International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

Improvising the Efficiency Rate by Knowing Earned Value Analysis using Primavera P6 8.2

Smithagowda M S[1], Kavya S N[2], Rajeshwari B[3]

[1]*Assistan Professor, Department of civil Engineering, East West institute of Technology, Bengaluru*
[2]*Assistan Professor, Department of civil Engineering, East West institute of Technology, Bengaluru*
[3]*Assistan Professor, Department of civil Engineering, East West institute of Technology, Bengaluru*

Abstract - *Construction industries always deal with variation in duration as well as cost, which is very common in this industry. To lookout for the project delay and cost overrun it should be seen that a corrective measure should be taken for the improvement of the project for this to happen monitoring of the project plays an important role. Apart from monitoring, predicting the in-future effect on duration and cost is also important. This prediction is done using a tool called "Earned Value Analysis". Here Earned value analysis plays an important aspect in monitoring by alarming about the "To Complete Performance Index which predicts, the efficiency rate of the project by calculating the "Cost performance, schedule performance and Estimate at Complete" of the updated activities. This study mainly concentrates on the monitoring of the project by day to day updating and to calculate the "Cost performance, schedule performance and Estimate at Complete" of the updated activities and to compute the efficiency rate at certain duration of the project and to cut down the Cost overrun by improvising the plan according to situation for the betterment of the project so that, the efficiency rate improvement is seen in the project.*

***Key Words*: primavera p6 8.2, Cost performance, Schedule performance, Efficiency rate of the project, Earned Value Analysis.**

1. INTRODUCTION

Despite the fact that development industry is the second biggest industry in India, the development of this industry has been differential throughout the country. The provincial districts need tools for monetary advancement, land use and environment wanting, to adapt to the status of improvement with urban regions. The time accessible to accomplish this objective is less. Here emerges the requirement for effective management administration. Numerous issues are being faced by development industry that must be dealt with. That includes incorporate time and cost invades because of insufficient task definition, lack of common sense for usage, absence of legitimate contract arranging and administration and absence of appropriate administration during execution.

It has been evaluated by experts that normal expense of a project goes up by 30% rate contrasted with the planned expense. Observation demonstrates that appropriate administration is basic for the convenient finish of the Project within evaluated spending plan and with assigned assets. Ventures just with great arranging, satisfactory apparatus and adequate stream of assets can't naturally accomplish the desired result. There must be some notice system, which can alarm the association about its achievement and disappointments, on and off. Venture observing is the procedure of gathering, recording, and reporting data concerning venture execution that venture administrator and others wish to know. Monitoring includes watching the advancement of the task against time, assets and execution plan amid execution of the undertaking and distinguishing slacking territories requiring opportune consideration and activity though extend controlling utilizations information from screen movement to convey genuine execution to arranged execution.

One of best programming which significantly utilized by a large portion of the vast firms for their administration is Primavera P6 8.2.

1.1 Project Management

There is a general incident, where a large portion of the general population hops straightforwardly into the executing, once their ideology is imagined. In such case philosophies breakdown attributable to flurry. It is at this point, "Project Management" proves to be useful. It streams line the belief systems into a task, and guarantee significance to each and every single aspect in the venture, along these lines covering all measurements and bearings. Lastly the undertaking is directed to achievement. Project Management is consequently a science, craftsmanship and calling without anyone else. PMBOK guide characterizes it as "The application of skills, knowledge's, tools and techniques to project activities to meet the project requirements". Project Management includes recognizing the task prerequisites, tending to the different needs of partners, adjusting the imperatives and taking the requirements and desires of the partners.

1.2 Earned Value Analysis

Earned Value Analysis goes as the alert signs for the task. It's a system administration method which will utilizes the "work which is under progress" to demonstrate what might happen to the work later on. Earned value analysis utilizes the cost, as the normal measure for cost of project and

schedule execution. It permits the estimation of expense in cash, hours, labourer days, or some other comparative amount that can be utilized as a typical estimation of the qualities connected with task work.

Cost and schedule execution should be measured, and analysed as feasible with regularity and intensity consistent with project management need including the magnitude of performance risk. Analysis should be progressive and should follow therule of administration by exemption. Change thresholds should be made up in the planning phase itself and should be used to guide the examination of performance.

