International Journal of Multidisciplinary Engineering in Current Research - IJMEC
Volume 8, Issue 5, May-2023, http://ijmec.com/, ISSN: 2456-4265

COST MANAGEMENT IN CONSTRUCTION PROJECTS

A. Pani Bhushan, B. Anil Kumar, M. Sreekanth, P. Vijay Kumar,
S. Anil, S. Mahesh
Dept. of Civil Engineering, SVITS, Mahbubnagar, Telangana, India.

ABSTRACT: The reality of most project scheduling applications is extremely complex; project managers must make task start decisions under different scheduling needs (such as smooth resource utilization profiles and resource constraints) and under conditions of uncertainty that sometimes extend beyond task durations. Resource Management is a difficult task due to inherent complexity of construction projects. The present study deals with resource planning for a fast-track project with constrained durations. The study was carried out in two phases. In the first phase, I have been taken a plan of G+2 Residential building. From the plan I am estimated the quantities for various activities. According to the Standard Schedule Rates (CPWD) the manpower and cost required for various activities were estimated. By using Microsoft Project software project schedule was prepared. The requisite data was collected from the detailed drawings and prevailing site conditions. In the second phase, a Resource (Cos)t Constrained Analysis was carried out by Resource Levelling for various activities by decreasing resources with increased duration to study the time-cost implications.

PREAMBLE

1.0 General Introduction:

The term "Construction Project" refers to a high-value, time bound, and special construction mission with predetermined performance objectives. The project mission is accomplished within complex project environments, by putting together human and non-human resources in to a temporary organization headed by the 'Project Management'. Project Management is the Planning, Organizing, Directing and Controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives.

Due to the resource-driven nature of construction management, the construction manager must develop a plan of action for directing and controlling resources of workers, machines and materials in coordinated and timely fashion in order to deliver a project within the limited funding and time available. Hence, aside from a technology and process focus, a resource-use focus must be adequately considered in describing a construction method or operation in a project plan.

In general, construction projects are high value, and they employ huge resources of men, materials and machines. Major works involve heavy investments, say from a hundred crores of rupees to a few rupees, require high level of technology and need effective management of resources.

1.1 Definition of a Resource:

The resource has been defined as many ways.

"A resource is any entity that contributes to the accomplishment of project activities."

- Personnel
- Equipment
- Contractors
- Spaces
- Materials

A resource is a "physical quantity" such as manpower, material, money, equipment, time or space, which are required for carrying out a project. The resources may be raw materials, machine, time or people time, money or anything else to maximizing profits, minimizing costs, or achieving the best possible quality.

1.2 Importance of Resources in Construction Projects:

The crucial factor in successful implementation of a construction project not only depends on the quality & quantity of work, but also largely depends on availability of resources. All activities involved in the project require certain amount of resources to be completed. Each activity is allocated with a specific resource and completed within the time limit, otherwise implication of overall duration of the project.

The best combination of resources to use for performing a construction activity is based on contractor's ability to identify the interdependencies of the various resources. The time and cost directly concerns to the availability of resources. The time required may be determined by dividing the productivity associated with the resources used on the activity into the defined quantity of work for the activity.

1.3 Classification of Resources:

Resources are responsible for actually completing the tasks in the project. They can be classified in various way based on various factors involved in different projects.

a) Based on nature:

Resources can be classified as follows.

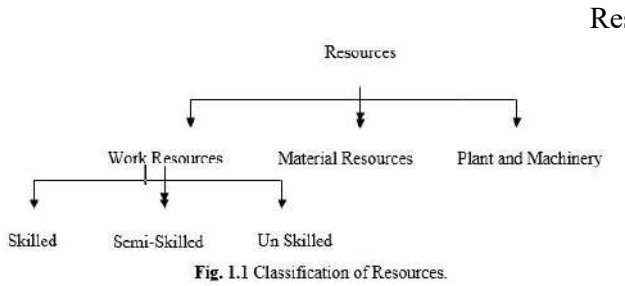


Fig. 1.1 Classification of Resources.

Fig. 1.1 Classification of Resources.

Work resources:

People and equipment resources that perform work to accomplish a task. Work resources consume time (hours or days) to accomplish tasks.

Material resources:

The supplies or other consumable items used to complete tasks in a project.

b) Based on their Attributes:

Generally, resources in a construction project may be categorized into two groups- namely,

- Simple resources
- Complex Resources

All resources can be classified as either simple resources or complex resources. Each resource has its own attributes, such as quantity and capacity. For example, in an earth moving operation, earth could have quantity and density as its attributes, while truck not only has number and capacity as its attributes, but also has loading, moving to dump, dumping, and moving load as its methods. In this example, earth is a simple resource, and truck is a complex resource.

c) Based on Category:

Skilled: Experts in performing their jobs are called skilled. Eg., Carpenter, Barbender, Masons, Electrician, and Plumber. They cannot involve or perform many activities.

