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Study of Scheduling In Microsoft Project Software

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Abstract **- Planning and scheduling are important task in construction projects. In this project, scheduling in Microsoft (MS) Project software, was undertaken. For planning and scheduling work huge amount of paperwork is required, which makes the management very burdensome. These problems can be solved using project management software which helps to give a planned approach to planning. This analysis was done because of their comparable technical features and to evaluate on the basis of the function to manage the project. Each software had many benefits; MS Project also scored best in terms of easy to use. In this study, a case of an apartment building has been taken to display how proper planning and scheduling is done using MS project.**

Keywords- **CPM, MS PROJECT, Basics of CPM Scheduling, Gantt chart**

I. INTRODUCTION

Project is an activity to meet the creation of unique product or service and thus activities are undertaken to accomplish routine activities cannot be considered as project. The completion time for a unique endeavor can vary from a few hours to many years, and the cost can change from low to very high. Each project has a specified mission or a purpose to be achieved. It ceases after the mission is accomplished. A construction project mission is to create desired facilities like a housing complex or a fertilizer plant with predetermined performance objectives defined in terms of quality specification, completion time, budgeted costs and other specified constraints.

Project management is the discipline of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria. A project is a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value. Construction planning is a fundamental and challenging activity in management and execution of construction projects.

It includes the selection of technology, the definition of work task, the estimation of required duration and resources of individual task, and identify the interactions between different work tasks. A good construction plan is the base for developing the schedule and the budget for work. Project management is the planning, monitoring and scheduling of all aspects of a project and the motivation of all those involved in it to achieve the project objectives on time and to the specified cost, quality and performance. Construction project management is the art and science of managing all aspects of the project to achieve the project mission objectives, the specific time, budget cost and predefined quality specifications; working efficiently and effectively in the changing project environment with due regards to construction worker's safety and health. Project management is essentially aimed at producing an end product that will effect some change for the benefit of the organization that instigated the project. It is the initiation, planning and control of a range of tasks required to deliver this end product. A multitude of reasons affect the success of a project, but one reason for failure should not be unrealistic schedules. Every project struggles with various types of intervening variables which complicate planning. Preparing a project schedule is an easy endeavor compared to evaluating its quality.

Project scheduling has been identified in various studies as a major factor in predicting project success or failure (Fortune and White, 2006). This indicates the crucial role of schedules in project management. Since the mid-twentieth century a large part of research in project management has focused on project scheduling. The assumption has been that developing better scheduling techniques will help project management resulting in successful completion of projects. A number of authors have made efforts to find factors that influence project success or failure. Different frameworks are summarized by Belassi and Tukel (1996). Project management software is a process which involves estimation, sequencing and activities, resource allocation and timing. The construction scheduling is to complete the

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project in time and equal the resources with the allocated tie. Planning of huge projects requires huge amount of paperwork, which can e reduced with help of PRIMAVERA and MS Project software. The comparisons are made to know the efficiency of each software. PRIMAVERA and MS Project is the modern tool of project management that aid to beat the obstacles faced remaining to conventional way of planning and organization. It helps for the optimal and resourceful organization of activities which helps to give the dream to complete the project in planned duration and within the market.

II. PROPOSED METHODOLOGY

The methodology used in this project is divided into 3 main phases. By adopting planning and scheduling the activities critical path will be obtained by schedule reports by logical relationship which will be helpful in execution. Resource availability can be known and assigned, analysed and leveling will be done. The results obtained are concluded. The entire project is integrated with Primavera and MS project and reports are generated. Following flow chart explains the phases.

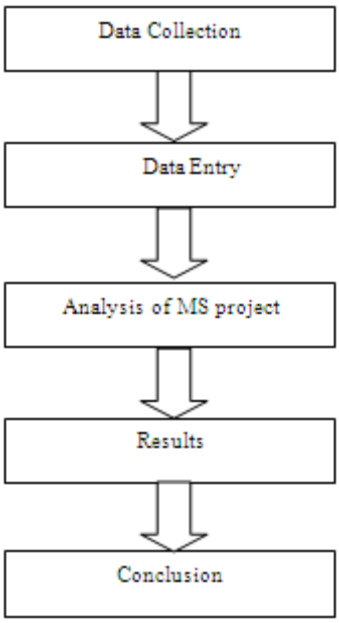

Fig.1 Research Methodology Chart.

III. LITERATURE RIEVIEW

Chiranjeevi D S, Dr G Narayana, Rajeeva S J:
Construction industry is the vital industry in the developing countries like India, as it contributes to the socio-economic development of country. Project cost and time is the critical factor in construction industry as its overrun /under run impact the total project duration and cost. So, main preference wants to give for cost & schedule. As a developing country so much competition is there in a market for a construction sector in order to sustain in the market we have to follow the promise was given to the client & customers of the completion of the project on the time and within the budget. We have to think and do our work in a more sustainable way. The EVM gives the details of project working from the planned data, actual cost incurred in project and worth of the work done as spent the money [EV]. Performance indices data is given in EVM by using that data we can ladder way to the project success.

