

Project Planning from Bidding to Foundation Completion using MS Project

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Abstract— Construction planning is very important task to successful and smooth completion of construction work especially when construction is very critical. In previous days, it has been done either by manually using pen & paper or by using MS Excel sheets. With the advancement of technologies, automated tools come in market like MS project. MS project is very easy to use automation software where construction planning and project management becomes very easy. MS project takes the requirement from user and automatically create its graphical charts, cash flow models, timeline model and resource sheets etc. In our work, construction planning starting from bidding for the contract to laying down foundation is planned using MS project. It has been found that the graphical views of MS project tool makes analysis of the task and status of working very easy and smooth.

Key words: PMS (Project Management Software), MS Project Software, Construction, Scheduling, Resource Allocation, Resource Sheet, Timeline, Gantt Chart, Calendar View, Task Management, Network Diagram, EPM (Enterprise Project Management)

I. INTRODUCTION

Manual project planning is very time consuming and tedious. Each and every calculation like resource management, timeline, costing etc. has to do individually. Therefore in order project for to make planning process faster software like MS PROJECT can be used for effective management of man power, machinery as well as materials. MS project software is at utmost requirement because construction activities are not limited only to the physical activity of allocating men, materials and machines, it involves more than this. This software can reduce the efforts and also helps in maintaining the accuracy and quality of the project [1]. 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.

Project can be defined as a unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including constraints of time, cost and resources. 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 [2]. Project Management can also be defined as an application of knowledge, skills and Techniques to project activities to meet project requirements.

Planning of Construction is a very challenging activity in management and execution. It consists of the selection of technology, defining work task, estimate the required duration, decide the resource allocation for individual task, and identify the interactions between

different work tasks [3]. In our proposed work, MS project software is used to plan the construction of foundation starting from the planning of bidding of contract to completion of the foundation development.

II. IMPORTANCE OF PROJECT MANAGEMENT

Project management is capable of managing Risk, managing the Quality, managing the integration, managing the Change, Clearing Issues, Retaining, Using Knowledge and Learning from the Failures come while working [2]. When the project is started, it always goes in the right way but with time sometimes it gets off its usual track. Therefore project management comes in requirement and plays a vital role in arranging the critical activities of the project which is called as task to function in the appropriate way. Project Management aid the project in better efficiency to deliver services [6].

III. SCOPE & NEED

Now a day, lots of automation tools is in process of development for computer based automated storage, easy and broad level analysis and quick graphical representation of analyzed data. This automation leads to a new era where planning and management is effective and accurate. These efforts have apparently been the result of increasing demands by users for the data and information of a spatial nature. For proper monitoring of the project development process, these software gives better overview which not only helps in tracing the project progress properly but also they are using to make decisions and to see the results of those decisions sooner and in a crisper more comprehensible format. It is very tedious and time consuming to give details of construction and explaining the status of the project to the client therefore tools like MS project helps in easy display of the entire project including schedule, resource usage, costing used up to current date etc, in very easy and clearer way [7].

IV. MS PROJECT SOFTWARE

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. Microsoft Project was the company's third Microsoft Windows-based application, and within a couple of years of its introduction it became the dominant PC-based project management software [9]. It 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, Standard and Professional. Microsoft Project's proprietary file format is .mpp. Microsoft Project and Microsoft Project Server are the cornerstones of the Microsoft Office enterprise project management (EPM) product.

Project 2016 adds a new Reports section, backwards-compatibility with Project Server 2013, better integration with other Microsoft products, and improved appearance of user interface items like Timeline which allows user to customize views to have multiple timeline bars and custom date ranges in a single view, Resource Agreements, which gives features for resource planning coordination between Project Manager and Resource Manager etc. Primary reasons for using a PMS in the construction industry were a periodic control of work after the start of construction, development of 'look ahead' schedules, coordination of subcontractors, detailed planning of work prior to construction, schedule impact, claims analysis, tracking of changes, coordination of own trades, estimating and bidding, tracking shop drawings and submits, calculating payment requests for work performed, design development, operation and maintenance of projects, tracking costs and materials planning [8].

