

PLANNING, SCHEDULING AND COSTING OF COMMERCIAL BUILDING (G+4) BY USING MICROSOFT PROJECT

¹Devana Manidurga, ²Grandhi Satya Sai, ³Revella Venkata Koteswara Rao, ⁴Solapuri Naga Babu, ⁵A.Rajendra
¹UG Student, Department of Civil Engineering, Godavari Institute of Engineering & Technology(A), Rajahmundry, AP, India
²UG Student, Department of Civil Engineering, Godavari Institute of Engineering & Technology(A), Rajahmundry, AP, India
³UG Student, Department of Civil Engineering, Godavari Institute of Engineering & Technology(A), Rajahmundry, AP, India
⁴UG Student, Department of Civil Engineering, Godavari Institute of Engineering & Technology(A), Rajahmundry, AP, India
⁵Assistant Professor, Department of Civil Engineering, Godavari Institute of Engineering & Technology(A), Rajahmundry, AP, India

Abstract : Project management in construction aims to accomplish the precise goals by virtue of perfect planning, scheduling, executing, monitoring, cost optimization, controlling time and resource optimization. It directs the project time to accomplish a project successfully within specified cost as well as time. Improper project management and using traditional practices reduces the efficiency of the construction industry, which affects the project in the form of increasing the duration of the project, this leads to increase in the overhead cost of the project and poor quality of work. In order to eliminate these flaws in construction, an effective Project management tool is introduced in the form of Microsoft Project Software. It is designed for developing the schedule, assigning the resources to tasks, tracking progress and managing the budget.

This project aims at planning, scheduling, costing and resource allocation of a commercial building(G+4) with various methods such as bar chart and critical path method by using Microsoft Project Software.

Keywords – Microsoft Project, Cost Optimization, Resource Optimization, Project Management.

1. INTRODUCTION

A project generally starts at right time but as its proceed, activities gets off the schedule due to various tribulations like improper planning, uncertainties, non delivery of resources at a time, execution delays, environmental factors and other which directly impact the cost of the project. The application of project management in construction aims to accomplish the project goals by virtue of perfect planning, scheduling, executing, monitoring as well as controlling time, utilizing all the resources effectively.

1.1 Microsoft Project

Microsoft project is a project management software program. It is developed by Microsoft, Microsoft project software released in 1998. Microsoft project software is used for planning, scheduling, monitoring, controlling, and resource optimization of the project. It is designed to assist the project manager to track the progress, manage the budget and analyze the workloads data. This Software is applicable to track single project with numerous activities and resources. It comprises of an option to visually choose the resources as per the requirement. Calendars, tables, filters, views and other customization aspects in Microsoft project are stored, which can be accessible to all users. Microsoft project utilizes the team collaboration and accesses the results.

Microsoft project is a software tool that takes a lot of the manual updating and guess work out of managing Projects. We can enter information about our project's tasks, when they need to happen, Duration and who should be doing the work.

Project creates budgets based on assignment of work and resource cost. As resources are assigned to the task and 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 level and finally to the project level. Resource definitions (Labour, equipment and materials) can be shared between projects using a shared resource pond. Each resource can have its individual calendar, which defines number of days and time of a resource present. Resource rates are used to calculate resource assignment costs. Each resource can be assigned to multiple tasks in multiple projects and each task can be assigned to numerous resources. The execution of the scheduled task work based on the resource availability as defined in the resource calendars. All resources can be defined in Work, Material and Cost. Therefore it cannot estimate how many finished products can be obtained with a given amount of raw materials. This makes Microsoft Project unsuitable for solving problems of available materials. The application creates critical path schedules, critical chain and event chain methodology. Schedules can be resource leveled, and task networks are visualized in a Gantt chart. Additionally, Microsoft Project can identify divergent classes of the users. These different classes of users can have differing access levels to projects, views and other data. Customization of aspects in Microsoft Project such as calendars, views, tables, filters and fields are stored in an enterprise global which is accessible by all users.