Software package primavera p6 is used in this analysis of cost schedule & tracking of a project. From this software package we will get know the performance of project better. Project management body of knowledge (PMBOK) is the body giving set of procedure and policies to maintain in the construction project to make it better manageable, good vision able and stipulated to the budgeted cost. As a construction industry is vulnerable to uncertainties we have to manage a project in good aspects. The Earn value management is a program evaluation approach which is evaluated and tracks a project in better manner. This project report indicates significance, execution and particular components of earned value management that advantages extend director &eventually brings about project achievement.

Sushma.H, Mrs .Bhavya.S, Mr Rajeeva S.J, Mr G. Narayan:
The infrastructure development plays an important role in development of country. Road transport plays an important role in economic growth for a developing country like India. The construction of roads brings about a variety of benefits by all the sectors of economy. Highway constructions are the yardstick to measure the development of country. Project management is the main key role in the construction industry. Any construction project requires proper planning and scheduling for its completion within time and cost. In this project the popular primavera tool/software is used. Planning and scheduling is very important in construction projects for reducing and controlling delays of the project. Substantial amount of time, money, resources are wasted each year in a construction industry due to improper planning and scheduling.

With globalization the construction projects have become vast and complex. Planning of such requires huge amount of paper work, which can be reduced with the help of project planning software. Providing good planning, sufficient of flow of resources to a project can be automatically achieved desired result. In the present scenario there is an immensely increase in demand for the road construction projects due to the rate of development in India which is increasing day by day .in India as we have observed there are many underperforming projects which is effecting on time and

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cost to overcome all the facts that are effecting the construction of project with poor performance there we should include proper planning and scheduling techniques to have a good and effective performance of the construction economically. So to include the best planning and scheduling techniques we can use Primavera P6 for the minimum duration. construction of road construction. Primavera P6 gives a proper project management solution for the planning and scheduling team of the enterprise.

S.Ragavi, Dr. R.N.Uma:

Planning and scheduling is important role in construction projects because of the increasing complexities in this field. Construction Planning is the necessary warning to Scheduling and determining general sequence, defining labor tasks, construction methods and assigning responsibilities. Inappropriate planning can lead to major delays in the project work. For the planning and scheduling work huge amount of paperwork, which makes the management very burdensome these problems can be solved using a project management software which helps to give a planned approach to planning. In this study, a case of a apartment building has been taken to demonstrate how proper planning and scheduling is done using primavera and MS project.

Planning and scheduling helps in future situation and implementation of the project. The Primavera Software provides user friendly options while performing any task. The cost of individual work break down can be known along with the duration. Thus decisions can be made sensibly for proper management. In multiple projects resource leveling is very important to maintain proper resource allocation.

For multiple projects under a single company such analysis should be done to check out for over allocation. Scheduling real-time projects is also an important standard for managing multiple projects. A Resource constrained project schedule as per the site situation. For resource constrained analysis resource leveling is arranged. Scheduling using Microsoft project Software gives good controlling and clear schedule to a project. This project deals with scheduling using Microsoft project.

IV. METHODOLOGY

1. Project Management

Project management as defined by PMBOK 2000 is the application of knowledge, skills, tools, and techniques to a board range activities to meet the requirements of the particular project. Munns and Bjeirmi (1996) define project management as the process of controlling the achievement of the project by applying a collection of tools and techniques, without adversely disturbing the routine operations of the company. The function of project management includes defining the requirement of work, establishing the extent of work monitoring the progress of the work and adjusting deviations from the plan. The main elements of project management according to Austen and Neale(1995) are given in Fig No.2 and the cycles of activities to achieve the project goals is shown in Fig No. 3. Project management aims to achieve the stated goals of the project leading to complete facility, by virtue of planning executing and controlling time, fund sand human and technical resources.

The planning essentiality consists of setting objectives, identifying resources and forming strategy. Executing consists of allocation of resources, guiding execution, coordinating efforts and motivating the staff. Controlling consists of measuring achievement goals reporting, reporting, and resolving problems. The planning, executing and controlling are performed on a continues basis till the goals of the project are realized.