V. LITERATURE SURVEY

Monish Kumar K, Maheshwar S Maregoudru, Sparsha B.P studied that 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 MS project 2013 software. Budgeted cost, time, and materials of the project are obtained by resource allocation [1].

Shubham Laddha, Prerna Chanda, Sneha Khedekar analyzed that project management practices are often absent from typical construction projects in India. It has motivated us to carry out the working and functioning of a project using the modern project management tool available in the market; and then comparing it with the traditional software (Excel) which is being use. We carried on an online survey focusing on all the stakeholders related to the project with a view to obtain an idea of various project management practices in construction industry. Notably, 80% of the total construction industries in India still use traditional software Microsoft Excel for planning, scheduling and controlling of their projects and 86% felt the need for adapting to new software. They then approached a Pune based construction company in which Excel is still the dominant source of managing the projects. They expressed them our visions and desire to work on one of their projects using Microsoft Project. We carried on the planning & scheduling of the building using Microsoft Project tool. The results obtained were considerably positive than those using traditional software [2].

According to the study of Chidambara kumar M. G., Gomathi Sankar G., Ashok Manikandan S, Planning and scheduling is very important in construction project. Proper planning, scheduling and tracking are the major parameter in construction industry. The systematic flow of work is adopted by using Critical Path Method and Programme Evaluation and Review Technique. Without proper controlling and

scheduling will cause cost overrun and consequently increases project duration? In order to minimize the complexity in manual calculation Project Management Software can be preferred [3].

Chayma Sabiri, Dr Ilham Kissani, in their work they describe that project management has become a science with specific criteria because of many factors such as the increase in the number of tasks at work that should be completed at a specific period of time. And by the development of the work methods there was a need for new tools that can help manage big size project and projects with more complexity. Projects now tend to be more complex, which brings the point of changing the project management methods that can be based on three points, according to J. Davidson Fram in his book "The New Project Management Tools for and Age of Rapid Change Complexity and Other Business Realities" [4].

Shanmuganathan N, Dr. G.Baskar analyzed that effective cost and time management play an important role to achieve the project success in the construction industry. Various cost and time management techniques which help to control cost and time overrun in the construction project. This research was conducted to identify the most successful cost and time management techniques and software's used to control the projects in the construction industry .The data's were collected through questionnaire survey from engineers, contractors and clients worked in the various construction industry. According to the collected data's were analyzed using relative importance index (RII) and ranking the factors based on percentage of relative importance. The results will help the construction industry to take measures in improving the cost and time performance and also identifies the most popularly used software's such as primavera, Microsoft project in the construction industry [5].

According to P M Wale, N D. Jain, N R Godhani, S R Beniwal, A A Mir, The project may have a simple goals that does not require many people or a great deal of money or it may be quite complex, calling for diverse skills and plethora of resources. But the bottom line is that every one of us manages projects. Owing to this the purpose of dealing with the project should not be only execution but effective and efficient execution of project is essential which is needed to be highlighted. Their presented work will provide an Opportunity to clearly observe the difference between the Microsoft Project (MSP) and the Traditional Planning Techniques which speeds up Construction and also make the Project Cost Effective with Proper Planning with the help of the case study on the single wing of project executed in Pune, Maharashtra, India. For finding out various aspects that proves efficient planning & execution of the project, disparate methodologies adopted and to find out remedial measures, international journal papers were referred. Methodology adopted includes defining of problem statement, insinuating the objectives from the data collected in two part viz. Primary data and secondary, analyzing the data and finally coming to the conclusion [6].

VI. PROPOSED WORK

Construction planning has been performed in our work. MS project software is used for our work. Fig. 1 shows the task information dialog box of MS project.

