International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 03 Issue: 12 | Dec -2019 ISSN: 2582-3930

Cash-Flow Management of High Rise Building By Using MSP Software

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Abstract - The study shows cash flow for profit optimization and handles scheduling of multiple projects. By identifying the amount and timing of individual inflow and outflow at each period, construction contractors can observe the cash flow at specific time point according to project progress. Since most contractors handles multiple projects simultaneously, so managing project finance becomes complicated and tough job for contractors. Therefore in this study a profit optimization model has been proposed, and the capability of model is checked by using MSP software over building construction projects handle by single contractor. Using MSP software, we get total profit amount of a project in given days and also get one of the most profitable building with time and cost from all buildings.

Key Words: Inflow, Cash Outflow, Multiple Projects, Profit Optimization, Financial Gap.

1. INTRODUCTION

The study is on cash flow for profit optimization and handles scheduling problems in multi-project environment. By identifying the amount and timing of individual inflow or outflow at the end of each period, contractors can observe the cash flow at specific time points according to project progress. Since most companies handle multiple projects simultaneously, managing project finance becomes complicated and tough for contractors. Therefore, the study considers cash flow and the financial requirements of contractors working in a multiple-project environment and proposes a profit optimization model for multi-project scheduling problems using constraint software's.

Cash flow at the project level comprises a complete history of all cash disbursements (cash outflow) and earnings (cash inflow) received from project execution, and net difference between the cash inflow and outflow is the overdraft. The concern focuses not just on the amount of cash flow but also on its timing, which is critical to effective budget management during construction. By identifying the amount and timing of individual inflow or outflow at the end of each period, contractor can observe cash flow at a specific time point according to project progress. For example, contractor can determine the amount and timing of borrowing from bank to smooth financial conflicts, such as budget overruns. Due to the importance of project finance, therefore, numerous researchers employed techniques and tried to solve project scheduling problems by integrating scheduling and financial factors assist contractors in assessing overall performance when minimizing project duration or maximizing project profit.

In addition, contractors always execute multiple construction projects simultaneously and thus face challenges in project financing to ensure long term financial health of their operations. The dissertation thus presents an optimization model considering cash flow for multi project scheduling problems and determines periodic cash flow using the proposed model in an effort to maximize overall profit.

Cash flow is the difference between cash spent and cash received by a firm during a specific period of time. Cash flow management mandates the application of practices in managing project cash flow against a set baseline. Actually, the accurate estimation of cash flow in the early stages of a project is considered a vital factor that provides an indication of the project's financial significance.

2. PROPOSED METHODOLOGY

- Literature Study
- Site visit
- Meeting with building construction contractors
- Data collection and analysis

3. LITERATURE REVIEW

A. CASH FLOW PROCESS

The preparation of the cash flow projection can be divided into three phase and they are as follows:

a) Prepare a job operation schedules.

b) Prepare the cash flow projection of current and expected contract.

c) Prepare the project wise cash flow projection which will include every detail of the jobs.

A job operating schedule is a month by month analysis of expected contract production, progress bills and revenue recognition for each contract. The developing of the schedule starts from the estimate phase when the contract was first estimated and bid. The schedule should include the timing of the labour, sub- contractors, materials and equipment used in the contract. Once the schedule was prepared, the job cash flow projection can be accomplished. This projection indicates the cost incurrence and expecting to be paid and when progress bills are collected. Some of the factors in developing these projections are such as the contractor's payment policies and past history with customer.

The operating schedule of job or task and a cash flow projection of project must be different, which are usually different for every contract. This is done when the contractor

expects to expand their financial resources or to collect funds during the planning period where this include the current contracts, anticipated work and closed contract with remaining receivable balance. This schedule should be updated monthly in order to shown the changes the contract pricing, costs and timing. [6]

B. CASH FLOW MANAGEMENT IN CONSTRUCTION FIRM

The level of insolvencies in the construction industry is high, when compared to other industry sectors. Given the management expertise and experience that is available to the construction industry, it seems strange that, according to the literature, the major causes of failure are lack of financial control and poor management. This indicates that with a good cash flow management, companies could be kept operating and financially healthy. It is possible to prevent failure. Although there are financial models that can be used to predict failure, they are based on company accounts, which have been shown to be an unreliable source of data. There are models available for cash flow management and forecasting and these could be used as a starting point for managers in rethinking their cash flow management practices. The research reported here has reached the stage of formulating researchable questions for an in-depth study including issues such as how contractors manage their cash flow, how payment practices can be managed without damaging others in the supply chain and the relationships between companies financial structures and the payment regimes to which they are subjected.