Unskilled: All helpers come under this category. They can help anybody in various activities of construction. These labor which are not involved in the skilled work. Eg., Earth labour, concreting labor.

Semi-Skilled: Person who is not as expert as skilled labor, but can perform the same job in more duration.

1.4 Quantification of Resources:

Resources can be quantified as follows.

One way is to use some measure of resource usage – Output

- Staff hours
- Equipment hours

Another way is to indicate the number of units of resource assigned

- Numbers of staff
- Number of Equipment's

Factors Affecting the Number of Resources:

- Skill or expertise – workmanship
- Site conditions
- Nature of work
- Quantity of work
- Continuation of work

1.6 Resolving Workload/Resource Imbalances:

- Request additional resources
- Plan to work overtime
- Contract out work
- Delay start or extend durations of non-critical activities
- Change the approach used to perform the work
- Reduce project scope or extend project deadline

1.7 Need for This Study:

Resources required for the construction industry are:

1. **Men:** For skilled and unskilled work men, supervision and management.
2. **Materials:** Such as cement, bricks, aggregates, reinforcement, fittings and fixtures, and consumable items like petrol, lubricants, etc.
3. **Machines:** To facilitate construction, such as trucks, earth moving equipment, pile drivers, etc., together with repair and maintenance facilities.

Objectives of Study:

- To investigate the importance and necessity of "Resource" and need for "Resource Management" in Construction Industry.
- To achieve "Resource Plan" through Resource Allocation and Leveling using Manual and Computer Applications.
- To know the "Cost implication" for increased duration based on the "Resource Constrained Analysis".

1.9 Scope of Study:

This study is carried out during the construction period of an ongoing project of medium size during from December 2011 to July 2013.

The proposed methodology for estimated resources and resource implication on cost is based on

- The available information on the project.
- Experiences of experts in the field of construction.

LITERATURE REVIEW

2.0 Introduction:

A brief review of the important aspects of the available literature pertaining to project management and resource levelling are presented in this chapter. Khaled El-Rayes and Dho (2009) studied "**Resource Levelling in Construction Projects**". Construction schedules, generated by network scheduling techniques, often cause undesirable resource fluctuations that are impractical, inefficient, and costly to implement on construction sites. This paper presents the development of two innovative resource levelling metrics to directly measure and minimize the

negative impact of resource fluctuations on construction productivity and cost. The first metric quantifies the total amount of resources that need to be temporarily released during low demand periods and rehired at a later stage during high demand periods. The second measures the total number of idle and non-productive resource days that are caused by undesirable resource fluctuations. The two new metrics are incorporated in a robust and practical optimization model that is capable of generating optimal and practical schedules that maximize the efficiency of resource utilization. An application example is analyzed to illustrate the use of the model and demonstrate its capabilities. The results of this analysis show that the present model and metrics are capable of outperforming existing metrics and eliminating undesirable resource fluctuations and resource idle time.

M. Easa, (1989) studied "**Resource Levelling in Construction**". Resource levelling is needed in construction to avoid the difficulties associated with the large variations in resource usage. This paper presents an integer- linear optimization model of resource levelling (single resource, continuous activities) which guarantees the optimal levelling. The objective function of the model minimizes the absolute deviations between the resource requirements and a uniform resource level, between consecutive resource requirements, or between the resource requirements and desirable non-uniform resource levels. The model requires as input the critical path method (CPM) scheduling results, from which the constraints and objective function of the model are established automatically by an interface program. Extensions of the model to multiple resources and trade-off of cost scheduling are suggested. The model is applicable to activity-on-arrow, activity-on-node, and precedence networks and is intended for small- to medium sized construction projects.

Tarek Hegazy (1999) studied "**Resource Allocation and Levelling using Genetic Algorithms we get Cost management**". Resource allocation and levelling are among the top challenges in project management. Due to the complexity of projects, resource allocation and leveling have been dealt with as two distinct sub problems solved mainly using heuristic procedures that cannot guarantee optimum solutions. In this paper, improvements are proposed to resource allocation and levelling heuristics and the Genetic Algorithms (GAs) technique is used to search for near-optimum solution, considering both aspects simultaneously. In the improved heuristics, random priorities are introduced into selected tasks and their impact on the schedule is monitored. The GA procedure then searches for an optimum set of tasks priorities that produce shorter project duration and better-levelled resource profiles. One major advantage of the procedure is its simple applicability within commercial project management software systems to improve their performance. With a widely used system as an example, a macro program is written to automate the GA procedure. A case study is presented and several experiments conducted to demonstrate the multi objective benefit of the procedure and outline future extensions.

