhead</th>
<th>Quantity</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5</td>
<td>225.55</td>
<td>10</td>
<td>22.55</td>
</tr>
<tr>
<td>P2</td>
<td>50</td>
<td>2255.5</td>
<td>100</td>
<td>22.55</td>
</tr>
<tr>
<td>P3</td>
<td>15</td>
<td>676.65</td>
<td>10</td>
<td>67.66</td>
</tr>
<tr>
<td>P4</td>
<td>150</td>
<td>6766.5</td>
<td>100</td>
<td>67.66</td>
</tr>
</tbody>
</table>

Panel C: Overhead Costs Reported by an Activity-Based Costing System (ABCS)

Overhead Consumption Intensities

<table>
<thead>
<tr>
<th></th>
<th>DLH</th>
<th>setup time(SUT)</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead cost</td>
<td>5764</td>
<td>2160</td>
<td>2000</td>
</tr>
<tr>
<td>Units consumed</td>
<td>220</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Consumption intensity</td>
<td>26.2</td>
<td>270</td>
<td>500</td>
</tr>
</tbody>
</table>

Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>Consumption by Product</th>
<th>DLH Cost</th>
<th>TSU Cost</th>
<th>PN Cost</th>
<th>Overhead Trace</th>
<th>Q</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DLH</td>
<td>TSU</td>
<td>PN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>131</td>
<td>270</td>
<td>500</td>
<td>901</td>
</tr>
<tr>
<td>P2</td>
<td>50</td>
<td>3</td>
<td>1</td>
<td>1310</td>
<td>810</td>
<td>500</td>
<td>2620</td>
</tr>
<tr>
<td>P3</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>393</td>
<td>270</td>
<td>500</td>
<td>1163</td>
</tr>
<tr>
<td>P4</td>
<td>150</td>
<td>3</td>
<td>1</td>
<td>3930</td>
<td>810</td>
<td>500</td>
<td>5240</td>
</tr>
</tbody>
</table>
Panel D: The differences between VBCS and ABCS

<table>
<thead>
<tr>
<th>Product</th>
<th>VBCS</th>
<th>ABCS</th>
<th>Different Per Unit</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>22.55</td>
<td>90.1</td>
<td>67.55</td>
<td>300</td>
</tr>
<tr>
<td>P2</td>
<td>22.55</td>
<td>26.20</td>
<td>3.65</td>
<td>16.18</td>
</tr>
<tr>
<td>P3</td>
<td>67.66</td>
<td>116.3</td>
<td>48.64</td>
<td>71.9</td>
</tr>
<tr>
<td>P4</td>
<td>67.66</td>
<td>52.4</td>
<td>-15.26</td>
<td>-22.55</td>
</tr>
</tbody>
</table>

Table 3.4

PRODUCT COSTING DATA FOR COMPANY B

Panel A: Annual Input Consumption Patterns and Value by Product

<table>
<thead>
<tr>
<th>Product</th>
<th>M</th>
<th>DLH</th>
<th>MH</th>
<th>Setup time</th>
<th>Order s</th>
<th>Time Handled</th>
<th>Part Numbers</th>
<th>Total Overhead Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>60</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P2</td>
<td>600</td>
<td>50</td>
<td>50</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Units Consumed</td>
<td>660</td>
<td>55</td>
<td>55</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>66</td>
<td>550</td>
<td>825</td>
<td>480</td>
<td>500</td>
<td>100</td>
<td>1000</td>
<td>3521</td>
</tr>
</tbody>
</table>
Panel B: Overhead Costs Reported by a Volume-Based Cost System (VBCS)

Overhead Consumption Intensity

Total Overhead Cost 3521

DLH (Units consumed) 55

Consumption intensity per DLH 64.02

Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>DLH Consume by Product</th>
<th>Cost Traced = Total Overhead</th>
<th>Quantity</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5</td>
<td>320.1</td>
<td>10</td>
<td>32.01</td>
</tr>
<tr>
<td>P2</td>
<td>50</td>
<td>3210.0</td>
<td>100</td>
<td>32.01</td>
</tr>
</tbody>
</table>

Panel C: Overhead Costs Reported by an Activity-Based Costing System (ABCS)

Overhead Consumption Intensities

<table>
<thead>
<tr>
<th></th>
<th>DLH</th>
<th>Times Set up</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead cost</td>
<td>1441</td>
<td>1080</td>
<td>1000</td>
</tr>
<tr>
<td>Units consumed</td>
<td>55</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Consumption intensity</td>
<td>26.2</td>
<td>270</td>
<td>500</td>
</tr>
</tbody>
</table>
Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>Consumption by Product</th>
<th>DLH Cost</th>
<th>TSU Cost</th>
<th>PN Cost</th>
<th>Overhead Trace</th>
<th>Q</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DLH</td>
<td>TSU</td>
<td>PN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>131</td>
<td>270</td>
<td>500</td>
<td>90.1</td>
</tr>
<tr>
<td>P2</td>
<td>50</td>
<td>3</td>
<td>1</td>
<td>1310</td>
<td>810</td>
<td>500</td>
<td>26.2</td>
</tr>
</tbody>
</table>

Panel D: The differences between VBCS and ABCS

<table>
<thead>
<tr>
<th>Product</th>
<th>VBCS</th>
<th>ABCS</th>
<th>Difference Per Unit</th>
<th>Difference %</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>32.01</td>
<td>90.1</td>
<td>58.09</td>
<td>181.47</td>
</tr>
<tr>
<td>P2</td>
<td>32.01</td>
<td>26.2</td>
<td>-5.81</td>
<td>-18.15</td>
</tr>
</tbody>
</table>

According to Cooper (1988)\textsuperscript{88}, traditional method (Volume-based cost) also generates inaccurate unit cost in case of difference in product volume. For example, company B produce two small product size (P1, P2), P1 is a low volume product and P2 is a high volume product. Table 3.2 Panel A, B, C and D illustrate that there is difference in allocation of overhead cost between TCA and ABC, as well as, the results are different according to TCA (see Panel B Table 3.3 and Panel B Table 3.4). Thus these results emphasis the distortion of unit cost according to traditional method (VBCS).