Since the 1970s, many researchers have applied financial models to predict failure. Financial ratios, however, reveal only the symptoms, rather than the causes of failure. There is some confusion between causes and symptoms of failure, but researchers highlight important aspects of the distinction and cite the most important causes and symptoms. The literature shows that apart from poor management, lack of adequate financial control is the most common characteristic of declining firms. In construction, failure studies have focused on explaining failure at the project level, rather than the company level, where there has been comparatively little work. Several authors have investigated the causes of failure. Their results show that cash flow problems and poor management are the main causes. It is possible to reduce these levels, since the major causes are known. Therefore, research on how to avoid the causes should be encouraged. In other words, the most important step to take is to help construction companies to develop good cash flow management practices. [1]

C. METHODS IN CASH FLOW PROJECTION

For the study of cash flow, basically there are two type of cash flow projection method in the construction industry and their projection is based on planning techniques and based on the Standard 'S' curves.

Most of the medium and large construction project will have their own program developed to assist in the cash flow projection. Some of the convenient planned techniques are such as using the bar charts. Critical path method, Precedence diagrams and line of balance. From these program developed, they can be assisted in the cost of various resources needed for their operations, credit conditions, sub- contractors, material supplier and so on.

Secondly, cash flow projection can be assisted based on the developed of the Standard 'S' curves. Some of the past cost information and details of completed projects have shown its enormous value in cost planning at the initial stage of design. Such information can be utilized for establishing cash flow in different type of projects. Besides it also can be utilized for the cash flow planning for both the client and contractors considerations. The standard cumulative value versus time curves based on the past information of the completed project can be developed. [5]

4. METHODOLOGY

CASH FLOW

Cash flow refers to the movement of money in and out of the business in terms of income and expenditure. Ideally, a positive cash flow is expected meaning that more money is coming in to the business than goes out. If there is a positive cash flow, the business will be able to settle its bills and invest in growth. A negative cash flow means there is a need to find an alternative source of income to be able to pay off debts.

It is defined as, "The cash receipts or net income from one or more assets for a given period, reckoned after taxes and other disbursements, and often used as a measure of corporate worth". It is also defined as, "the pattern of receipts and expenditures of a company, government, etc., resulting in the availability or non-availability of cash"

To work out the net cash flow, add up all of the cash payments over a set period (typically a month) and take that away from the cash receipts. It is important not to get too hung up on one particular month, however, cash flow can be more accurately judged over a period of three months or more since most businesses will, naturally, have peaks and troughs.

While the turnover might be a nice big number that gives confidence that the business is doing well. It's the cash flow that offers a better insight into how well the business is managing. As the old saying goes turnover is vanity, profit is sanity and cash flow is reality.

MICROSOFT PROJECT SOFTWARE

Microsoft Project is a project management software program, developed and sold by Microsoft, which is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget and analyzing workloads. Project creates budgets based on assignment work and resource rates. Resource includes people, equipment and materials. Each resource can have its own calendar, which defines what days and shifts a resource is available. Resource rates are used to calculate resource assignment costs which are rolled up and summarized at the resource level. Each resource can be assigned to multiple tasks in multiple plans and each task can be assigned multiple resources, and the application schedules task work based on the resource availability as defined in the resource calendars.

USE OF SOFTWARE'S

Scheduling Techniques:
The scheduling techniques widely used in construction projects are:

- Bar Charts and Linked Bar Charts

- Network Analysis and Critical Path Method
- Line of Balance

1. Bar Charts and Linked Bar Charts:

Bar Charts are the easiest and most widely used form of scheduling in construction management. Even with other scheduling techniques the eventual schedule is presented the form of a bar chart. A typical Bar chart is a list of activities with the start, duration and finish of each activity shown as a bar plotted to a time scale. The level of detail of the activities depends on the intended use of the schedule. To reduce the tedious work of calculation in arranging & scheduling of activities, software 'Microsoft Office Project Document' (MSP) has been used.