Earned Value Management, is definitely a well understood management framework, which coordinates cost, calendar and specialized execution. It permits the estimation of expense performance indices and schedule variances and forecasts of project cost and schedule duration. The earned value method provides early signs of project performance to highlight the need for eventual corrective action.

Earned Value Management System, is not the particular framework or instrument set, yet rather, an arrangement of rules that guides an organization's administration control framework. To cover up overrun cost, Project management team can execute, a value engineered program, which can be used for cost reduction by either reducing quality or also changing scope of few project areas or also by providing additional budget on the project. Usage of EVM can be scaled to fit projects of all complexities and sizes.

So also, for duration overrun type of case, they undertake few plan such as fast tracking or crushing of duration for decreasing the time. Therefore the part of EVM, and also proper as well as on time forecasting is essential, to fulfil project objectives.

1.3 Primavera P6

Primavera P6 is astonishing programming, which is utilized by organizers, as well as specialists, schedulers, and any other person required in arranging, administration, reporting of a task.

Primavera P6 has profited each industry from aviation to assembling, gadgets to IT, Telecom to Civil, any more. Primavera is an astounding Project administration programming apparatus which is not simply utilized by task directors. Intended to make managing huge or complex project a bit of cake, Primavera is the perfect apparatus for any individual who is included in arranging, Monitoring and giving an account of the advancement of any huge assignment, improvement or endeavour. The project management software is the tool of choice in industrial commercial ventures, such as, development, building, aviation, transport and security, and in numerous other industrial divisions. Primavera takes into account top level planning and in addition being perfect for dealing with the multifaceted points of interest. This empowers project administrators, organizers, arranging controllers and other related experts to have moment access to all the task data they require at the touch of a catch.

Primavera Systems Includes: provides project and program management software for the Architecture, Engineering and Construction industry. Concentrated onproject portfolio management, or PPM, Primavera solutions let user's measure progress, assure governance, improve team collaboration and prioritize project investments and resources.

2. LITERATURE REVIEW

Alberto De Marco, et.al, [1] this paper says that Performance estimation is a useful device for taking restorative activities and controlling a venture. To the extent this empowers precise time and cost gauges amid the main phases of the development exertion when the administration group still has chances to make modification. This paper beats the quandary of practicability and consistency of customary evaluations at consummation in light of early advance estimation by showing the observational results from the development venture of a modern office. The case might be a reference rehearses for evaluating time and cost execution estimation of any building, whose format can be sensibly divided into repeatable bits. In such circumstances, a viably oversaw customary earned quality strategy and suitable measurements for processing execution give venture directors precise conjectures as valuable apparatuses for fruitful task administration and control.

Virle, et.al, [2] This technical paper says "Earned Value Management (EVM)" is an intense technique which helps official, venture chief, program administrator and different partners of the undertaking to deal with the venture all the more viably. Earned Schedule is an imperative expansion to EVM that permits EVM measurements to be changed to time or length measurements to improve the assessment of undertaking calendar execution, gauge the span expected to finish the venture. It helps the undertaking directors to comprehend the time gauges for the fulfillment of the task, and gives further experiences to settling on better choices about the venture plan and other basic parameters. Earned Schedule has turned into an effective new measurement which gives free gauges of time with the assistance of earned worth information as faras time. The use of earned esteem and earned timetable apparatuses for late completing development ventures gives better forecasts.

3. Methodology

The following methods will be adopted to carry out the thesis work:

- Estimating the quantity of work, resource requirement.
- Planning, Scheduling, Budgeting using primavera p6 8.2.
- Resource allocation for the activities using primavera p6 8.2.
- Base line creation in primavera p6 8.2.
- Updating of the progress in primavera p6 8.2.
- To calculate Construction performance index, Schedule performance index, Estimate at Complete and To Complete Performance Index (EVA) in primavera p6 8.2.
- To know the efficiency of the project at the specified interval.
- To change the plan if efficiency is not satisfiable.
- To calculate Construction performance index, Schedule performance index, Estimate at Complete and To Complete Performance Index (EVA) in primavera p6 8.2 after the change of plan.
- To know the efficiency of the project at the specified interval after the change of plan.

Planning, Scheduling, Budgeting and Resources

After the project is approved and initiated, it is time to put it together using scheduling in the software. Activities that occur at this time include:

- Adding tasks to a schedule.
- Creating relationship between tasks using outlining and task linking.
- Assigning people and other resources to task.