\textsuperscript{88} Cooper, R. (1988a), ibid
Table 3.5 shows company C which produces two large size products (P3 with low volume and P4 with high volume). Table 3.5 panel A, B, C and D show the details on product costing data of Company C.

Table 3.5

PRODUCT COSTING DATA FOR COMPANY C

Panel A: Annual Input Consumption Patterns and Value by Product

<table>
<thead>
<tr>
<th>Product</th>
<th>M</th>
<th>DLH</th>
<th>MH</th>
<th>Time Set up</th>
<th>Orders</th>
<th>Time Handled</th>
<th>Part Numbers</th>
<th>Total Overhead Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3</td>
<td>180</td>
<td>15</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P4</td>
<td>1800</td>
<td>150</td>
<td>150</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Units consumed</td>
<td>1980</td>
<td>165</td>
<td>165</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Value</td>
<td>198</td>
<td>1650</td>
<td>2475</td>
<td>480</td>
<td>500</td>
<td>100</td>
<td>1000</td>
<td>6403</td>
</tr>
</tbody>
</table>

Panel B: Overhead Costs Reported by a Volume-Based Cost System (VBCS)

Overhead Consumption Intensity

<table>
<thead>
<tr>
<th>Total Overhead Cost</th>
<th>6403</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLH (Units consumed)</td>
<td>165</td>
</tr>
<tr>
<td>Consumption intensity per DLH</td>
<td>38.81</td>
</tr>
</tbody>
</table>
Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>DLH Consume by Product</th>
<th>Cost Traced = Total Overhead</th>
<th>Quantity</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3</td>
<td>15</td>
<td>582.15</td>
<td>10</td>
<td>58.21</td>
</tr>
<tr>
<td>P4</td>
<td>150</td>
<td>5821.15</td>
<td>100</td>
<td>58.21</td>
</tr>
</tbody>
</table>

Panel C: Overhead Costs Reported by an Activity-Based costing (ABC)

Overhead Consumption Intensities

<table>
<thead>
<tr>
<th></th>
<th>DLH</th>
<th>Times Set up</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead cost</td>
<td>3323</td>
<td>1080</td>
<td>1000</td>
</tr>
<tr>
<td>Units consumed</td>
<td>165</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Consumption intensity</td>
<td>26.2</td>
<td>270</td>
<td>500</td>
</tr>
</tbody>
</table>

Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>Consumption by Product</th>
<th>DLH Cost</th>
<th>TSU Cost</th>
<th>PN Cost</th>
<th>Overhead Trace</th>
<th>Q</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DLH</td>
<td>TSU</td>
<td>PN</td>
<td>393</td>
<td>270</td>
<td>500</td>
<td>1163</td>
</tr>
<tr>
<td>P3</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>393</td>
<td>270</td>
<td>500</td>
<td>1163</td>
</tr>
<tr>
<td>P4</td>
<td>150</td>
<td>3</td>
<td>1</td>
<td>3930</td>
<td>810</td>
<td>500</td>
<td>5240</td>
</tr>
</tbody>
</table>
Panel D: The Differences between VBCS and ABCS

<table>
<thead>
<tr>
<th>Product</th>
<th>VBCS</th>
<th>ABCS</th>
<th>Difference Per Unit</th>
<th>Difference %</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3</td>
<td>58.21</td>
<td>116.3</td>
<td>58.09</td>
<td>99.8</td>
</tr>
<tr>
<td>P4</td>
<td>58.21</td>
<td>52.4</td>
<td>-5.81</td>
<td>-9.98</td>
</tr>
</tbody>
</table>

While comparing the results of companies (A, B and C) which are producing same products using same manufacturing process, the unit costs of Company B and C reported by the (VBCS) differ from those of Company A, whereas there are no differences in unit costs of all companies (A, B and C) according to ABCS. A comparison of product costing data of all three companies shows that the ABC system is able to accurately trace product costs when products are manufactured in varying volumes.

On the other hand, Cooper, (1988a)\(^89\) also examined the ability of TCA and ABC to trace cost of product in case of diversity of product size. Table 3.6 Panel A, B, C, D describe the details of product costing data for company D which produce two products (P1 and P3) small and large product size with low volume. However, the results of this show that there is difference in unit cost of product between two systems, in spite of both (P1 and P3) are manufactured on the same equipment using similar process.