1.2 Project Management

The way towards overseeing and bringing human and material asset into a proficient method for working for the duration of the life of an undertaking by utilizing current administration advances to accomplish foreordained targets, cost, extension, time and quality and individual fulfillment is satisfied with project administration. The objectives are settled up in the undertaking Project Management, which is to be satisfied by executing a genuine arrangement of activities subjected to asset requirements.

1.3 Construction, Planning, Scheduling and Tracking

1.3.1 Construction Planning

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, resources of individual task and identifying the interactions between different work tasks. A good construction plan is the base for developing the schedule and the budget for work. Developing the construction plan is a critical task in construction management. During planning a planner begins with a result (a design) and he must synthesize the steps required to yield this result. The necessary aspects of construction planning include the generation of required activities, analysis of the implications of these activities and the choice among various alternatives methods of performing these activities.

1.3.2 Scheduling

Scheduling is determination of the timing of events in the project. In other words we can say, planning involves advance thinking like What, How, and Who is to be done. 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 that what is going on and what is expected to take place

1.3.3 Tracking

Tracking is the process of collecting, entering and analyzing of actual project performance values, such as work on tasks and actual durations. Tracking is the second major phase of project management. The main thing to focus on project planning is developing and communicating the details of project plan before actual work starts. When work begins, the next phase of project management is tracking progress. Tracking means recording project details such as what work did by whom, when the work was done, and at what costs these details are called as actual. Properly tracking actual work and comparing it's against original plan is useful to identify the difference in actual and planned and it enables to adjust incomplete task of the plan.

1.4 Current Problem

As we know that usually projects fails at an alarming frequency. Numerical evaluations show that projects more than thirty percentage got failed in advance to completion by deteriorating overall money and time. Hence that failed projects taking more cost every year which also happen in different kinds of projects. Every project has an aim and to obtain such project aim three necessary conditions are required as follows

1. The project scope should set a least measures to its consequences.
2. Supreme price should be fixed by the project budget.
3. Extreme period should be fixed in the project schedule.

The above three necessary conditions are depended on each other. More the project consumes time, more it costs. More the project cost, more the project consumes time. The more projects consume time, the more opportunities occur to change the project scope. The cost and schedule of the project will increase if the project scope changes. One of the main constraints of the project is the period of time in which it should be completed, which is due to the following reasons:

1. A delay in implementation of project has a high increase of cost contingency.
2. A delay in implementation of project has negative consequences about cash flow, related mostly to the increase of general or overhead costs.
3. Change in scope of the project, change in technology of project tasks implementation or change in the functionality in the matter of project activities expectations may occur in the situations of extending completion time of the project and the expectations of stakeholders are modified.

In construction activities there will a clear correlation between the completion time of project and its probability. Beyond the directive project deadline the project has negative financial consequences, such as delay in achieving proposed benefits, postponing profit and repeatedly loss of share in market. The consequences of delay in construction project and investment may be significantly more than the budget only.

1.5 Research Objective

Basically this thesis will conduct an exploratory study on implementation of Microsoft Project in every aspect of a project which comprise of Planning and Scheduling stage followed by the Monitoring and Controlling stage. In this regards, in terms of construction management, this dissertation is written for the objectives listed below

1. To study the scheduling technique using network models (CPM).
2. To reduce the total duration than the actual project's duration.
3. To reduce the cost by proper allocation of resources.
4. The other objective of this project is to use the available resources in a most optimum

2. Literature Review

➤ **Vittal Anantatmula (2010)**

He found out that Similar to a traditional project, managing an academic degree is related to the triple constraints of time, cost, and scope. It is concluded that by applying project management concepts, tools, and techniques, undergraduate degree program advising and planning can be improved after comparing the planning aspects of a conventional business project with the planning of an Planning and Scheduling of Project using Microsoft Project... DOI: 10.9790/1684-12335763 www.iosrjournals.org 59 | Page academic degree. Author also helps to explain the application of project planning techniques to manage the multiple constraints and the complexity associated with academic advising and planning.