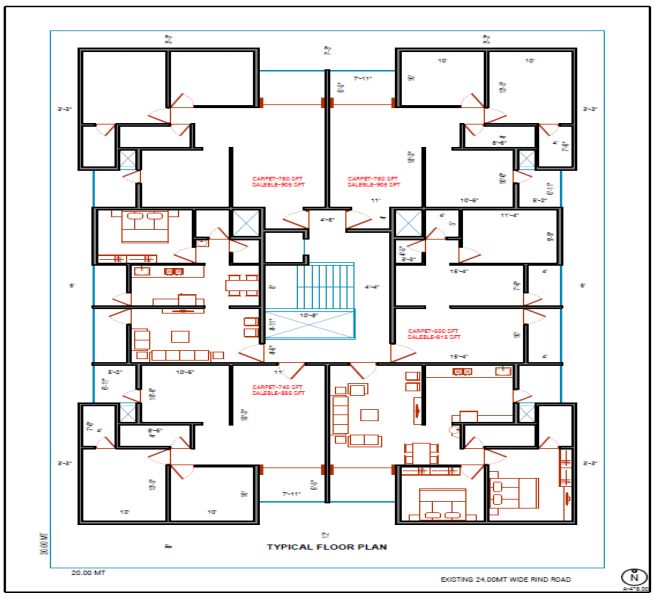


Fig 1: Typical Floor Plan

This is a typical floor plan of a G+4 high rise building. The important information about the given project site is as follows:

Name of Site: Green rose
Location: Ravet, Pune
Type of project: High Rise Building (Wing A,B,C)
Project Manager: Mr. Vikram Sakad
Site Engineer: Mr. Akash Rathod

Methodology adapted to get cash flow with the help of Microsoft project software-
i. First set activities and its durations.

ii. Then assign the resources to the activities.

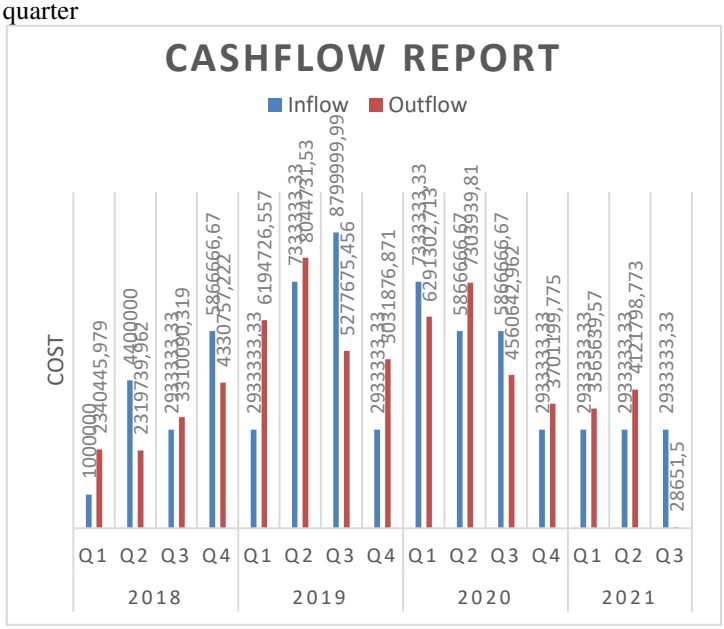
iii. Then tracking is done to get planned and actual duration of the project.

iv. Then from the visual reports selecting resource summary report get resource summary report.

v. And then from visual reports selecting cash flow report, cash flow get generated.

5. RESULTS AND CONCLUSIONS

After applying model to all projects, the finding are than represented in graphical format, which shows the cash flow profile for each project. In this graph, X-axis denotes the number of quarters in years and Y-axis shows cash flow of the project. To read the graph, for e.g. up to Q1 of 2018 cash outflow is Rs 2340445.979 and after cash inflow is Rs 13,40,445 denoted by vertical line at first quarter of 2018, this cash inflow is payment made for activities finished in 1st quarter

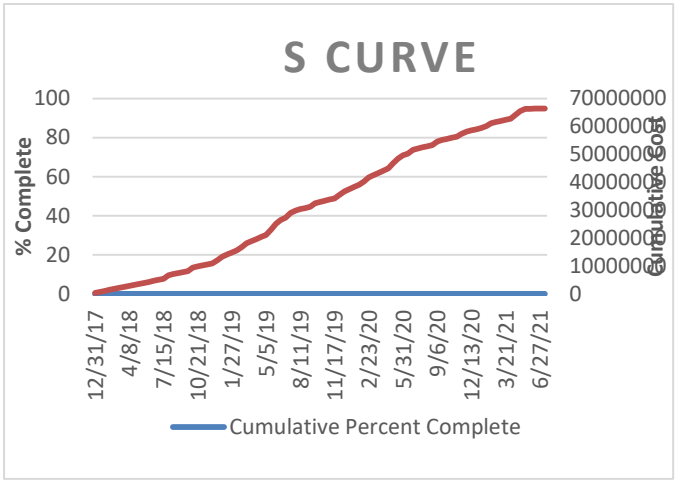


Graph 1: Combination of Cash Inflow and Outflow Report

S-Curve

S curve report shows the graph Time vs. Cumulative cost. It shows the progress of the project after feeding all required data and costs it get generated from the visual reports. It means adding every month outflow one by one so final we get sum that is cumulative cost. It shows the progress and flow of the total project.