\(^{89}\) Cooper, R. (1988a),ibid
Table 3.6

PRODUCT COSTING DATA FOR COMPANY D

Panel A: Annual Input Consumption Patterns and Value by Product

<table>
<thead>
<tr>
<th>Product</th>
<th>DLH</th>
<th>MH</th>
<th>Time Setup</th>
<th>Orders</th>
<th>Time Handled</th>
<th>Part Numbers</th>
<th>Total Overhead Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>60</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2064</td>
</tr>
<tr>
<td>P3</td>
<td>180</td>
<td>15</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Units consumed</td>
<td>240</td>
<td>20</td>
<td>20</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Value</td>
<td>24</td>
<td>200</td>
<td>300</td>
<td>240</td>
<td>250</td>
<td>50</td>
<td>1000</td>
</tr>
</tbody>
</table>

Panel B: Overhead Costs Reported by a Volume-Based Cost System (VBCS)

Overhead Consumption Intensity

| Total Overhead Cost | 2064 |
| DLH (Units consumed) | 20   |
| Consumption intensity per DLH | 03.2 |
### Panel C: Overhead Costs Reported by an Activity-Based Costing System (ABCS)

#### Overhead Consumption Intensities

<table>
<thead>
<tr>
<th></th>
<th>DLH</th>
<th>Times set up</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead cost</td>
<td>524</td>
<td>540</td>
<td>1000</td>
</tr>
<tr>
<td>Units consumed</td>
<td>20</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Consumption intensity</td>
<td>26.2</td>
<td>270</td>
<td>500</td>
</tr>
</tbody>
</table>

#### Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>Consumption by product</th>
<th>DLH Cost</th>
<th>TSU Cost</th>
<th>PN Cost</th>
<th>Overhead Trace</th>
<th>Q</th>
<th>Reported Unit cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5</td>
<td>131</td>
<td>270</td>
<td>500</td>
<td>901</td>
<td>10</td>
<td>90.1</td>
</tr>
<tr>
<td>P3</td>
<td>15</td>
<td>393</td>
<td>270</td>
<td>500</td>
<td>1163</td>
<td>10</td>
<td>116.3</td>
</tr>
</tbody>
</table>
Panel D: The Differences between VBCS and ABCS

<table>
<thead>
<tr>
<th>Product</th>
<th>VBCS</th>
<th>ABCS</th>
<th>Difference Per Unit</th>
<th>Difference %</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>51.6</td>
<td>90.1</td>
<td>38.5</td>
<td>74.61</td>
</tr>
<tr>
<td>P3</td>
<td>154.8</td>
<td>116.3</td>
<td>-38.5</td>
<td>-24.87</td>
</tr>
</tbody>
</table>

In addition, Table 3.7 illustrate the details of product costing data in panel A, B, C, and D for company (E) which manufactures two products (P2 and P4) in this case the product is in high volume but with small size for P2 and large size for P4. These results also emphasis the differences between TCA and ABC.

Table 3.7

PRODUCT COSTING DATA FOR COMPANY E

Panel A: Annual Input Consumption Patterns and Value by Product

<table>
<thead>
<tr>
<th>Product</th>
<th>M</th>
<th>DLH</th>
<th>MH</th>
<th>Time Setup</th>
<th>Orders</th>
<th>Time Handled</th>
<th>Part Numbers</th>
<th>Total Overhead Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>600</td>
<td>50</td>
<td>50</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>1800</td>
<td>150</td>
<td>150</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Units consumed</td>
<td>2400</td>
<td>200</td>
<td>200</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>240</td>
<td>2000</td>
<td>3000</td>
<td>720</td>
<td>750</td>
<td>150</td>
<td>1000</td>
<td>7860</td>
</tr>
</tbody>
</table>
Panel B: Overhead Costs Reported by a Volume-Based Cost System (VBCS)

Overhead Consumption Intensity

Total Overhead Cost 7860
DLH (Units consumed) 200
Consumption intensity per DLH 39.3

Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>DLH Consume by Product</th>
<th>Cost Traced = Total Overhead</th>
<th>Quantity</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>50</td>
<td>1965</td>
<td>100</td>
<td>19.65</td>
</tr>
<tr>
<td>P4</td>
<td>150</td>
<td>5895</td>
<td>100</td>
<td>58.95</td>
</tr>
</tbody>
</table>

Panel C: Overhead Costs Reported by an Activity-Based Costing System (ABCS)

Overhead Consumption Intensities

<table>
<thead>
<tr>
<th></th>
<th>DLH</th>
<th>Times Set up</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead cost</td>
<td>5240</td>
<td>2160</td>
<td>1000</td>
</tr>
<tr>
<td>Units consumed</td>
<td>200</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Consumption intensity</td>
<td>26.2</td>
<td>270</td>
<td>500</td>
</tr>
</tbody>
</table>
Reported Overhead Cost

<table>
<thead>
<tr>
<th>Product</th>
<th>Consumption by Product</th>
<th>DLH Cost</th>
<th>TSU Cost</th>
<th>PN Cost</th>
<th>Overhead Trace</th>
<th>Q</th>
<th>Reported Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DLH</td>
<td>TSU</td>
<td>PN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>50 3 1</td>
<td>1310</td>
<td>810</td>
<td>500</td>
<td>2620</td>
<td>100</td>
<td>26.20</td>
</tr>
<tr>
<td>P4</td>
<td>150 3 1</td>
<td>3930</td>
<td>810</td>
<td>500</td>
<td>5240</td>
<td>100</td>
<td>52.4</td>
</tr>
</tbody>
</table>

Panel D: The Differences between VBCS and ABCS

<table>
<thead>
<tr>
<th>Product</th>
<th>VBCS</th>
<th>ABCS</th>
<th>Difference Per Unit</th>
<th>Difference %</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>19.65</td>
<td>26.20</td>
<td>6.55</td>
<td>33.33</td>
</tr>
<tr>
<td>P4</td>
<td>58.95</td>
<td>52.4</td>
<td>-6.55</td>
<td>-11.11</td>
</tr>
</tbody>
</table>

Finally, from the above tables it can be noted that, the companies A, D and E manufacture same products using same manufacturing process in the same volume, but the unit cost of the companies D and E as reported by TCA or VBCS differ from those in company A, while the ABCS reported the same product cost in all companies (A, D and E). Thus, the results of ABC regarding product cost per unit are more accurate than those by TCA. Cooper (1988a)\(^9\) concludes that 'a simple volume-related allocation base cannot capture the complexity of the relationship between volume and lot or order size'. The product costs reported by the ABC system are more accurate than those by the traditional volume-based system in many situations, including diversity of product size or volume.