➤ **Abhishek sharma and k.k. pathak(2011)**

As explained above, the management of time and manpower is the prime factor that affect greatly to the efficient and timely completion of the project. This is the management that sets up the relations among various activities and helps Manpower Planning, Scheduling and Tracking of a Construction Project Using Microsoft Project Software 169 the site engineer to fix the priorities of task. Having the information about the availability of the manpower and have those available at right time for the activities plays a vital role in managing the costs and smoothly executing the project activities. The software Microsoft Project 2013 is the popular tool in modern days to manage the project efficiently.

➤ **R. Prabhakar and G. Ravichandran (2014)**

He analyzed that; Construction planning is an important part of the overall management process. The planning and management includes organizing the work, executing the work, correlating plan and progress information and controlling the work, the three inter-related factors of time, money and quality need to be managed in a proper way. Completion of many of the projects nowadays is not in estimated duration. This will direct to an increase in overheads as well as various other factors. It will not only reduce the expected revenues but also will affect the reputation of the contractor. Scheduling is one of the vital functions in construction project to determine the sequence of activities necessary to complete a project.

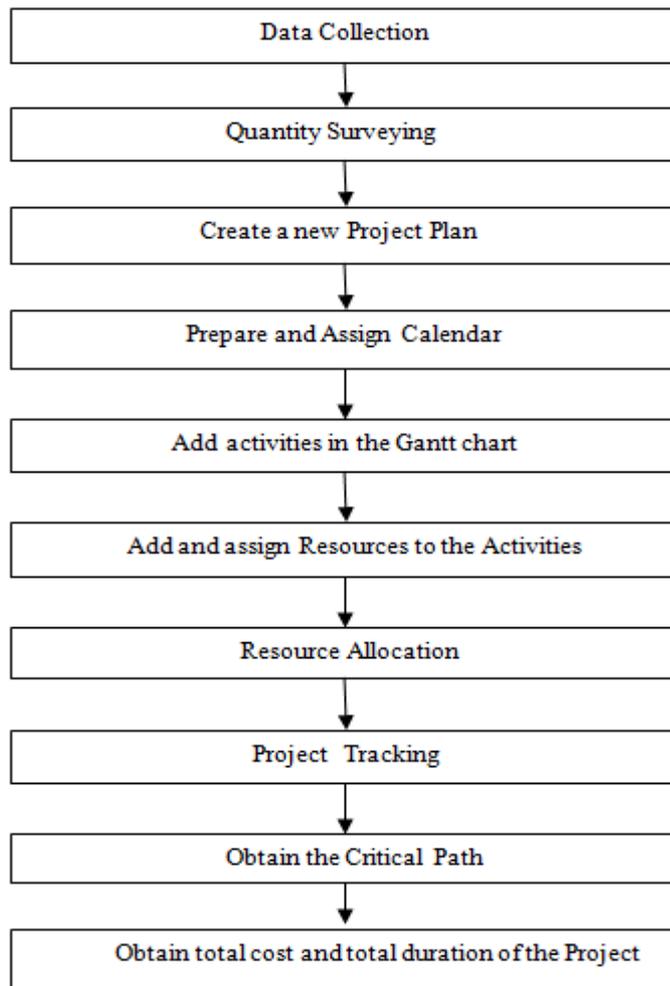
➤ **Aftab Hameed Memon and Ismail Abdul Rahman (2014)**

He suggested that time is the biggest element that every contractor has to deal with while practicing the construction activities. Variety of approaches and tools has been introduced over the past decades to cherish the management of the projects. Author identified commonly used techniques and software of time management together with their effectiveness level in large construction projects. Data was collected from the construction organization that deals with huge projects. Relative Importance Index calculation was employed to assess the level of effectiveness for time management techniques and software packages adopted in the construction project. The results depicts that most common and effective time management technique and software Package are CPM and Microsoft Project respectively.