PROJECT MANAGEMENT

3.0 Introduction:

3.1 Defining Construction Project Management:

It is impossible to define a complex operation such as Construction Management in a simple one-sentence. We will have to dissect the term and define its many facets.

3.1.1 Construction Projects:

In general, major construction works are time bound and employ huge resources of men, material and machines. Construction projects involve heavy investments from hundred crores of rupees to a few rupees. They require a high level of technology, and need an effective management of resources. The execution of major construction capital works is undertaken by projecting them that is, by organizing many simpler construction projects and performing the jobs to complete or achieve the goal or objective (major construction).

3.1.2 Project Management:

Project Management is the utilization of knowledge, skills, tools, and techniques to project activities in order to meet or exceed client needs and aspirations from a project. Meeting or exceeding client needs and expectations invariably involves balancing competing demands among:

- Scope, time, cost, and quality.
- Stakeholders with differing needs and expectations.

PROJECT ATTRIBUTES

4.0 Introduction:

This chapter presents details of an ongoing project in terms of project schedule, manpower required for different activities to carryout resource constrained analysis. The costs incurred in the project have also been presented.

4.1 Project Brief:

Spike Technologies is a software company situated on Whitefield - Bangalore. M/s Equips India is the project management consultants and M/s KNK Swamy and Co. is the contractors for the building project.

4.1.1 Project Details:

Name of the project	:	Construction of G+1 Building
Built up area	:	2500 Sft
Number of Storey's	:	Ground + one Floor
Floor to Floor height	:	3.0 m
Height of Plinth	:	0.50 m above Ground Level
Depth of Foundations.	:	1.50 m below Ground Level.
External Walls	:	250 mm thick including plaster
Internal Walls	:	150 mm thick including plaster
Parapet Walls	:	250 mm thick including plaster

4.1.2 Collection of drawings:

Generally, the collection of drawings from the company is very much useful for resource management in construction projects. From these drawings we can estimate the quantities of respective activities. These quantities

plays key role for proceeding resource constrained analysis. Especially in this thesis construction of office building drawings were collected from Company Ltd. A plan of all the details of ongoing project is shown in Fig.4.1

4.3 Estimation of quantities:

After collecting the drawings from a company the quantities were estimated for various activities. The quantities such as earthwork excavation, concrete, steel etc., were estimated from the drawings.

4.4 Manpower Required:

Manpower output is the output quantity i.e., the quantity of work which can be done per day per person considering all safety and quality measures as required by client. This was calculated based on the CPWD Analysis of Rates and IS: 7272 (part I – 1974) recommendation for labour output constants for buildings work and also considering views based on the experiences and thorough technical knowledge, of many project managers, architect's, engineer's and many contractors who are experts and working in this field for many years.

Some of the output constants for various types of activities are shown in table 4.1. The study is limited to these activities only under normal working and site conditions.

Table 4.1: Manpower output constants for different labours

Activity	Labour output per day
1. Unskilled (incl. Excavation, transportation)	
- Excavation	1.5 M^3
- PCC and Concrete	0.2 M^3
2. Carpenters (for all activities)	6.0 M^2
3. Barbenders (for all activities) (incl. Cutting, bending, fabrication, transportation etc.,)	0.2 MT
4. Masons (includes shifting of materials with in the site, wetting in water and dressing in SSM)	0.9 M^3
	6.0 M^2
- Size stone masonry	6.0 M^2
- Block Masonry	8.0 M^2
- Plastering	
5. Painters (incl. Preparatory works as required)	10.0 M^2

Table 4.2 Manpower required for various works as per CPWD Analysis of rates

Activity	Per Unit	Masson	Bhisti	Beldar
Plane Cement Concrete (PCC)	1 Cum	0.1	0.7	1.63
Bar bending work	1 Ton	7.5	-	10
Shuttering work	4 Sqm	1	-	1
Reinforced Cement Concrete (RCC)	1 Cum	0.17	0.9	2
Masonry work	1 Cum	0.72	0.217	1.56
Plastering work	10 Sqm	0.67	0.93	0.86
Painting work	10 Sqm	0.54	-	0.54

Based on the total quantities (obtained from drawings), output constants, manpower required have been computed for various activities as shown in table 4.4. The following example illustrates the computations carried out for these activities. Similarly, the quantities have been computed and presented in table 4.3

Example computations: The example has been carried out for various activities

Table 4.3: The manpower required for few activities

Name of Activity	As per CPWD							
	Per Unit	Masson	Bhisti	Beldar	Actual Quantity	Masson	Bhisti	Beldar
PCC	1 Cum	0.1	0.7	1.63	16.4 Cum	1.64	11.48	26.73
bar bending work for Foundation	1 Ton	7.5	-	10	2.892 Tons	21.69	-	28.92
Shuttering work for Foundation	4 Sqm	1	-	1	324 Sqm	81	-	81
RMC for Foundation	1 Cum	0.17	0.9	2	194 Cum	32.98	174.60	388.00
Masonry work for Ground Floor	1 Cum	0.72	0.217	1.56	280.36 Cum	201.85	60.83	437.36
Internal wall Plastering for Ground Floor	10 Sqm	0.67	0.93	0.86	1287.5 Sqm	86.26	119.73	110.72
Painting for All Floor walls	10 Sqm	0.54	-	0.54	16190 Sqm	874.26	-	874.26

