

EFFECTIVE PROJECT MONITORING THROUGH THE INTEGRATION OF GIS AND PRIMAVERA

Rohit Suresh Bhandare

M. TECH (construction management)

Sardar patel college of engineering, Andheri. Mumbai

Dr. P. H. Sawant

Professor, Sardar patel college of engineering

Abstract -

In construction project number of stakeholders are involved to make a project a big success such as contractor, architects, and engineers and sub-contractor and so on. A project in construction industry contains information in the form of spatial (drawings, layouts, etc.) and non-spatial form (schedule, quantities, cost estimates) are stored using different available tools. Throughout the lifecycle of the project, the software's from a different discipline (architecture, structural, construction) are used to maintain as well as analyze such information. Drafting department uses CAD tools, panning department uses primavera and MSP. Information flow among various department of an organization working on a project is not through well-defined standards and procedures, which result in data redundancy and poor information quality. The overlap and Lack of consistency among information causes construction errors and can lead to miscommunication which can be expensive and time-consuming. To overcome these shortcoming spatial and non-spatial data need to be maintained in a single environment so that if any changes need to be made in documents will be made at one place only schedule, drawings, quantities of the construction project will be consistent to each other. GIS can improve design and planning efficiency because it can integrate locational and thematic information in a single environment. The study focuses on integration of GIS and project management is developed using ArcGIS, PRIMAVERA, and Revit to assist the construction manager in controlling and monitoring construction progress.

Key Words: GIS, Spatial and non-spatial data, PRIMAVERA

1. INTRODUCTION

Primavera P6.

It is a primarily a visualization tool, which has ability to exchange complex ideas among project participants with the use of primavera it has become easy to generate and reuse the information for construction projects. This is a CIEPM (computer

integrated enterprise project management) concept which allows the meaningful extraction of project management data, information and knowledge from the participants beyond their imagination. Its applicability is not limited to one particular phase of construction project in fact it can be applied to the entire life cycle of construction project including, planning and designing, construction and operation and maintenance phases

Application of primavera project management

- Basically, project management deals with project cost and resources so these software enables an organization to deliver project on time and on budget through reuse of best practices
- Primavera stores all project in single database system, which gives greater flexibility, increased efficiency, consistency, repeatability and can save organization time and money
- Big organization deals with complex and multilevel projects so it is necessary to have strong coordination and centralized resource management, higher level reporting about project and resources all these can be achieved with the use of primavera
- One of the most valuable and expensive assets is human resources and is often become difficult to maximize its productivity and cost – effectiveness, so in EPM we have optimizing resources across organization for proper survival
- Primavera defines hierarchy in project from top level to bottom level and can associate responsible person on individual project so, it directly/indirectly, assign the responsibility, accountability and authority over the work heads.

Geographic Information System (GIS)

A tool that has flourished within civil engineering in recent years in GIS. A GIS is a computer system for processing (assembling, storing, manipulating and displaying) geographically related information. GIS is a spatial class of information system which has four components involving a computer system. GIS activities may be grouped into spatial and attribute data management, data display, data exploration, data analysis, and modelling. The spatial and non-spatial data in GIS are synchronized so that both can be queried, analyzed and display spatial data is related to geometry of feature, while attribute data stored in the tabular form described the characteristic of different features of layer in GIS. Each row of table represents a feature while column represents characteristic of features. The intersection of column and row shows a value of particular characteristic of that features.

GIS uses vector and raster data model to represents the spatial features.

GIS has been recognized in a majority of the civil engineering discipline as a beneficial technology. The GIS which combines a CAD like design program with a relational database management System for spatial data analysis, appears to have potential in solving these problems. GIS is a promising tool for solving construction layout problems and thus open up a new way thinking for the management of spatial information in construction planning and designing. Database is a essential part of any information system employed for construction management so the usefulness of GIS need to be explored. GIS not only speed up the modelling process and data extraction from the various resources but ensure data integrity and accuracy also GIS form an effective foundation for planning construction activities.