Graph 2 shows the cumulative cost of overall project, which can help contractors in periodically inspecting project financing. The profile reveals that maximum overall project profit (Rs) 576781 occurs on Day 1246, later than the overall completion time (Day 1246) owing to payment delay. Overall Project cost is (Rs) 6,64,23,219.



Graph 2: S Curve

Individual Profit:

Name	Remaining Cost	Actual Cost	Cost
G+ 4 WING A	₹ 22,155,123.00	₹ 0.00	₹ 22,155,123.00
G+ 4 WING B	₹ 22,134,048.00	₹ 0.00	₹ 22,134,048.00
G+4 WING C	₹ 22,134,048.00	₹ 0.00	₹ 22,134,048.00

Table 1: Project Profit

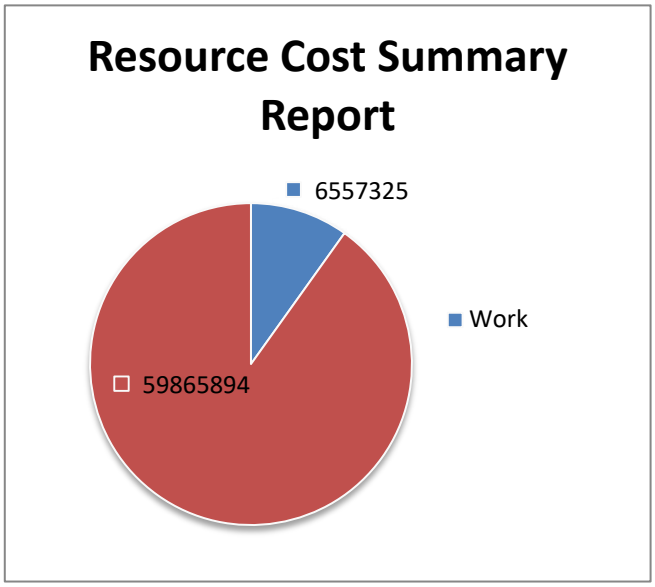
Table 1 shows the remaining cost or the profit cost of all the projects. And Table 2 shows the completion date of Project 3 (Day 1246) is later than that of Projects 1 and 2.

Overall Profit:

Overall Project Start Day	Duration of Days	Completion Day	Overall Profit (Rs.)
0	1246	1246	5,76,781