\(^9\) Cooper, R. (1988a), ibid
Manufacturing managers and top management should be learning new ways for understanding and measuring product cost and product profitability. However, ABC provides more accurate and reliable information. It also enables determination of cost reduction, pricing and profitability. ABC uses two stage procedure in tracing overhead cost to cost objects, products, process and customers. Cooper, 1988a\textsuperscript{91}, 1989 a\textsuperscript{92}, b\textsuperscript{93} and Cooper and Kaplan 1991b\textsuperscript{94}.

### 3.8 ADOPTION AND IMPLEMENTATION OF ACTIVITY BASED COSTING

This section briefly reviews the adoption and implementation procedures of Activity Based Costing.

According to Bjornenak (1997)\textsuperscript{95}, the very idea of adoption of ABC, although it may not be implemented at all, still affects the way of thinking in an organization quoted by Chongruksut, W (2002).\textsuperscript{96} The decision of adoption of ABC depends on the management’s perception about the importance of cost accounting information and their desire to improve and utilize the information produced by their cost accounting systems. Over the last 20 years there have been a growing awareness of ABC and ABC has been adopted and implemented in several countries around the world in the manufacturing and service sector organizations (Cooper, 1992)\textsuperscript{97}. Characteristics for adoption and implementation of ABC are the highly competitive markets (Cooper

\textsuperscript{91} Cooper, R. (1988a), ibid
\textsuperscript{92} Cooper, R. (1989a), ibid
\textsuperscript{93} Cooper, R. (1989b), ibid
\textsuperscript{94} Kaplan, R. S. and Cooper, R. (1998), ibid
\textsuperscript{95} Bjornenak, T. (1997), Diffusion and Accounting: The Case of ABC in Norway, Management Accounting Research, Vol. 8, pp. 3-17
\textsuperscript{96} Chongruksut, W. (2002), The Adoption of Activity-Based Costing in Thailand, Published Ph.D. Dissertation, School of Accounting and Finance, Victoria University
\textsuperscript{97} Cooper, R. (1992), ibid

Cooper (1991a) have suggested seven-steps for the design and implementing of ABC:

1. Seminar on ABC: The objectives of this seminar are to provide management of manufacturing organisations with the concepts and benefits of ABC, and discuss the ABC requirement with the members of the design team.

2. Design Team: The aim at this stage is to teach and educate the implementation of ABC. Training exercise should be given to team about ABC, its stages, Allocation bases and ABC drivers etc.

3. Design and Data Gathering: This includes direct labour, direct material and overhead cost. Analysis of the overhead cost should be done according to activities that drive it.

---

98 Cooper, R. (1988a), ibid
102 Cooper, R. (1988a), ibid
103 Krumwiede, K (1998), ibid
105 Cooper, R. and Kaplan R. S. (1992), ibid
106 Cooper, R. (1991a), A Structured Approach to Implementing ABC, Accountancy UK, June, pp. 78-80
The remaining stages are regarding progress, results, interpretation meeting and executive seminar. The purposes of these steps are to keep management informed about the progress of the new costing system, as well as, provide management with more detailed information about ABC.

ABC was applied to the manufacturing firms to provide these firms with a better comprehension of costs and increased profitability. However, the problem in the new environment is not with assigning direct labour or direct material cost. Both are handled well with TCA but do a poor job while assigning overhead costs to individual products (Cooper and Kaplan 1988a).\(^\text{107}\)

ABC identifies the approach to most accounting cost information in modern manufacturing operation (Cooper 1990a, Cooper and Kaplan 1991a, Cooper 1991a).\(^\text{108}\) The manufacturing industry has experienced a significant increase in automation and robotization. This need of support services and the resultant accounting of overhead justify the implementation of ABC which traces consumption of services and overhead costs to different and several products. Additionally, information in modern manufacturing operation became necessary for decision making process, competition purposes and the advanced manufacturing environment, make TCA methods of overhead allocation based on direct labour hours obsolete due to the intensive shift from labour to capital. All these reason created the need for adoption of new system such as ABC to calculate accurate product cost.

\(^{107}\) Cooper, R. and Kaplan R. S. (1988a), ibid

\(^{108}\) Cooper, R. (1990a), Cost Classification in Unit-Based and Activity-Based Manufacturing Cost Systems, Journal of Cost Management (Fall), pp. 4-14

\(^{109}\) Cooper, R. and Kaplan R. S. (1991a), ibid

\(^{110}\) Cooper, R. (1991a), ibid
According to Turney (1991)\textsuperscript{111}, there are several objectives which can be achievable if ABC is implemented in manufacturing industry.

1. Provide information about non-value added activities and reduce waste.
2. Provide design engineers with cost information that lead to low cost with high quality product designs.
3. Provide information about channel market.
4. Provide accurate product cost which lead to make good pricing decision.

