

Application of Primavera & GIS for Effective Project Management

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Abstract—the paper focuses in the perspective of a planning engineer with respect to conventional method demonstrate the benefits of using GIS with construction project management. In this integration of GIS and Project Management is developed using ArcGIS, Primavera, AutoCAD, and Visual Studio to assist construction managers in controlling and monitoring construction progress. Successful project control is a challenging responsibility for all construction managers but when it is complimented with visualization of information, the job becomes easier.

Keywords: Planning, Project Management, Primavera, Geographic Information System (GIS).

I. Introduction

Construction industry plays a vital role in overall development of country. In India, it is the 2nd largest employer after agriculture. However, the growth of this industry has been differential across the nation it is more concentrated in the urban & semi-urban areas. Good planning, adequate organizational machinery and sufficient flow of resources are the pre requisites of an efficient project but not without a warning mechanism which will alert the organization about its SWOT (strength weaknesses opportunities and Threats). Project monitoring is the process of doing the same. . The time available for this process is shrinking day by day as the customers need the finished project at the earliest. Effective project management can help to solve this problem.

II. Material and Methodology

Primavera Project Planner is specialized in managing all types of projects, small, medium and large; throughout the world. It has sufficient functions to help the user plan for the time, resources and cost and then later monitor them. It is used to handle very large and complex projects, especially in the engineering and construction business. Geographic Information System (GIS) is a computer based tool which can be used for capturing, storing, analysing, querying and displaying the geographic information. Modern GIS technologies use digital information, for which various digitized data creation methods are used. The most common method of data creation is digitization, where a hard copy map or survey plan is transferred into a digital medium through the use of a CAD program, and geo-referencing capabilities.

The construction schedule prepared using primavera is not capable of graphical or pictorial representation as well as real time monitoring. Few attempts have been made in the past to inter link project management software's and GIS so as to reap the benefits of both the applications. Primavera gives us a detailed plan & schedule of the works to be accomplished /executed. If this schedule is complimented with a pictorial representation from GIS, it can create a very effective platform for executing as well as monitoring of the project.

Methodology adopted:

Step 1: Creating AutoCAD drawings

The plan of construction project is created using AutoCAD, for which only typical floor plan is used for calculations from which a study area was considered.

STEP 2: Creating work breakdown structure (W.B.S.)

WBS for the project is to be done to make project control effective and manageable.

Step 3: Initiating scheduling process

Primavera P6 software is used as the scheduling tool. The project was scheduled based on the activities identified in the WBS described in Step 2.This tool is used to schedule the project showing the start and completion dates, locating the critical path(s), showing the sequence and interrelationships between the activities.

Step 4: Digitizing AutoCAD drawings to GIS format

After creating drawings in AutoCAD, the dwg files transferred to ArcMap a module of ArcGIS. The topologic data structure of the basic design layers in AutoCAD was created as layers in GIS based on the layers and activities identified in the AutoCAD drawings.

Step 5: Creating feature classes' w.r.t. Activities

The feature classes (Polygons, lines or points) created for activities were merged together into activities defined earlier in MS Project schedule. Thus, the activities which belong together but are located at different positions were joined together as one "feature class". For example all the various components of the Column were merged into one merged feature class called the "BLDGColumn" activity.

Step 6: Creating database w.r.t. feature class, activities

The attributes needed for each layer were created in a database. The database includes information about all the components that are included in a project.

Step 7: Create updates of PRIMAVERA P6 schedule

The percent complete information on the activities is entered in the database. This information will be used in step VII to calculate the percent complete for each activity, which is obtained by calculating the average of the percent complete of the activities.

Step 8: Run-time application

The run time application is developed using Visual Studio 5.0 in C# language. With the help of this run-time application a User Interface was developed. Here the user would come to know about the location of the source file. The user interface displays present date and time. It has drop down lists for the user to select accordingly.

Step 9: Import information about activities and update GIS database

The percent complete information is transferred with the help of custom run time application to PRIMAVERA P6 every time a progress evaluation is made and the application is run. PRIMAVERA P6 was run to generate the updated schedule network. The updated schedule shows the progress for all the activities as of the new date of the update (e.g. at the end of every month or daily updates) and the percent complete information.

Step 10: Showing progress of activity in 3-dimensional view

The project's 3D view was created in Arc Scene a module of ArcGIS. The activity layers created in Step V were converted into 3D layers in Arc Scene.

Step 11: Preparing report as per required format

The progress of work was shown in graphical format and in different colors. The amount of work done on the various activities could be seen in 3D view. The project was updated as progress information became available and the corresponding MS project schedule was sent to Arc Scene. The updating was done with the help of a custom runtime application.

III. Study Area

The integrated tool developed will be used for proposed 96 row houses at Vasai. The project started in the year 2015 to be completed by 2017.

IV. Expected Outcome

1. Learning & understanding project management software primavera p6 & GIS software ArcView GIS.
2. Creating an application meant for project management & scheduling using Primavera & GIS.
3. To get pictorial representation of all the project schedule of mega project.

V. Discussion & Suggestion

The Construction Industry has a huge number of tasks involved and cost involved in these projects is also very large. The Project Managers have a hard time monitoring the projects between site and office. They have to come on site to know the progress of work and decide the sequence of work. They are generally confused on what to do next or what would be the changes faced by them in future. So the cost involved is large and it varies w.r.t. to the completion of the project i.e. time. The traditional approach for scheduling and progress control techniques such as bar charts and the critical path method are still being used by the project managers for planning which a serious disadvantage for the decision is making purpose as the spatial aspects fail to provide the required information.

There is pressure on the project managers to shorten the delivery times and thus the current scheduling and progress reporting practices are in need of substantial improvements in quality and efficiency. Integration of Geographical Information System (GIS) and project management software's with visualization was recognized as one of the most important tools for achieving this goal.

The main objective of this piece of work is to display the progress and sequence of construction work in 3-D while synchronizing this information with a formal CPM work schedule. This would help all parties involved in a construction project to visualize the progress in a natural way, hence minimizing delays and cost overruns. In addition to monitoring the schedule, the system can also be extended to monitor quantities of materials, costs, and resources.

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