"A COMPETITIVE STUDY OF COST TIME BALANCING OF RESIDENTIAL AREA"

DISSERTATION PHASE II

SUBMITTED TO THE

SAGE UNIVERSITY BHOPAL



TOWARDS PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF TECHNOLOGY

IN

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

ΒY

SAMEER KHAN

ENROLLMENT NO: 20MTE5CTM10008

UNDER THE SUPERVISION

OF

SUPERVISOR

Dr. Sanjeev Kumar Verma

OCTOBER 2022

http://xisdxjxsu.asia

VOLUME 19 ISSUE 01 JANUARY 2023 1487-1519



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This is to certify that the work incorporated in the project report entitled "A Competitive study of cost time balancing of residential area" is a record of work carried out by Sameer Khan, enrollment no. 20MTE5CTM10008, under my guidance and supervision for the award of Degree of Masters of Technology, SAGE University, Bhopal.

To the best of my/our knowledge and belief the project report

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Dr. Sanjeev Kumar Verma

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Sameer Khan

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ACKNOWLEDGEMENT

I take the opportunity to express my cordial gratitude to I take the opportunity to express my cordial gratitude to **Dr. Sanjeev Kumar Verma**, for the valuable guidance and inspiration throughout the dissertation work. I feel thankful for her innovative ideas, which led to successful completion of this work.

I extend my deepest gratitude to **Dr. V. K Jain, Vice Chancellor, Sage University Bhopal,** for providing all the necessary facilities and true encouraging environment to bring out the best of my endeavors.

I also want to acknowledge **Prof. Sudhir Shrivastav, Co-ordinator Phd cell,** Sage University Bhopal, for giving me the opportunity to present my work successfully and giving me the assistance for my dissertation works.

I express my gratitude and thanks to all the staff members of **School of Engineering and Technology** for their supporting my work and providing me the proper guidance during my work.

I would like to thank my friends. I am also thankful to my classmates for all the thoughtful and mind stimulating discussions we had, which prompted us to think beyond the obvious.

Sameer Khan [20MTE5CTM10008]

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ABSTRACT

Amongst the most glaring issues concerning project leaders and their customers is the formal settlement on the development's completion date. Consumers have often requested project duration that are faster than those who were initially estimated. Three research-related factors-total expense, work quality, and legal risks most likely be impacted by this suggestion. This study suggests a multipurpose cumulative advanced mathematical computing to decrease "project expenditure," "raise total development risk," and "promote better process capability" in accordance with "time restrictions." To look at it another way, in order to reduce the program's duration, several of the four defined aims are also proven in the planned study. The usefulness of time was also evaluated using mathematical testing. Clients are not guaranteed that all submitted bids reflect realistic, realisable values under the existing bid review process in building projects. In order to help clients easily assess whether building companies had already placed prolonged offers, that is, if the source includes might not be all that substantial and the competitive tender valuation is not even an accessible empties price, the research includes the main proposal to remove the breadth of knowledge provided by different suppliers throughout direction to disburse (in the building projects). The Conjugated Triangle Method (CTM), used in the development industry to identify conflicting bids, is composed of three interrelated factors: the factors of production, the cost of work, and also the time required to finish the task. Despite price, this should adhere to certain requirements.

Primavera P6 has been the software that was chosen with this study. That can be used from either the preliminary stages towards the management of a project, and it greatly decreased the amount of documentation. A program rarely voluntarily reach the desired outcome even with the best planned, administration, and financial flow imaginable. A warning system that can inform the organization of its potential successes and failures across the endeavor must be included. A great deal of time & money are lost each year or we may in each and every building execution and completion of unsightly planning, inconsistent coordinating and managing of activities. The evolution of designing, organizing, monitoring, and regulating operations is covered in this study. Likewise, throughout this approach, we had researched many techniques and different materials utilised for efficiency measures. In this methodology, we have examined different factors that have an influence on project costs. The necessity of efficiency is also covered. This design is then used to find a solution in some other study, and its results, capabilities, and weaknesses are compared to the previous model. The findings show that the proposed that most the earlier versions throughout all four independent variables.

Keyword: Time, Cost, Quality, Risk, Survival pyramid

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CHAPTER ONE: INTRODUCTION AND RESEARCH SIGNIFICANCE

At complete the tasks on schedule, within economy, and to a defined level of perfection would have been the fundamental goal of development. The three most important aspects of construction are therefore considered to be time, money, and excellence. This original study goal is to make a significant contribution to the established twofold time-cost trade-off (TCT).