Cooper and Zmud (1990)\textsuperscript{112} used six stage models to the adoption and implementation of ABC as follows:

1. Initiation: Due to organization pressure to change the exiting costing system, ABC is being considered for adoption and implementation as a solution to TCA system.
2. Adoption: That is decision or approval to implementation of ABC. However, this point is very important, this decision as a permission to invest the resources for implementing of ABC.
3. Adaptation: In this stage implementing team begins to determine project scopes and objectives, collection of data, as well as, analysis of activities and trace these activities to product units using activity drivers.
4. Acceptance: That means analysis is completed and ABC project acceptance from other parties in the organization who will benefit from the ABC. In this stage, ABC can provide information to the management better than TCA.

\begin{footnotesize}

\end{footnotesize}
5- Routinization: In this stage ABC is perceived as a normal activity part of organization's information system. ABC in this stage is used for the decision making purposes.

6- Infusion: In the final stage, ABC information is used outside the accounts department for decision making purposes such as competition, profitability and continuous improvement.

Several researchers have attempted to evaluate the factors that influence the decision of adoption and implementation of ABC Gosselin (2007)\(^{113}\). Anderson (1995)\(^{114}\) who tested a model on an information technology and organizational change framework in order to evaluate ABC implementation at General Motors found that the factors of technology had great impact on the success of ABC. While Shield (1995)\(^{115}\) in his study, the relationship between a diversity of behavioral, organizational and technical factors, and the success of implementation of ABC found that, there are differences among organizational, behavioral and technical factors in ABC success, organizational and behavioral factors are significantly associated with success of ABC, while technical factors are not.

Krumwiede and Roth (1997)\(^{116}\) also found that behavioral and organizational variables can overcome the barriers of each stage in the implementation of ABC and can lead to the successful implementation of ABC. This variable comprises top management support, linkage of the ABC system to competition strategies, linkage of ABC system to performance evaluation and compensation, sufficient internal resource training in designing and implementing of ABC and non-accounting ownership which

\(^{113}\) Gosselin, M. (2007), ibid
\(^{114}\) Anderson, S.W. (1995), ibid
is the commitment of non-accountant to use ABC information (Shield and Young 1989\textsuperscript{117}, Shield 1995\textsuperscript{118}, Chongruksut, W 2002\textsuperscript{119}).

3.9 ESSENTIAL FACTORS IN APPLICATION OF ACTIVITY BASED COSTING

The success of ABC implementation depends on the seven factors. These factors are explained in detail in the following.

Top Management

This factor is very important. The top management should focus on the resources, strategies, and goals. The top management support plays an essential role in successful implementation of ABC. Top management should help in the communication process between employees, as well as, in all levels of the organization. According to Hankinson and Lioyd (1991)\textsuperscript{120} obtaining super managers’ support is important for three major reasons. First, they provide sufficient time and resources for implementation of ABC. People who are respected or top performers are especially important resources. Second, ABC will generally be more successful if it supports the company’s overriding strategies. Third, they can frequently communicate the importance of ABC throughout the organization. For successful implementation of ABC in organisations it must create high attention and interest at all level of organisation. This attention will provide support for successful implementation of


\textsuperscript{118} Shields, M.D. (1995), ibid

\textsuperscript{119} Chongruksut, W. (2002), ibid

ABC (Turney 1989). Shield and Young (1989) found that top management is clearly associated with success of ABC.

Resources

The other success factor for implementation of ABC is the resources. Adequate resources are essential for implementation of ABC in most of the organizations. It’s the backbone as all other factors entirely depend on resources. So in many studies on the implementation of ABC, respondents have cited limited resources as an important hindrance (Corrigan 1996, Clarke P.J. et al 1999, Innes and Mitchel 1995). Thus adequate resources are one of the variables that appear to be correlated with ABC success (Shield 1995, Hankinson and Lioyd 1991, Morrow and Connolly 1995).

Training

For the successful implementation of ABC, implementation team and employees must have a clear understanding of principles, goals, and objectives. The

122 Shields, M. and Young, S.M. (1989), ibid
124 Clark, P. J., et al. (1999), Activity-Based Costing in Ireland: Barriers to and Opportunities for Change, Critical Perspectives on Accounting, 10, pp. 443-468.
126 Shields, M.D. (1995), ibid
127 Hankinson, H. and S. Lioyd (1991), ibid

141
degree of training relating to the design implementation, and usage of ABC is very important in attaining ABC success (Shields 1995).

Training in implementation can aid the development of pilot systems, cross-function teams, early-user involvement, and coordination with other initiatives and broad-based ownership. Training in the use of ABC helps people to know how to interpret ABC information and how to use it for targeted objectives. However, this factor will enable fulfillment of expectation of ABC in the organization and lead to avoid employee's resistance. If the employees get enough training they can easily understand and apply the ABC system and save or reduce the idle time, as well as, waste. When the organizations continuously provide training facilities, they will gain latest knowledge and maintain their competition in global markets. Training should include reading, lectures and practices on the application of ABC. So software packages are very important to understand and know the steps and stages of implementing ABC. Training provides confidence to the trainer and employees to deal with ABC. Training in designing, implementation and using the ABC system, as well as, how to use ABC information for product design, product pricing, and process improvement is very important for success of ABC.

Non-Accounting Ownership

When ABC is owned only by accountants, there is a danger that it might be used only to satisfy their needs. But if non-accountants, such as designer, engineers, and operating employees, as well as, top management are committed to use ABC information, the implementation will be effected smoothly and successfully. If non-accountants are committed to use ABC, they can create and provide essential economic information for all the employees at every level of the organization. Lack of

---

129 Shields, M.D. (1995), ibid
managerial commitment is often the primary reason for failure of any major project, and ABC is no exception.