Basis for calculating manpower:

In the table 4.4, skilled manpower is taken as mason quantities and unskilled manpower is taken as from bhisti and beldar adding their quantities. In the finishing works since we cannot take it as a manpower basis, but we take as lump sum basis such as plumbing work, electrical & mechanical works, flooring work and fixing the doors and windows of all floor works.

Table 4.4 The different activities and quantities involved in construction of office building.

sk Name	Work	Cost
g+1 house	**30,764.45 hrs**	**rs1,720,301.21**
construction of (g+1) building	**8,160 hrs**	**rs202,750.00**
cleaning of site	240 hrs	rs5,500.00
labour (man)	160 hrs	rs4,000.00
labour(women)	80 hrs	rs1,500.00
earthwork in excavation	7,280 hrs	rs171,500.00
labour (man)	5,600 hrs	rs140,000.00
labour(women)	1,680 hrs	rs31,500.00

1st class brick in foundation	640 hrs	rs25,750.00
cement	20	rs7,000.00
sand	0.25	rs1,250.00
marble	100	rs1,500.00
labour (man)	520 hrs	rs13,000.00
labour(women)	80 hrs	rs1,500.00
head maison	40 hrs	rs1,500.00
ground floor	**10,782.05 hrs**	**rs599,963.38**
structural work	**10,782.05 hrs**	**rs599,963.38**
marking	168 hrs	rs4,200.00
labour (man)	168 hrs	rs4,200.00
dressing for pcc	1,320 hrs	rs46,350.00
cement	1	rs350.00
sand	1	rs5,000.00
kankar	1	rs8,000.00
labour (man)	960 hrs	rs24,000.00
labour(women)	240 hrs	rs4,500.00
head maison	120 hrs	rs4,500.00
plain cement concrete(p.c.c)	0 hrs	rs0.00
reinforcement for footing	504 hrs	rs55,700.00
steel	1	rs44,000.00
labour (man)	360 hrs	rs9,000.00
labour(women)	144 hrs	rs2,700.00
shuttering for footing	600 hrs	rs15,000.00
labour (man)	600 hrs	rs15,000.00
RCC footing	1,760 hrs	rs91,800.00
steel	1	rs44,000.00
cement	8	rs2,800.00
kankar	0.5	rs4,000.00
labour (man)	1,280 hrs	rs32,000.00
labour(women)	480 hrs	rs9,000.00
back filling	1,360 hrs	rs30,500.00
labour (man)	800 hrs	rs20,000.00
labour(women)	560 hrs	rs10,500.00
anti termite treating	0 hrs	rs0.00
milestone 1	0 hrs	rs0.00
shuttering for plinth beam	0 hrs	rs0.00
labour (man)	0 hrs	rs0.00
labour(women)	0 hrs	rs0.00
reinforcement for plinth beam	900 hrs	rs28,025.00
steel	0.1	rs4,400.00
labour (man)	540 hrs	rs13,500.00
labour(women)	180 hrs	rs3,375.00
head maison	180 hrs	rs6,750.00
RCC plinth beam	576 hrs	rs18,800.00
cement	10	rs3,500.00
labour (man)	288 hrs	rs7,200.00
labour(women)	144 hrs	rs2,700.00
head maison	144 hrs	rs5,400.00
column starter marking	224 hrs	rs7,250.00