Cost, scheduling, and scheduling are all interrelated but have an effect upon each other. It is difficult to walk a tightrope among all three of these. Conflicting construction goals led to the realisation that no one thought it was crucial to find three more goals. the success of the company. The number, quality, and calibre of both the company's aims, for example, have an impact on its time, cost, and efficacy. A fundamental framework is initially constructed in order to optimize the volume, cost, or dependability of straightforward building projects that use the GA-based approach beyond integrate in Exupéry. The dynamics approach is then used to create a randomized simulator in order to improve quantity, cost, and building quality while lowering license uncertainty. Consequently, the property management and technological indications are essential to the accomplishment of this significant endeavor. According to design and construct guidelines, a project is "a commencement as well as an end completed to produce new goods or services." In those other contexts, a programme is a grouping of numerous connected but independent actions with a common goal. Just a few instances of such requirements include dependability, privacy, copyright, and several other professional or professional contract elements. According to the anticipated evaluation, completing the activities on time, within budget, and maintaining an appropriate standard, continues to be the major goal of almost any building project. Downhole sites with characteristics like endurance, resilience, and the possibility to go unnoticed can be highly beneficial in lowering susceptibility by moving machinery and persons. The relevance of systems engineering in achieving its goals has been underscored by the dynamic market and reduced financing in recent years. In just this study, a variety of co-mathematical strategies are proposed in identify the greatest amount of expenses, time, and effectiveness in construction industry utilising stainless components in underground structures. A range of executive tactics have been investigated for ongoing undertakings. The cost, time, and effectiveness of operations are likely to vary in each of the specified methods among compressed and standard values, and also the aim is to identify the best way to carry out each activity. For the purpose of solving the suggested number of co framework, the evolutionary computing NSGA-II is used. Bandwidth, schedule, & price are indeed the three main components of the triangles that program executives referred to as "endeavour limits." Initiatives are finished on schedule, within schedule, and in full compliance with all specified requirements laid out by personnel because an equal distance has identical angles at each of its three sides. The procedure could, though, become distorted even though one of the vertex starts to depart from projections.

Professional constructions managers should be aware that only a small percentage of existing projects finish the whole project life cycle before schedule. But at the other side, a good manager cares about making each of the three design constraints interact with the others in a way that maintains the program's integrity. Some tactics for maintaining business projects within limitations are obviously political, including forbidding stakeholders from changing the scope and maintaining emotional and economic resource limits. Other strategies call for the use of standard project management techniques, such as keeping teammates engaged and changing goals as necessary. But from the other extreme, sustaining teams' effectiveness within predetermined boundaries calls for a program firm's ability leadership—that is frequently misused. Task managers can take advantage of limitations while they have faith in particular responsibilities. The four articles that follows in this sequence go through each of those iron triangle restraints in detail, providing best recommendations from knowledgeable construction projects and examining several of the strategies specialists employ to avoid letting constraints become constraints.



Fig. 1: Constraint restrictions

1.1 SURVIVAL PYRAMID

Among the most glaring issues amongst construction projects and their customers is the formal settlement on the program's date of completion. Repeatedly, customers have demanded time requirements that are faster than only and those who were initially stated. The three constraints—total price, construction phase, and operating risk be impacted by this requirement. This paper suggests a multifaceted cumulative challenging proposed methodology to raise entire construction risk, decrease total program expense, and improve overall project outcomes due to "time limitations." To put it another way, the suggested study is also shown among the four stated aims in an effort to finish the work sooner.

Additionally, mathematical tests were done to gauge how well the suggested strategy worked. The major goal of this research is to improve the synchronised integration of something like the four surviving pyramid components in complicated industrial uses (duration, budget, excellence, and danger). A novel resolution process was created using the inter.

At this point, it is necessary to quantify the tasks' durations and also the quantity and type of access needed to assets and the connections between the processes that are required. Every activity is timed to start and end as during planning process in order to maximise organisational objectives, spend the least amount of time and money, and produce high-quality work.



Fig. 2: Project Management Triangle

One can adjust to evolving requirements to ensure that even a deadlines are met and within budget by bearing in mind the three limitations of the Triple Constraints as you lead it. Project is indeed vital, as is clever administration of the triple constraints in terms of hours, cost, and performance. Being ready makes sure that any modifications at all don't have an effect on or imperil the overall effort.

CHAPTER TWO: LITERATURE REVIEW

[1] Shanmugapriya S., Dr. Subramanian K. (October 2013) Cost and time overruns have been a significant problem in numerous Indian infrastructure projects. The goal of this research is to investigate key variables responsible for overruns in time and money in Indian building projects. The survey's findings showed that contract modifications, resource market rates, and strict quality standards are the main causes of schedule overruns, respectively. Changes in material specifications, exorbitant cost of transportation, and an increase in material prices were the main causes of schedule slippage.

[2] Salunkhe. A, Patil R (Janeuary2014) Another of the ongoing issues in the construction market is development delays, which have a negative impact on the timeliness, expense, and performance of projects. Both the employee and the contractor typically care about how quickly and inexpensively a project will be completed. The writers emphasise the several forms of delays in construction projects that cause schedule and expense overruns on operations. Additionally, list both internal and external variables that affect production, and describe how delays affect big building projects.

[3] T.Subramani, P S South, M.Kavitha (June. 2014) The major goals of this essay are to pinpoint and examine the factors that contribute to cost overruns in architecture. The study's findings revealed poor supplier performance, protracted judgement call, ineffective schedule of work, and an escalation in equipment and supplies prices. The main reasons for overruns in costs are poor design in giving design, maintenance due to incorrect work, extended time among layout and moment of competitive tendering, and incorrect forecasting process.

[4] Kunal B. Badgujar, B.A.Konnur, Amarsinh B. Landage "A Review of EVM Analysis with Primavera". These authors form an outline of construction project management by using a project management software primavera p6. The main advantage of the primavera software is tracking of the project, analysis, auditing of a project can be done easily. The primavera management software package helps in making a customized report from the report wizard that extract a specific data from the data base, many projects with more number of planners can work together. This paper include the purpose of earned value management, input data needed, earned value forecasting parameter, advantages & limitations of EVM, application of EVM toward project because it gives an sign to managers to correct the project early to get the project to track.