Baseline

Baseline is a known state by which something is measured or looked at. It is the procedure of overseeing change. It's additionally the assessment of spending plan expected for the undertaking.

Plan Baseline is the endorsed rendition of a timetable model with a benchmark begins and standard completion dates. This will have the insight with respect to the assets doled out too. The one will be acknowledged and affirmed by every important partner.

Updating the progress

Updating of the project consist of entering the information about actual, such as the actual start date, the actual finish date, and the actual duration of a task. when the actual information is entered, project shows a schedule with projections of how the remaining of the schedule is going to complete, based on actual activity.

Earned Value Analysis

In construction the computation of efficiency rate of a project has a vital part. When we compute the effectiveness rate of a task at a state of the project duration , one can have the capacity to comprehend the project progress and what may be the end of the project look like. The technique used to ascertain the efficiency is earned value analysis method.

Earned Value is an upgrade over customary bookkeeping traditional accounting progress measures. Conventional strategies concentrate on planned accomplishment (expenditure) and real expenses. Earned Value goes above and beyond and analyzes genuine achievement. This gives managers more prominent knowledge into potential danger regions. With clearer picture, managers can make hazard relief arranges in light of genuine cost, schedule and specialized advancement of the work. It is an "early cautioning" program/project management device that empowers managers to recognize and control issues before they get to be impossible. It permits activities to be overseen better – on time, on budget. EVA utilizes the accompanying task parameters to assess project performance:

Primary Data required for Earned value analysis

Planned Value (PV or BCWS)

Planned value or Budgeted Cost of Work Schedule shows how much of the budget should have been spent in view of the baseline cost of the task, assignment, or resources. BCWS is calculated as the cumulative time phased baseline costs up to the status date or today's date. Budgeted cost values are stored in the baseline fields. Planned value is calculated as follows:

PV = Hourly Rate * Total Hours Planned or Scheduled

Actual Cost (AC or ACWP)

Actual cost or Actual Cost of Work Performed shows actual costs incurred for work already performed by a resource on a task, up to the project status date or today's date. Normally project correlates actual costs with actual work. Actual cost is calculated as follows:

AC = Hourly Rate * Total Hours Spent

Earned Value (EV or BCWP)

Earned value or Budgeted Cost of Work Performed shows how much of a task's should have been spent, given the actual duration of the task. Earned value is calculated as follows:

EV = Baseline Cost * % Complete Actual

Budget at Completion (BAC)

Budget at completion is the sum of all budgets allocated to a project scope. The project BAC must always be equal the Project Total PV. If they are not equal, earned value calculations and analysis will be inaccurate. Budget at Completion is calculated as follows:

Budget at completion = Latest Revised Estimate

Cost Forecasting required for Earned value analysis

Cost forecasting is a planning tool that helps in managing its attempt to cope up with the uncertainty of the future overruns of cost. Relaying mainly on data from past and present and analysis of trends.

Estimate at Completion (EAC)

The objective in preparing an EAC is to provide an accurate projection of cost at the completion of the project. Estimate at Completion is calculated as

EAC=AC+ (BAC-EV)/CPI *SPI

Estimate to Complete (ETC)

Estimate to Complete is the estimated cost of completing the authorized remaining work, a detailed ETC will include a description of the work remaining and any revisions to the estimated resources or cost for completing the project. Estimate to Complete is calculated as below

ETC = EAC-AC

Performance Indices required for Earned value analysis

Performance index is a tool used for management which allows to use multiple set of information to be collaborated into the overall measure. It is the measure of estimate of the project capability.

Cost Performance Index (CPI)

The ratio which provides us with the financial effectiveness of a venture is known as Cost Performance Index. It can be calculated by the below given formula.

CPI =EV/AC

- When CPI is less than one then it is over budget or budget overrun.
- When CPI is greater than one then it is under budget or budget under run.
- When CPI is equal to one then it is as per budget.

Schedule Performance Index (SPI)

The ratio which provides us with the Schedule effectiveness of a venture is known as Schedule Performance Index. It can be calculated by the below given formula.

SPI=EV/PV

- When SPI is less than one then it is behind schedule.
- WhenSPI is greater than one then it is ahead of schedule.
- When SPI is equal to one then it is as per schedule.

