

# Activity based costing in Construction Projects.

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## 1. INTRODUCTION

### 1.1. GENERAL INTRODUCTION

There are a lot of non-value adding activities or wastes in construction practices and many among those were left unnoticed or unattended. Previous studies have shown that there were significant amounts of values loss due to construction process flow wastes and tremendous productivity improvements can be achieved by simply targeting at reducing or eliminating those wastes and/ or improve the process flow.

This process of "Activity Based Costing in Construction Management" will be carried out on the basis to study the waste concepts and the level of "ABC" in local construction practices based on philosophies and principles drawn by Activity Based Costing. A quantitative survey will be carried out through structured questionnaires over a randomly selected group of managerial personnel in construction activities.

Activity Based Costing is a costing approach that assigns resource costs to cost objects such as products, services, or customers based on activities performed for the cost objects. The premise of this costing approach is that a firm's products or services are the results of activities and activities use resources which incur costs. Costs of resources are assigned to activities based on the activities that use or consume resources (resource consumption drivers), and costs of activities are assigned to cost objects based on activities performed for the cost objects (activity consumption drivers). ABC recognizes the causal or direct relationships between resource costs, cost drivers, activities, and cost objects in assigning costs to activities and then to cost objects. ABC assigns factory overhead costs to cost objects such as products or services by identifying the resources and activities as well as their costs and amounts needed to produce output. Using resource consumption cost drivers, a firm determines the resource costs consumed by activities or activity centres (activity cost pools) and calculates the cost of a unit of activity. The firm then assigns the cost of an activity to products or services by multiplying the cost of each activity by the amount of the activity consumed by each of the cost objects.

In case of similar projects found in the construction industry, the repetitive activities are repeated throughout the project. These activities represent the work to be performed and enable the project to run smoothly. This in turn helps to speed up the project performance and minimize the project duration.

For the construction projects, an effective resource management is always crucial for planners. Comparing the characteristics of the resource management issues in highly automated industry, the complexity of resource management in labour intense construction projects arises from the diversity of resource acquirement.

In the project, improper planning affects the project greatly. And nowadays small scale industries are also facing the problem of improper planning.

### 1.2. SCOPE OF WORK

This study will provide the information regarding the proper planning of activities in housing construction projects. The effective management of activities reduces not only the construction cost but also project completion time or project duration. This enhances the profit of a construction industry.

The primary data will be collected through detailed drawings and from that detail drawing the activities will be evaluated. Planning and scheduling of all these activities will be done and with the help of this reduction of the activities will be done. Unnecessary activities will be reviewed and it will be rectified or removed. With the removal of unnecessary activities we can execute the project smoothly and complete the project in economical manner and within given time.

In construction industry, a project mainly focuses on two things, one is optimum utilization of resources and the other is speedy completion of project. In line to this trend, construction industry has seen Human Resource Management as a primary entity for every company or a project. Human Resource Management is managing organizational workforce. It has been broadly defined as a field of organizational activity and professional practice covering functions related primarily to training, career development, and organizational development

### 1.3. IMPORTANCE OF STUDY

The importance of this study is to provide the optimum duration for the housing construction (repetitive type of construction) projects by applying proper resource to the construction activities.

In India, construction industry is second largest industry after agricultural industry. The development of physical infrastructure, consequently the construction sector has been focusing from last decade. It was given more importance to infrastructure development from the tenth five year plan (2002 – 2007). During the period of 2007 -2011 Indian construction industry had witnessed a rapid and strong growth. Due to the country's expanding economy, increasing investment of India's government in development of infrastructure and with support of foreign direct investment (FDI) system.

There are many challenges that are faced by construction industry in India, but one of the important challenges is proper planning in construction. Every project has some difficulty in construction like material, money, tools and local contractor's construction cost. Looking to the current scenario there is a continuous downfall of construction planning and due to this productivity is decreased.

### 1.4. OBJECTIVES OF THE STUDY

The goal of any construction industry is to achieve higher productivity with optimum duration and optimum cost. The present study aims to evaluate the effective management of activities to achieve the optimum duration for project.