➤ **B. S. K. Reddy et.al. (2015)**

In this work the authors have described how the profitability or the performance of the project can be accelerated. According to them the performance of the project mainly depends on how the assets or the resources required for the projects are managed. They have also highlighted the importance of "Resource Allocation" and Resource Smoothing. In this study the authors have done the comparison of resource requirement for two ongoing projects in Dubai by different ways at first they calculated the requirement of the resources if the projects were started with a lag time and later again the requirement of the resources were calculated by considering that both the projects are started simultaneously by doing this they found that by starting both the projects simultaneously there will be the reduction in resource requirement by 5.65%.

3. METHODOLOGY:



3.1 Data collection

Data collection is collecting the required data such as drawings of the plan, resources required for the plan. Resources are how many labourer are required for the entire work and what are the materials and how much amount of the materials that are need for the completion of the project.

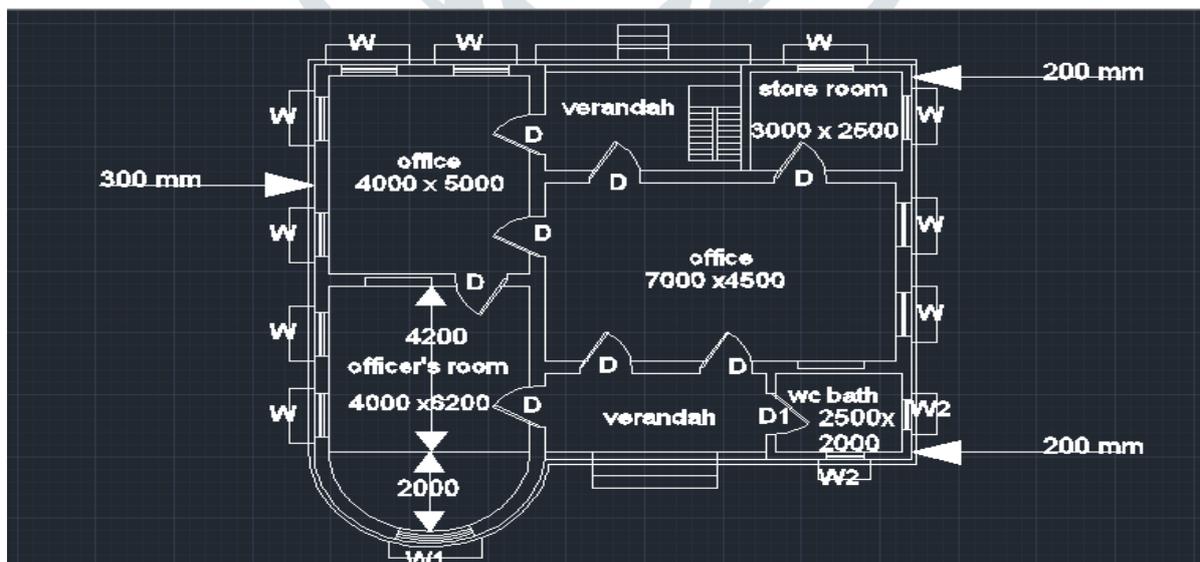


Fig.3.1 Plan of the Commercial Building

3.2 Starting a new project

General options

Before starting a new project we have to change some options in the Gantt chart. In this we have to do some default options before starting the project .Every project should be kept in Gantt with time line for better view and in this we can change the date format. These are the options that are primarily done before starting any project.

3.3 Preparing a calendar

3.3.1 Selecting type of calendar

In display options we have to select the suitable type calendar required for the project. There are mainly three types of calendar namely

- 1.Gregorian
- 2.Hijri
- 3.Buddist

Among the three types of calendars Gregorian type of calendar is used and it is the standard type of calendar .