Shield (1995)\(^{130}\) found that non-accounting ownership of ABC was an important determinant of ABC success, even though it was also found to be far less prevalent during implementation than accounting ownership. These individuals knowledge that they are part of the processes is essential for identifying activities and cost drivers. Thus non-accounting ownership of ABC is one of the important factors to gain acceptance of personnel responsible for using and operating the system.

**Information Technology**

Information Technology (IT) is one of the greatest challenges faced by business managers. This challenge arises as several organisations are still using traditional cost accounting system. TCA fails to provide the true cost of their operations in the IT age. A detailed operation data are needed for resources and activities analysis and this will help in implementation of ABC easily. IT leads to improve the cost structure of the manufacturing companies. In order to reduce the increase in operating costs the company should be invest in a new IT system. According to Cooper (1988a)\(^ {131}\) ABC requires higher levels of IT to become more beneficial as it reduces the cost of data collection and processing. The strong information technology is needed at the highest levels of implementation (Krumwiede 1998)\(^ {132}\).

\(^{130}\) Shields, M.D. (1995), ibid

\(^{131}\) Cooper, R. and Kaplan R. S. (1988a),ibid

\(^{132}\) Krumwiede, K (1998),ibid
Linkage to Performance Evaluation and Compensation

Shields and McEwen (1996)\textsuperscript{133} claims that the importance of the linkage between performance evaluation and compensation, and ABC is natural because employees give interest to those things that affect their welfare. Hence linkage of ABC system to performance evaluation and compensation stimulates employees to facilitate in the implementation of ABC system, as well as, they will cooperate in ensuring that it succeeds. Also Shields (1995)\textsuperscript{134} found evidence about the degree of linkage between ABC and performance evaluation and compensation as an important factor for successful ABC implementation. Employees will give more attention for performance measures that affect their personal welfare.

Other Major Factors

Cooper \textit{et al.} (1992)\textsuperscript{135} has found that an essential factor for successful implementation of ABC is to clearly define objectives and scope of the ABC project early in the analysis stages. Cooper \textit{et al.} (1992)\textsuperscript{136} found that the most successful ABC project occurred when a specific target for change (i.e., an individual's groups) was identified early in the project. At the same time, determination of the objectives in early stages will help implementation teams to have a clear understanding of how the system should be designed and used. If the designers, engineers, and users accept the ABC system they will do their best to improve its concepts, frameworks and design. In addition, the clarity of ABC objectives will lead to a good design and effective utilization of ABC information.

\textsuperscript{134} Shields, M.D. (1995), ibid
\textsuperscript{135} Cooper, R. et al. (1992), Implementing Activity-Based Cost Management-Moving from Analysis to Action, Institute of Management Accountants, Montvale New Jersey
\textsuperscript{136} Cooper, R. et al. (1992), ibid
Linkage of the ABC to competition strategies like quality or speed strategies is necessary for competition since ABC information is helpful in improving competition position and profitability of firms. For example, if a firm utilizes a low cost strategy in competition, the ABC system will prepare a precise assessment of product or process costs for designers to know the costs of customization (Shield and McEwen 1996\(^{137}\), Chongruksut, W 2002\(^{138}\)) In addition, Total Quality Management and Just-In-Time will help in successful ABC implementation.

3.10 BENEFITS OF ACTIVITY BASED COSTING

The literature shows that cost allocation according to ABC system has been increasingly introduced and applied to provide information regarding activities and more accurate product cost. ABC has become more and more popular due to its benefits and its advantages over TCA (Chuentragun, T 2003\(^{139}\)). The main benefits of ABC can be described briefly as follows.

BOX NO.3.1

**BENEFITS OF ACTIVITY BASED COSTING**

- ABC Provides Accurate Product Cost
- ABC Provides Financial and Non-Financial Information
- ABC Encourage Continuous Improvement
- ABC Helps Improving Visibility and Transparency

---

\(^{137}\) Shield M.D and M. A. McEwen. (1996), ibid

\(^{138}\) Chongruksut, W. (2002), ibid

1) **ABC Provides Accurate Product Cost**

ABC provides more accurate product cost because ABC uses more activity drivers and more types of activity drivers than that of traditional or conventional costing. ABC uses different activity drivers to fit different circumstances (Turney 1996\(^{140}\)). It can help in determining product profitability and designing product mix. More detailed information based on cost drivers is provided by ABC system. Finally this leads to more accurate product cost. Due to accuracy, ABC information managers can make better decision on product, product design, process implementation, market segments and customer mix (Cooper and Kaplan 1988\(^{141}\), Cooper et al. 1992b\(^{142}\), Kaplan 1992\(^{143}\)).

Booth and Giacobbe (1997)\(^{144}\) found that the major benefit that adopters of ABC received from the implementation of ABC were more precise profit analysis. More accurate costing is achieved by assigning overhead to activities in accordance with their consumption of the activities that cause costs (Johnson 1991,\(^{145}\) Drury 1992\(^{146}\)).

ABC avoids or minimizes distortion in product costing that result from arbitrary allocation of indirect costs.

---

\(^{140}\) Turney, P. B (1996), ibid

\(^{141}\) Cooper, R. and Kaplan R. S. (1988a), ibid

\(^{142}\) Cooper, R. et al. (1992), ibid


\(^{144}\) Booth, P. and Giacobbe, F. (1997), Activity-Based Costing in Australia Manufacturing Firms: Key Survey Findings, Management Accounting Issues Report by the Management Accounting Center of Excellence of ASCPA, No. 5, March, pp.1-6.