labour (man)	168 hrs	rs4,200.00
labour(women)	56 hrs	rs1,050.00
lime	20	rs2,000.00
column starter concreting	406.85 hrs	rs20,644.38
cement	30	rs10,500.00
labour (man)	400 hrs	rs10,000.00
labour(women)	6 hrs	rs112.50
head maison	0.85 hrs	rs31.88
reinforcement for coloums	960 hrs	rs34,250.00
steel	0.25	rs11,000.00
labour (man)	480 hrs	rs12,000.00
labour(women)	360 hrs	rs6,750.00
head maison	120 hrs	rs4,500.00
shuttering for coloums	0 hrs	rs0.00
RCC for coloums	360 hrs	rs54,500.00
steel	1	rs44,000.00
labour (man)	240 hrs	rs6,000.00
head maison	120 hrs	rs4,500.00
shuttering for slab	0 hrs	rs0.00
reinforcement for slab	320 hrs	rs95,500.00
steel	2	rs88,000.00
labour (man)	240 hrs	rs6,000.00
labour(women)	80 hrs	rs1,500.00
electrical conduting	80 hrs	rs1,600.00
electrician	80 hrs	rs1,600.00
rcc for slab and beam	1,080 hrs	rs73,950.00
steel	0.5	rs22,000.00
cement	65	rs22,750.00
kankar	0.4	rs3,200.00
labour (man)	800 hrs	rs20,000.00
labour(women)	240 hrs	rs4,500.00
head maison	40 hrs	rs1,500.00
complition of GF slab	163.2 hrs	rs21,894.00
cement	40	rs14,000.00
sand	0.8	rs4,000.00
labour (man)	104 hrs	rs2,600.00
labour(women)	40 hrs	rs750.00
head maison	8 hrs	rs300.00
plumber	8 hrs	rs180.00
electrician	3.2 hrs	rs64.00
milestone 2	0 hrs	rs0.00
first floor	**4,734.4 hrs**	**rs251,592.00**
stuctural work	0 hrs	rs0.00
coloum starter marking	72 hrs	rs2,187.50
labour (man)	54 hrs	rs1,350.00
labour(women)	18 hrs	rs337.50
lime	5	rs500.00
coloum starter concreating	2,304 hrs	rs70,700.00
cement	10	rs3,500.00
kankar	1.5	rs12,000.00

labour (man)	1,344 hrs	rs33,600.00
labour(women)	768 hrs	rs14,400.00
head maison	192 hrs	rs7,200.00
reinforcement for coloums	72 hrs	rs10,964.50
cement	18	rs6,300.00
kankar	0.2	rs1,600.00
marble	24.3	rs364.50
head maison	72 hrs	rs2,700.00
shuttering for coloums	80 hrs	rs38,000.00
cement	100	rs35,000.00
head maison	80 hrs	rs3,000.00
RCC for coloums	640 hrs	rs48,616.67
cement	89	rs31,150.00
kankar	0.18	rs1,466.67
labour (man)	400 hrs	rs10,000.00
labour(women)	160 hrs	rs3,000.00
head maison	80 hrs	rs3,000.00
reinforcement for slab	782.4 hrs	rs46,373.33
steel	0.15	rs6,600.00
cement	50	rs17,500.00
sand	0.27	rs1,333.33
marble	200	rs3,000.00
labour (man)	480 hrs	rs12,000.00
labour(women)	288 hrs	rs5,400.00
head maison	14.4 hrs	rs540.00
shuttering for slab	480 hrs	rs10,800.00
labour (man)	288 hrs	rs7,200.00
labour(women)	192 hrs	rs3,600.00
electrical conduting	48 hrs	rs960.00
electrician	48 hrs	rs960.00
rcc for slab and beams	256 hrs	rs22,990.00
cement	45	rs15,750.00
sand	0.2	rs1,000.00
labour (man)	192 hrs	rs4,800.00
labour(women)	51.2 hrs	rs960.00
head maison	12.8 hrs	rs480.00
compleation of first floor slab	0 hrs	rs0.00
finishing works for both the floors	**7,088 hrs**	**rs665,995.83**
BLOCK WORK(100 MM THICK)	2,400 hrs	rs61,850.00
sand	0.4	rs2,000.00
kankar	0.2	rs1,600.00
marble	50	rs750.00
labour (man)	1,400 hrs	rs35,000.00
labour(women)	800 hrs	rs15,000.00
head maison	200 hrs	rs7,500.00
BLOCK WORK(50 MM THICK)	1,920 hrs	rs50,350.00
sand	0.4	rs2,000.00
kankar	0.2	rs1,600.00
marble	50	rs750.00
labour (man)	1,120 hrs	rs28,000.00

