Time and Cost Analysis using Project Planner Software

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Abstract: Construction companies are always looking for improvement in planning, scheduling, monitoring and controlling of a project, for which many methods have been developed and worked out. Most of the construction projects have time and cost constraints, which will affect the whole project, the projects are either planned and scheduled by traditional methods or by the use of a project planner software. The traditional methods have failed to achieve the desired result and it is very time consuming as it is based on paper work. This can be eliminated or reduced by the use of the Project Planner Software. The present study demonstrates the use of Primavera (P6) software in construction project for which a case study of (Stilt+7) building is adopted. The construction activities were scheduled and analyzed in Primavera (P6), results obtained from Primavera (P6), the total project duration of 511 days out of which 467 days are critical inculcating total construction cost of ₹5,62,95,785/-. The results obtained clearly indicate that the project is behind schedule, hence necessary actions must be taken to bring the project on schedule. The result also indicates that use of Primavera (P6) eliminates lots of paper work, minimizes the chance of delay by taking necessary action and keeps the project within the budget.

Index Term: Construction project Planning, Scheduling, Tracking and Primavera (P6).

I. INTRODUCTION

The Construction industry is an integral component of a nation's infrastructure and plays an important role in economic growth through multiple effects on other sectors of economy. Companies are always looking for improvements in equipment features, communication tools, efficient management techniques, and training human resources. Many problems and issues are being faced by the construction industry, major of them are cost [7] and time overruns due to inadequate project formulation, poor planning for implementation and improper management during execution. Many analysts state that the average cost of a project goes up by 30% as of the budgeted cost due to improper planning and scheduling. . Large projects become more complex and the ability to exchange information on paper within an organization, on a timely basis, gets difficult. The traditional project management system cannot meet the demands of today's projects, as tremendous amount of information and data on a project are always changing. Project managers from the construction industry state that 70-80% time is spent on communication and 70% of project documentation is paper based [8]. A warning mechanism must be present which can alert the organization about its possible success and failures throughout the project. Project monitoring acts like a warning mechanism; it is the process of recording, collecting and reporting information regarding project performance that the project manager and others wish to know. Primavera P6 is one of the most widely used project planner software's in the construction industry.

II. LITERATURE REVIEW

Study on monitoring and controlling process using Primavera P6 [1].

The Author has discussed about the project monitoring process and has compared the planned progress and actual progress of the construction work of the Standard Design Factory, a four storey (G+3) factory building ongoing project at Cochin Kerala, Total Contract Value of 7 crore, built-up area 5472 Sqm, and expected time to complete within 21 months. The progress at site is incorporated in Primavera (P6) scheduled and updated. The result obtained is, the project is behind the actual schedule, the project progress is 51.73% at 62.48% of consuming total estimated project duration. Schedule Variance (SV) is -11.05% therefore project is 11.05% behind the schedule. The project was delayed by 2.6 months. This investigation proved to be a guideline in understanding the progress of standard design factory construction work and also to identify the progress of the construction work. Primavera (P6) proves to be an efficient tool in monitoring scheduling, controlling and updating the project at any stage of construction process to meet the project requirements.

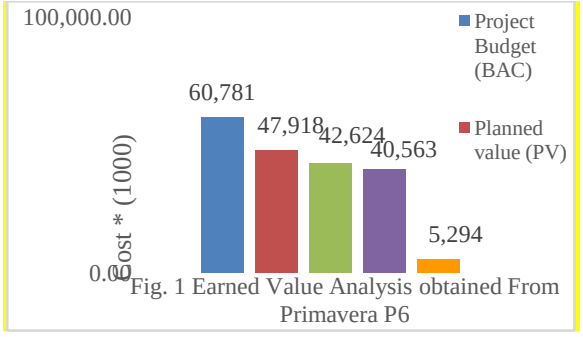

Fig. 1 Earned Value Analysis obtained From Primavera P6

Study on Study on Cost Controlling in Construction Industry [4].

Construction projects are involved with several numbers of tedious activities which cause the projects to suffer from cost and time overrun due to multiple factors. Earned Value Management (EVM) is a project management evaluation technique which gives early indications of project performance to highlight the need for eventual corrective actions. The main parameters involved in the evaluation of project performance and cost management are planned value (PV), Earned Value (EV), Actual Value (AV). In this research earned value analysis software is developed in Visual studio 2008, SQL Server 2005, .Net and is compared with Microsoft Project 2007, Primavera (P6). Two projects analyzed in the above mentioned software and compared for CPI, PD, AD, CV, PV, AC, EV variables were selected. This result shows the strong relationship between software's giving 99.5% of accuracy.

Study on comparison between Industrialized Building System (IBS) and Conventional method of planning and scheduling [7].

The Author discussed about the planning and scheduling scenario of the construction industry. The study conducted was "comparison of time performance of the Industrialized Building System (IBS) and conventional method (Gantt chart, Network scheduling and Line of Balance technique)" to formulate benchmark measures of industry norms for overall time of construction using scheduling simulation modeling. The method adopted was modeling the step-by-step procedure of high rise residential buildings for both IBS and the conventional method. The model was developed using Primavera (P3) project planning software. The various high rise residential building projects were selected for the study. the result of one study clearly indicated that the construction by conventional method requires a total of 912 days to construct an 18 storey high-rise residential building, while a total of 529 days is required using the IBS method. Hence sufficient time saving can be achieved by adopting IBS and can improve the construction of 18 stories residential building with a total 42% of time saving. Figure 2 shows the comparison between Conventional Method of Planning and Primavera Project Planner Software.