(a)

ID	Task Name	Type	Lag
61	Lumber Delivery	Finish-to-Start (FS)	0d

(b)

Resource Name	Units	Cost
Waterproofing Subcontractor	100%	\$0.00

(c)

(d)

Fig. 1: MS project Task information dialog box (a) General Tab, (b) Predecessors Tab, (c) Resources Tab, (d) Advanced Tab

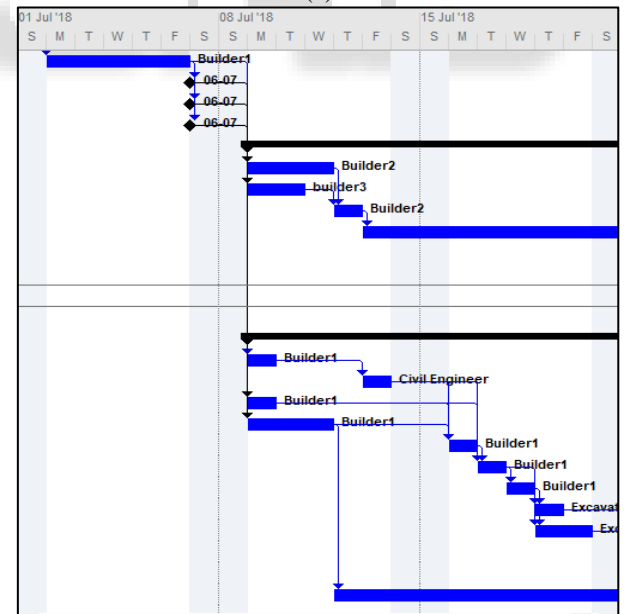
As shown in Fig. 1(a), in general tab, name of the task is required to define like here waterproofing and drain

tile is given. Percentage complete shows how much work is completed. In duration, it is defined that how many days it will take to complete the task. In dates section starting date and finish date of the task has to be provided [4]. Fig. 1(b) shows the predecessors tab, this tab contains the ID and name of the task which has to be done before starting the current task like Lumber delivery is define in predecessors, it means only after lumber delivery water proofing of tile is possible.

In fig. 1(c) resources tab is given. This tab contains the information regarding the resource or person allocated for this task. It also represents how much presence of this resource is required to complete the task like in this case 100% presence is required. In fig. 1(d) advanced tab, the important parameter here is constraint type and date. Here what is the constraint of the task like in this case it is defined that it should be completed as soon as possible.

Task Name	Duration	Start	Finish	Predecessors	Resource Names
Print Construction Drawings	5 days	Mon 02-07-18	Fri 06-07-18	10,11,12	Builder1
Approve Revised Plans	0 days	Fri 06-07-18	Fri 06-07-18	13	Client
Approve Revised Specifications	0 days	Fri 06-07-18	Fri 06-07-18	13	Client
Approve Revised Site Plan	0 days	Fri 06-07-18	Fri 06-07-18	13	Client
Bids & Contracts	24 days	Mon 09-07-18	Thu 09-08-18		
Make Copies of Plans	3 days	Mon 09-07-18	Wed 11-07-18	14	Builder2
Make Copies of Specifications	2 days	Mon 09-07-18	Tue 10-07-18	15	builder3
Distribute Plans & Specifications	1 day	Thu 12-07-18	Thu 12-07-18	18,19	Builder2
Receive Bids	10 days	Fri 13-07-18	Thu 28-07-18	20	builder3
Review Bids	5 days	Fri 27-07-18	Thu 02-08-18		
Sales	5 days	Fri 27-07-18	Thu 02-08-18	21	Builder2
Construction	5 days	Fri 27-07-18	Thu 02-08-18	21	builder3
Execute Subcontractor Agreements	5 days	Fri 03-08-18	Thu 09-08-18	23	Builder1
Grading & Building Permits	17 days	Mon 09-07-18	Tue 31-07-18		
Schedule lot stake-out	1 day	Mon 09-07-18	Mon 09-07-18	13	Builder1
Stake lot	1 day	Fri 13-07-18	Fri 13-07-18	27FS+3 days	Civil Engineer
File Grading Permit Application	1 day	Mon 09-07-18	Mon 09-07-18	16	Builder1
File Building Permit Application	3 days	Mon 09-07-18	Wed 11-07-18	14,15,16	Builder1
Post Lot Identification	1 day	Mon 16-07-18	Mon 16-07-18	28,29,30	Builder1
Meet Sediment Control Inspector	1 day	Tue 17-07-18	Tue 17-07-18	29FS+2 days,28	Builder1
Walk Lot w/ Owner	1 day	Wed 18-07-18	Wed 18-07-18	32	Builder1
Install Construction Entrance	1 day	Thu 19-07-18	Thu 19-07-18	32,33	Excavation Subcontr
Install Sediment Controls	2 days	Thu 19-07-18	Fri 20-07-18	32,33	Excavation Subcontr
Sediment Control Insp.	1 day	Mon 23-07-18	Mon 23-07-18	34,35	Sediment Control Ins
Grading Permit Issued	1 day	Tue 24-07-18	Tue 24-07-18	36	Sediment Control Ins
County Permit Process	10 days	Thu 12-07-18	Wed 25-07-18	30	Department of Permi