Methodology adopted

1. Creating work breakdown structure

WBS for the project is prepared to make project control effective and manageable

2. Initiating scheduling process

Primavera p6 software will be used as scheduling tool. the project was based on the activities identified in the WBS described in above step. This tool is used to schedule the project showing the start and completion date, locating the critical path, showing the sequence and interrelationship between the activities

3. Creating REVIT model

The model of the construction project will be created using REVIT

4. Digitizing REVIT model to GIS format

After creating model in REVIT, the layers were converted into IFC file. The IFC file will be converted to a (.gdb) file which is compatible with GIS. By using data interoperability extension, the (.gdb) file can be opened in ArcGIS software.

5. Importing the schedule

The schedule prepared in primavera will be imported to excel which was then converted to a geodatabase file to be compatible with ArcGIS

6. To exporting file from primavera to GIS

For exporting construction schedule prepared in primavera SDK extension of PRIMAVERA is used to covert excel file to (.gdb) file

7. For converting IFC file to (.gdb) file

To carry out these process data interoperability, extension of ArcGIS will be used. By using Data Interoperability extension, the (.gdb) file can be opened in ArcGIS software

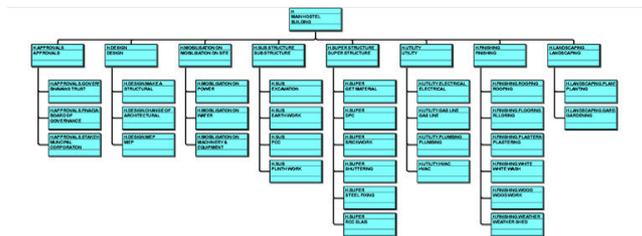
8. Linking of schedule and model

With the help of the data Interoperability extension and software development kit interlinking of schedule and 3D model can be done

work break down structure building

Work break down structure or WBS is the name given to a technique in project management in which the project is broken down into manageable chunks. WBS represents task-oriented family tree of activities and organizes, defines, and graphically displays the total work to be accomplished in order to achieve the final objective of the project. This provides a central

organizing concept for the project and serves as a common framework for the exercise such as planning, scheduling, cost estimating, budgeting, configuring, monitoring and controlling the entire project. Thus, it should be intuitively clear that for a complex project, grater care is required in formulating a successful WBS.



Work break down structure

Schedule of construction activities using Primavera

Preparing project schedule is extremely important due to a number of reasons. Project schedule is the basis of extracting a number of other schedule and information. Even at the tendering stage, project schedule needs to be prepared although there may not be required information for preparing project schedules. Project schedules are helpful not only for a contractor, but for the owners as well. In order to draw up a comprehensive schedule, the steps mentioned below must be systematically followed

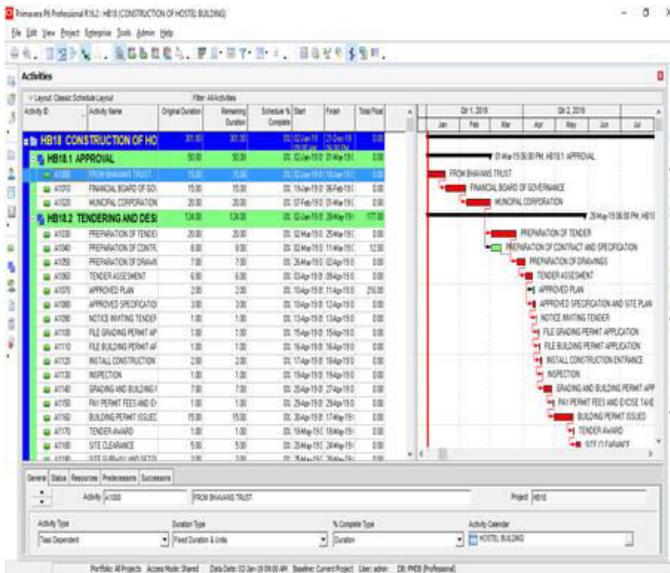
Identification and classification of tasks: This is the first critical step wherein all individual task or activities required to complete the project are listed out.