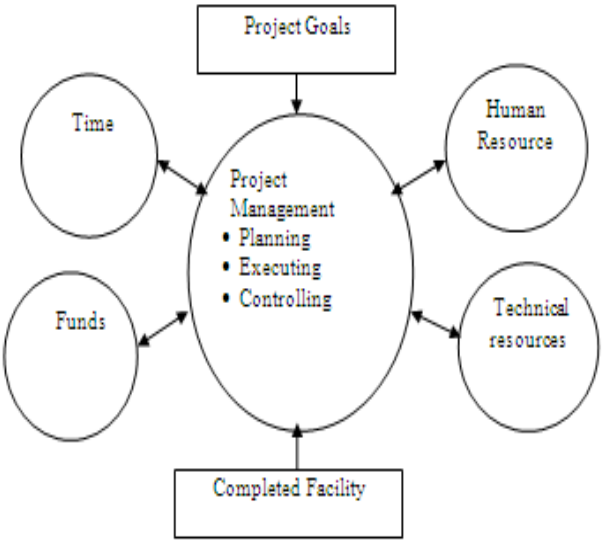

Fig. 2 The elements of Project Management.

Project management knowledge and practices are best described in terms of their component processes. These processes can e placed into five process groups (initiating, planning, executing, controlling and closing) and nine knowledge areas (project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management and project procurement management).

Project management is essentially about managing project from an idea through to completion. Projects today are getting increasingly complicated than they have

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ever been, embracing multiple disciplines and including increasingly larger sums of money. The basic ingredient of bringing together ideas and successfully executing them remains, even though the new techniques in project management are continuously being deployed.

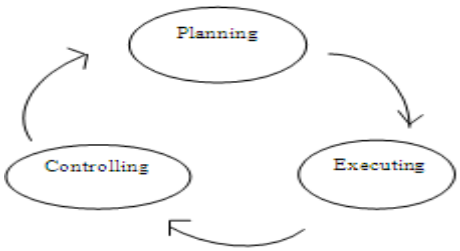

Fig. 3 Cycle of Activities.

Project management, as we know if today first emerged in the early 1950s on large defense projects. It was adopted gradually by smaller organizations, and currently been the smallest construction organizations are known to operate project management in some form. The two stages Planning and Scheduling of project management are described below,

2. Scheduling

Scheduling is determination the timing of events in the project that is when and which task will be performed. Putting it in simple words it is a reflection of plan. In other words we can say, planning is How, What and Who whereas scheduling is when and why. Scheduling can be also defined as the detailed plan of the project work tasks with respect to time. A schedule is also a good communication tool between all the stakeholders of the project. Schedule gives an overall sense of expected progress of the project without schedule it is very difficult to explain someone unfamiliar with the project what is going on and what is expected to take place.

3. Purpose of Scheduling

- A Schedule is the reflection of the plan.
- It is the determination of time and sequence of operation in the project and their assembly to give the overall completion time.
- The process of scheduling uncovers flaws in the plan, leading to easy revision of the plan.

4. Project Management Software

Modern construction management has fast evolved in to an independent field of study to include a gamut of issues including financing of large infrastructure projects, construction equipment, planning and scheduling, and tender and contract management. The emergence of computers and their widespread use in the construction industry for data storage, retrieval and analysis have on the one hand made the job of the construction manager easier, and on the other hand made it more complex.

Software is helpful at both planning and execution phases of the project. In the former, software helps to create a well thought out plan and, at times, also a more creative solution, based on logical sequencing of events, besides helping a planner to foresee problems. During the execution of a project, software is helpful for prompting effective coordination and better resource allocation.

Some of the advantages associated with project management software are;

- Speed and accuracy have greatly improved.
- It is not a very costly proposition and even medium and small companies can afford these software.
- Most of the software are user-friendly and one can use them quite easily
- The software can handle complex problems involving multiple stakeholders as well as number of constraints
- It is easy to modify the inputs, and maintaining the records has also become easier
- Decision making has become easier. It is possible to try different possible alternatives and select the best alternative with the assistance of ‘what if’ analysis in project management software.

The history of project management software is perhaps as old as the history of the computer. While the early project management software were limited in features, their modern counterparts are very powerful. Artemis, Can Plan, Hard Hat Manager, Microsoft Project Primavera Project Planner Primavera Suretrak Project Kick Start and Scitors business Solutions-PC Suite are some of the project management software available in the market, besides Microsoft Excel, which is also used y managers. Based on a survey of the actual user base of software, it was found that MS Project was by far the most popular (about 48%), followed by Primavera Project Planner(about 14%).

5. Microsoft Project

MS Project is popular software offering a number of functions such as scheduling, resource leveling, tracking and reporting, in a user-friendly manner. In appearance, it is almost like a spreadsheet. Preparation of schedule and identification of critical path are easily achievable in MS Project. MS Project distinguishes between work resources and and material resources.. Tracking is possible by entering the information on percent completion of task. The newer versions are equipped with work breakdown-structure tools, risk analysis tools and multiple project-planning tools. Microsoft Project was developed in the US during for the management of the development of Microsoft software. It was put on sale in 1984 and was aimed at managing software development projects.

