

Construction Project Scheduling of MK Apartment Using MS Project 2013

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Abstract - Countries around the world provide major preference to the construction industry, as it contribute vastly to the growth of a nation, but use of traditional practices and improper planning reduces the efficiency of the construction industry which affects the project in the form of increased duration of the project, this leads to the increased overhead cost of the project and poor quality of work. In order to eliminate these flaws in construction project, an effective project management tool is introduced in the form of Microsoft Project 2013 software. In this study project scheduling, estimation and resource allocation are adapted in MK apartment residential construction project using MSP 2013 software. Various work involved in the construction of MK apartment project are estimated and the activities are scheduled, as project starting form 1st Aug 2016 and finishing on 29th July 2017. Budgeted cost, time, and materials of the project are obtained by resource allocation.

Key Words: Project, Construction, Time, Cost, Scheduling, Estimation, Resource Allocation

1. INTRODUCTION

Countries around the world provide major preference to the construction industry, as shelter and transportation facilities are the basic needs of a society and also construction industries contribute vastly to the growth of a country. The major construction activities of a country involves, Building constructions which includes residential and commercial buildings, Heavy infrastructure projects such as roads, bridges, dams and industrial constructions etc, these construction activities are carried out using old and traditional construction practices which causes several problems in the construction such as increased cost of construction, delay in delivery of project poor quality in construction, increased risk of crises, all these flaws in construction practices calls for an effective project management and quality control system.

Construction activities are not limited only to the physical activity of allocating men, materials and machines, it involves more than this, such as effective management of man power, machinery as well as materials by proper planning using project management tools such as Microsoft Project, Primavera, Microsoft Excel and techniques such as CPM, PERT which can reduce the efforts and also helps to

maintain the accuracy and quality of the project. The effective management of a construction project can be achieved by controlling the cost of construction, scheduling, managing resources, and maintaining the quality in construction as these constituents contribute significantly to the efficiency of the project these can be effectively managed using Microsoft project 2013 software. In the present study effective construction project management techniques are adapted for the purpose of scheduling the MK residential apartments, some of the areas under the scanner are schedule development, resource planning and budget cost of the project using Microsoft project 2013 as the project management tool.

1.1 Project and Project Management

A project is an individual or collaborative enterprise involving research, design that is carefully planned by the project assigned team to achieve a particular aim. Construction projects have many constraints such as time, cost, resources and many more.

The Project management is the effective management of all the resources involved in a project such as skills, knowledge, tools and techniques, cost, people, time, money and many more in order to meet the needs and expectations of the stake holders.

1.2 Project Planning

A construction project planning is the process of scheduling all the activities of the project, and managing various resources involved in the project which may be men, material, machinery, skill, knowledge, money etc, in order to complete the project within the stipulated time period with the specified quality.

There are several steps involved in the construction project planning; some of the important stages are as follows

Step 1: Defining the scope of the project Scoping stage of the project planning, is where client expresses his views and thoughts of a project and the budget cost of the project to engineers and architects. Engineers and architects further carry out a market survey to know the suitability of the

project, and submit a report with the plan and estimate of the project

Step 2: Schedule is the stage where actual plan is built .At this stage of the project a project management tool is involved, in this case it is Microsoft project2013.In this stage the schedule of the project is developed and resources involved in the project are allocated .This stage answers many questions regarding cost, Duration and Budget cost of the project.

Step3: Execution stage is the stage where the actual work is carried out; in this stage of the project the scheduled work is carried out along with the allocated resources and assigned man power. This is the stage of planning where the actual project is realized.

Step 4: Monitoring In this stage of the project, the execution is monitored on a regular basis for its quality and the progress is documented.

Step 5: Rescheduling is that stage of the project when it is realized that the project cannot be executed as per schedule, in this stage of the project the project is rescheduled as per the new realization. Step 3, 4, and 5 of the project are looped perfectly and these steps keep continuing till the end of the project. MSP 2013 helps to keep a baseline which is a snap shot of the project and helps to measure with the other steps.