ABC Provides Financial and Non-Financial Information

ABC information is useful for managers in budgeting and performance measurement as activity based budgets prepare objectives for each activity (Oliver 1994\textsuperscript{147}) quoted by Chongruksut, W (2002\textsuperscript{148}). Turney (1996)\textsuperscript{149} reported that, traditional costing can provide a lot of financial information (cost information) about resources, activities, and cost objects such as salaries and depreciation at the department level, but does not provide non-financial information. For example, it does illustrate what work is done by the employees, who earning salaries or it does not provide any details about which machine is represented by the depreciation or the activity the machine performs. Turney, also informs that ABC is clearly able to provide both cost and non-financial information. According to Innes and Mitchell (1990)\textsuperscript{150} ABC provides meaningful financial (period cost driver rate) and non-financial (period cost driver volumes) measures which are relevant to cost management at an operational level. This information is about the work done in an activity and relationship of this work and other activities. In additional, it provides information about cost drivers and performance measure for each activity or process in customer chain (Turney 1996).\textsuperscript{151} Thus, the non-financial data can be used for activity based management to achieve a continuous process improvement and re-engineering.

\textsuperscript{147} Oliver, L. (1994), The Cost Management Toolbox, Amacom.

\textsuperscript{148} Chongruksut, W. (2002), ibid

\textsuperscript{149} Turney, P. B (1996), ibid

\textsuperscript{150} Innes, J. and Mitchell, F. (1995), ibid

\textsuperscript{151} Turney, P. B (1996), ibid
3) **ABC Encourage Continuous Improvement**

As it has been mentioned above, ABC generates not only cost information but also non-financial information about the events that influence the performance of activities. Moreover ABC encourages improvement by its information. It complements the organization to initiate improvement initiatives such as re-engineering, the theory of constraints, target-costing economic value addition, product life cycle costing and strategic costing. It provides feedback information related to product design and potential areas for process improvements. In the same way detailed information which is provided by ABC can analyze profitability of customers and marketing channels. Different customers need different product mix. Their order sizes of products are also different. Thus, ABC may be the better costing methodology. Using ABC allows companies to group overhead costs into several activity pools and recognizes that some products demand more resource than other. The TCA methods typically rely on grouping overhead costs into a single account and allocate these costs based on one cost driver.

The information will also be used to target customer that have the potential of increase profitability through additional/ different products. With ABC information organisation can analyze customer profitability and determine which customer is profitable.

4) **ABC Helps Improving Visibility and Transparency**

Transparency cost helps in identifying high-cost activities that can be redesigned by creating a greater understanding between service departments and operation departments and assisting buyers/suppliers interface to be efficient. In addition, ABC allows management to focus on value added and non-value added
activities in order to reduce or eliminate those activities that are not adding value but are being incurred. Also Pholbud (2002) ^152^ (Quoted in Chuentragun, T. 2003), stated that ABC helped to improve cost tracing and allows an organization to follow policies to have a transparent financial management because cost could be traced down to the level that was explainable to any one who wanted to know how an organization utilized the resources.

Finally, ABC adds the most value to an organization when it is used as the information basis for managing and improving the business. Activity analysis leads to an ABM business model from which management can make decision to improve the effectiveness of the organization. ABC provides information regarding an activity's performance and cost. This information can be used for effective cost management through activities. So this finally leads to control and reduces cost. With analysis of activities, management can improve and change product design and manufacturing process in order to reduce costs. ABC makes analysis of activities into activities which are value-added and activities which are not value-added in turn leading to cost reduction.

3.11 LIMITATIONS OF ACTIVITY BASED COSTING

Though ABC has several of benefits and advantages over the TCA; but it also has some limitations and shortcomings. No doubt application of any new system like ABC, in its first stages may face some difficulties. The main limitations of ABC as observed from previous studies and applications are the following:

---

1) The main limitation is selection of cost drivers. Proper and appropriate cost drivers must be used in order to attach pooled costs to individual products. Innes and Mitchell (1990)\textsuperscript{153}, Smith (1994)\textsuperscript{154} states that the selection of the cost drivers may not be representative of the cost behavior of the whole cost pool. To have a usable cost driver must be cause by an activity that is measurable and which can be related through the measure to production output. Innes and Mitchell (1990)\textsuperscript{155} not all cost will readily impact this process. For example, it will be difficult to identify meaningful cost drivers for corporate based advertising, top managerial activity relating to the business as a whole etc.

2) The causal relationship between activities and products is not always clearly identifiable. An activity does not mean that the cost pool will increase or decrease in direct proportion to the change in cost driver activity. This puts even more priority

\textsuperscript{153} Innes, J. and Mitchell. F (1990), Activity-Based Costing: A Review with Case Studies, Chartered Institute of Management Accountants, London.

\textsuperscript{154} Smith, M. (1994), Managing Your ABC System, Management Accounting, April, pp. 46-47.

\textsuperscript{155} Innes, J. and Mitchell. F (1990),ibid
into the exercise of judgment and the utilization of experience. Cooper (1989c)\textsuperscript{156} points out that "redesigning a cost system is expensive and time-consuming".

3) ABC is more complex than TCA. In order to obtain more detailed analysis, data of cost activities and more analytical work needs to be performed. This may not be easily implemented for all products. In addition, data collection processes, analysis processes are costly and time-consuming experience with ABC.