labour(women)	640 hrs	rs12,000.00
head maison	160 hrs	rs6,000.00
milestone 3	0 hrs	rs0.00
DOOR FRAME FIXING	480 hrs	rs52,000.00
carpenter	480 hrs	rs12,000.00
wood	100	rs40,000.00
ELECTRICAL CONDUTING	256 hrs	rs7,500.00
electrician	256 hrs	rs5,120.00
wires	100	rs1,500.00
switch boards	25	rs500.00
bulbs	6	rs60.00
tube lights	8	rs320.00
PLASTERING -CELLING	264 hrs	rs12,233.33
cement	5	rs1,750.00
sand	0.12	rs583.33
head maison	264 hrs	rs9,900.00
PLASTERING - INTERNAL WALLS	200 hrs	rs14,500.00
cement	25	rs8,750.00
sand	0.25	rs1,250.00
labour (man)	120 hrs	rs3,000.00
labour(women)	80 hrs	rs1,500.00
FLOORING(ROOMS)	128 hrs	rs260,866.67
cement	20	rs7,000.00
sand	0.13	rs666.67
labour (man)	128 hrs	rs3,200.00
marble	250	rs250,000.00
FLOORING(TOILETS)	96 hrs	rs9,875.00
cement	15	rs5,250.00
marble	25	rs375.00
labour (man)	72 hrs	rs1,800.00
labour(women)	24 hrs	rs450.00
washing basin	2	rs2,000.00
FLOORING(CORRIDOR/LOBBY AREA)	144 hrs	rs5,185.00
cement	5	rs1,750.00
marble	9	rs135.00
labour (man)	96 hrs	rs2,400.00
labour(women)	48 hrs	rs900.00
FLOORING(STAIRCASE)	448 hrs	rs14,000.00
cement	8	rs2,800.00
labour (man)	128 hrs	rs3,200.00
carpenter	320 hrs	rs8,000.00
RAILING WORKS(STAIRCASE)	224 hrs	rs5,880.00
labour (man)	224 hrs	rs5,600.00
railing	4	rs280.00
RAILING WORKS(BALCONY)	32 hrs	rs1,080.00
labour (man)	32 hrs	rs800.00
railing	4	rs280.00
FIXING OF DOORS& WINDOW SHUTTERS	224 hrs	rs23,600.00
carpenter	224 hrs	rs5,600.00
wood	45	rs18,000.00

INTERIOR PAINTING	24 hrs	rs4,700.00
head painter	8 hrs	rs180.00
painter	16 hrs	rs220.00
paint	50	rs4,000.00
paint brushes	3	rs300.00
ELECTRICAL FIXTURES	72 hrs	rs2,280.00
electrician	72 hrs	rs1,440.00
wires	40	rs600.00
switch boards	2	rs40.00
bulbs	4	rs40.00
tube lights	4	rs160.00
SANITARY & WATER SUPPLY WORKS	112 hrs	rs11,380.00
plumber	112 hrs	rs2,520.00
washing basin	4	rs4,000.00
foset	3	rs4,500.00
showers	4	rs360.00
EXTERNAL PLASTERING	32 hrs	rs125,805.83
cement	0.02	rs5.83
sand	25	rs125,000.00
labour (man)	32 hrs	rs800.00
CLADDING WORK	0 hrs	rs0.00
EXTERNAL PAINTING	32 hrs	rs2,910.00
head painter	8 hrs	rs180.00
painter	24 hrs	rs330.00
paint	25	rs2,000.00
paint brushes	4	rs400.00

4.5.1 Types of Relationships:

We can define relationships from the predecessor to the successor activity.

The relationships can be classified as
Finish-to-Start (FS)

Start-to-Start (SS)

Finish-to-Finish (FF)

Start-to-Finish (SF)

Finish-to-Start (FS):

The successor activity can begin only when the predecessor activity completes.

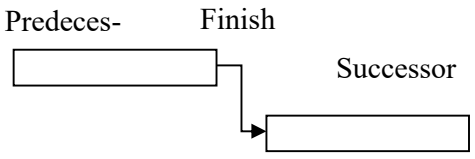


Fig 4.3: Finish to start

Start-to-Start (SS):

The start of the successor activity depends on the start of the predecessor activity. They may end at different times (depending on the duration of each activity), but they can start at the same time. This relationship is utilized when two activities will be launched at th

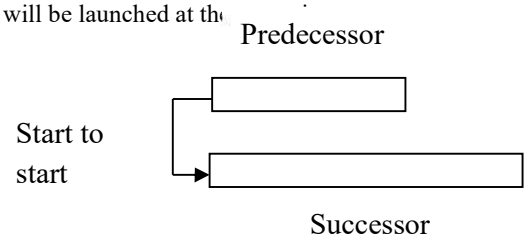


Fig 4.4: Start to start

Finish-to-Finish (FF): The finish of the successor activity depends on the finish of the predecessor activity. The two activities may start at different times (depending on the duration of each activity), but the completion of the two activities is coordinated. This relationship is utilized when the completion of two activities should be linked together.

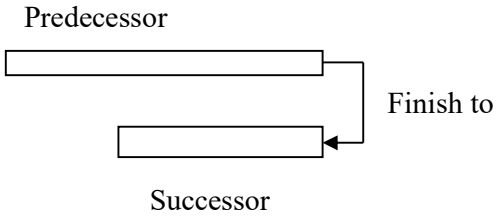


Fig 4.5: Finish to Finish

Start-to-Finish (SF): The successor activity cannot finish until the predecessor activity starts.