The objectives of the project are

1. To study the concept of activity based planning in construction projects.
2. To study the deviation of actual completion of project and the planned completion of project.
3. To study the effect of deviation on the cost of project.
4. Analysis the above collected data.
5. To give the discussion and suggestion for effective activity based costing management for construction project

### 1.5. METHODOLOGY

The methodology to achieve the above objectives is given below

Step 1:

Literature survey is carried out from the relevant journal papers, manuals and books. This help in getting updated knowledge on the subject besides helping in the study of various types of resources used in the construction industries and management of same resources. The various types of resource management done in construction industries are, Manpower management, Machinery management, Money management, Material management, Space management.

Step 2:

At initial stage the project will be studied from Details drawings obtained from construction site. Planning of all the activities will be done and scheduling will be done depending upon the number of activities in Software.

Step 3:

The data is collected from the housing construction project. The data is based on the residential buildings consisting of various types of blocks. The following data is collected from the construction site for various types of blocks i.e. expected Completion time of project,

Quantity of work for each activity, optimistic, pessimistic and most likely time for each activity, expected skilled and unskilled labour required for completion project etc.

Step 4:

Analyse the above collected information and prepare a result. In the analysis to minimize the overall project duration in the construction projects by activity based and spread sheet are used to prepare optimum scheduling for the effective utilisation of the project on the basis of data collected from housing project.

Step 5:

To outcome of this will be feasibility of the project before execution, during execution and after execution can be analysed.

### 1.6. ORGANISATION OF PROJECT

The project has been divided in to six chapter and description of these chapters are given below

The First chapter deals with the introduction of project and consist of general information, scope of work, importance of study, objectives of project and methodology to achieve respective objectives.

The Second chapter deals with the literature survey, in this chapter we study about the factors affecting activity based costing in the housing construction projects for the management of activity to improve productivity and cost optimisation.

The Third chapter deals with the study of various types of activities used in the construction projects i.e. manpower management, material management, machinery management, space management and money management. Also in this chapter we study about the network techniques i.e. grant chart and cost optimisation techniques.

The Fourth chapter deals with the collection of data from site and the analysis of collected data by using the activity based costing technique and use theoretical model which is studied in a literature survey. And also use spread sheet to show graphical analysis. In this chapter we study how to find out the optimum duration to complete the construction project and that is the result.

The Fifth chapter deals with the result and discussion for the effective labour management to improve the productivity of construction project.

The Sixth chapter deals with the conclusions on the study which is carried out in whole project.

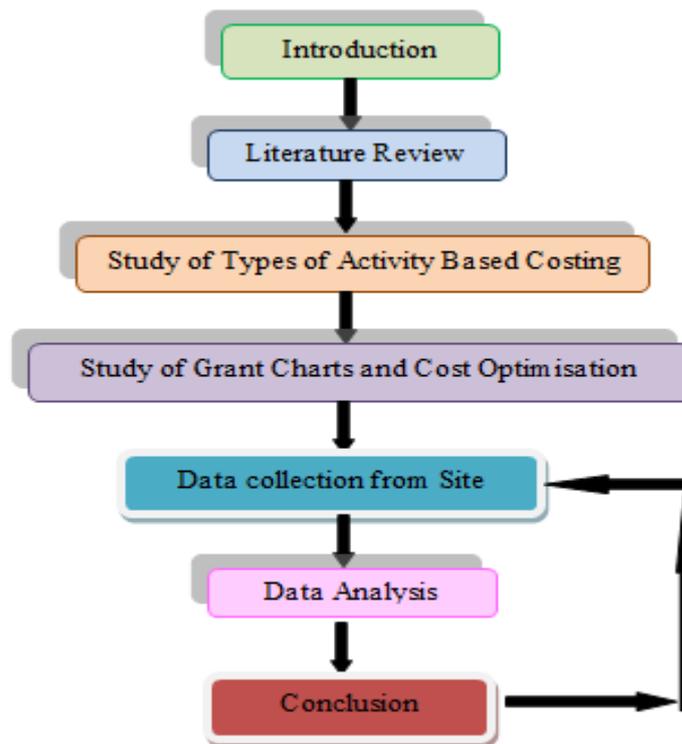


Fig 1.1Flowchart of Project

### CHAPTER NO: - 2

### 2. LITERATURE REVIEW

#### 2.1. INTRODUCTION

Now a day's Construction industry deserves the second largest one in India. The infrastructure growth of a country depends on the development of construction industry. Implementation of infrastructure projects are usually failing in each stage and ultimately failure occur, which leads to cost and time overrun.