To Complete Performance Index (TCPI)

- To Complete Performance Index is a calculated projection of the cost performance that much be achieved on the remaining work to meet recognized business goals, such as the BAC or EAC.
- TCPI is essentially a ratio of the remaining work to the remaining funds. It enables a project manager to determine the level of performance needed to achieve the cost or time objectives.

TCPI = (BAC-EV) / (EAC-AC)

- This field appears by default in the Earned Value Cost Indicators table and is not a time phased field.
- The normal method of identifying actual costs in a project and comparing them to planned costs can take time to calculate. This loses the main benefit to personnel in seeing their progress performance in real time.

4. Analysis and Results

No of Floors = 10 floors

Project duration: 340 days

Project total final cost: Rs 6, 16, 20,000 approximately

Resource calculation

Example:

Activity name: Form work for column footing.

Quantity of Plain Cement Concrete required: 333m^2

5 Labour Productivity: 1skilled, 1 unskilled labours can complete 4 m2 of Form work in 1 day working 8 hours a day.

6 Therefore,

Let's plan the activity of laying of PCC for say 5 days

So, quantity of work to be completed in a day is as below

333/5=66.6m2/day

Now considering labour productivity

66.6/4=16.65

Let's take labour required as 17 skilled and 17unskilled per day working 8 hours a day.

After calculation of the resource and allocating the duration for each and every activity the sequence of the activity will be done and work breakdown structure will be created. The activities later will be linked with one another for the consequent activities and the total duration of the project will be obtained.

Budgeting will be done by allocating the resources like manpower, material and machinery used up for the

specified activity. The resource allocated should be given rate per unit so that when we allocate the number of resource required for the specified activity the software automatically computes the total price for that activity. Later the total cost of all activity will give the total budget of the project.

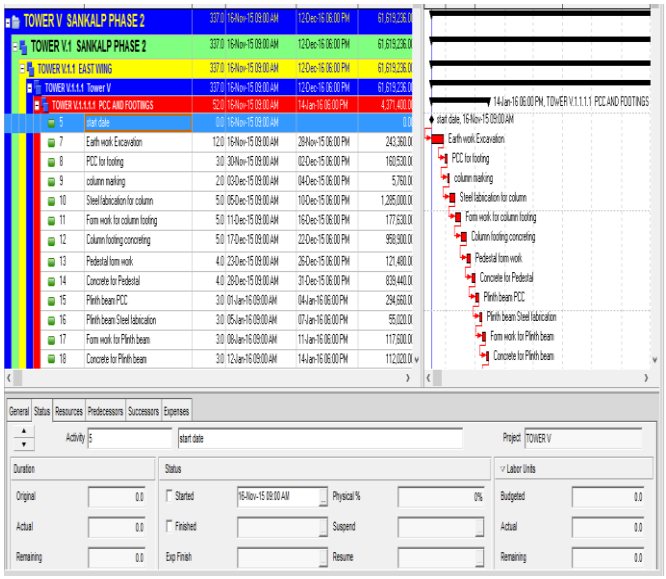

Fig. 1: Planning done in Primavera p6 8.2

Creating the Baseline for the Project

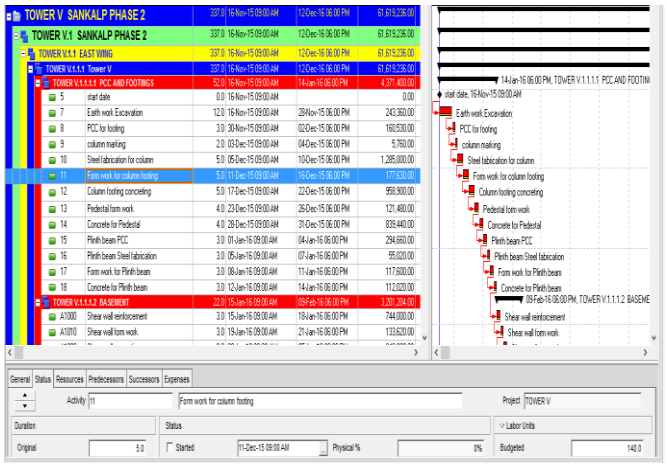

Fig. 2: Planning with baseline 1 assigned

Updating the Project

After the assignment of the baseline as and when the project starts executing at the site and the daily what quantity work was completed should be recorded in daily progress report and the same is again updated in the software.