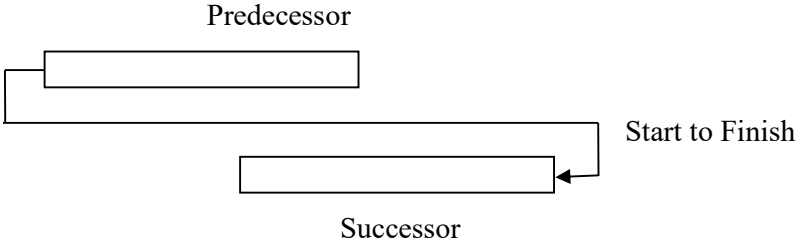
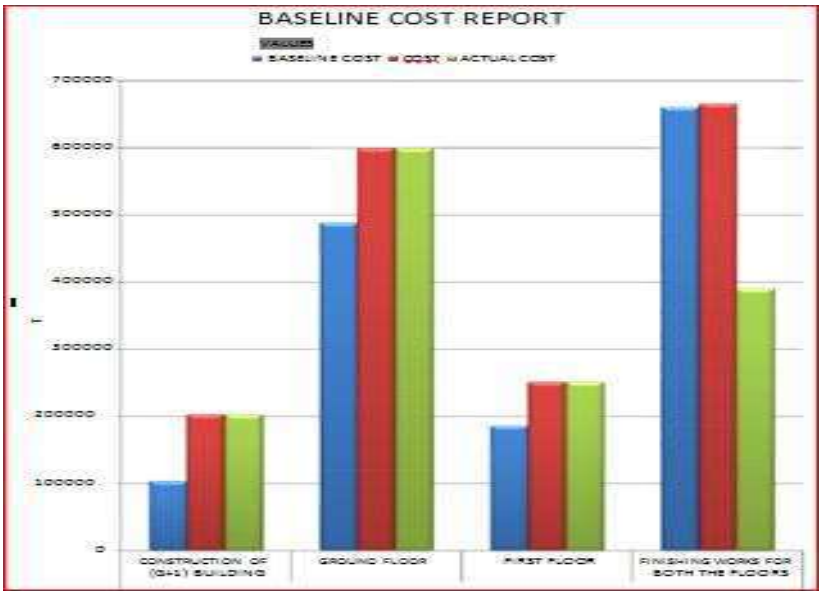
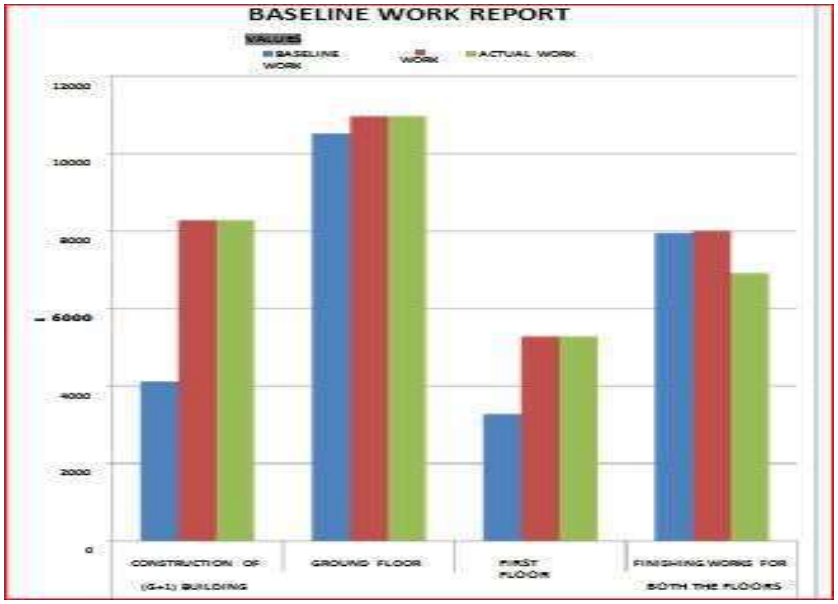