1.3 Objective of Study

The main objective of this study is

- To develop effective schedule by defining the various activities and arranging these activities in an appropriate sequential order.
- To identify the resources required for all activities, allocating and managing the same with efficiency.
- Estimating the time duration required to complete the individual activity with the available resources and give start and end date of the project.
- To estimate the cost required to complete the project with efficiency.

2. LITERATURE REVIEW

Many authors have considered the case study on constructions project management, and use of construction management tools such as MSP, Primavera and many more, some of the most related papers published are by the following authors .

Abishek and Pathak (2015) Analyzed the relation between the project completion time and the manpower availability as inversely proportional that is the completion time of the project can be reduced by increasing the

manpower. For the present study, author considered a multi storey building construction named “MahadevParisar at ShivajiNagar Bhopal”. The project attributes consists of G+6 floors residential apartments with 92 flats in it. With an available land area of 2.64 acres at shivajinagar Bhopal with he estimated duration of completion of 24 months, but the project was delayed. In this paper author suggests that delay was due to the improper planning, scheduling, execution and controlling of the project, this may lead to the increased over head cost of the project and increased duration of completion of the project and also poor quality in construction. In this project MSP2013 is used as the project management tool, and two phase methodology is adapted in this project scheduling process. in the first phase the information available from the site and all the drawings available are collected, the quantities of materials going into the project are estimated and tabulated .For the second phase various activities involved in the construction of apartment are listed in the MSP 2013, these activities are broken down using WBS application in MSP into sub tasks. The activity start and finish dates are defined manually or using auto schedule option, various resources available for the construction of the project are allocated and the critical path of the project is given by MSP2013,the baseline of the project was set and the activities are tracked for completion the incomplete activities were rescheduled as a result the estimated time of completion was exceeded from 693 days to 1424 days, the cost of manpower was exceeded from 2.5 crores to 3.1 crores . The variance cost of 67 lakhs and the variance time of 731 days were found as a result of application of scheduling. [1]

Ramya and Toufeeq (2016) Analyzed the use of Microsoft project in comparing the construction of villas, in this paper the author has considered a case study on a live project construction called “Ramky Pearls” villas in Hyderabad. Time and material management is explained in order to increase the effectiveness, efficiency and productivity of the project, need for the adoption of an effective management system with a management tool, effects of inappropriate time management, such as increased cost, loss of profit and damage to the reputation are clearly stated. The project planning methodology adapted is CPM by using MSP, in this methodology two types of construction practices are considered, Method 1: Construction of three villas one after the other, Method 2: Construction of three villas simultaneously, and the data from both the cases are collected on regular basis, the variation of time and cost on both the methods are reported using the different report options available in MSP report. [2]

Suresh and Krishnamoorthi (2015) Suggests that the purpose of multi-storey buildings are, they were built to reduce the space requirement for the construction on the ground and to increase the area of the building thus resulting in the large buildings in the small built up area. Project

schedule is considered as the core of the project plan, and the purpose of the project schedule is to show the organization, how the work will be performed and to uncover the mistakes of the plan and design. Project schedule is said to provide the control over the project to the project manager. Brief discussion of MSP software includes the procedure to be followed while planning with MSP software such as selecting an appropriate activity list, providing a WBS and estimating the time duration required for a particular activity allocating the resources required to complete the activity within the estimated time duration, this will be advantageous while specifying the project completion date in the clause of the project and very much helpful in forecasting challenges of the project. Earned value analysis is carried out in order to find the variance cost of the project. [3]

Rhuta and Patil (2013) discuss the construction project management in various countries like USA, Canada, and Australia. Compares the construction project planning scenario over the construction project at ground execution stage, where some of the difference are spotted as in case of planning process, it is assumed that everything runs smoothly, it is not same in case of real project scenario, availability of resources may be limited Resolving this using a project management software MSP 2013. This is resolved by leveling the resources and comparing the time cost implementations with scheduled time and estimated cost. Project management techniques like CPM/PERT are adapted in order to resolve various defects such as over allocation, unbalanced use of resources and to predict the futuristic problems arising in the project. in this case study two phase methodology was adapted in the first phase various project related data are collected from the site , the quantity of work that need to be performed was calculated and the calculations were tabulated , in the second phase all the project related activities are listed sequentially using MSP2013 .[4]

3. METHODOLOGY

A two phase methodology is adapted in which the first phase or the initial phase comprise of the collection of basic information required for the schedule development and the second phase comprise of the development of a formidable schedule .