Success of a project heavily depends on the ability to complete a project on scheduled time within the budget as per the required quality. Efficiency of a construction firm is to complete in time. Delay of a project during its progress would suffer material loss, machinery idling including tools and plants and equipment. The time overrun is the main cause of cost over run and it affects both clients and contractors.

Respectively there are many challenges that are faced by construction industry in India. While doing project management, if we did the proper planning the total project cost would be reduced.

There are so many factors that affect the planning which are studied in literature survey, and in this survey we observed that absenteeism in planning is major problem. The effective utilization of planning gives the effective cost reduction for the entire project.

Therefore the goal of this study is to evaluate effective planning and management to improve the productivity of project. There are so many factors on which the planning is depend, so study of these factors is necessary. And also it is observed that after doing survey on various construction industries the absenteeism in planning is major factor.

Productivity remains an intriguing subject and a dominant issue in the construction sector, promising cost savings and efficient usage of resources. Productivity is one of the most important issues in both developed and developing countries.

**2.2. ACTIVITY BASED MANAGEMENT TO IMPROVE PRODUCTIVITY**

In construction industry, a project mainly focuses on two things, one is optimum utilization of resources and the other is speedy completion of project. In line to this trend, construction industry has seen Activity Based Management as a primary entity for every company or a project. Activity Based Management is organizational workforce. It has been broadly defined as a field of organizational activity and professional practice covering functions related primarily to training, career development, and organizational development. Activity Based Costing is not structured in construction industry but the awareness about the need and importance of planning is growing. Though the construction sector is booming, with urbanization at its peak, the industry is not bereft of its share of woes. The biggest problem that the industry confronts is the acute shortage of skilled and trained manpower. Getting skilled and trained workforce these days has become an uphill task. (1)

**2.3 ABC AND ABM**

Activity-based costing (ABC) is defined as a methodology that measures the cost and performance of activities, resources, and cost objects. Specifically, resources are assigned to activities, then activities are assigned to cost objects based on their use. ABC recognizes the causal relationships of cost drivers to activities Activity-based management (ABM) is subsequently defined by CAM-I (Consortium for Advanced Manufacturing-International) as a discipline that focuses on the management of activities as the route to improving the value received by the customer and the profit achieved by providing this value. ABM includes cost driver analysis, activity analysis, and performance measurement, drawing on ABC as its major source of data. Using ABC data, ABM focuses on how to redirect and improve the use of resources to increase the value created for customers and other stakeholders. ABM accomplishes its objectives through two complementary applications: operational and strategic ABM. (2)