Fig 4.6: Start to Finish

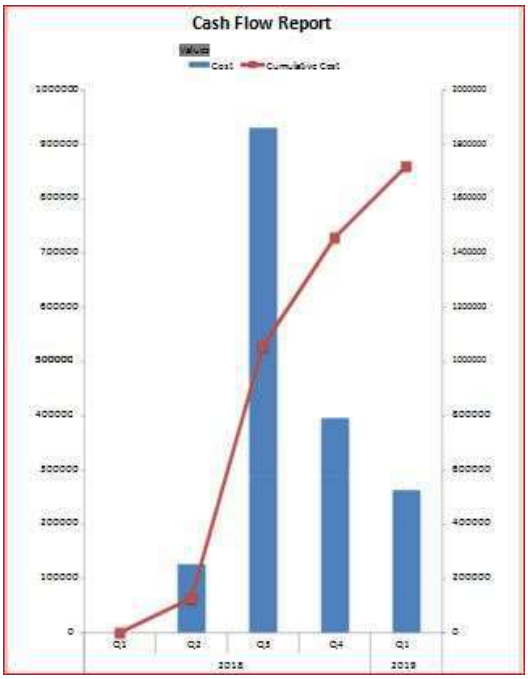
BASELINE COST REPORT



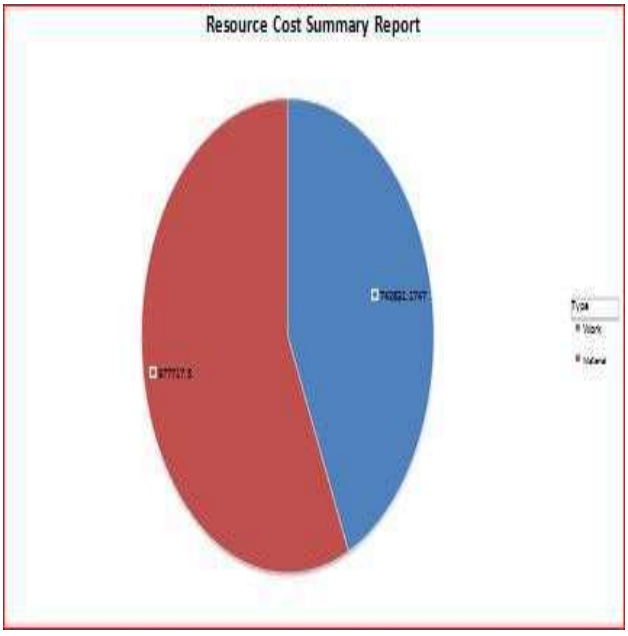
BASELINE WORK REPORT



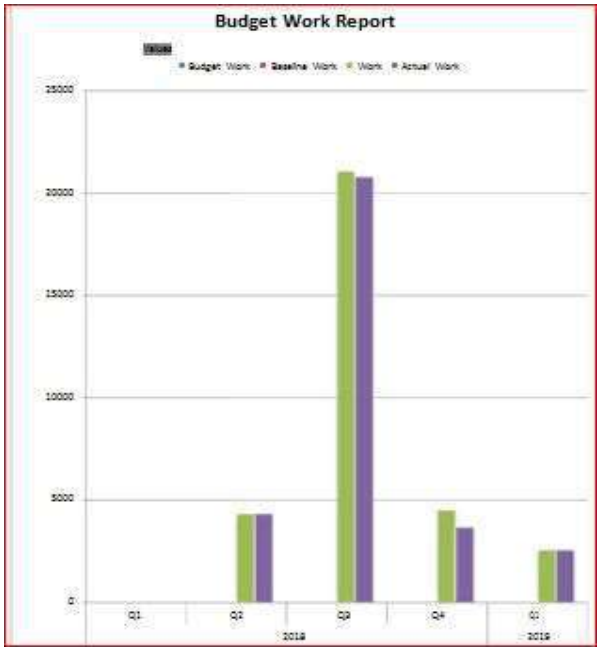
CASH FLOW REPORT



RESOURCE COST SUMMARY REPORT



BUDGET WORK REPORT



CONCLUSION

The above given examples of software application are meant to provide insight to the software. The purpose is to make the software more approachable to all stakeholders of Real Estate Industry. The concept of Time & Cost Management remain the as the key processes of the Project & Construction Management. Software is a mere medium to apply the concepts efficiently. The cost management of construction project is a complicated system working and needs all employees' participating. Through pre-control, control in process, enterprises can strengthen the calculation and control of the project cost in all phases of construction, and can realize the goal of saving and reducing the construction cost. Only in effective cost management, construction enterprises can ensure to get the best economic benefits while the targets of quality, progress and safety are reached, and lay a good foundation for the sustainable development of them. Cost forecasting or planning and scheduling is an effective tool of cost management, it is worthwhile to be learned and applied by engineering contractors during the construction project and with the development of Information technology projects, cost estimating and scheduling will be more widely used in process of various construction projects. To provide data for future cost management, an evaluation is often carried out to prepare a detailed cost analysis of the completed project and to develop lessons learned to improve future design decisions. The cost data captured should also be fed back in to the owner's database to inform future estimates and budgets. We should also include a review of energy performance of the building during occupancy, to ascertain if the data used was accurate for the actual performance.

References

1. Journal of Construction Engineering and Management, January 1998, Vol.124.
2. Construction Management and Economics, 14 (1996).
3. Cost performance for building construction projects, in klang valley- A.S. Ali, S.N. Kamaruzzaman, University of Malaya, Faculty of Built Environment.
4. F Harrison; "Advanced Project Management: A Structured Approach"; Gower Publishing; 2004.

AUTHORS PROFILE

A. PANI BHUSHAN student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

B. ANIL KUMAR student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

M. SREEKANTH student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

P. VIJAY KUMAR student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

S. ANIL student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

S. MAHESH Assistant Professor Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.