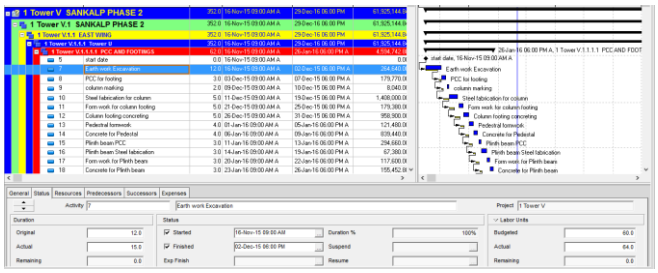

Fig. 3: Resource and work updated in the software

Calculation of Performance Index of the project at 28% duration complete of the project

Cost Performance Index (CPI)

Cost performance of the project can be calculated with the help of below formula. Where EV is the earned value for that activity, AC is the actual cost spent on that activity.

CPI = EV / AC

For example: for an activity earth work excavation,

EV=Rs243360 AC=Rs266440

CPI =243360 / 266440

CPI =0.91

Similarly CPI for all the activities will be calculated till where the project is updated and average of all the updated activity CPI will be taken for the entire project and that value will be considered as the CPI for the entire project till that update calculation.

Schedule Performance Index (SPI)

Schedule performance of the project can be calculated with the help of below formula. Where EV is the earned value for the entire project till where it has been updated, PV is the planned value of the project.

SPI = EV / PV

For example: for the first 28% duration complete of the project

EV =Rs 5954034

PV =Rs 8690833.5

SPI = 5954034 / 8690833.5

SPI =0.69

The reason behind the cost variance and schedule variance in the project study was found because of the reasons like

- Delay due to unpredicted heavy rain.
- Delay due to delay in the arrival of the detailed drawings.
- Delay due to shortage of labours.
- Delay due to few reworks at site.
- Delay due to low productivity.
- Delay due to conflict between the contractor and the owner.

Calculationof estimate at completion (EAC) of the Project for 28% duration complete of the project

The above obtained CPI and SPI value will be used to calculate EAC. EAC helps us by providing an accurate projection of total cost at the final finishing stage of the project. Estimate at Completion can be calculated as
AC=Rs6197780.80
BAC=Rs 61619236
EV = Rs5954034
CPI = 0.96
SPI = 0.69 EAC=AC+ (BAC-EV)/CPI *SPI
EAC= 6197780.8 +6(1619236- Rs5954034)/0.96*.69
EAC=Rs 90233411.84

Calculation of To Complete Performance Index at 28% duration complete of the project

By the obtained value of BAC, EV, AC values the TCPI of the project till that update will be calculated. This calculation acts as the indicator of the efficiency of the project to the management team.
It is said that if the TCPI value is equal to 1 then the project is 100% efficient.
If the TCPI value is more than 1 the project is more efficient than 100% efficient. If the TCPI value is equal less than 1 then the project is not 100% efficient.

TCPI = (BAC-EV) / (EAC-AC)

For this study TCPI obtained was
BAC =Rs 61619236.0
EV = Rs5954034
EAC=Rs90233411.84
AC = Rs6197780.8
TCPI=(61619236−5954034)/
(90233411.84−6197780.8)

TCPI = 0.662

The obtained value of TCPI was found to be less than 1, so that indicates the efficiency rate of the project at this point of time is found to be 0.662 i.e. it is at 66% efficient. And the EAC value was very high of Rs90312431.65 corer so to cut down the cost overrun which might occur and might increase the duration of the project if the same efficiency continues. So to improvise the efficiency few changes in the initial plan were required. So the team decided to do the changes from the base plan.

Rolling wave planning and creating secondary baseline and updating of project

Rolling wave plan is nothing but a few changes in the initial base plan. As the project executes depending upon the nature of the work the planning also keeps changing to the betterment of the project.

In this project study the base plan was revised by crushing of the activities i.e. duration of the activity is cut down by increasing the labors per day so that the quantity of work completed per day is increased and a few activities where the work could be done simultaneously was scheduled in such a way that with no much difficulties both activities are carried out simultaneously. And also if possible where ever it was possible to start the activity earlier than the planned start was done.

For example,

The activity formwork for roof had 8 numbers of days initially so in the rolling plan this activity was decreased to 4 days by increasing in labor per day i.e. by allocating later 4 days labor to the first four days itself.

The activity reinforcement of steel was scheduled to be done after form work but in the rolling plan the reinforcement was planned to start with form work after a lag of three days.