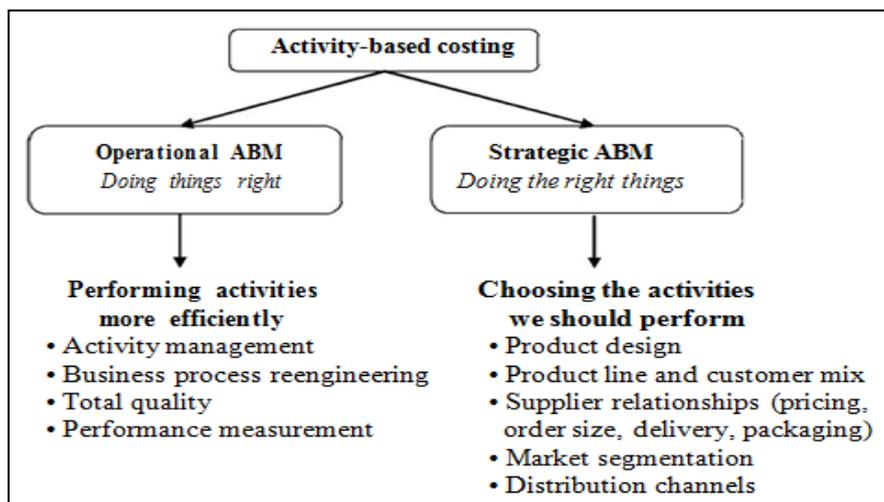


Fig 2.1 – Using ABM for operational improvements and strategic decisions

## 2.4. FACTORS AFFECTING ACTIVITY BASED COSTING

Most of safety risk focuses on high-severity safety risks for large-scale construction processes. Such studies help firms identify the highest risk processes so they may be targeted for improvement. However, few studies quantify safety risk at the activity level or include low-severity, high-frequency risks that some literatures suggest contribute to a large proportion of total risk. Three major efforts are discussed:

1. Identification of activities required to construct concrete formwork;

2 Selection of an appropriate all-inclusive and mutually exclusive risk classification system; and

3. The quantification of the average frequency and severity levels for each risk classification associated with each activity. To identify formwork construction activities, 256 worker-hours of observation were conducted and the resulting activity descriptions were reviewed and validated by industry professionals. Risk classifications appropriate for this study were created by aggregating relevant literature. Finally, the Delphi method was implemented to individually quantify average frequency and severity using scales that define the entire spectrum of possible values. In total, 130 frequency ratings and 130 severity ratings were obtained over three rounds of Delphi surveys. Results indicate that there are 13 major activities required to construct concrete formwork and the highest risk activities are applying form oil, lifting and lowering form components, and accepting Materials from a crane.(3)

### 2.5 The role of managers and management accountants when implementing ABC/ABM

“There has been a lively academic and professional debate on the changing role of accountants, particularly management accountants, during recent years. The propagated role shift has essentially meant transition from being oriented around number crunching and maintaining the overall functioning of the accounting systems to an increasingly business-oriented role”

Management accountants can perform an important role in the design of an ABC system. Based on their skills and training, they can help identify what is appropriate for analysis (product, customer, process, etc.) and explain the probable causes of an existing cost system's deficiencies. In addition, based on their detailed knowledge of the information in their company's costing information systems, they are uniquely qualified to judge the level of aggregation appropriate to the ABC costing system. They can use their understanding of costing methods to recommend appropriate methodologies for the assignment of costs to activities and cost objects. Finally, they will be able to use their understanding of the information and cost relationships to support the system once it is implemented.

As with any new management technique or tool, an effective change management process must be in place when implementing an ABC/ABM system. An objective of this process should be to ensure that there is support for the system at all levels of an organization. This includes having a top-level manager to champion the initiative, as well as acceptance by lower-level managers.

Besides management accountants and managers, the organization's information technology (IT) systems play an essential role in the implementation process. Information Technology (IT) refers to information systems and the organizational planning of resources required, acquiring, implementing, delivering and monitoring them. For many years, information technology (IT) has been playing an important role in the operations of organizational, strategic and managerial systems. It is often difficult, however, for generalists - who most board members are - to keep up with the rapid changes taking place in IT and, therefore, to know what questions to ask to ensure that IT issues are being properly addressed. IT systems must provide data that measures the outputs. Collectively, the organization's IT systems should contain information about most of the cost objects and the resource and activity cost drivers.

All and all effective communication - at all levels of an organization is essential. An organization needs to communicate the deficiencies of its existing costing system, the effect of this distortion on managerial decision making, how ABC costing principles can be used to provide information that is more relevant for managerial decision making, and the effect of the new system on the evaluation and rewarding of individual employees. Communication is a multi-way process, and employees', managers', accountants' concerns need to be addressed.