[5] Anuj dubey "Earn Value Analysis for a Construction Project". Anuj dubey has carried out a case study of bridge constructed on Pune Solapur highway at Saswad phata pune of costed INR25cr. He stated that the cost-over run and schedule over run are the prevalent in the most of the project; this problem can be reduced by using construction project management software like Microsoft project and primavera p6, in that the efficient use of earned value method.

When the project is full crash and the less cost when the project is smoothened. So, the project manager should have a sufficient experience to make optimal solution by using earn value analysis.

[6] Harsha H.N, Devanand.R & Shaik mohammad masood, "An Analysis on Resource Planning, Cost Estimation and Tracking of Project by Earned Value Management". These authors carried out their study on a Duplex apartment in Whitefield, Bangalore. It's a real time project; authors states that the estimation of cost and time for a project with the progress of the project can be reviewed through the baseline as set up earlier. For project planning, EVM calculation and analysis authors used primavera p6 software. Authors have done cost estimating and resource planning by considering parameters involved in EVM. After the planning and scheduling, they form a project cost base line by integrating project cost, time, scope, and technical operation. By comparison with the base line authors evaluate the project performance. Necessary action should take if a project takes a deviation from planned values. The project is traced by four type of tracking.

[7] P. Esaki Thaana: The established time monitoring system is thought to play a crucial function in the company, since it is in charge of finishing the project on schedule and staying within budgets. Major issues the construction business faces are poor time and money effectiveness. The principal objective of this study is to establish the appropriate strategy and schedule for the installation of a 6-lane highway at VOC PORT TRUST, Tuticorin. Primavera P6 software handles scheduled administration and control. The development's primary benefit was its prompt conclusion and use of Primavera P6 technology.

[8] E. Suresh kumar, Primavera software is a method that includes estimating, began operating, capital allocation, and timetable. The goal of process planning is on-time project completion and personnel allocation. Primavera scheduling provides effective control.

[9] Ismail Abdul Rahman : In major building projects, knowledge management was linked to efficacy levels, according to a study. The information was gathered from the construction company that handles large-scale projects. To determine the success of the people management tools and software used in the infrastructure project, the relative relevance index computation was used.

[10] B.S.K.Reddy; On two work progress in Dubai, United Arab Emirates, they performed sustainable resource experiments. They separately levelled and then integrated alternative with consolidated and then levelled, which shows clearly a reduction in resource usage of 5.65% in the latter option, which may be the best taken into account for the ecosystem. Finally, they said Resource levelling at the development site and downstream demand may result in regional cooperation between projects.

CHAPTER THREE: OBJECTIVES

3.1 TO STUDY THE NEED OF QUALITY MANAGEMENT

When designing a piece of infrastructure, budget, timing, and performance all must be taken into account. It is feasible to speed up the initiative while maintaining quality standards at a minimal price, or conversely. When there is a lack including both finances, productivity is prone to suffer. Clients frequently have other priorities in mind besides quality, such as expediency or cost. One is the same everywhere. The presentation papers' needs for the clients should be reflected in the designing team having standard of excellence. The consumers are then free to compare the provided design possibilities to the criteria they have actually specified.

Components of a layout that can be examined are as follows:

The extent to which the design reflects the client's values.

How different spaces connect with each other.

The design's ability to establish sections for entry, receptions, pauses, refreshment, and so forth.

The consequences for the environment and community.

Security.

The design's cost-effectiveness in terms of administration and maintenance.

Whether or not the structure allows use of standardization and prefabricated construction opportunities.

The dangers associated with design.

It is essential that rational solutions be evaluated in a standardised, formal environment and properly recorded. The client may choose an internal layout advocate to guarantee that now the layout meets the specified graphical fidelity. The customer may decide to hire a third-party customer consulting firm them unless they somehow lack experience with engineering and building tasks. Inside the building projects, performance can be measured as the accomplishment of adequate standards of accomplishment from construction projects. When the operation meets or exceeds the requirements of the clients or operator, this degree of success is attained. Price, schedule, and excellence ought be balanced by construction firms. It is appropriate to have amazing quality as well as a faster delivery at a price, or conversely, to be have better efficacy and a relatively inexpensive at the cost of higher. Development and licencing are two crucial phases wherein the program's operating concept, as well as the agency's accessibility, reliability, and ease of maintenance, may be affected. The building's smooth and problems transition into the project's licensing and validation phases appears to become more probable if one has a booming construction quality management programme and few defects. In the long term, establishing excellence in the construction industry has been a challenging problem and a task. A significant amount of time, energy, resources, and resources will be wasted if performance management practices are inadequate or not used at all. Construction projects with poor quality are commonplace all around the world. This was also highlighted that a serious issue is that even the grade of contentment in building projects has still not been achieved. However, in order to preserve the calibre of equipment, the majority of countries have developed quality criteria.

Investigating the role of excellence in the accomplishment of infrastructure projects is therefore crucial. This study's primary objective is to maintain the value of excellence in the accomplishment of infrastructure spending. This creates the high-quality structure necessary for building projects to succeed.

