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A Survey on Structural Planning, Scheduling and Resource Allocation of Project

Akash Mishra[1], Kapil Malviya[2]

SRK University, Bhopal, India[1,2]

Abstract- *A few development exercises can be figured out how to accomplish the benefit inside restricted assets and time. In this manner project the board procedures are helpful in planning and organizing the different assets by controlled technique. The board strategies like Critical Path Method, Program Evaluation and Review Techniques (CPM/PERT) have been effectively executed before the 1970's, in different Civil Engineering projects in the nations like USA, Canada, Australia. These procedures help the executives in proficient and financial utilization of assets for consummation of venture goals with limitless accessibility of assets, however it is seen that assets are restricted in genuine task situation. It has been seen that the undertaking delays happen because of inadequate stockpile of assets. In huge scope projects, setting up an exact and useful arrangement is truly challenging. PC bundles like MS Project and Primavera project organizer are utilized in development industry. Task the board methods can be utilized to determine asset clashes and furthermore helpful in limiting the undertaking term inside restricted accessibility of assets to make the venture beneficial. The primary point of this review is to break down the Project the executives' methods by booking different development exercises, distribution of assets and asset evening out utilizing Microsoft Project 2013 for private structure. This paper dissects asset compelled project utilizing Microsoft Project 2013 by asset evening out and contrasts the time cost suggestions and booked time and assessed cost.*

Keywords:- Project Management, Resource Scheduling, Resource Leveling, Structural Planning.

Introduction

Project is a onetime activity with defined objectives which has to be finished in a certain period of time using limited number of resources. The project management comprises the computation of the early and the late start schedule, slack times of the activities and the allocation of the available resources over time to the execution of the activities. The project management techniques such as CPM/PERT has been widely used for scheduling. CPM provides minimum time required for completion of project and gives an advanced warning about future problems.

Some variables affect completion of construction projects such as activity durations, early start time, late start time, early completion time, late completion time and budget of project. The constraints such as weather, traffic, and the limited availability of resources such as skilled workers, machines, equipment, etc., cause increase in duration and cost of project. Therefore, new critical sequences will get developed and float calculated using CPM techniques will lose its significance. Schedules that neglect material constraints may affect the control of projects. Thus for successful completion of project resource scheduling is very important task. Resource scheduling is the futuristic planning of activities that is limited by the available resources. Resource scheduling includes resource allocation to various activities and resource leveling. Resource leveling is a technique which is used to analyze unbalanced use of resources (usually people or equipment) over time, and resolves over-allocations or conflicts among different resources.

In large scale project preparing accurate and workable schedules with consideration of resources is very difficult task, for this use of project management software's like MSP, Primavera can be advantageous. Resource conflict or over allocation can be resolved in Microsoft Project 2013 by delaying activities, splitting certain task or updating task automatically. When project levels resources, assignments are distributed and rescheduled.

In India, due to an increasingly local and international competition, construction companies are always striving for maximum efficiency and a competitive operational advantage. Companies are always looking for improvements in equipment features, communication tools, efficient management techniques, and training human resources. They are also narrowing their focus to specialize in certain projects instead of taking up all forms of it. This specialization requires a very streamlined approach for controlling techniques and extremely good planning for the best services. The benefits of effective planning, scheduling and control of construction projects are: reduced construction time, reduced cost overruns.

Project Management is the Application of knowledge, skills and Techniques to project activities to meet project requirements. It is a strategic ability to do something successfully for organizations, enabling them to patch the project results to Organizational goals and thus, better compete in their markets. In other words it can be also defined as the process and activity of planning, organizing, inspiring, and controlling resources, procedures and protocols to achieve specific goals. The project is expected to get completed within the specified time limit and budget. There are numerous software's available in the market for project management. MS project and Primavera are widely used for planning and scheduling. Planning of huge projects requires huge amount of paperwork, which can be reduced with the help of primavera and MS project software. Each software has got its own merits and demerits. These tools help us for optimizing the construction procedure to prevent time and cost overruns to give the dream to complete the project in planning duration and within the budget.

Ms Project Software MS Project is a project management software product, developed and sold by Microsoft. It is designed in such a way to help project managers in creating a project plan, assigning resources to task items, tracking their progress, updating of project, managing the budget, and analyzing workloads. Project creates budgets based on assignment work and resource rates. As resources are assigned to tasks and assignment work estimated, the program calculates the cost, equal to the work times the rate, which rolls up to the task level and then to any summary tasks and finally to the project level. Microsoft Project is part of the Microsoft Office family, but has never been included in any of the Office suites. It is available currently in two editions viz., Standard and Professional.

It can also be defined as the process of converting a general or outline plan for a project into a time-based graphical representation with then necessarily provided information on the available resources and time constraints. Construction Planning is the necessary forerunner to scheduling and it includes:

- Defining work tasks,
- Determining a general sequence to the defined tasks
- Assigning responsibility

II. Related Work

Any construction project requires proper scheduling of resources for its completion within time and cost. For this various scheduling techniques have been used. Critical Path Method (CPM) is a technique that has been used since 1950"s for scheduling and controlling of projects, communicating plan and training new managers. Since, it has some limitations like; this technique doesn't consider the resources required for the execution of construction project.