3.3.2 Default working time

Before entering activities in the Gantt chart we have to prepare a calendar. In the calendar we have to adjust the number of working days in a week and number of working hours in a day

Tools => change working time => options

3.3.3 Project calendar

The first thing to do after creating a new project is to create the project calendar. If we do this at any time after resources or tasks have been added then the way MS-project handles time and day will introduce confusion downstream.

Tools=> change working time=> New

It does not make much difference whether you make a copy of standard or create a brand new one. Enter a name for the calendar using the project name ,for example “my new project” then press OK.

3.4 Adding activities in the Gantt chart

Gantt chart is a chart in which a series of horizontal lines shows the amount of work done or production completed in certain time in relation to the amount planned for these periods.

Gantt chart shows the activities involved in the entire project and their series and duration for the each and every particular activity and it shows what are the resources available for the each activity and percentage of completion of work of that particular activity.

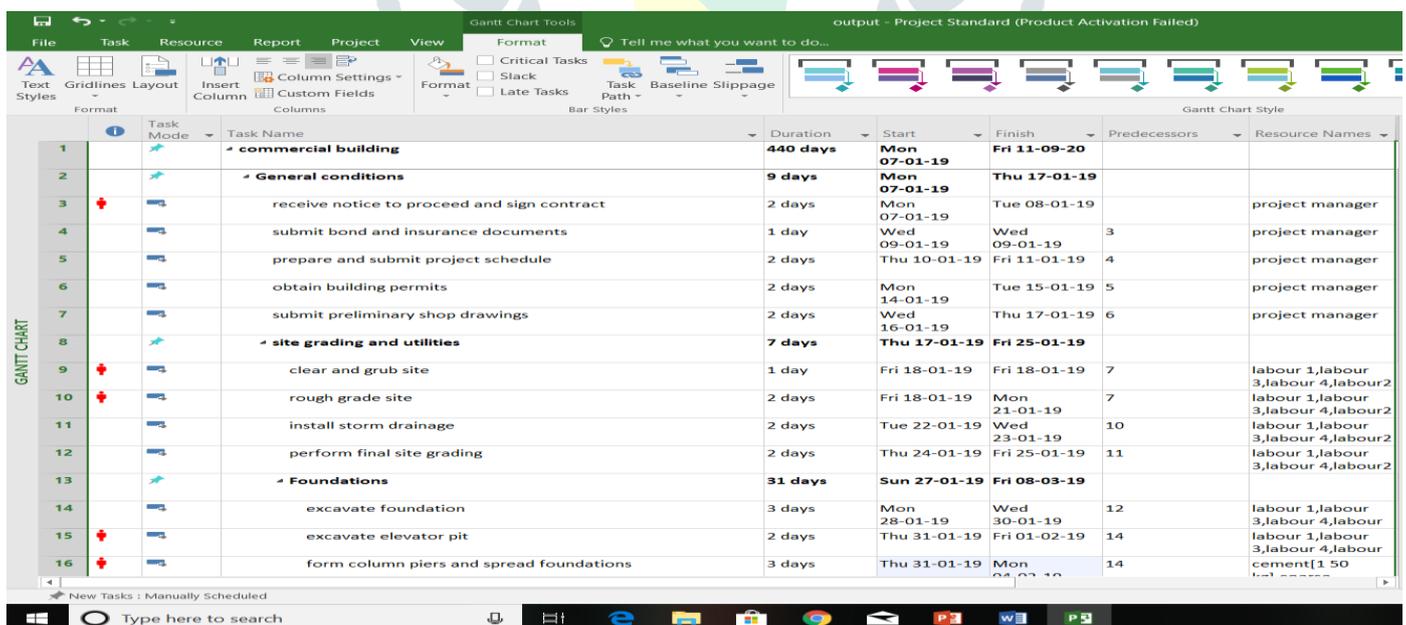


Fig.3.4 Gantt Chart View

3.4.1 Creating Work Breakdown Structure

After the complete planning of a project, the next step is to create work breakdown structure (WBS) to define and organize the project elements at different levels. A WBS represents a hierarchical breakdown of a project into elements. At first level of work break down structure, a project with name is created. Inside this, Block B is created. Then inside this Block B, project break down structure like excavation and earthwork, substructure, superstructure, brick work including door frame, lintel work, internal plaster, waterproofing work, external plaster, finishing work and service work are created.