3.2 TO STUDY THE NEED OF TIME MANAGEMENT

According to the CIOB, construction projects usually have subpar time efficiently. As a consequence, minimising the potential of construction project delays requires effective time management. This study's goals are to look into how much respondents are involved in huge construction administration, how developmental records are kept, and what method the housing industry uses to track building progress. The programme manager appears to also have the greatest percentage in both drafting a technique declaration and taking part in research strategy meetings, per the findings. Previous studies have indicated that the sequence was timetabled as the result of a discussion and published design specification, that now the project tasks were largely determined accordingly, that now the cost was apportioned in separate files with backup plan, that dating site constrictions were also used to reduce achievement towards the date and time set of contract records, and also that sliding restrictions were being used to start regulating seriously.

The ability to plan and organise the hours are spent doing tasks through the day is known as time administration. Self discipline increases production and efficiency. It is an essential component of project management that calls for skills like prioritisation, preparation, and objective setting for increasing efficiency. The length of time it will take for each activity to be completed must be determined once you have identified and prioritised them. Make sure to take into account all restrictions as well as many other elements in your evaluation. Almost always, things don't go according to plan, so make room in your building timeline for unforeseen circumstances. Give yourself enough time for crucial tasks like research, training, conferences, and other operations. Considering the other group members too though. Then when you've created your schedule, it needs to be controlled and monitored. It is important to periodically review and revise your performance so how you can compare your actual job completed here to the plan.

3.3 TO STUDY THE NEED OF COST MANAGEMENT

The price supervising inspector is essential to the business ' financial and contractual administration, although the specific services they offer are subject to the enterprise business's terms and conditions. This can include being required to serve in a diverse array of consulting capacities, including providing cost as well as expert advice for budgetary planning at the early stages of a project, managing costs as during construction stage, managing contracts, and serving as the company's project leader to oversee the entire building process.

Price Project manager covers critical work performance variables including measures (centered on RICS's New Rules of Unit of measure), purchase, estimated cost, purchase orders, and cost estimating strategic planning. It centres on the manufacturing client's pricing supervisor assessor. It provides thorough instructions for the role in the office but out in the fields, including with instances that particularly reference the cost supervisor surveyor's typical working environment. One of it's biggest issues that come up during any venture is almost always the price. Any task business strategy must include creating a cost of the project. A lot of things need to be taken into account when creating a cost strategic plan, including staff costs, technology prices, necessary gear expenditures, and so forth. Expenses for such a business are an indicator of its commitment and timing. A thorough budget provides management with information on the how the money would be spent on initiatives throughout time.

Nearly half of project managers cited budget excess as the sole reason why their initiatives failed, and according to study. In order to develop the system, an S-Curve is a statistics chart that shows pertinent obtained information for simply a program, including one with a money, projected against duration.



Fig. 3: Cost management

Developing a project cost also makes it possible for some of you to evaluate the numerous project tasks. Sometimes it does seem like everything is done at once, but it is not true due to poor management. One can determine which parts of both the task could be completed first by using a timetable. This is a technique for calculating the probable costs of various occurrences that are covered by a proven approach to construction delivery. It also entails cost management in order to accomplish a project well within proposed amount.

As during course of data collection, the occurrences could change, which would have an effect on price estimates. To solve this problem, a budgetary control strategy is needed. Without it the, it is difficult for enterprises to start.

3.4 TO STUDY THE NEED OF RISK MANAGEMENT

Every endeavour has some level of risk. People and corporations need to be prepared for the various threats that could arise. Businesses continue to have a tendency to take significant risks at the beginning of their operations, and as a result, far too many of these fail from the first two years. Is from the other extreme, financial companies have a minimal tolerance for risk. They run their business in a vulnerability manner while they manage the depositaries' funds. They decide to add investments with the right proportion of variance (lack of certainty) to respective inventories.

As a result, before to implementation, each action should go through a risk analysis and the search for potential risks. The core of identified risks in construction works is understanding what kinds of risks may influence, evaluating their favorability, and estimating the probability of an event in the construction process. Despite is among the most costly products, many structural engineers have never taken the expense into account. Management helps major stakeholders, including the client, builder or development, analyst, and suppliers, fulfil their duties and limit adverse effects on the expense, scheduling, and production standards of infrastructure projects. Experts have inherently connected the three goals of timing, budget, and workmanship to the success of this project. Contractors must take responsibility toward their own risk mitigation due to the financial crisis and challenges in the fiercely competitive building projects. The study examined vulnerability assessment & risk management systems in construction industry, and then that investigation is the main topic of this publication.

Risk assessment is undoubtedly one of the most challenging aspects of projects. A venture manager must be able to identify dangers, research their underlying reasons, and follow these problems from their inception through each of the programs to their conclusion. Additionally, risk mitigation in the development of construction program management is a rigorous and organised way of identifying, analysing, and responding to threats in terms of achieving desired outcomes. Utilizing risk evaluation from the early stages of a project, whenever important decisions, such like alignment.