The functionality of the desktop software has not significantly changed since Version 2000 which introduced the ability for tasks to be assigned different calendars. Other functionality such as Cost Resources and the ability to name Calendar Exceptions have been introduced more recently. MS Project is a project

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management software product, developed and sold by Microsoft. It is designed to help project managers in creating a project plan, assigning resources to task items, tracking their progress, managing the budget, and analyzing workloads. 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.

Microsoft Project is a project management software product, developed and sold by Microsoft. It is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analyzing workloads. MS project can be used as a standalone tool for tracking project progress or it can be used for tracking complex project distributed in many geographical areas and managed by a number of project managers Microsoft project is designed to assist a project manager in;

- Developing a plan,
- Assigning resources to tasks,
- Tracking progress,
- Managing budget and
- Analyzing workloads.

Microsoft project has three versions:

- Standard which is a desktop application and will only open a standalone file saved locally or on a server in single user mode.
- Professional which is a desktop application which will either open a single file as the Standard version or download a file from a Microsoft Project Server.
- Web, this is a browser based application that will open a file from a Microsoft Project Server. Most building and construction companies use the Standard version with their project files saved on a server.

Microsoft project is mainly used by the following types of companies:

- Residential builders.
- Architects and Quantity Surveyors.
- Companies constructing small and medium commercial buildings.
- Smaller civil construction companies.

Most companies that use Microsoft Project do not update their project files with actual dates to produces a revised end date.

V. ILLUSTRATION OF MS PROJECT

1. Providing Input on Project and task

1.1 Input on project

After completing the initial planning (scope, objectives assumptions and constraints of the project determine), the planner starts a new file in the MS Project program. At this point of time, the window screen looks like the one shown in screenshot no. The default view in MS Project program is the Gantt chart view which can be changed to other views such as network diagram view task usage view, and so on. The project information such as start date and finish date if applicable, the planning process such as schedule from start date or schedule from finish date project priority on a scale of o to 1000, and some other general information are entered by clicking on 'project information''. Entering all these information is not compulsory and if nothing is specifies, the program considers the default option and proceeds. The information on different task of project is entered next.

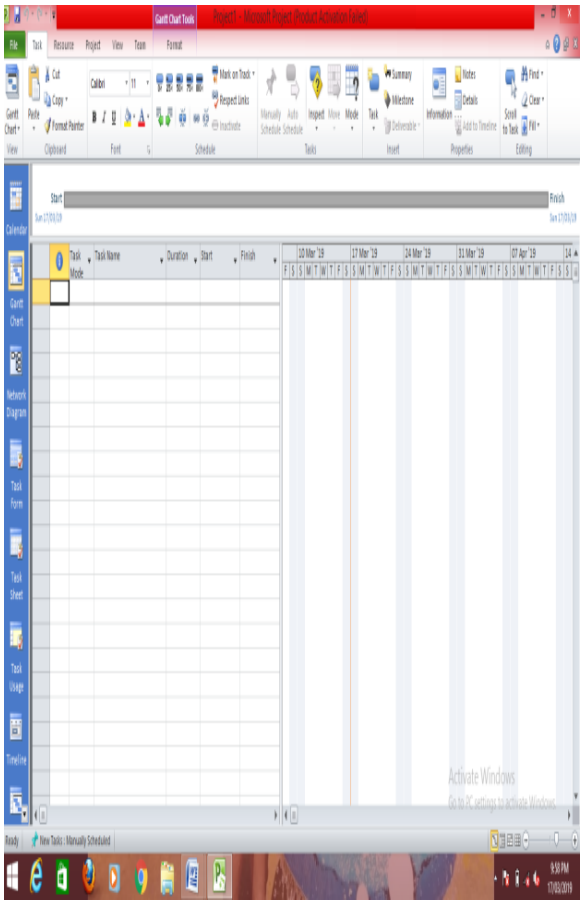

Fig.4 Screen view after the file-New command is invoked in MS Project.

1.2 Input on working times

Working calendar is defined in which the working days in a week and the working hours are specified. Y default MS Project considers 8 working hours per day, 5working days in a week, and 20working days in month-thus it considers 40 working hours in week and 800 working hours in a month. The user can make changes to these values if required. Different resources of the project do not follow the same calendar. For example some specialist may be required on the project only for a few days in a week or on some particular days in a month. In such cases separate calendars can be made and attached

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to the specialist resource. Similarly, separate calendars can be made for different activities. For example, for the activity 'curing of concrete' we can have a calendar that has seven working days in a week.