4) ABC utilizes, and produces data/information which is largely historical, that does not suit all purposes. Smith (1994)\textsuperscript{157}, Allen (1989)\textsuperscript{158} pointed that ABC is still a "historic cost system" and raises doubts on ABC's usefulness in certain circumstances especially if future cost considerations are of greater importance. Yong and Wu (1993)\textsuperscript{159} observed that product unit cost developed under ABC using historical data is often used to make pricing decisions without considering either the future price index (for variable cost) or capacity utilization (for fixed cost). Thus products are underprovided when unit variable cost is underestimated or overpriced when unit fixed cost is overestimated. They suggest using "strategic" ABC unit costs, based on the capacity rate that the company wants the operation to achieve over its useful life or planning horizon. Finally, this enables the user to calculate a close approximation of the true long-term costs and to make better decisions about product mix, investments and staffing.

\textsuperscript{156} Cooper, R. (1989c), ibid
\textsuperscript{157} Smith, M. (1994), ibid
\textsuperscript{158} Allen, D. (1989), Never The Twain Shall Meet, Accountancy Age.
\textsuperscript{159} Yong, G. Y and Wu, R. C (1993), Strategic costing and ABC, Management accounting, May, pp. 33-37.
ACTIVITY BASED COSTING IN PORT SECTOR.

Activity-based costing is now an accepted element of the accounting and control systems of industrial and service firms, and it has been employed in both governmental and not-for-profit organizations. "Using Activity-Based Costing to Manage More Effectively," by University of Texas at Austin professors Michael H. Granof, David E. Platt, and Igor Vaysman,\textsuperscript{160} outlines a case study of the application of activity-based costing principles to one department of a large university's business college. The case study found that in this and other settings, ABC has advantages over conventional accounting systems, chiefly because it allocates "overhead" costs to programs and activities in a way that is more reflective of the factors that influence them.

Port investors are expecting progressive shareholder value creation to justify their investment. This anticipation to achieve high performance has compelled port companies to build a value tree, which will show the total enterprise value to shareholders and how their growth expectations can be met.\textsuperscript{161} Wen Cheng Lin and Shmuel Yahalom(2009), have concluded in their research on "Target performance management for an international shipping harbor: An integration activity-based budgeting with a balanced scorecard approach, the case of Keelung Harbor" that ABC methods can assist in conducting rational cost allocation and budget planning with respect to profit planning and cost control.

\textsuperscript{160} http://www.allbusiness.com/professional-services/accounting-tax-auditing/6461934-1.html

\textsuperscript{161} http://www.accenture.com/NR/rdonlyres/5A9A5990-DCF0-442A-B284-CE7E505BFD45/0/Accenture_TTS_Managing_Terminal_Performance.pdf
Porter and Kehoe\textsuperscript{163} in their article "Using activity-based costing and value analysis to take the pain out of downsizing at a naval shipyard" have concluded that Activity-based costing is ideally suited to downsizing and restructuring support departments that handle functions such as personnel, accounting, administration, and materials management. Using the Charleston, South Carolina, Naval Shipyard as an example, this article shows how combining activity-based costing and value-added analysis techniques made support activities visible and understandable, facilitated the restructuring of support functions, helped judge which activities were necessary, and improved the cost and performance of activities.

Bichou and Gray (2004)\textsuperscript{164} have shown that through conceptualizing ports from a logistics and supply chain management approach, it is possible to suggest a relevant framework of port performance. Although there is widespread recognition of the potential of ports as logistics centres, widely accepted performance measurements for such centres have yet to be developed. The essence of logistics and supply chain management is an integrative approach to the interaction of different processes and functions within a firm extended to a network of organizations for the purpose of cost reduction and customer satisfaction. The logistics approach often adopts a cost trade-off analysis between functions, processes and even supply chains. This approach could be beneficial to port efficiency by directing port strategy towards relevant value-added logistics activities.

\textsuperscript{163}http://www3.interscience.wiley.com/journal/113466109/abstract?CRETRY=1&SRETRY=0

\textsuperscript{164} Khalid Bichou; Richard Gray (2004); Maritime Policy and Management, volume 31, issue 1, January 2004, pg 47-67
3.12 RESEARCH GAP

In the current global business environment firms must be competitive in order to survive. The firm must analyze the nature of its particular industry and environment. A popular method for achieving the competitive advantage is the ABC. This method is particularly useful in providing management with the types of information necessary for decision making.

ABC is a cost management process that assigns costs to products/service according to the activities and resource consumed. The literature shows that the rate of ABC adoption by the firms around the world are not very high, however, the adoption rates of ABC and the entrance in ABC are growing. Many studies reported that the ABC provided many significant benefits over the traditional costing systems, such as accurate product costs, enhanced cost information for performance measurement and management’s decision making etc.

This Chapter introduced the concepts of ABC, discussing its relevance in today’s business world, where the rise in overhead costs, increased product diversification, increased use of advanced manufacturing technology, having fundamentally altered cost structure, has rendered traditional cost systems obsolete. The distortions created by traditional cost systems and how these are minimized by an ABC system, were discussed.

The literature review of numerous research papers, articles, books and journals reveal that there are many researches in the field of Activity Based Costing mainly in manufacturing industries. Activity Based Costing, its merits and limitations with respect to its functioning in manufacturing sector has been over emphasized but there are fewer studies with respect to service sector. Installation of Activity Based Costing
in Service sector is slowly gaining momentum and there is very less concentration on port sector. To the best of researcher’s knowledge, there is a research gap in the analysis of profitability in installation of Activity Based Costing in port sector. Further, there has been no specific study or research in this field with special emphasis on Mumbai Port Trust.