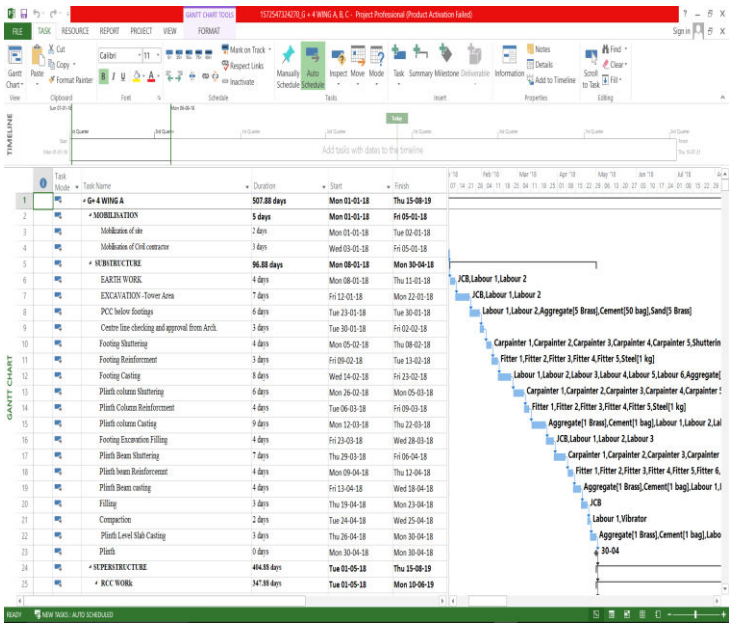
Table 2: Overall Profit

Resource cost summary report generated by adding resources as shown below-

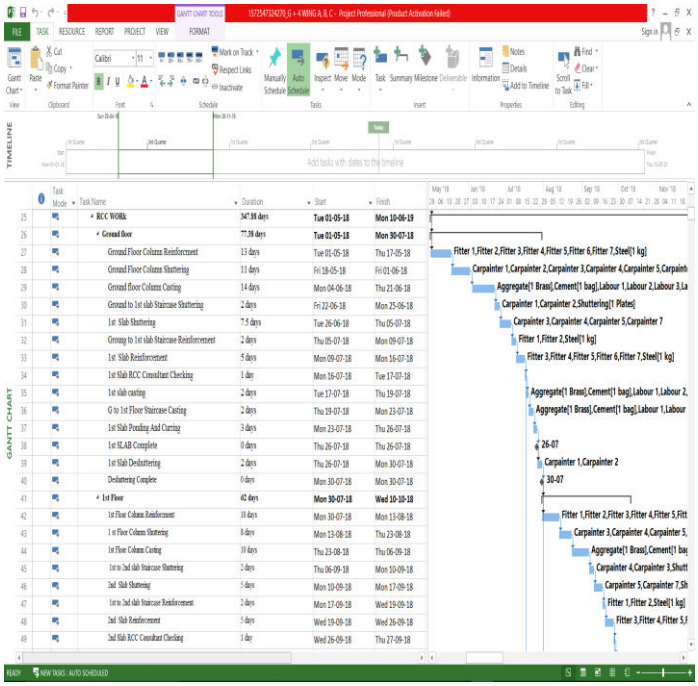


Graph 3: Resource Cost Summery

Schedule, cost & payment details of Building 1 (Wing A):



Screenshot no: 1



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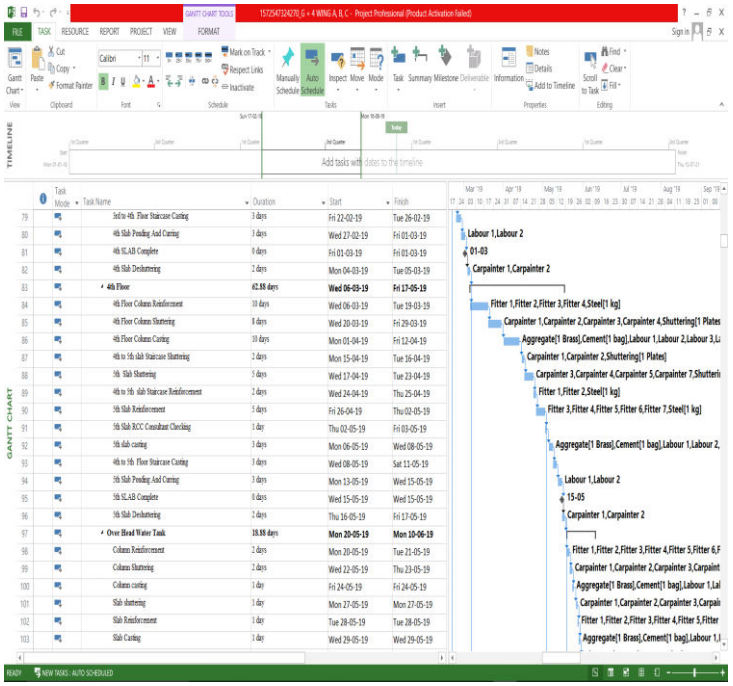

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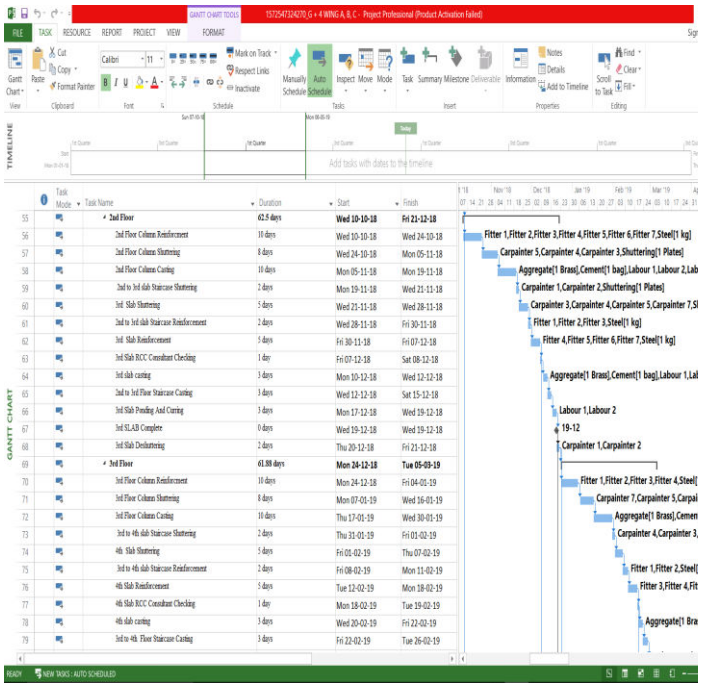