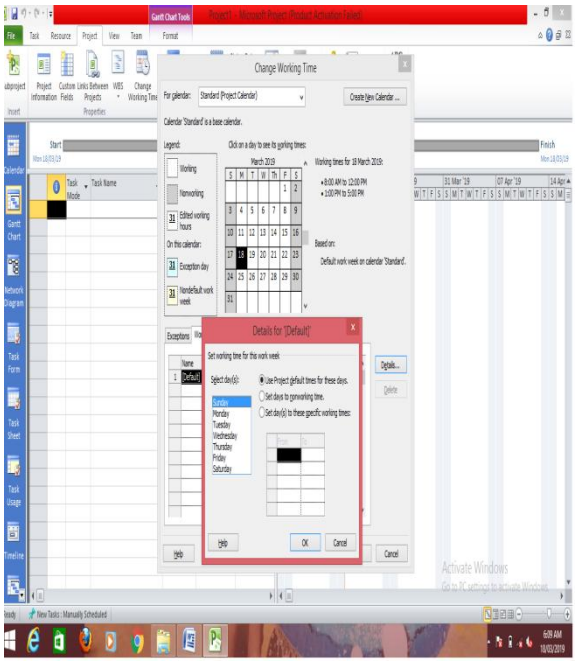

Fig.5 Calendar view in MS Project.

1.3 Input on task list

The task is either individually entered or it can be copied and pasted in MS Project window as shown in above screenshot no. The tasks are normally entered in the order they occur. For each of the task, the duration and its predecessors are defined. The task duration could be in terms of minutes, hours, days, weeks and months.Tasks should be entered in the order they occur. For each task, enter its task name, duration and the relationship It is advisable not to enter the start date and finish date of tasks manually, and to let the program calculate these dates on their own. Information on Milestones if any, in the project also entered at this point of time. For creating a milestone, the user just needs to assign zero under duration column against the milestone.

The milestones are important review points in a project. Hierarchy among different tasks can e created by invoking the indent and out dent options of MS Project. For example let us assume that a project consists of the tasks plain cement concrete (PCC) and reinforced cement concrete(RCC). Further let us assume that RCC has 3 subtasks-formwork, reinforcement and concreting. Thus RCC known as summary task in the MS Project terminology. Clearly the start date of a summary task is the start date of its first subtask and the finish date of the summary task is the finish date of its last subtask. For making RCC the summary task the task formwork reinforcement and concreting are selected and indent option is pressed. The final result is as shown in following screenshot.

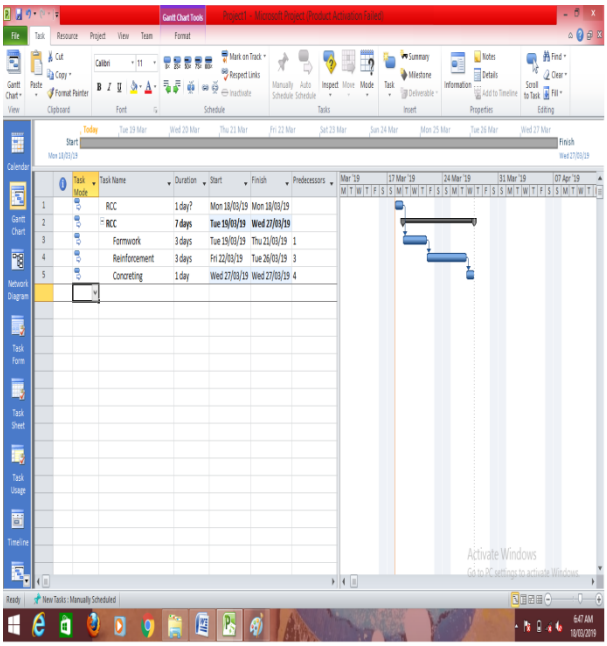

Fig.6 Illustration of summary task in MS Project.

Additional information on any task can be provided by selecting the task clicking the right button of mouse and selecting the 'task information' option. In addition, the information pertaining to a task can be given by inserting a column and selecting from the default options. If the default option does not have the column that the user desires, the user can creates his own column wherein he can enter the information pertaining to that task. MS Project offers the option of specifying the deadline and constraints associated with a task. Deadline can be directly entered in the form of a date.

For example, the completion deadline of activity xyz could be assigned as 9/4/2019 or it can be selected by clicking on a date on the calendar. An indicator is displayed if the deadline for task is set. Examples of constraints given in MS Project program are –as soon as possible, as late as possible finish no earlier than and so on. Constraints and deadlines options are used when the user wants to set a specific start or finish date for a task.

The user can also split a task as many times as necessary, if work on the task is interrupted and then resumes later in the schedule. In addition to the above features, there are many other features associated with task in MS Project program, such as identifying risks to the project, publishing project information on the web, adding documents to the project and so on.