3.4.2 Scheduling the Project

After all the tasks are entered along with their respective duration, the information of task dependencies is specified by specifying predecessor of each of the task. The information is entered using predecessor column of the software. The four types of task relationships or inter dependency are FS, SS, FF and SF. The default relationship in the software is finish to start with zero lead and lag.

Task Relationships:

- Finish-to-start (FS): The finish date of the predecessor task determines the start date of the successor task.
- Start-to-start (SS): The start date of the predecessor task determines the start date of the successor task.
- Finish-to-finish (FF): The finish date of the predecessor task determines the finish date of the successor task.
- Start-to-finish (SF): The start date of the predecessor task determines the finish date of the successor task.

3.5 Add and Assign Resources

3.5.1 Setting up Resources

Resources include the people and equipment needed to complete the tasks in a project. Microsoft Office Project 2016 focuses on two aspects of resources:

- Their availability and
- Their costs.

Availability determines when specific resources can work on tasks and how much work they can perform, and costs refer to how much Amount will be required to pay for those resources. In addition, Project supports two other types of special resources They are Material and Cost.

3.5.2 Setting up People Resources

Project works with three types of resources: Work, Material, and Cost resources. Work resources are the people and equipment that do the work of the project. some of the people resources are Mason, labour, Electricians etc.

3.5.3 Setting Up Equipment Resources

In Microsoft Project, setting up of people and equipment resources is exactly the same way because people and equipment are both examples of work resources. Most people resources have a working day of not more than 12 hours, but equipment resources might work around the clock. Moreover, people resources might be flexible in the tasks they can perform, but equipment resources tend to be more specialized

3.5.4 Assigning Manpower

A manpower 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 resource to the activities and to find the estimated cost for the activities and for the whole project .This work is done using Analysis of Rate CPWD.

3.5.5 Setting Up Material Resources

Material resources are consumables that you use up as the project proceeds. On a construction project, material resources might include nails, lumber, and concrete, etc. We work with material resources in Project mainly to track the rate of consumption and the associated cost.

3.5.6 Setting Up Cost Resources

The third and final type of resource that you can use in Project is the cost resource. Cost resources are used to represent a financial cost associated with a task in a project.

3.5.7 Entering Resource Pay Rates

- For material resource enter a fixed amount rather than a rate (hourly, daily, or weekly).
- For material resources, the standard rate value is per unit of consumption
- For the Travel cost resource standard pay rate cannot be entered.

3.6 Viewing the Project's Critical Path

A critical path is the series of tasks that will push out the project's end date if the tasks are delayed. It refers only to how their scheduling will affect the project's finish date; however, the project finish date is of great importance in most projects.

4. RESULTS AND DISCUSSION

Construction of building using Traditional way proves to be uneconomical and consumes more time with more complexity and enormous errors. 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. 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. The starting date of project was 07/01/2019 and schedule completed date was 11/09/2020. Project was tracked on 24/03/2019, it was found that percentage of work completed is 17% and percentage of cost completed is 19%.