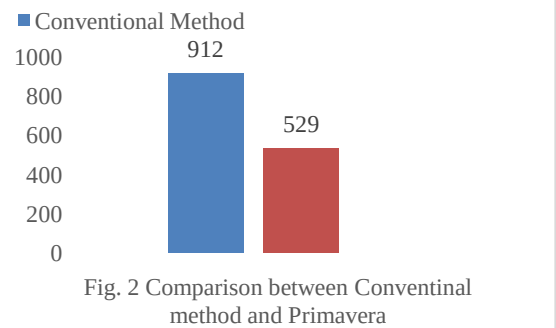

Fig. 2 Comparison between Conventinal method and Primavera

Study on planning and scheduling using Primavera software [8].

The Author discussed that the construction industry is the 2nd largest revenue generating firm in India but due to improper planning, scheduling and tracking of project status substantial amount of time, money, resources are wasted which can be avoided if proper planning and scheduling tool is adopted, the primavera was adopted as a planning tool. The Kalashree developer residential project was adopted as a case study and the data required for research methodology is pre data collection, post data collection. Data collection has been done in three parts DPR, work output of labor and activities with their planned duration. The data collected is analyzed in Primavera software. The study investigated the defects in planning and scheduling procedure, the result revealed that the contractor and subcontractors plays a vital role in the completion of a project scheduled.

III. METHODOLOGY

Methodology involves planning and scheduling of (Stilt+7) RCC building in Primavera P6, a detailed literature survey is conducted in the areas of construction planning and scheduling, for which different case studies and research papers have been referred to provide a background of the study. The flow chart of the study is as shown below.

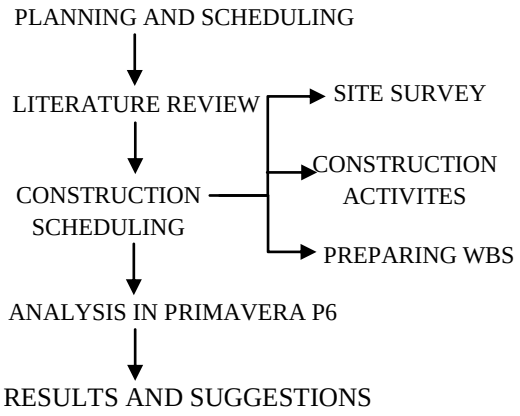

Fig. 3: Study flow chart

The residential building adopted for the case study is an ongoing project. The construction activities are collected from the site in order to schedule in Primavera P6 to find out the current scenario of construction phase i.e. whether the project is as per schedule, behind schedule or ahead of schedule. Details of the project adopted for the case study is as given below.

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

The project construction activities are scheduled in Primavera P6 as per construction sequence, linking each activity with its predecessor and successor. The study involves project monitoring and controlling through Primavera P6, the tools and techniques involved for this process 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.

IV. RESULT AND DISCUSSIONS

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.

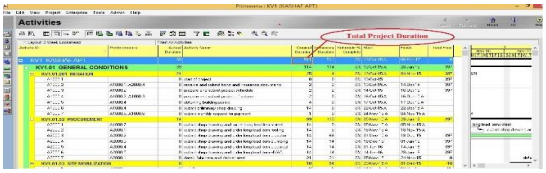

Fig. 4: Total Project Duration

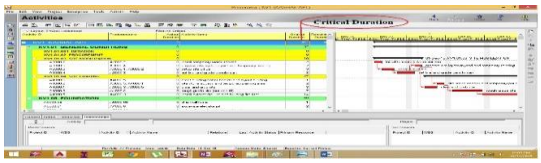

Fig. 5: Critical Duration

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

The earned value of the work has been calculated after including the actual cost of each activity, the project was updated 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): It indicates the efficiency of the project team with which they are utilizing time.

SPI =EV/PV

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

= 0.822

f) Cost Variance (CV): it shows whether the project is under budget or over budget.

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): it is an indicator which shows the cumulative cost efficiency of the project.

- 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

V. CONCLUSION

From the results obtained in Primavera P6, following conclusions are drawn on the basis of

1) The Schedule Variance (SV) obtained is a negative value, hence Primavera P6 gives a warning that the project is behind the planned Schedule at the rate of 17.80%.

2) The Schedule Performance Index (SPI) of 0.822 indicates that the project is working or progressing at an efficiency of 82.2% of originally planned.

3) Cost Variance (CV) and Cost Variance % (CV%) obtained is □11,33,836.8 and 3.656% respectively and both the values are positive hence it indicates that the project is under budget.

4) Cost Performance Index (CPI) obtained is 1.03 hence it shows that the project is within budget.

5) The project is updated in the 11th month from the starting date. According to the planned schedule 64.70% of total was to be completed, but the actual work completed is 46.9%. the project is thus delayed by 3.026 months

The project requires 3.026 months more for its completion i.e. total project duration will be 20.026 months, if project is to be completed within the planned

duration it should be levelled and smoothened by increasing the number of labors and providing the materials on time. From the study it is clear that Primavera P6 is an effective tool for tracking the project progress, cost associated with progress and managing to avoid delays. Primavera P6 eliminates lots of paper work unlike in the conventional method of planning and scheduling.

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