After making all the necessary changes the change in plan was made as the secondary baseline. And again updating of the executed work in site was done and was implemented to software.

After rolling plan. Initially the project was planned for 337 days after the first updating since the duration was extended than planned and to improvise the efficiency if was necessary to cut short the activity duration by increasing labours per day. So the activity of roof form work from ground floor to roof form work till 8th floor which was of 8 days with 23 carpenters and 23 helpers per day initially was reduced to 4 days and resource was increased to 46 carpenters and 46 helpers per day. Due to this change in the critical path of the activity the total duration of the activity reduced to 314 days and due to this crushing of activities the start date of the consequent activities were also found to be started earlier after the formwork of ground floor.

Calculation of Performance Index of the Project at 40% duration complete of the project

CPI = EV / AC
For example: for an activity ground floor column form work,
EV=Rs117860 AC=Rs133710
CPI =117860 / 133710
CPI =0.88

Similarly CPI for all the activities will be calculated till where the project is updated for the second time and average of all the updated activity CPI will be taken for the entire project and that value will be considered as the CPI for the entire project till that update calculation.
SPI = EV / PV

For example: for the first 40% duration complete of the project
EV =Rs13298473
PV = Rs17043840
SPI =13298473 / 17043840
SPI =0.78

Calculation of Estimate at completion of the Project at 40% duration complete of the project

The above obtained CPI and SPI value will be used to calculate EAC. The EAC provides with an accurate projecting of cost which might occur at the finish of the project. Estimate at Completion can calculated as

AC=Rs1403483.88
BAC = Rs61619236 EV = Rs13298473 CPI = 0.95
SPI = 0.78
EAC=AC+ (BAC-EV)/CPI *SPI
EAC=14030483.88 +
(61619236−13298473)/(0.95*0.78)
EAC=Rs79240690.36

Calculation of To Complete Performance Index (TCPI) of the project at 40% duration complete of the project

By the obtained value of BAC, EV, AC values the TCPI of the project till that update will be calculated. This calculation acts as the indicator of the efficiency of the project to the management team.
It is said that if the TCPI value is equal to 1 then the project is 100% efficient.

If the TCPI value is more than 1 the project is more efficient than 100% efficient. If the TCPI value is equal less than 1 then the project is not 100% efficient.

TCPI = (BAC-EV) / (EAC-AC)

For this study TCPI obtained after second updating was
BAC = Rs61619236
EV = Rs13298473
EAC =Rs79240690.3
AC = Rs14030483.88
TCPI=(61619236−13298473)/(79240690.36−1403 0483.88)

TCPI = 0.74

It's seen that the cost for few activities is slightly more than that of the planned cost. The reason for the cost overrun of the activities is as below:

- For the activity Earth work excavation due to unexpected heavy rain the excavated area was filled with water so an extra expense of dewatering and again compacting the soil was necessary which caused a slight increase in the cost.
- For activity PCC of footing the activity which was supposed to be done within 3days was extended to 5 days work by this the cost was increased
- During activity column marking the activity was started late by a day than scheduled day because the column design plan was not finalised and delivered to the site at proper time. This was because of lack of communication and lack of co-ordination.
- For the activity steel fabrication due to uncertainty in planning of resource the work could not be completed within the specified duration and duration got increased leading to increase in the labour cost.
- And finally at the end of the activity due to unexpected weather condition, electrical bill, travelling charges etc. an extra amount of expense was seen
- During the shear wall reinforcement activity it was found that due to shortage of labour the activity got delayed in turn leading to increase in cost.
- For activities like column marking and starter concrete of both first floor and second floor it was necessary to increase the labour per day due to lack of productivity due to extreme hot weather so there was no other way to complete the work on schedule other than by increase the labour slightly which ended up in increasing the cost overrun.
- In activity column steel reinforcement due to lack of planning of resource the work could not be completed within the specified duration and duration got increased leading to increase in the labour cost.
- And also few expenses like rework due to non-verticality of the column and raise in the price of the resource was seen which caused their effect on the project cost.

Cost Performance Index of the project

After updating of the project for base line 1 till 28% of total duration and after assigning of rolling wave plan and again for the second update of 40% of total duration the cost performance index of the project was found to be that Due to all the cost overrun in the activities as mentioned earlier for the variation in the actual cost effect, when we calculated the cost performance index of each and every activity individually depending on the cost overrun the CPI which should be 1 for the activity for which there is no variation, and for activities cost shows a decrease in the performance index by decreasing the value lesser than one i.e. showing 0.91, 0.72,0.82 etc. which indicates that there is a cost overrun for that particular activity with values less than one.