Phase I: This phase includes the collection of data required for the project scheduling; this phase has nothing to do with the software, in this phase of the project the data required for the schedule development which includes the architectural and structural drawings, soil test report, water test report, site survey reports, labours and materials availability report, contact information of all the consultants are collected from the site.

Phase II: This is the phase where the actual scheduling process starts, various activities involved in the project are listed based on the expert judgement and the past experience from various similar projects, a most suitable project calendar is selected mode of task is mostly selected as auto schedule, number of days required to complete a task is entered this automatically selects the start and the finish date of that particular task as the task mode is selected as auto schedule. The available resources are allocated to each and every task; sometimes the resources are over allocated such resources are levelled using the levelling option available in the Microsoft Project 2013. A critical path is obtained in MSP 2013 by following which the delay of the project can be prevented.

4. SCHEDULING

4.1 Site Details

Name of the Project: MK Apartment
 Client: Mohamed Kanni
 Contractor: SNIP Builders
 Project Type: Residential
 Number of Floors: 2B+G+2F
 Project Cost: 3Crores
 Place: Karee moole, Sullia, DK
 Fig 1 shows the 3D image of MK apartment



Fig -1: 3D image of MK apartment

4.2 Scheduling Using Microsoft Project

Microsoft project 2013 is used for the purpose of scheduling MK apartment.

4.2.1 Studying Various Constituents of MSP 2013

Microsoft project is the software developed by Microsoft in order to plan and schedule various activities involved in a project, MSP helps to define hierarchy of the activities by defining the start date and end dates of the various activities. By using MSP various resources involved in the project are efficiently handled, cost budget of the project can be defined prior to the start of the project or at any stage of the project. MSP prevents the delay of the project by showing the critical path of the project which can be continuously taken care of MSP gives an option to track the project on a regular basis by

this project can be compared with the baseline of the project which is created priory at the scheduling stage .

4.2.2 Schedule Development

A feasible schedule is developed by following steps data required for the project is collected from similar successfully executed projects, All the data required for the preparation of the schedule is collected from the site and the site conditions are thoroughly studied, which includes drawings, labor allocation details, and site survey reports. With the available data and expert judgment various activities involved in the project are listed and the relationships between each and every tasks or activities are defined. Start and end dates for the completion of each and every activities are defined.

The resources available are allocated for each and every activity; project calendar is set as per the companies working days and working hours per day. The activities are represented by graphical representation called Gantt chart, which clearly indicates the relation between the activities in a easily understandable manner. Over allocated resources are leveled by reducing the work hours, or by increasing the labor as per the required quantity

	WBS	Task Mode	Task Name	Duration
458	1.11		Over Head Tank Construction	19 days
469	1.12		Finishing Work	310.75 days
470	1.12.1		External Plastering	22 days
471	1.12.2		Plumbing Work	273.75 days
472	1.12.2.1		Appointing Plumbing consultant	1 day
473	1.12.2.2		Preparation of Plumbing Drawing	4 days
474	1.12.2.3		Getting the prints of Plumbing Dwg	1 day
475	1.12.2.4		Finalise the material Specification	1 day

Fig -2: Work Breakdown Structure in MSP2013

4.2.3 SCHEDULE ESTIMATION

The resource for the specific task can be allocated only by knowing the quantity of the work to be performed or by knowing the quantity of materials to be used for that particular activity, the quantity of materials to be used and the quantity of work to be performed in order to complete a particular activity can be calculated manually using long wall short wall method or grid line method of estimation with the help of the hard copy of good for construction drawing available, all the quantities can also be obtained by softcopy of AutoCAD drawing approved and issued by the architects. The quantities that need to be calculated are Excavation quantity, concrete quantity, and steel quantity, block work quantity, plastering quantity, painting and many other quantities of materials and work that take part in the project. All the quantities obtained are tabulated using most popular Microsoft software called MS Excel.