CHAPTER FOUR: PROPOSED METHODOLOGY

4.1 TIME-COST OPTIMIZATION WITH NETWORK ANALYSIS

Given the existence of several optimization algorithms and management tools, many housing developments fail to meet their cost estimates goals. The Critical Path Method (CPM) as well as Program Evaluation Review Technique are the fundamental scheduling strategies that are frequently employed in practise (PERT)

4.2 WORK BREAKDOWN STRUCTURE (WBS)

It is said that the WBS is a centralized organization created to systematically split all of the program's work-elements into such a graphical display. The graphic begins with the project's entire statement of work there at top, followed by local work components at each subsequent level below that. The work components are referred to as work packages at the WBS's most basic level. The WBS will effectively describe the budget and schedule and each task program's responsibilities. While what would have been a perfect fit once per profession may be an uncomfortable load for that other, there isn't absolutely a correct or incorrect structure. The organisational breakdown structure (OBS) of the contracting company, which clearly outlines accountability levels & their necessary reporting requirements as indicated in, can be tied to the WBS components at differing stages. The picture also demonstrates the connection between project tasks and the corporate standard code of accounting. All material can be categorised, sorted, and summarised using the universal code of accounting.

4.3 CRITICAL PATH METHOD

A Critical Path Method (CPM) were developed to detect crucial operations in such a network's critical path and thus to optimise the design of sophisticated techniques. The critical path is indeed the duration of the line segment from the program's start to conclusion since system and processes can be completed in simultaneously. Since there is no latency in establishing the starting and finishing times of an operation, it also seems to be essential. The program duration is indeed the aggregate of the timings of most of the critical path and may be determined using CPM once many of the expected activity durations have been determined.

4.4 PROGRAM EVALUATION AND REVIEW TECHNIQUE

It may be challenging to accurately predict time required to complete because of the unknowns that may arise that during construction project, including such bad weather, unanticipated site characteristics, subpar labour effectiveness, insufficient resource allocation, subpar performance data, and an unsuitable management structure. The initial purpose of the Program Evaluation and Review Technique (PERT) was to organise the schedule aspects of the project. It used a stochastic timetable to assess the likelihood that a construction would be finished by a specific date.

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The average critical route is then calculated using the predicted average scores.

1.Optimistic time (O): the shortest amount of time necessary to perform a task.

2. Supposing that everything goes more smoothly than is typically anticipated. Pessimistic time (P) is the length of time that could possibly be needed to finish a task. supposing that a negative outcome occurs (but excluding major Catastrophes).

3. The best estimation of the amount of time needed to perform a task is perhaps the most likely scenario (M). assumption that everything that comes before is normal.

4. Expected time (TE): A task's completion time is best predicted using this metric. Recognizing that everything do not go according to plan TE = $(O + 4M + P) \div 6$

The concept behind time-cost optimization would be to reduce the duration of crucial tasks while increasing cost per minute as little as possible. Typically, it involves the following steps:

1. Making a timetable based on the typical length of time and typical expense of ongoing projects.

2. Determining the crashing slope and calculating the crash cost and time with each operation the following formula will reveal the crashing slope, which would be an all this per unit time: Crash cost per time (Slope) = (Crash cost – Normal cost) / (Normal time – Crash time).

3. Finding the critical activity that could be crash with both the least financial loss, or the action with the lowest crash slope, after finding the critical critical path of the project. As provided even as two identified activity could still be wrecked and the overall crash price of the various projects is the lowest, a crucial activity out of each main path should really be chosen if there are multiple critical paths.

4. Reducing the action's duration by the necessary number of units (maximum crashing units = average time – crashing time).

5. At around this phase, the program's new price and length should be computed. Steps three through five should therefore be performed until the project reaches its optimal solution, in which the reduced operational expenses outweigh the higher direct expenses. This method is designed to take advantage of "Link lag values," which aid in estimating the potential frequency of activity crashes. Using a single opportunity instruction set, the financing variability can be taken into account and converted into a matching predictable at a specified amount of certainty.

To guarantee that now the costs of the project is kept inside the predicted cost limitations, the price optimization method should be used all through the building project. Time savings in the building projects can also be converted into opportunities like bonuses for finishing early or cost savings.

They will produce men. The cost management system will work in conjunction with other important activities in the management of a project, not as a stand alone operations. For instance, it might be used with a labour utilisation strategy, where the focus of optimizing is maintained on the most effective use of the labour force.



Fig. no. 4-: TIME (PROJECT DURATION)

4.5 FREQUENTLY USED METHODS

1) Work Programmes: Companies create and employ agendas to track the project's development and monetary success.

2) Inspection of Works: The assessment of the works is done, and the results are compared to the project's budget.

3) The project budgets: The costs and outlays related to the functional units as well as the work objectives to be attained.

4) Site Meetings: Gatherings organised to assess the state of the project and contrast it to the budgetary allotments.

5) Record-keeping: The record of tasks performed enables the rapid recognition of deviations from the established norms.

6) Monitoring Work and Cost Performance: To constantly check on the program's performance indicators, clients, advisors, and subcontractors used monitoring systems like timetables, budgets, inspections, and comments.

4.6 TO EVALUATE EFFECTIVENESS OF MSP AND PRIMAVERA P6 PROFESSIONAL

4.6.1 CASE STUDY 1

Table 1- Case study 1

Project name	Hakeem Aghghan Apartment
Туре	G+4
Client	Mr. Raza
Builder	Mr. Aftab Ahmad
Site location	Ranimandi, Allahabad
Built up area	646 sq. ft.
Project duration	1 year



Fig. 5- Project plan

4.6.1.1 CASE STUDY 1 USING MSP SOFTWARE :-

The project would determine the capital demand curve for said entire project based on how many resources are used for each operation, the amount of time, money, and effort required for each task, as well as how the resources can be allocated among each type of work unit. Consequently, it is simple to calculate the objective and the smaller tasks flow operating strength, alter the time frame there in "resources usage scenario," and configure the workforce and budget separately.