A Critical Path Segment (CPS) mechanism was developed by [4] Tarek Hegazy and Wail Menesi (2010). In this technique, each activity was divided into separate time segments to accurately identify all critical path fluctuations, better allocation of limited resources, avoid multiple calendar problems and accurate analysis of

project delays. CPS facilitates accurate schedule analysis by simplifying complex relationships and avoiding the use of leads and lags. CPS is expected to assist Project managers in preparing reliable schedules that reflect better reality and offer better support for planning, corrective action and schedule analysis decisions.
Apart from CPM technique, project duration can be minimized by employing a variety of crew scheduling techniques. Standard crew schedule includes, 40-hr work per week, considering five 8-hr days, four 10-hr days or a second shift. Various crew scheduling techniques were applied by [5] Awad & Aviad (2013) to provide a comprehensive comparison that outlines a variety of crew scheduling options, along with their impact on labor efficiency, project duration, worker safety and project cost. The tables provided by authors can be used as a tool by contractors who are interested in selecting a scheduling technique that will meet the specific requirements of a project.

As the nature of construction industry is Resource driven and huge investment is involved in resources, resources are supposed to be properly utilized by different techniques. For proper scheduling of resources [6] Robert (1990) had developed a Packing method which is based on Critical Path Method (CPM). In this method, to measure the level of resources, the minimum moment of resource histogram was used. The heuristic program assigns project activities to specific days so that the final resource histogram approaches a rectangle and its moment approaches a minimum value. Serial methods for resource leveling and a measure for judging the effectiveness of resource leveling techniques was presented by [8] James and Gerald (1991). This paper deals with establishment of initial resource profiles for construction projects, resource leveling of the schedule, analysis of resource usage verses assumed levels and the adjustment of resource profiles based upon this analysis.

To minimize undesirable resource fluctuations and to maximize efficiency of resource utilization on construction site [7] Khaled and Dho Heon (2009) developed two innovative resource levelling matrices. The first metric considers 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 metric measures the total number of idle and non productive resource days because of undesirable resource fluctuations. Application examples of these two matrices highlights that these two matrices are useful to construction planners and schedulers to enhance the efficiency of resource utilization and improvement in construction productivity.
Artificial intelligent methods are exploited in the form of expert system, artificial neural networks for scheduling of construction project. An expert system is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning about knowledge, represented primarily as if–then rules rather than through conventional procedural code. An expert system for the progress scheduling in the construction of modular multi-storeyed building was developed by [9] O. Shaked and Warszanski (1992). Practical limitations of heuristic methods cause the writers search for optimal & suboptimal schedules for construction projects using evolutionary algorithms. An evolutionary algorithm was developed by [10] Piotr and Anna (2006) to solve the problem of minimizing construction project duration in deterministic conditions, with – in time changeable parameter and limited accessibility of renewable resources.

To achieve the project objectives that are minimizing cost and time under resource restrictions fuzzy logic have been used. [11] Danial, Gursel, Julian and Yates (2009) evaluated the viability of using fuzzy mathematical models for determining construction schedules and for evaluating the contingencies created by schedule compression and delays due to unforeseen material shortage.
Resource scheduling is normally used to minimize the duration & cost of project, by proper allocation and leveling of resources. For schedule monitoring Earned Value Management (EVM) technique is used. [3]

Antony and Thirumalai (2014) have compared the budgeted cost of work performed against actual cost of work performed and budgeted cost of work scheduled to access cost and schedule variance respectively.
For project scheduling CPM/PERT, different softwares like MSP, Primavera and optimization techniques, fuzzy logic is used. [2] Indrasen and Venkateswarulu (2014) had successfully applied Primavera software to National Highway project for planning & controlling cost and resources and help to achieve timely completion of project. Similarly, [1] Nagaraju & Reddy (2012) applied Primavera software for resource scheduling of a fast track construction of a commercial building with constrained time duration. In this paper, the study has been carried out in two phases. In the first phase, using PRIMAVERA software, project was scheduled for various activities for the construction of a commercial building. Subsequently, requirements of resources were calculated to the activities based on Standard Schedule Rates (CPWD) and IS 7272 (part I – 1974). The required data was collected from the detailed drawings and prevailing site conditions. In the second phase, a Resource Constrained Analysis was carried out by Resource Leveling for various activities by decreasing resources with increased duration of float activities.

III. Methodology

The paper gives the idea about the most appropriate process to control the time delay on the case study project. At first, a literature survey was carried out on pertinent topics based on theses, books in libraries, scientific papers, articles and web sources. This literature survey was carried out on construction time delays, causes of time delays, their types, and time delay analysis techniques and was used to understand the difference between the concepts of project planning and project scheduling, and to determine the objectives of monitoring and tracking.

1) Data collected from the construction site.
2) Study and analysis of the data to fetch quantifiable results.
3) Establish reasons of delay of the project.
4) Problem statement
5) Data analysis by using MSP and Primavera.
6) Planning and scheduling using MSP and Primavera

IV. Result Analysis

In the above reviewed papers construction of various structures was made by proper planning and scheduling details as per the project by comparing two Project management Software's like Primavera and MS Project. On comparison Primavera is superior to MS Project on various aspects. From those results Primavera is better than MS Project by some of the operational characteristics, functionality and technical features. Primavera also provides better security tools for accessing project files and Baseline plans.

V. Conclusion

From the above literature reviews it is concluded that project scheduling which done by using these project management software's i.e. Microsoft project software and primavera, is very helpful for the successful completion of project. This software's has much advantage, like it can be useful for planning, scheduling, costing, allocation of resources, tracking of project and updating. By the use of these MSP and primavera software's we can complete projects successfully and at required time and budget.

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