Schedule Performance Index

After updating of the project for base line 1 till 28%, of total duration, and after assigning of rolling wave plan and again for the second update of 40% of total duration the schedule performance index of the project was found as shown in the below graph graph explains the planned number of days for the specified activity and after execution started at the site what was the actual number

of days that particular activity was taking, by which the SPI of the project was computed.

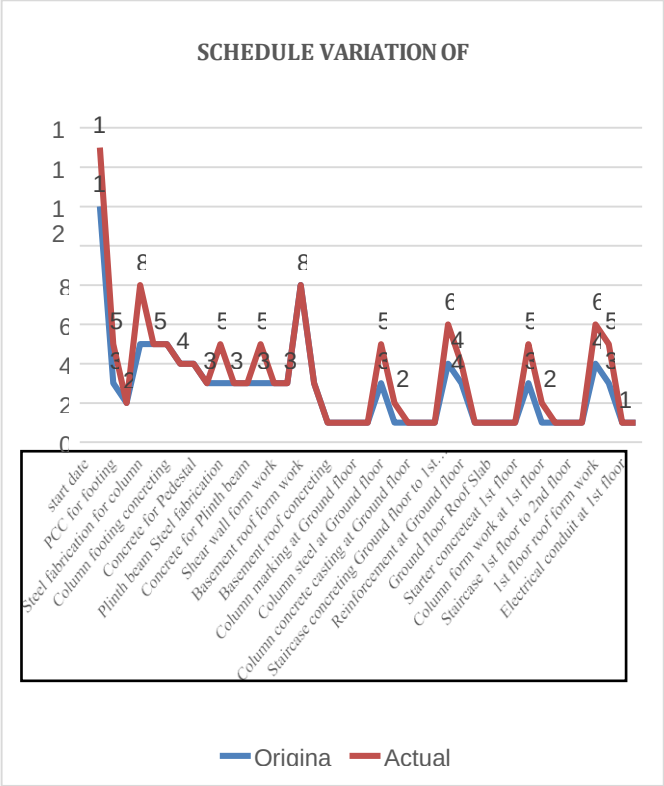

Fig.4: Graph indicating the Schedule variation of the activities

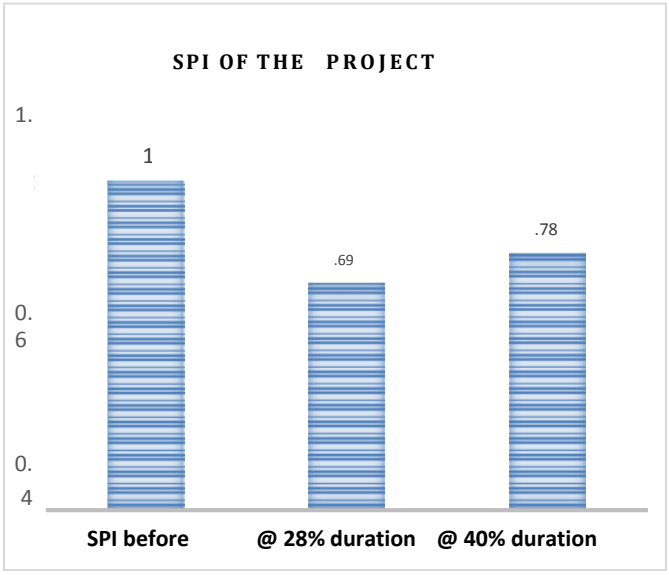

Fig. 5.4: Graph indicating SPI of the project

From the above graph it's seen that the SPI @ 28% duration complete was found to be decreasing, which was supposed to be 1 was decreased to 0.69 due to the delay in the activities. And SPI @ 40% duration complete of the project is showing a small improvementation of 0.78 after the rolling wave plan which indicates that the project is improvising schedule wise.

Estimate at Complete

Table.1: EAC for the updated activities.

NAME	BUDGETED COMPLETE	EAC @28% duration complete	EAC @ 40% duration complete
ESTIMATE AT COMPLETE	Rs61619236	Rs90233411.84	Rs79240690.36

To Complete Performance Index

Table.2: TCPI for the updated activities.