Table 2- CPM Chart

Sr.	A	Duration
No.	Activity	in Days
1	Document review & plan formation	5
2	Site cleaning	3
3	Line out	2
4	Excavation	4
5	Preparation of steel cage	2
6	PCC	3
7	Column line out	2
8	Footing	4
9	Column	3
10	Ground beam	2
11	Curing	3
12	Brick work up to plinth level	2
13	Murum filling	3
14	Compaction	1
15	Plinth beam	2
16	Installation of septic tank and plumbing pipe	1
17	Bed concrete	5
18	Column line out and column starter	3
19	Column casting up to 7 feet	4
20	Brick work up to 7 feet	7
21	Seal casting	3
22	Lintel	4
23	Loft and lintel	3
24	Porch slab	2
25	Brick level up to slab level	2
26	Slab beam casting	2
27	Centring and shuttering	2
28	Slab casting	2
29	Head roomcolumn	3
30	Head room brick work	4

31	Head room lintel	3
32	Head room slab	4
33	Head room slab level brick work	5
34	External plastering	10
35	Internal plastering	10
36	Plumbing	7
37	Electrification work	7
38	MS Work	4
39	Steel railing	5
40	Water proofing	4
41	Flooring	20
42	POP	2
43	Wall putti	3
44	Sliding window fixing	10
45	Door fixing	7
46	Colour	18
47	Glass work	10

Therefore for project plan to be optimised, critical path determination is crucial. It is common knowledge that any critical route changes could result in a change inside the project's completion date, which would impact the project's personnel, schedule, & purpose. Therefore, it becomes crucial to identify the vital path with important tasks for each project using acceptable and correct methodologies. To determine the critical route in just this business, we employed the CPM methodology.

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Fig. 6- Case study 1 run on MSP Software

Utilizing project management software allows for thorough managing projects. Additionally, it offers qualities like being on time, quick, accurate, and economical, etc. Whatever the case, manual labour just cannot compare. Because of this, Construction would be widely utilised due to its important function in project planning and its attributes of ease of use, monitoring, and adjustment. CPM assessment was conducted for management. The outcome of our analysis indicates that the projected timeframe of this venture is 12 months and 8 days, with the critical path period needed to complete some operations taking longer than it would to produce software.

4.6.1.2 Using PRIMAVERA P6 PROFESSIONAL SOFTWARE

Data have been collected from the construction project and then entered into a program for immediate study. Residence in a (G+4) residential complex is used as a case study of this research.

The collected data will be investigated in the Primavera software, the undertaking will be tracked, all updates and results produced by the software will be examined, and connections with the organisation regarding the choice of a planning procedure and software that can be used in there own future developments will be conducted.

Three approaches have been used to collect the data:

daily updates on progress (DPR)

Production of labor-intensive activities over their intended timeframes

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Table 3- DPR OF CASE STUDY 1

Daily progress reports (DPRs) include a thorough summary of the job completed, as well as labour and resource information. From the start of the project until the present, all DPR have also been gathered.

WORK OUTPUT OF LABOUR- Work output is the total amount of work a labourer completes in a given day. Based on the available workforce on location, it is used to determine the amount of time needed for a task.

Sr. No	Particular of	Quantity done per day by one person				
	Item	M^2	M ³			
1	Brickwork in Lime or Cement Mortar in Foundation Plinth		1.25			
2	Brickwork in Lime or Cement Mortar in Super Structure		1			
3	Coursed Rubble Stone masonry including dressing		0.8			
4	Cement concrete	1:2:4	5			
5	RCC Work		3			
6	12 mm Cement Plaster	8				
7	White washing or Color washing	200				
8	Painting and Vanishing doors and windows (lcoat)	25				
9	Painting Large surface (1 coat)	35				
10	Distempering (lcoat)	35				

Table 4- Work output of labour

To take adequate precautions against impossibility, routine monitoring of the activity in progress must be completed at least once every week. With this programme, conducting a review to see where the timetable helped depart from the planned one and to manage against it is a breeze. WBS assisted in organising, systematising, and knowing the success in percentage at each chunk and node in it.

Appropriate synchronization and simplicity in stating how the job would be done. In this project by employing explosive and quick the frequency of the selected occurrences is tracked using ability to schedule while staying within in the budget. Using the Primavera resource management method Concentration of multiple activities is forced. performed by lengthening the workday. Primavera (P6) was the most effective tool for arranging, observing, and regulating shows only if it achieves the best outcomes with fewer resources user's effort to prevent a large volume documentation

Activities with their planned duration :-

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Fig. 7- Updation of the Project



Fig. 8- Tracking Cost of the Project

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Fig.9- Scheduling of the apartment building

By using the primary baseline and Gantt chart that have been developed, it is simple to meet the project objectives and evaluate task improvement against each other by looking at the colours of the bars.

4.6.2 CASE STUDY 2

The house that was chosen as the case study's setting is still under construction. To determine the present situation of such construction process, i.e., that whether operation is as per target, beyond schedule, or ahead of time, the infrastructure projects are recorded from the site and scheduled in Primavera P6. The project used for the research study's details are listed below.