1.4 Schedule task

The aim of task scheduling is to establish relationships between tasks and define tasks dependencies.
After all the task are entered along with their respective duration, the information on task dependencies is specified y means of specifying the predecessor and/or the successor of each of the tasks. A task whose start or finish depends on another task is the successor. The task that the successor is dependent on is the predecessor. The information is entered using predecessor and successor columns of the program. The overlap in tasks can be created by specifying lead or lag time between two tasks. For creating the schedule the easiest option is to use Gantt chart wizard.

Using this MS Project automatically calculates the start and finish dates for each of the tasks and also identifies the critical tasks and critical path of the project. It is possible to use all the types of relationship (SS, SF, FS, FF with leads and lags) in MS Project program. The default relationship type is FS with zero lead and lag. If the user is not happy with the schedule generated, he can adjust the schedule by utilizing the constraints option of the software. Further the user can increase or decrease the resource assigned for the project. All such adjustments can be carried out quickly and desired project schedule can be prepared.

2. Providing Input on Resources

Resource management function is carried out in MS Project in two steps. In the first step, the user identifies the different work and material resources proposed and committed for the project. In software parlance this is called 'creating resource dictionary'. In the resource dictionary shown in following screenshot no, the working time on work resources are also to be specified. It may also happen that different resources have different working times work resources are also to be specified. It may so happen that different resources have different working times and hence, different calendars. Further in order to perform the cost analysis, the user has to specify the rates (options of standard rates, overtime rates, and pre-use rates exist) for different work and material resources. The fixed cost associated with work resources can also be entered if it is known. The cost of resources is accrued on 'prorated' basis by default in MS Project. The other options available for distribution of cost are 'at start' or 'at end' of task.

In the next step, the resources are assigned to the different tasks of the project shown in Screenshot No below. The user can specify one or more resources to a task and also specify whether a work resource works full-time or part time on a task. MS Project automatically decreases the duration of a task in case more resources are assigned to a task. For example a task with two days duration and one assigned resource has 16 hours of work. With effort driven scheduling, if a second resource is assigned to it, the task still has 16 hours of work but its duration is reduced to one day.

MS Project has the option to switch off effort-driven scheduling before assigning another resource. The task will then have 32 hours of work and still have duration of two days. Using the resource usage view, the user can view the assignment of different resources to different task. For example, the user can find out how many hours each resource is scheduled to work on specific tasks. Besides this, one can also see which resource is over-allocated. It is obtained by clicking on View- Resource Graph. The user can also exercise the option of leveling in MS Project by invoking the command Tools- Level.

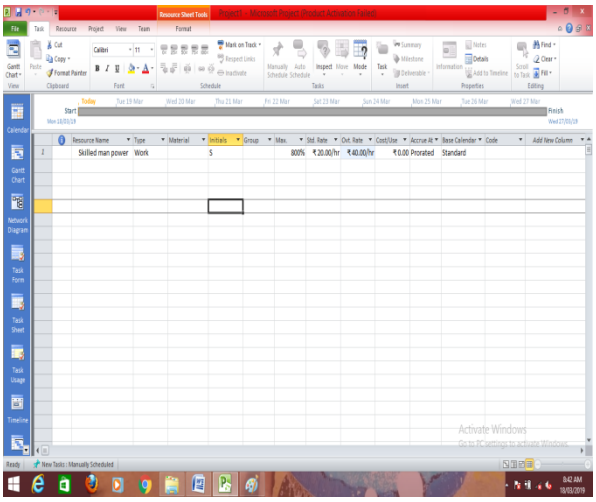

Fig.7 Screen view of resource dictionary.

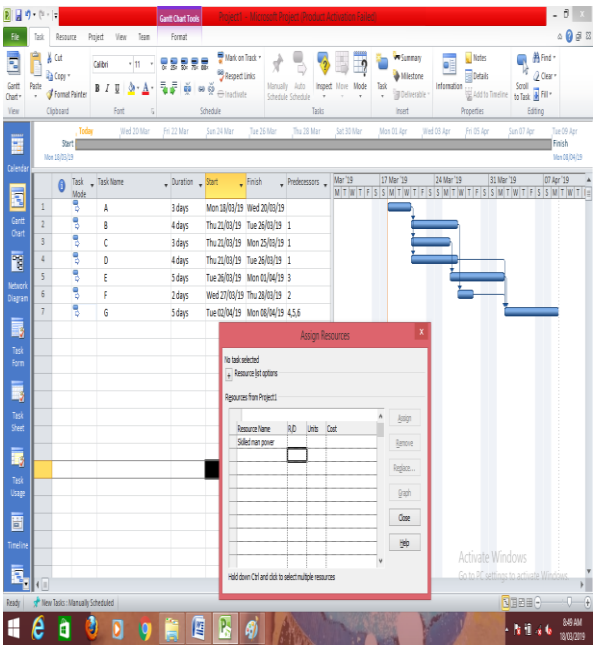

Fig.8 Resource assignment view for activity A.