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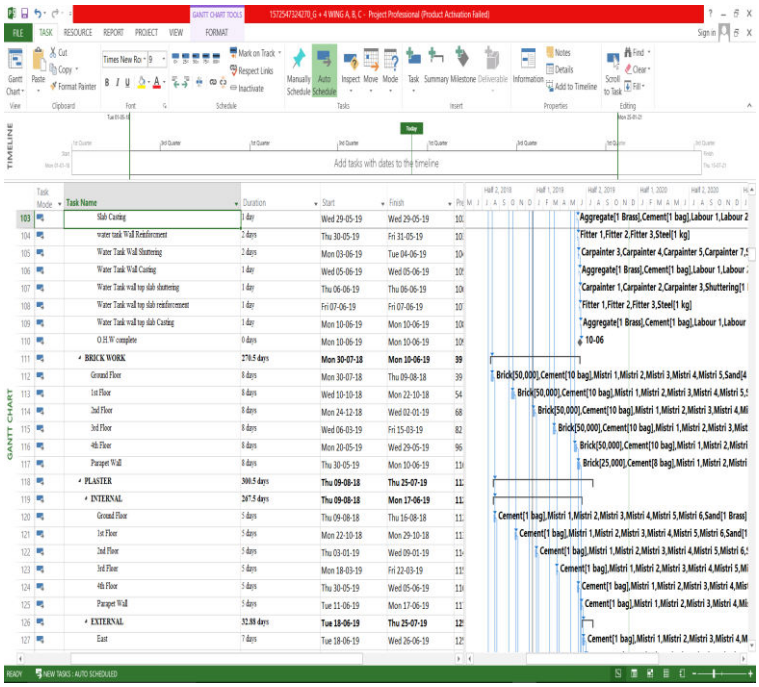

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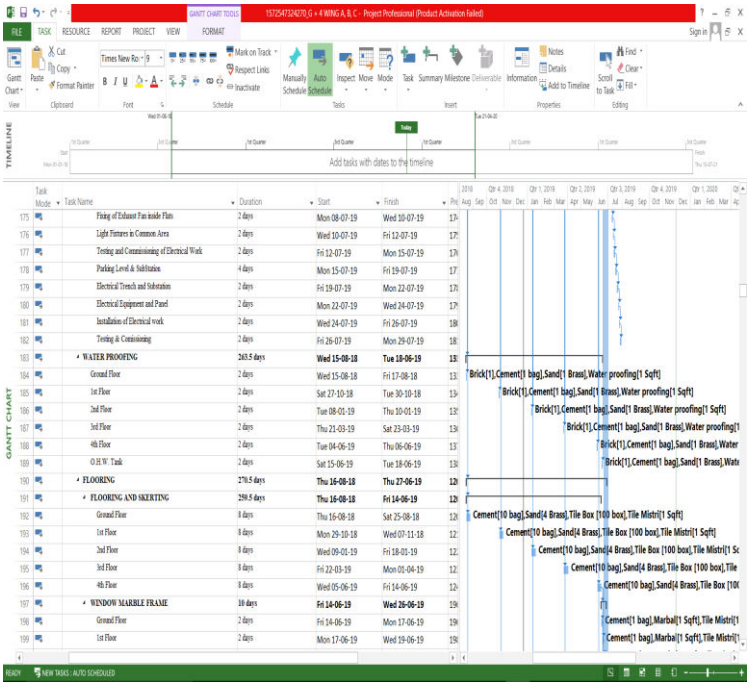
Screenshot no: 6