Name of Project (Building)	-	Sunshine Sapphire
No. of Floors	ಿಕ್ಟ್	Stilt+7 Floors
Typical Floors	(m)	1 st , 3 rd , 5 th , 7t ^h
		$2^{nd}, 4^{th}, 6^{th}$
Flats on each floor	- 12)	4
FSI	-	1.65
Plot Area	- 3 - (5100 Sq ft
Location	-	Vasai (E), Palghar
Name of Builder	್ರಾ	Shanti Builder
Project Start Date		January 2015
Project Duration	1.7	17 months
Planned Project Cost	12	6.5 Crore

Table 5- Case study 2

4.6.2.1 CASE STUDY 2 USING MSP SOFTWARE :-

For the project plan to be optimised, critical path assessment is crucial. It is common knowledge that just about any critical route changes could bring about a change inside this project's completion date, which would impact the project's personnel, schedule, & purpose. Therefore, it has become crucial to identify the vital path with important activities for each program using acceptable and correct methodologies. To determine the critical route in this business, we employed the PERT methodology.

Sr. No	Activity	To	Duration in Days (Tp)	Tm	Te	Sd= (Tp- To)/6	Variance
1	Document review & plan formation	4	5	6	5	0.1667	0.0277
2	Site cleaning	2	3	4	3	0.1667	0.0277
3	Line out	1	2	3	2	0.1667	0.0277
4	Excavation	4	4	5	4	0.1667	0.0277
5	Preparation of steel cage	2	2	3	2	0.1667	
6	PCC	2	3	4	3	0.1667	0.0277
7	Column line out	1	2	3	2	0.1667	
8	Footing	3	4	5	4	0.1667	0.0277
9	Column	2	3	4	3	0.1667	0.0277
10	Ground beam	1	2	3	2	0.1667	0.0277
11	Curing	2	3	4	3	0.1667	0.0277
12	Brick work up to plinth level	1	2	3	2	0.1667	0.0277
13	Murum filling	2	3	4	3	0.1667	0.0277
14	Compaction	0	1	2	1	0.1667	0.0277
15	Plinth beam	1	2	3	2	0.1667	0.0277
16	Installation of septic tank and plumbing pipe	0	1	2	1	0.1667	0.0277
17	Bed concrete	4	5	6	5	0.1667	0.0277
18	Column line out and column starter	2	3	4	3	0.1667	0.0277
19	Column casting up to 7 feet	3	4	5	4	0.1667	0.0277
20	Brick work up to 7 feet	6	7	8	7	0.1667	
21	Seal casting	2	3	4	3	0.1667	
22	Lintel	3	4	5	4	0.1667	
23	Loft and lintel	2	3	4	3	0.1667	
24	Porch slab	1	2	3	2	0.1667	0.0277
25	Brick level up to slab level	1	2	3	2	0.1667	0.0277
26	Slab beam casting	1	2	3	2	0.1667	0.0277
27	Centring and shuttering	1	2	3	2	0.1667	0.0277

Fable	6-	PERT	Chart
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3 4	External plastering	9	10	11	10	0.1667	0.0277
35	Internal plastering	9	10	11	10	0.1667	0.0277
36	Plumbing	6	7	8	7	0.1667	0.0277
37	Electrification work	6	7	8	7	0.1667	
38	MS Work	3	4	5	4	0.1667	s
39	Steel railing	4	5	6	5	0.1667	8
40	Water proofing	3	4	5	4	0.1667	0.0277
41	Flooring	19	20	21	20	0.1667	0.0277
42	POP	1	2	3	2	0.1667	0.0277
43	Wall putty	2	3	4	3	0.1667	0.0277
44	Sliding window fixing	9	10	11	10	0.1667	0.0277
45	Door fixing	6	7	8	7	0.1667	
46	Colour	17	18	19	18	0.1667	0.0277
47	Glass work	9	10	11	10	0.1667	
	Total	22 6	255	26 4	скан ск (2		0.9418

The project's schedule are being done on this site using MSP software. The operations to be completed, their runtime, timeframe, and links between the tasks are all provided to the MSP on this website as inputs, giving the MSP the concept of when and how long to conduct the activities.

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Fig 10- Case study 2 run on MSP Software

The MSP provides a visual representation of the tasks to be completed and the resources required to complete them. MSP has the capacity to manage challenging projects of any size and complexity. The operations were planned, scheduled, and organised using MSP, but the programme did not have access to information or evidence. As a result, no information was collected regarding the costs and investment needed to undertake a task.

4.6.2.2 Using PRIMAVERA P6 PROFESSIONAL SOFTWARE

Primavera P6 links each operation with its parent and successors by scheduling construction projects activities in compliance with the building sequence. Primavera P6 is used for the original study evaluation of performance; the instruments and methods used in this procedure are

- 1. Cost Performance Baseline
- 2. Earned Value Management (EVM)
- 3. Work Performance Management

The project adopted for the study is analyzed for Schedule Variance (SV), Schedule Performance Index (SPI), Cost Variance (CV), and Cost Performance Index.