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Advantages

- It is the most common software package used by BCRCs thus it is usually simple to swap files between companies.
- IT companies find it very simple to deploy as it is another Microsoft desktop package.
- It is approximately 1/3 of the price of P6.
- Many people are familiar with it due to its market penetration and it is often taught at educational institutions.
- It is simple to create a project schedule with Microsoft Project because it is very similar to Excel and most users find it very intuitive.

Disadvantages

Most companies start with Microsoft Project but these are the reasons why companies stop using MSP include:

- The MSP Blank Project template has a number of issues and schedules created with it are difficult to manage. This is because the calculation options are not ideal, and it does not display the Status Date when it is set. There are a number of other presentation issues such as the Legend displays irrelevant bars and there is no hearer or footer text. Companies are advised to create a template using the Eastwood Harris template found at www.eh.com.au.
- MSP only supports one relationship between two activities, thus making it difficult to create a closed network. P6 supports a maximum of 4 relationships between two activities and Asta an unlimited number which both allow ladder scheduling.
- It is not possible to have calendars with a different number of hours per day in MSP and end up with the correct duration in days. This is because there is only one factor to calculate the duration in days in MSP and this factor is used for all calendars. P6 and Asta have a factor for each calendar.
- Projects with multiple resources and multiple calendars are difficult to manage due to the way MSP changes durations when resources are assigned. This is because the Resource Calendar takes priority over the Task calendar and several settings have to be changed to prevent a resource calendar from driving the end date.
- Resources calendars are simple to ignore the Resource Calendar in P6.
- A Baseline is only a partial baseline as it does not save the critical path, relationships, constraints. It records Start, Finish, Work, Costs and Duration.
- The management of multiple Baselines is difficult as MSP Baselines may not be named. There are 11 Baselines and only the date that the Baseline was set on is saved in MSP. Both Asta and P6 allow multiple Baselines and notes on each Baseline.
- The MSP Finish Variance column only works with "Baseline" and not with any of the other baselines, so a calculated field has to be used calculate the finish variance of the other baselines.
- It is difficult to display multiple Baseline bars.
- The way MSP manages in progress tasks is less robust that P6 or Asta and it is very simple to end up in an illogical situation where complete work is in the future and incomplete work in the past.
- P6 will not allow incomplete work in the past as it always moves it into the future, but it is possible to enter Actual dates in the future. Asta has a simple function called "Straighten the Report Date" that moves incomplete work into the future and incomplete work into the past. There are numerous MSP functions to assist in updating a schedule, but these are all quite difficult to master.

VI. CASE STUDY

A working calendar is defined in which the working days in a week and the working hours are specified. In this study, the name given to the project calendar and the timings are also given with a lunch break of one hour. The calendar is 5 hours working per day, 6 working days in a week and 30 working days in a month. Exceptional holidays are given. Working Time is From 11 AM to 5 PM.

1. Selection of Task Mode

The Task mode gives the option whether a task is scheduled manually or automatically.

2. Manual schedule mode

The manually scheduled task placed anywhere in the schedule. This new feature gives greater flexibility and control over planning and managing schedule.

3. Auto Schedule Mode

Automatic scheduling provides a highly planned, systematic means of managing the project schedule. Project calculates the earliest and latest dates for tasks for the optimal schedule.

4. Entering Task

The task is individually entered in auto schedule mode in the MS project software. The tasks are normally entered in the order that they occur. The task duration is entered in terms of days only. Information about milestone in the project is also entered.

5. Creating Work Breakdown Structure

After the complete planning of a project, the next step is to create a work breakdown structure (WBS) to define and organize the project elements at different levels. At the first level of work breakdown structure, a project is created. Then inside wbs, project breaks down structure like excavation and earthwork, substructure, superstructure, brick work, including door frame, lintel work, internal plaster, waterproofing work, eternal plaster, finishing work and service work are created.

6. Scheduling the project

After all the tasks are entered along with their respective duration, the information is entered using a predecessor

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column of the software. The four types of task relationships or inter dependency are FS, SS, FF and SF.

7. Assigning Manpower

A man power can be defined as the number of people that is required to complete the task and is assigned to an activity. It is suggested to create and allocate the minimum number of resources to activities. When the project schedule is completed with the activities, duration, start and finish dates for each activity and for the whole project, next step is to define and assign resources to the activities then to find the estimated cost of the activities for the whole project. The scheduling in MS Project is shown in following screen shots.