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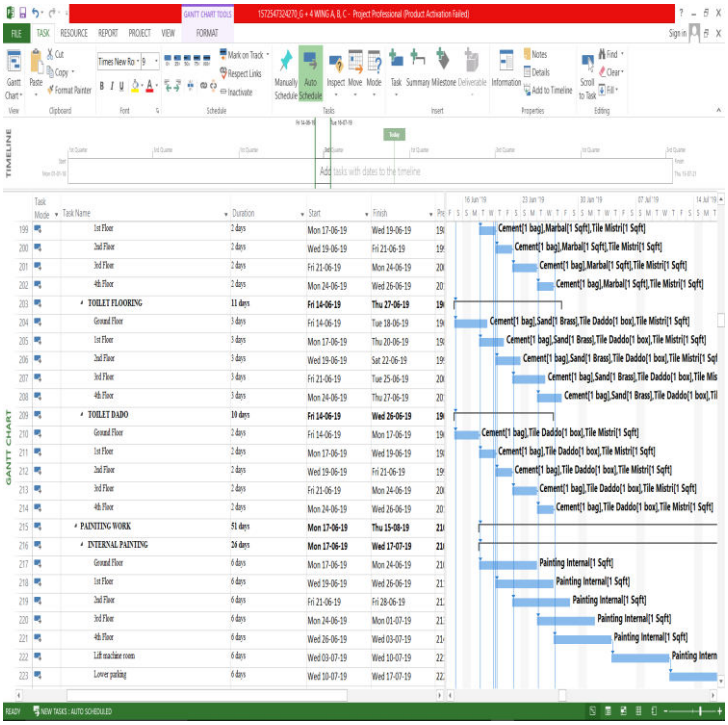

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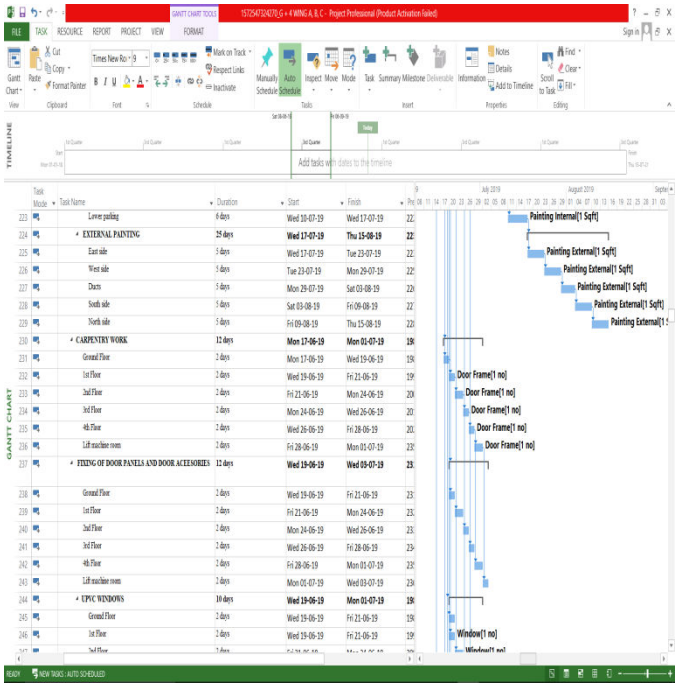

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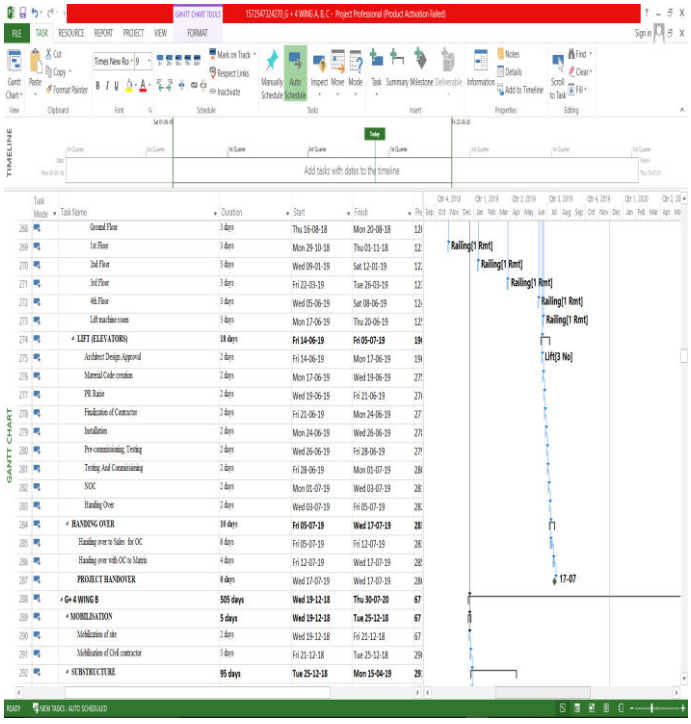