The results obtained for the project schedule Primavera P6 are as follows:-

1. Total Project Duration of 511 days out of which 467 days are critical.

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Fig. 11- Total Project Duration

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Fig. 12- Critical Duration

- 2. Total project cost is ₹5,62,95,785/-
- 3. Earned Value Analysis (EVA)

The program was modified on with the actual cost for every activity included to determine the earned value of the labour on 30th November 2015, and the data obtained from Primavera P6 are as follows

- a) Planned Value (PV) : ₹3,77,18,175.95/-
- b) Earned Value (EV): ₹3,10,05,982.76/-
- c) Actual Cost (AC): ₹2,98,72,146/-

d) Schedule Variance (SV): It gives an idea about the project status whether it is behind or ahead of the planned schedule. SV = EV- PV

= (3, 10, 05, 982.8 - 3, 77, 18, 175.9)

= ₹(-67, 12,193.19/-) SV% = (SV/PV)*100

= (-67, 12,193.2/3,77,18,175.9)*100

= -17.80%

e) Schedule Performance Index (SPI): This metric shows how well the development team is using its time.

SPI =EV/PV

= (3, 10, 05,982.8 / 3, 77, 18,175.9) = 0.822

f) Cost Variance (CV): This metric displays that whether program's budget is under or overspent.

CV = EV - AC

= (3, 10, 05,982.8 - 2, 98, 72,146) = ₹11, 33,836.8 CV%

= (CV/EV)*100 = (11, 33,836.8 / 3, 10, 05,982.8)*100

= 3.656%

g) Cost Performance Index (CPI): This metric demonstrates the project's overall cost effectiveness.

- If CPI < 1 (Over Budget)
- If CPI > 1 (Under Budget)
- If CPI = 1 (As per Budget)

CPI = (EV/AC)

= (3, 10, 05, 982.8 / 2, 98, 72, 146)

= 1.03

4.7 POINT OF DIFFERENCE BETWEEN MSP ND PRIMAVERA P6 PROFESSIONAL

S.NO.	PRIMAVERA P6 PROFESSIONAL	MS-PROJECT
1.	It supports unlimited baselines	It supports 11 baselines
2.	It enables the usage of particular features and also the collaboration of several individuals on a single assignment.	Many user access; MS Project prohibits the collaboration of multiple users on the same project.
3.	It enables the addition of additional project expenses, such as training costs and travel costs, in supplementary towards the project budget	It does not allow to calculate other expenses.
4.	Every column contains valuable information, and it enables up to 200 columns, incorporating customised columns.	MS-Project on other hand supports upto 40 columns only.
5.	It supports unique ID feature and is helpful in projects using activity ID systems.	The activity ID is based on the activity's positioning and does not provide the unique ID functionality.
6.	Primavera is a database based project management software.	MS Project is file based project management software.
7.	Primavera supports shuffling of onscreen activities using sorting, grouping, etc.	MS-Project lacks on-screen activity shuffling.
8.	Primavera software is best suited for developed countries.	MS-Project is best suited for the developing countries.
9.	Primavera allows issue and risk recording.	MS-Project lacks the feature of the project issue and risk tracking.
10.	Primavera allows the creation of WBS in which activities can be added.	In MS-Project activities are made to appear or function like WBS.
11.	Primavera supports a larger number of activities.	MS-Project supports less number of activities when compared to Primavera.

CHAPTER FIVE: CONCLUSION

In this study, we looked at a range of methodologies. It's critical to minimise construction costs and durations at every stage. The work must adhere to current standards in order to be completed on time, inside budget, and through the appropriate use of personnel. The primary determinants of project budget are design and construction delays. Numerous methods have been developed and used to examine the problems, so that they can only optimise one element. Several cheap materials are also suggested in order to maximise project expenses while maintaining the project's dependability and quality. This goal was achieved through lowering the rate of hardware failures, chopping back on idle time and short pauses, lowering factory accident rates, raising productivity levels, enhancing processing parameters, and boosting revenue through cost-saving strategies. Planning ahead, decision-making, purchase, production, organization, training, and troops and equipment approach are essential for a venture to be accomplished successfully.

The present study that looked at how to balance time, quality, cost, and risk. Timely delivery time, cost, risk, and quality are currently the most essential competitive advantages in sectors. Large corporations spend a lot of money on research and advancement every year in an effort to determine the best way to combine their services and goods. It's critical to remember that each component of the survival pyramid must be in proper balance for such corporation to prosper. The effectiveness of the organization's services and support operations are influenced by this equilibrium, as are the rates at which costs increase and decrease.

Both resources and labour are in great demand for construction projects. For an institution to be completed, the three requirements of time, budget, and performance must all be satisfied; alternatively, this may fail. This shows that tasks must be finished on time, within expense, and to the desired quality standards. The best feasible compromise between any of these multiple project-related factors was achieved in this work using computer analysis, a non-linear, semi with three critical points.

WBS made it easier to organise, compile, and determine the percentage of job completion at each chunk and component inside of it. A dequate cooperation and simplicity in stating how the assignment will be carried out. By using a quick and efficient tracking mechanism, it is possible to rearrange the time of the selected events inside this project while staying within the benchmark. By lengthening workdays, the Primavera strategy of resource coercion compresses a variety of activities.

Primavera (P6) has proven to be the best instrument for organizing, evaluating, and regulating. It only demonstrates its efficacy if best outcomes are achieved with minimal user effort by avoiding a significant amount of paperwork.

CHAPTER SIX: REFERENCE

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