After this process, thanks to the existing communication the managerial accounting function and management accountants' role changes from being the scorekeeper and watchdog to being the active advisor of management and an increasing participant in decision-making. (5)

## 2.6 STRATEGIC ABM –

Explores various ways a company can create and sustain a competitive advantage in the marketplace. ABM attempts to alter the demand for activities to increase profitability, encompasses decisions about product design and development where the biggest opportunity for cost reduction exists, improves relationships with suppliers and customers.

Some of the specific uses of ABM in organizations today include attribute analysis, strategic decision making, benchmarking, operations analysis, profitability/pricing analysis, and process improvement. Data attributes allow a company to perform analysis on many different dimensions of a management problem using the same basic store of data.

Organizations that are designing and implementing ABM will find there are five basic information outputs:

- Relevant information about the cost of activities and business processes;
- The cost of non-value-added activities – in order to identify activities that do not contribute to customer value or the organization’s need and make improvement efforts;
- Activity-based performance measures – to provide scorecards, to report how well improvement efforts are working;
- Cost drivers – in order to identify factors that can cause changes in the cost of an activity.

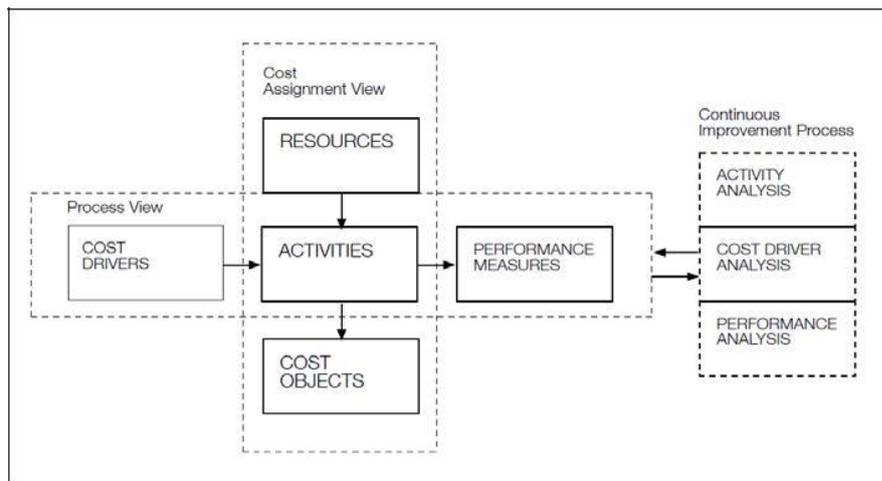


Fig 2.2 – Outputs of the ABM model

The shift from ABC (for product profitability assessment) to ABM (for more general managerial control and decision support) has been supplemented by the broadening of ABC/M application to different types of business, to different functional specializations within business and to the complementarities of ABC/M to other new high-profile management and accounting techniques.

Together, ABC and ABM methodologies provide the tools and the knowledge base for making informed decisions - decisions that relate to the pricing, management, and improvement of products and services. They are utilized to gain fuller understanding of the real cost dynamics and cost structures involved in business operations. ABM together with ABC principles can enable managers to better understand (a) both product and customer profitability, (b) the cost of business processes, and (c) how to improve them.

ABC and ABM are a continuum of value. ABM is the application of ABC data to manage product portfolios and business processes better. ABC becomes ABM (management) when it is used to:

- Design products and services that meet or exceed customers' expectations and can be produced and delivered at a profit;
- Signal where either continuous or discontinuous (re-engineering) improvements in quality, efficiency and speed are needed;
- Guide product mix and investment decisions;
- Choose among alternative suppliers;

- Negotiate about price, product features, quality, delivery and service with customers;
- Employ efficient and effective distribution and service processes to target market and customer segments;
- Improve the value of an organization's products and services.