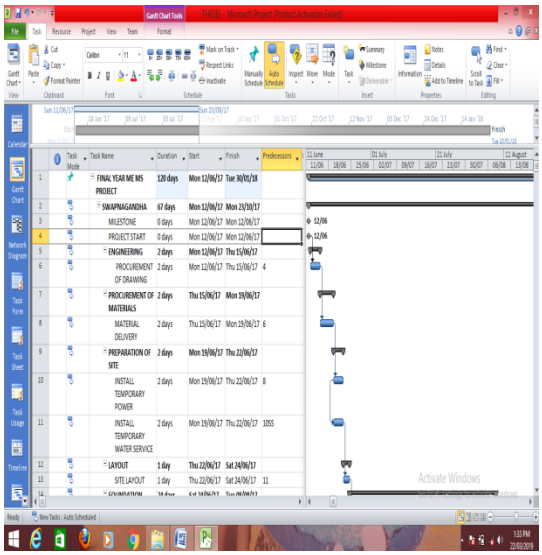

Fig. 9 Scheduling in MS Project.

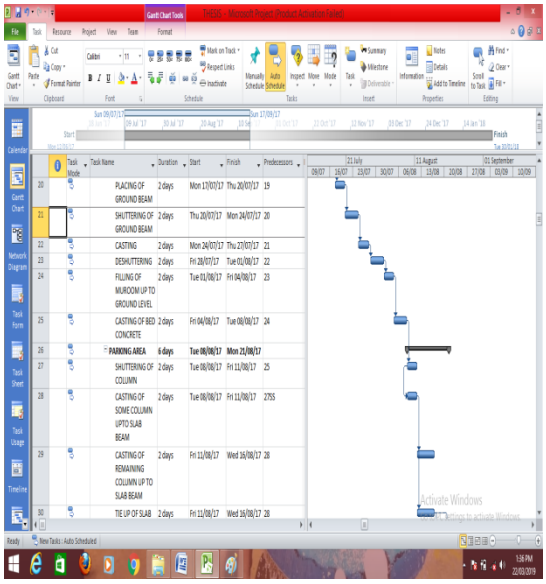

Fig.10 Scheduling in MS Project.

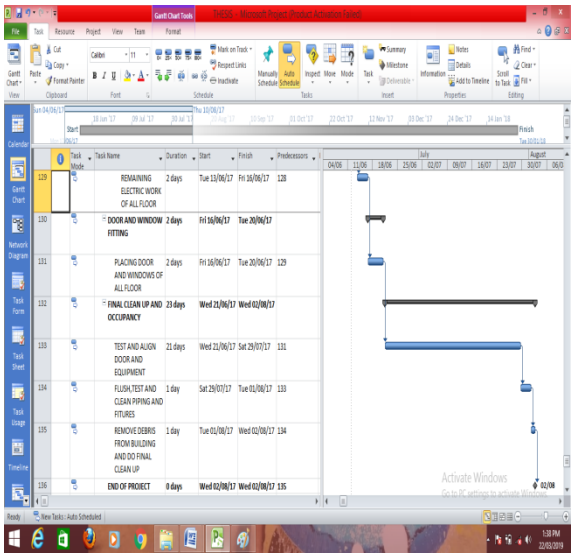

Fig.11 Scheduling in MS Project.

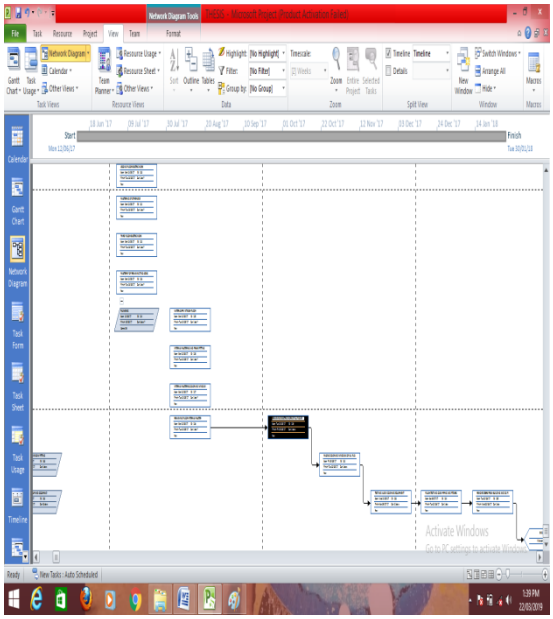

Fig.12 Network Diagram in MS Project.

VII. CONCLUSION

Construction of building using Traditional way proves to be uneconomical and consumes more time with many complexibility and enormous error which actual execution of the Project. Traditional way of planning doesn't sub divide the main task which future gets the hurdle of over allocation of resources, improper judgment of resources for particular activities etc. Microsoft Project is the modern tool of Project Management that aid to overcome the obstacles faced owing to traditional way of Planning and Management. It helps for the optimum and effective organization of activities which helps to give

the vision to complete the project in planned duration and within the Economy. We had used MS software for planning and scheduling of material as well as labour, which gives us brief information about the activities in construction project, showing their start and finish time, and material and labour requirement as well as project duration.

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