(a)



(b)

Fig. 2: Gantt Chart View (a) Sheet Part, (b) Chart Part

Fig. 2 shows the Gantt chart view of the task. Its sheet view contains complete information regarding all tasks like name of the task, start date and end date of the task, predecessors, duration and resources used etc. all these information can be edited in this view as per requirement [5]. Chart part shows the task execution in chart form. One can

clearly understand which task is important to start which next task using chart view.

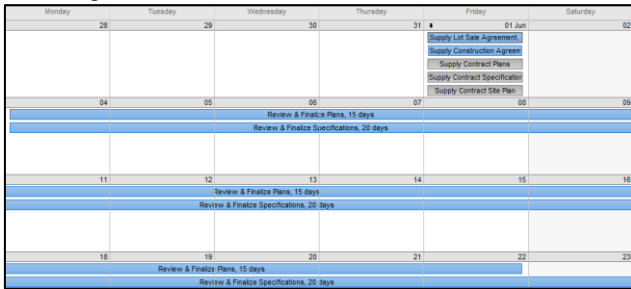
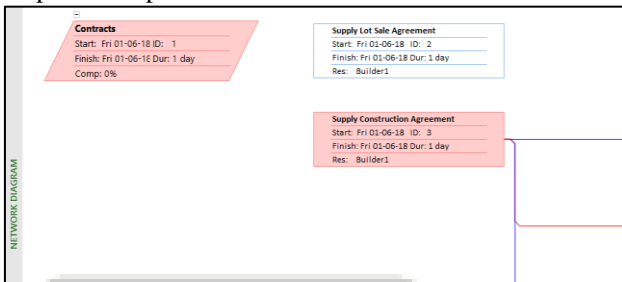
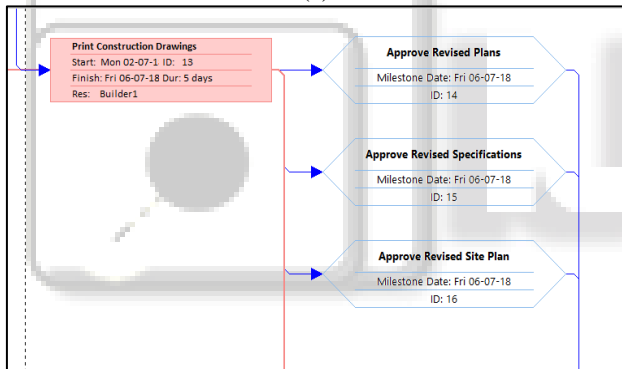


Fig. 3: Calendar View

Fig. 3 indicates the task information on calendar. Calendar view is helpful when the status of the task is required to see and if one wants to know the date of completion of particular task.



(a)



Task Name	Duration	Start	Finish	Predecessors	Resource Names
Contracts	1 day	Fri 01-06-18	Fri 01-06-18		
Supply Lot Sale Agreement	1 day	Fri 01-06-18	Fri 01-06-18		Builder1
Supply Construction Agreement	1 day	Fri 01-06-18	Fri 01-06-18		Builder1
Supply Contract Plans	0 days	Fri 01-06-18	Fri 01-06-18	3	Builder1
Supply Contract Specifications	0 days	Fri 01-06-18	Fri 01-06-18	3	Builder1
Supply Contract Site Plan	0 days	Fri 01-06-18	Fri 01-06-18	3	Builder1
Secure Financing	1 day	Fri 01-06-18	Fri 01-06-18		Client
Construction Loan Settlement	1 day	Fri 01-06-18	Fri 01-06-18		Client
Document Review & Revision	25 days	Mon 04-06-18	Fri 06-07-18		
Review & Finalize Plans	15 days	Mon 04-06-18	Fri 22-06-18	4	Builder1

(b)

Fig. 4: Network Diagram

Fig. 4 shows the network diagram of the construction work. Network diagram is helpful to understand the hierarchy of the task with dates and other useful information.