ABC/ABM systems are very effective means for improving company performance on many fronts. An organization can realize the power of ABC and ABM when the right individuals access the right information in the best format for improving performance. (6)

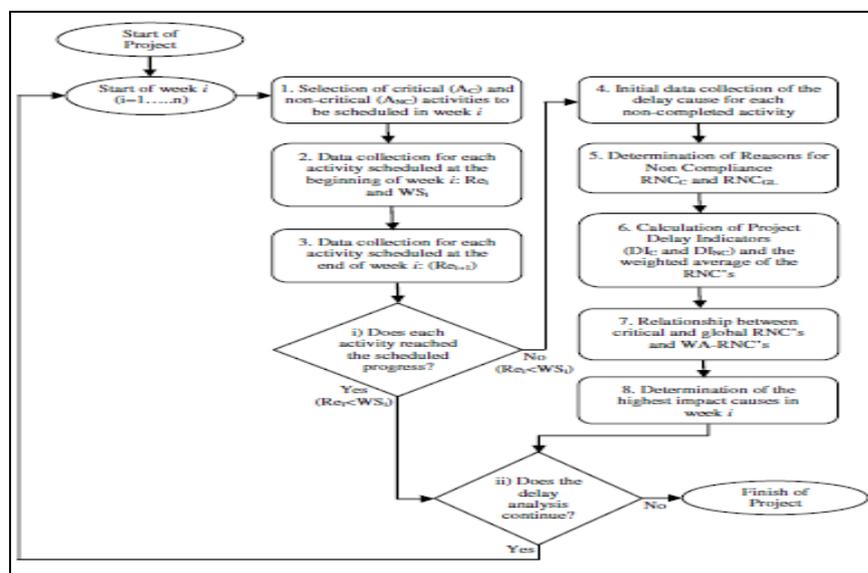
### 2.7 RESOURCE LEVELLING IN ACTIVITY BASED COSTING

Resource levelling aims at minimizing the resource usage fluctuations, which is accomplished by moving non critical activities within their float. The project duration is fixed and is not affected by the levelling. Most of resource levelling techniques assumes that activities cannot be split. Although this assumption is valid for most construction activities, there are several activities that can be split to achieve better resource levelling. However, there is an added cost associated with splitting such as start-up and restarting costs. The objective is to level resources in a way that provides a trade-off between the extra cost of acquiring and releasing resources versus the extra cost of activity splitting. The model can be used to determine at what values of the splitting cost, the pre-emption of an activity is recommended.

The critical-path method CPM is the most commonly used method for scheduling and controlling construction projects. Although CPM offers several advantages, it has some major limitations. One of these limitations is the assumption that resources are unlimited. The initial CPM schedule is prepared based solely on network logic with the assumption of unlimited resources. After the preparation of the initial schedule, resources are loaded to the network and a resource histogram, showing the daily resource forecast, is developed. Careful examination of the resource histogram may show several problems. On some days, the resource requirements might be more than the resources available which is referred to as overloading. The resource requirements might be less than the resources available which is referred to as under loading. Ideally, the resource requirements will be identical to the resource availability in any single day. Resource levelling is a technique that is used to solve these problems. The objectives of resource levelling are to reduce the peak resource demands and to minimize the peaks and valleys in these demands. (7)

### 2.8. FACTORS AFFECTING ACTIVITY BASED COSTING

Activity delays are a common issue in the construction industry and can increase project schedules and costs. Activity delays can negatively affect several dimensions of construction-project performance. Delays can lengthen schedules, increase project costs, and jeopardize quality and safety. Delays are one of the most common problems that affect the competitiveness of construction companies. The first step in identifying existing problems in projects and developing corrective actions is to determine their causes. It is not Only relevant to quantify delay impacts on performance but also to identify the primary causes of such delays to mitigate their effects. Delay analysis in construction has been primarily focused on the quantitative impact on the time performance of projects, leaving little room to address the qualitative dimension of delays in terms of their causes. In this regard, the writers argue that an approach based on the study of the causes of scheduling failure (i.e., to analyse causes of delay) could help support the qualitative dimension for delay analysis. (8)



## **Conclusion and Discussion:**

### **Conclusion:**

- 1) Planning is the basic of Construction.
- 2) With the help of Planning materials can be brought.
- 3) No wastage.
- 4) Time of construction is reduced.
- 5) Construction can be distributed into many phases.