5. RESULT AND DISCUSSIONS

As a result of implementing MSP 2013 in the construction schedule development of MK apartment

- A construction activity list of 603 activities is developed
- An appropriate activity sequence is listed based on the expert judgment
- Project starts on 1st Aug 2016 and finishes on 29th July 2017.
- Various resources used for the project are allocated.
- Budget cost of civil works is obtained as 2.03 crores .
- A critical path is obtained in the Gantt chart of MSP2013

Following Figure shows a typical network diagram showing the critical path

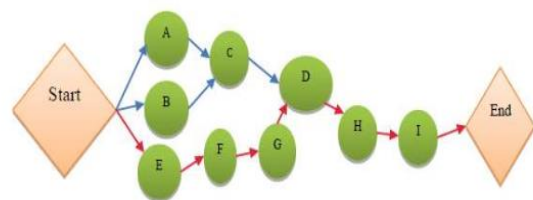


Fig -3: Typical Network Showing critical path

5.1 Duration calculation for plastering activity

Total quantity of plastering work in a floor = 145 Sqm ...A
 Productivity of (1 mason and 1.5 mason helper) = 10 Sqm /dayB
 Availability of mason =5 numbersC
 Availability of mason helper = 8 numbers
 Total working hours in a day = 8 hrs
 Total productivity in a day = Number of mason X Productivity per mason per day
 = 5 x 10B x C
 = 50 SqmD
 = 145/50A/D
 =2.9 =3 days

Total duration required to complete the plastering work of B1 =3days

5.2 Resource Levelling

Following figures shows the over allocated resources and their levelling in MSP 2013

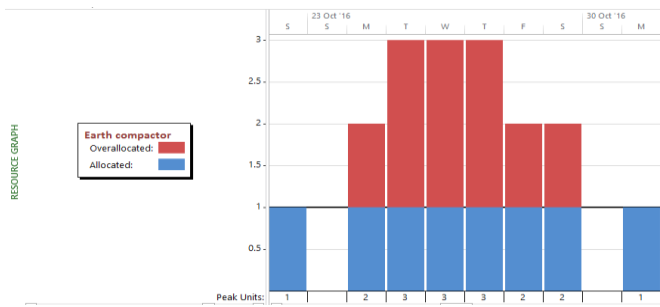


Fig -4: Over Allocation of Earth Compactor

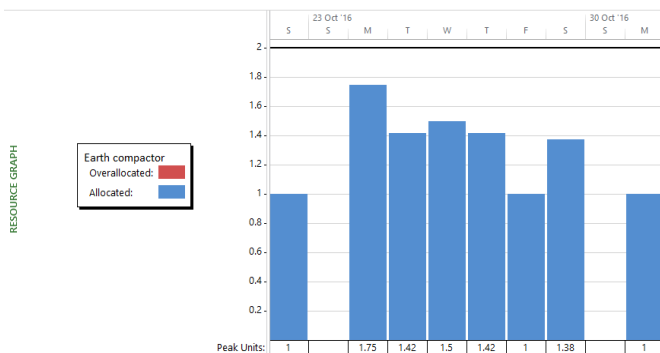


Fig -5: Earth Compactor after Levelling

6. CONCLUSIONS

Following conclusions can be made from the result obtained from the project

- Using MSP2013 as a construction project management tool, project planning is done accurately, this enables the management to organize the resources required for the project effectively
- A sequential arrangement of all the construction activities and their graphical representation on the Gantt chart are useful for better understanding of the project
- Resources of the project can be effectively used as the resources are planned, assigned, and allocated to each and every activity of the project
- Budget cost of the project is easily obtained as all the resources required for the project are planned and allocated priorly in MSP2013.
- Critical activities of the project are obtained from MSP 2013, the delay in project and increase in budget cost can be prevented by carefully following the critical path of the project.
- Labor management becomes easier as the over allocated activities are leveled using the leveling option available in MSP 2013 this helps to optimize the duration of the project, without affecting the original duration of the project.

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