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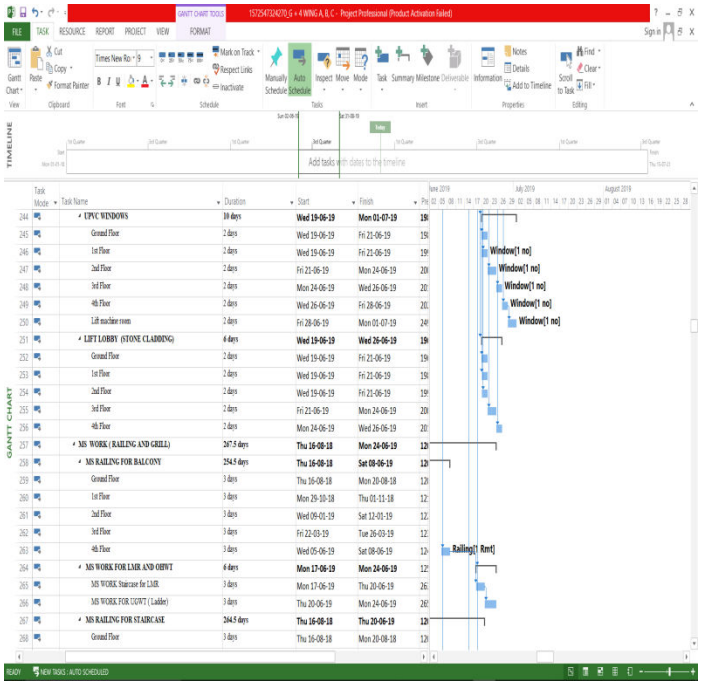

Screenshot no: 11

As per above screenshots of msp sheets, Schedule, cost & payment detail of building no 1 (Wing A), building no 2 (Wing B) and building no 3 (Wing C) also has been design and find all the calculations and results. Also all required resources are inserted in resource sheet in Microsoft project software and its per unit cost also given and it gives amount of each resources which shows in above graph no. 3.

CONCLUSION

The study considers cash flow, establishes a mathematical model using MSP for multiproject scheduling problems, and performs periodic financial inspection on behalf of contractors. This work creates an overall time framework and integrates cash flow and financial elements into the model to assist evaluating project financing in a multiproject environment. Scenario analysis employs buildings for model illustration, and the prepared schedule is conducted to pursue overall maximum profit. Consequently, the proposed model identifies an appropriate scheduling plan to fulfil contractor financial needs related to multiproject scheduling problems.

A project cannot proceed without an adequate financing, and the cost of providing an adequate financing can be quite large. For these reasons, the attention to the project finance is an important aspect of project management. Technique used for scheduling and financing will vary depending upon the project's size, complexity, duration, working capital cost and Contractor requirements. The study presented calculations of cash flows for construction projects to demonstrate their functioning and to present improvements in analysing and optimizing the relationship between the timing of activities in the schedule, their direct costs plus any indirect costs. So by arranging activity schedule, on

multiprojects scheduling helps contractors to smoothen financial conflict.
From all above things we can conclude that-

a. Cash flow is the backbone of any construction project and if we fail to manage that then project can fail.
b. All the items should be considered in cash flow like material cost according to its quantity charges, labour wages, fixed cost, overhead expenses and all direct and indirect cost expenses.
c. Poor cash flow hampers on construction project and results in delay of project completion, increase in costs etc.
d. Special attention required in case of execution of High Rise Buildings due to increase in variables, which needs special study and analysis experienced at different stages in construction.
e. Cash flow is essential to work out because it gives total inflow and outflow of the project and combination of it gives cash flow of the project. And from that easy to determine profit of the project.
f. The cash flow generation with the help of Microsoft project software.
g. Using MSP software for this project is beneficial and gives total profit amount as Rs 5,76,781 in 1246 days. Building no 2 (Wing B) is most profitable than others with cost and time.

ACKNOWLEDGEMENT

I take this humble opportunity to express my deep sense of gratitude to our Project Guide Dr. N. W. Ingole and Co-Guide Mr. A. B. Ugale, who in all respect helped us tangibly from the beginning till the fulfillment of our project. Their expert guidance and inspiration brought completion of the project.

I would like to thank Prof. S. B. Mohod, Dean of Post Graduation Studies, Who gives us this opportunity, I would also like to thank to all our teachers who directly or indirectly supports us time to time.

I also express our sincere thanks to Dr. M. S. Ali, Principal, PRMCEAM for his valuable guidance.

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