Defining duration of a task: This is essentially the first iteration at estimating the time duration involved in completing the different task. All available information should be used to make an accurate estimate of the duration of each task, and depending upon the nature of the project and activity, the estimated time may be given in hours, days or months.

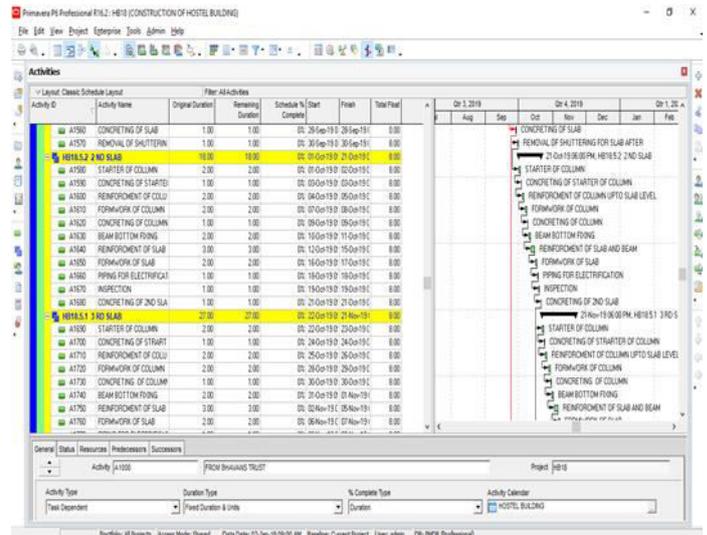
Task sequence: activities in a construction project may appear to be independent, but often depend upon each other – for example, the painting in house is done by an independent agency, but the work can commence only after the plastering of the walls is completed. Continuing with the help of house construction, there is obvious interdependence in electrical, plumbing and finishing works. Although it appears trivial, such issues of inherent logic and processor and successor tasks should be sorted out at the outset to reduce the possibility of difficulties later on.

In larger projects, it also helps to identify tasks that can be completed or carried out at the same time. Such tasks or others that require careful handling, may be flagged at the outset and special attention paid to their progress and any possible slippage. To that extent, it may be noted that an easy to understand depiction of relationships between different activities is an important function of the project planner. Different methods of such representation, such as a network diagram, are available and discussed in greater details elsewhere.

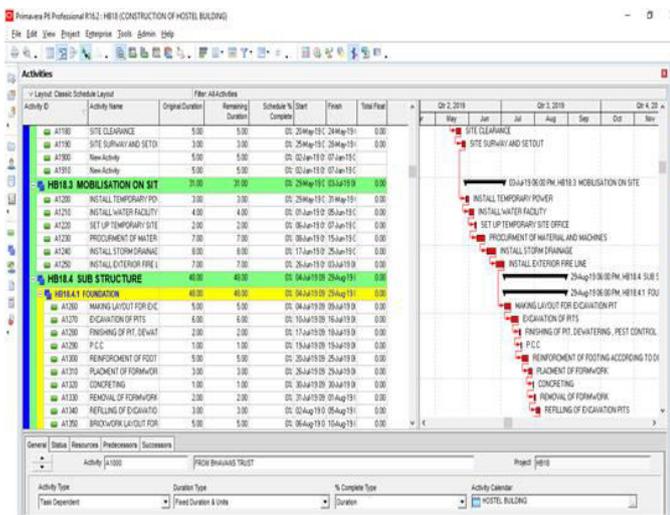
Creating a calendar of events: once the list of activities, their interdependence and the time involved in completing them the step above, a calendar of events can be easily created highlighting the milestone events.