Resource Name	Type	Material	Initials	Group	Max.
1 Sales Department	Work		S		100%
2 Construction Dep.	Work		C		100%
3 Sales Dept.	Work		S		100%
4 Client	Work		C		100%
5 County	Work		C		100%
6 County Sediment	Work		C		100%
7 Sediment Contro	Work		S		100%
8 Department of Pl	Work		D		100%
9 Building Inspecto	Work		B		100%
10 Mason	Work		M		100%
11 Civil Engineer	Work		C		100%
12 Concrete Subcon	Work		C		100%
13 Concrete Subcon	Work		C		100%
14 Excavation Subcontractor	Work		E		100%
15 Masonry Subcont	Work		M		100%
16 Block Masonry Su	Work		B		100%
17 Steel Supplier	Work		S		100%

Fig. 5: Resource Sheet

Resource sheet is shown in Fig. 5. Resource sheet contains the information of the man power required for the construction project. As shown in the figure above, suppliers, subcontractors etc has been defined in the sheet. Resources in the resource sheet is used while defining task in the Gantt chart.

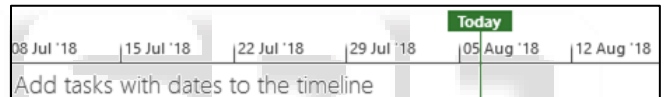


Fig. 6: Timeline

Timeline is the view in which how much task is completed and what will be final completion date of the project can be analyzed. As shown in fig. 6 above, a green marker shows that currently this is the task and date which is under process.

Review & Finalize Specifications	20 days	Mon 04-06-18	Fri 29-06-18	5	Builder2
Review & Finalize Site Plan	1 day	Mon 25-06-18	Mon 25-06-18	6,10	builder3
Print Construction Drawings	5 days	Mon 02-07-18	Fri 06-07-18	10,11,12	Builder1
Approve Revised Plans	0 days	Fri 06-07-18	Fri 06-07-18	13	Client
Approve Revised Specifications	0 days	Fri 06-07-18	Fri 06-07-18	13	Client
Approve Revised Site Plan	0 days	Fri 06-07-18	Fri 06-07-18	13	Client
Bids & Contracts	24 days	Mon 09-07-18	Thu 09-08-18		
Make Copies of Plans	3 days	Mon 09-07-18	Wed 11-07-18	14	Builder2
Make Copies of Specifications	2 days	Mon 09-07-18	Tue 10-07-18	15	builder3
Distribute Plans & Specifications	1 day	Thu 12-07-18	Thu 12-07-18	18,19	Builder2
Receive Bids	10 days	Fri 13-07-18	Thu 26-07-18	20	builder3
Review Bids	5 days	Fri 27-07-18	Thu 02-08-18		
Sales	5 days	Fri 27-07-18	Thu 02-08-18	21	Builder2
Construction	5 days	Fri 27-07-18	Thu 02-08-18	21	builder3
Execute Subcontractor Agreements	5 days	Fri 03-08-18	Thu 09-08-18	23	Builder1
Grading & Building Permits	17 days	Mon 09-07-18	Tue 31-07-18		
Schedule lot stake-out	1 day	Mon 09-07-18	Mon 09-07-18	13	Builder1
Stake lot	1 day	Fri 13-07-18	Fri 13-07-18	27FS+3 days	Civil Engineer
File Grading Permit Application	1 day	Mon 09-07-18	Mon 09-07-18	16	Builder1
File Building Permit Application	3 days	Mon 09-07-18	Wed 11-07-18	14,15,16	Builder1
Post Lot Identification	1 day	Mon 16-07-18	Mon 16-07-18	28,29,30	Builder1
Meet Sediment Control Inspector	1 day	Tue 17-07-18	Tue 17-07-18	29FS+2 days,28,31	Builder1
Walk Lot w/ Owner	1 day	Wed 18-07-18	Wed 18-07-18	32	Builder1
Install Construction Entrance	1 day	Thu 19-07-18	Thu 19-07-18	32,33	Excavation Subcontractor
Install Sediment Controls	2 days	Thu 19-07-18	Fri 20-07-18	32,33	Excavation Subcontractor
Sediment Control Insp.	1 day	Mon 23-07-18	Mon 23-07-18	34,35	Sediment Control Inspector
Grading Permit Issued	1 day	Tue 24-07-18	Tue 24-07-18	36	Sediment Control Inspector
County Permit Process	10 days	Thu 12-07-18	Wed 25-07-18	30	Department of Permits & Licenses
Building Permit Approved	1 day	Thu 26-07-18	Thu 26-07-18	38,37	Department of Permits & Licenses