4.1 Cost Overview

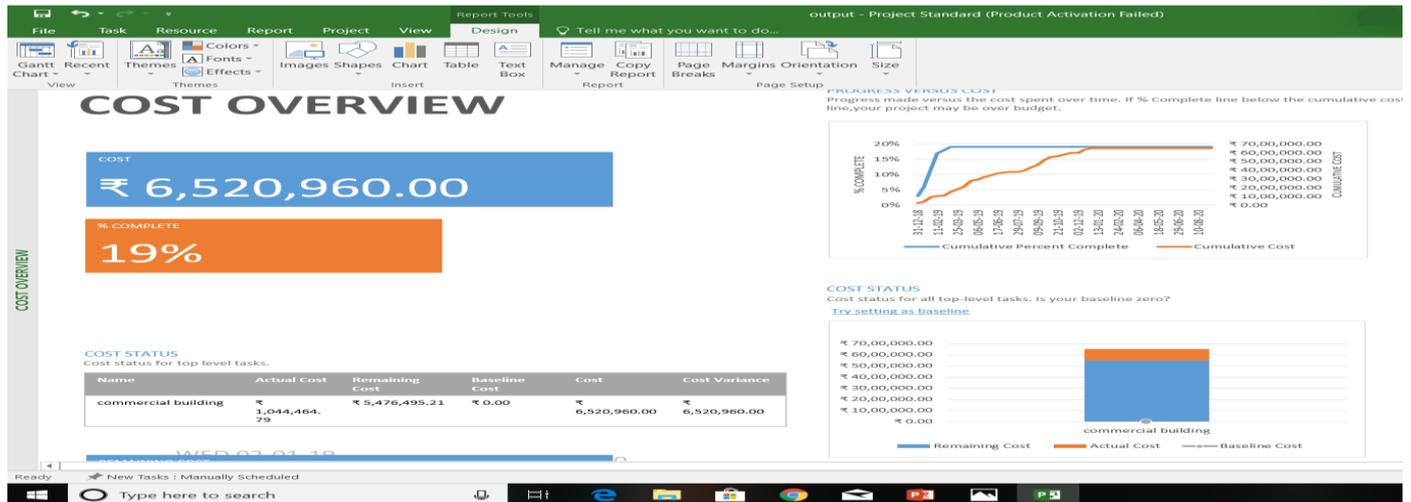


Fig.4.1 Cost Overview

4.2 Resource Overview

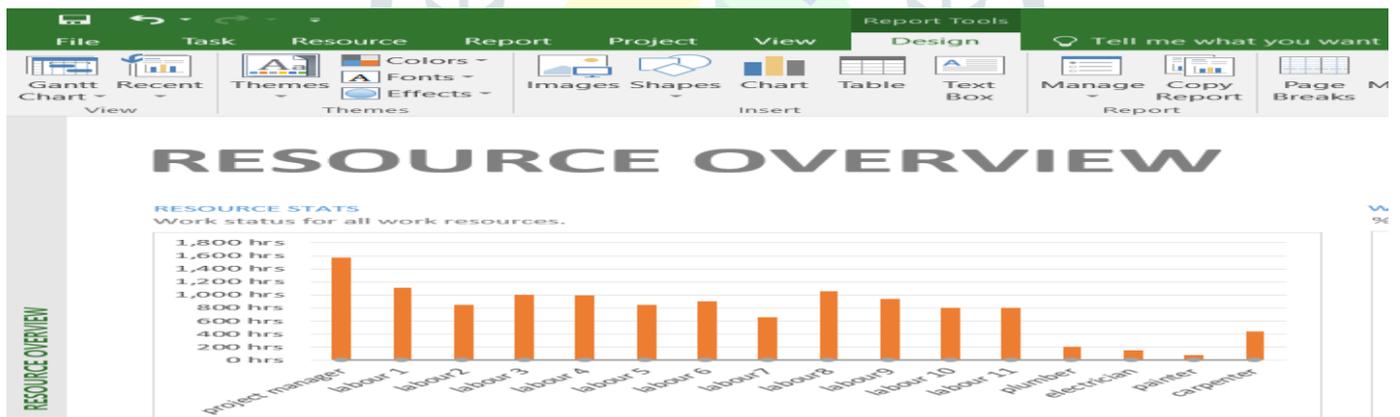
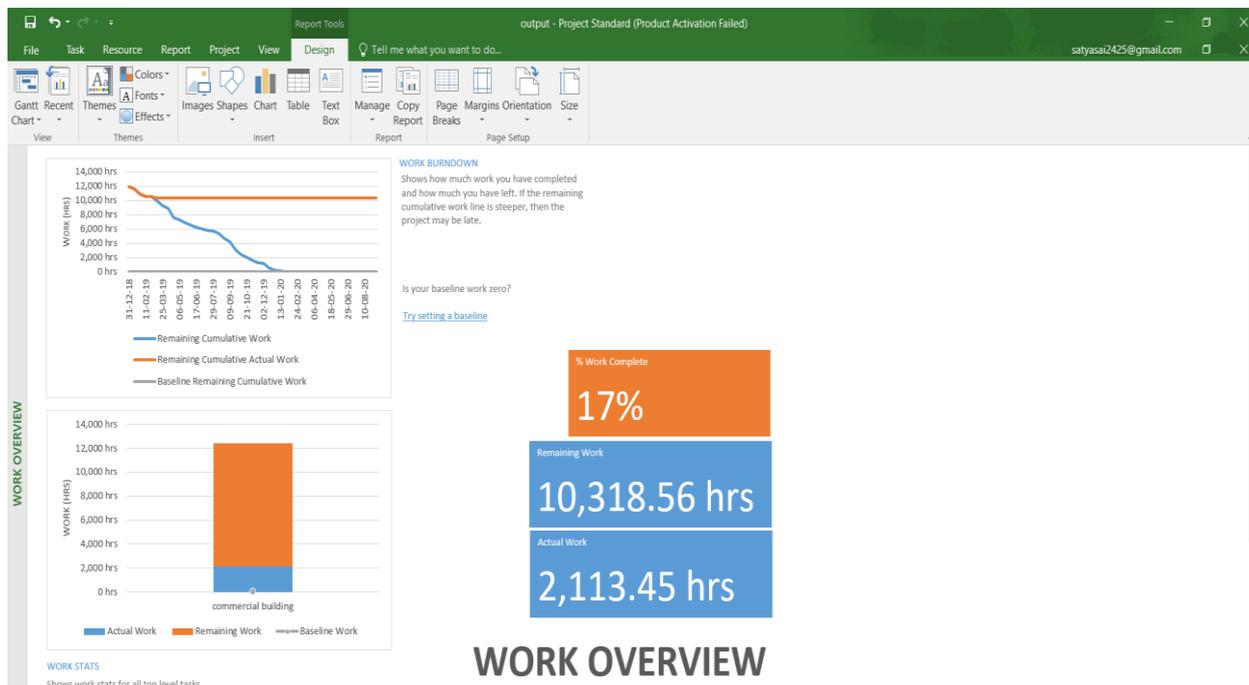


Fig.4.2 Resource Overview

4.3 Work Overview



WORK OVERVIEW

Fig.4.3 Work Overview

5. CONCLUSION

1. The use of project management technique in a proper way reduces the cost and time of construction, without affecting the quality and performance.
2. Use of Microsoft project software gives a proper schedule path which helps in setting a track of all activities, to check if there is deviation from planned cost and schedule.
3. The starting date of project was 07/01/2019 and schedule completed date was 11/09/2020. The total duration required for completion of this project as per Microsoft project is 440 days.
4. Application of proper Management helps Project Manager to achieve efficient project performance by waste minimization and resource optimization along with proper planning scheduling and controlling activities during Construction process.
5. Time management and resource management are considered as leading factors which highly affect the competent and timely completion of project within the schedule.
6. Total cost of project is Rs 65,20,960.00
7. Total duration of the project is 440 days.
8. Total Material cost of the project is Rs 42,95,960.00
9. Total Labour cost of the project is Rs 22,25,000.00
10. Percentage completion of work is 17%.

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