NAME	START OF THE PROJECT	TCPI @28% duration	TCPI @40% duration
TO COMPLETE PERFORMANCE INDEX	1	0.69	0.74
Date	16/nov/15	23/feb/16	27/apr/16

5. CONCLUSIONS

- With help of this study it was proved that Planning and scheduling was found to be more efficient in Primavera P6 8.2 than in excel.
- Using Primavera the initial planned cost and planned schedule was found out.
- Daily updating was done using Daily Progress Report from the office those updates where incorporated into Primavera.
- Keeping track of project expenditure helped in improvising the existing plan by introducing roller wave plan which in turn helped in improvising efficiency rate increment.
- Using cost variance and schedule variance calculation of Cost Performance Index and Schedule Performance Index was found to be easier to analyse in software and a variation of SPI from 0.69 to improvement of 0.78 was seen, after changing of the plan.
- Further it also helped in calculation of To Complete Performance Index which indicates the efficiency of the project i.e. the variance of 0.69 was made to improve to 0.74 after the change of plan.

- It was seen that monitoring of the project was easily done in software by implementing the above methods.

- Overall incorporation of Primavera P6 8.2 in the project helped in easy controlling, tracking and improvising the plan and more beneficial for the project. So it's advisable to implement project management tools for the improvement of the project.

REFERENCES

1. De Marco A; Briccarello D; Rafele C. (2009). "Cost and Schedule Monitoring of Industrial Building Projects: Case Study." Journal of Construction Engineering and Management, Vol. 9, Pp. 853-862. - Issn 0733-9364.

2. Virle, Rajesh, Mhaske, Sumedh "Application of Earned Value and Earned Schedule to Construction Project "International Journal of Scientific Engineering and Research (IJSER)www.ijser.in ISSN (Online): 2347-3878 Volume 1 Issue 1, September 2013.

3. MD Imran Khan, Maneeth P D, Brij Bhushan S "Project Monitoring and Controlling Using Earned Value Method" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 02 Issue: 07 | Oct-2015 p-ISSN: 2395-0072.

4. Samuel K. Ansah and Emmanuel Bamfo-Agyei "Effectiveness Of Monitoring Systems For Controlling Project Cost In The Construction Industry"www.ppml.url.tw/EPPM/conferences/ 2012.

5. Sagar K. Bhosekar, Gayatri Vyas " Cost Controlling Using Earned Value Analysis in Construction Industries" International Journal of Engineering and Innovative Technology (IJEIT) volume 1, Issue 4, April 2012.

6. Pramod M, K. Phaniraj, V. Srinivasan "Monitoring System for Project Cost Control in Construction Industry" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181Vol. 3 Issue 7, July – 2014.

7. Reda Abbas Sabry "Construction Project Forecasting "Practical Use of EV Metrics" Management Studies, ISSN 2328-2185 March 2014, Vol. 2, No. 3, 168-178.

8. Katia Rizkallah, Assem Al-Hajj "Earned Value in the UAE Construction Industry: Awareness Efficiency and Areas Of Improvement" Proceedings of the CIB W78 2012: 29th International Conference – Beirut, Lebanon, 17-19 October

9. Hui Li "Study on Construction Cost of Construction Projects" Asian Social Science volume 5 number 8 August 2008.

10. Aarthi T.R, Sasikumar V "Cost Control Technique in Building Construction" International Journal of Advanced Research Trends in Engineering and Technology (IJARTET) Vol. II, Special Issue X, March 2015 in association with HOLY GRACE ACADEMY OF ENGINEERING.

11. Muhammad Waris, Mohd Faris Khamidi, and AraziIdrus " The Cost Monitoring of Construction Projects through Earned Value Analysis" KICEM Journal of Construction Engineering and Project Management Online ISSN 2233-9582 42 Received June21, 2012 / Accepted November13, 2012.

12. PMBOK3rdEnglish Keith Lockyer BSC Emeritus Professor of Operations Management, University of Bradford James Gordon P~DM, SC, DLC, CEng, FIEE. FAPM, FRSA Project Management Consultant, "Project Management and Project Network Techniques Sixth edition of Critical Path Analysis and Other Project Network Techniques" Chainnan BSI Committee on Project Management, Convener IS0 Working Group on 'Guidelines to Quality in Project Management.