Pay Permit Fees and Excise Taxes	1 day	Tue 31-07-18	Tue 31-07-18	39FS+2 days	Builder1
Building Permit Issued	0 days	Tue 31-07-18	Tue 31-07-18	40	Department of Permits & Licenses
Site Work	7 days	Wed 25-07-18	Thu 02-08-18		
Clear Lot	3 days	Wed 25-07-18	Fri 27-07-18	37	Excavation Subcontractor
Strip Topsoil & Stockpile	1 day	Mon 30-07-18	Mon 30-07-18	43	Excavation Subcontractor
Stake Lot for Excavation	1 day	Mon 30-07-18	Mon 30-07-18	43	Civil Engineer
Rough grade lot	1 day	Tue 31-07-18	Tue 31-07-18	43,45	Excavation Subcontractor
Excavate for foundation	2 days	Wed 01-08-18	Thu 02-08-18	39,45,43,46	Excavation Subcontractor
Foundation	24 days	Fri 03-08-18	Wed 05-09-18		
Layout footings	1 day	Fri 03-08-18	Fri 03-08-18	47	Concrete Subcontractor
Dig Footings & Install Reinforcing	1 day	Mon 06-08-18	Mon 06-08-18	49	Concrete Subcontractor
Footing Inspection	0 days	Mon 06-08-18	Mon 06-08-18	50	Building Inspector
Pour footings	1 day	Tue 07-08-18	Tue 07-08-18	51	Concrete Subcontractor
Pin Footings	1 day	Wed 08-08-18	Wed 08-08-18	52	Civil Engineer
Stock Block, Mortar, Sand	1 day	Thu 09-08-18	Thu 09-08-18	53	Block Masonry Subcontractor
Build Block Foundation	15 days	Fri 10-08-18	Thu 30-08-18	53,54	Block Masonry Subcontractor
Foundation Certification	0 days	Thu 30-08-18	Thu 30-08-18	55	Civil Engineer
Draw #1 (Location Survey)	0 days	Thu 30-08-18	Thu 30-08-18	56	Lender
Fill Block Cores w/ Concrete	1 day	Fri 31-08-18	Fri 31-08-18	55	Block Masonry Subcontractor
Steel Delivery	1 day	Mon 03-09-18	Mon 03-09-18	58	Steel Supplier
Set Lintels, Bolts, Cap Block	2 days	Tue 04-09-18	Wed 05-09-18	59	Block Masonry Subcontractor
Lumber Delivery	1 day	Mon 03-09-18	Mon 03-09-18	58	Lumber Supplier
Waterproofing and Drain Tile	1 day	Tue 04-09-18	Tue 04-09-18	61	Waterproofing Subcontractor

Table 1: Complete Task Information in Tabular Form

MS project tools are very helpful in defining the tasks and resources for the project. The graphical views are very helpful in analyzing the status of the tasks.

VII. CONCLUSION

Manual planning of construction work is very tedious. Even planning using excel sheets are not very easy task. Therefore automation tool like MS project is developed to automate the planning process. In our work, MS project is used to plan the construction of foundation. Task started from bidding for contract to completion foundation work with water proofing is scheduled in our work. After feeding the data into the MS

project, MS project tools provide multiple graphical views like Gantt chart, timeline, network diagram for easy and smooth analysis of the construction work. Resource management and relational task can be easy feed in the task information with the available tools in the software. These graphical views are very helpful in providing the status of the project to clients.

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