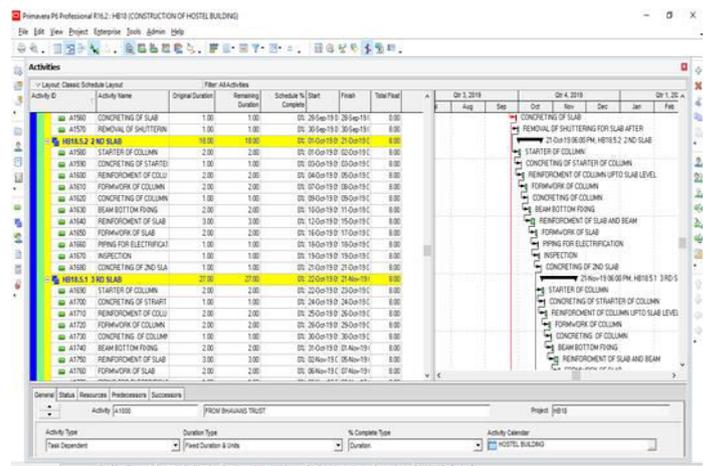
Schedule prepared in primavera



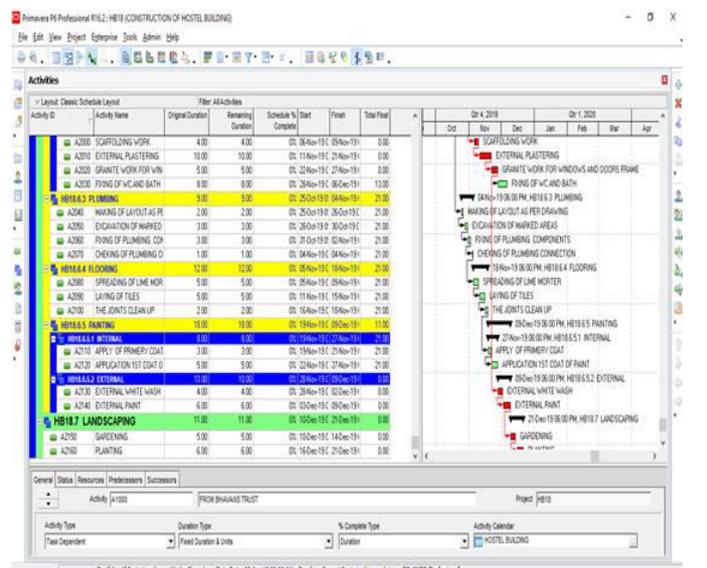
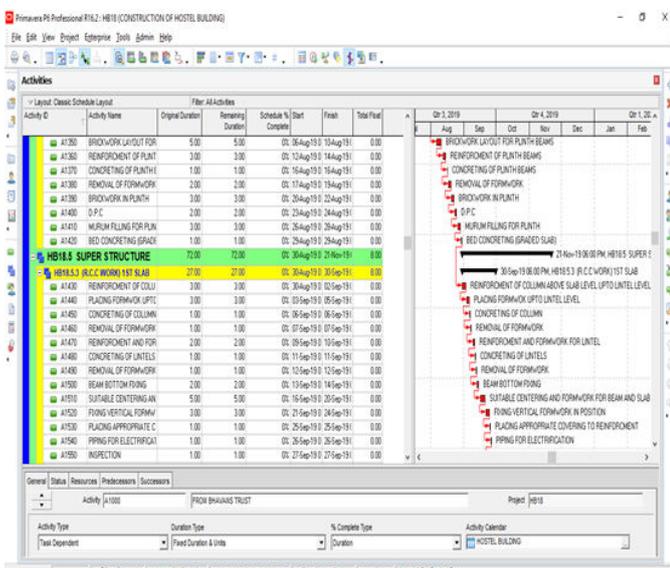
Schedule prepared in primavera



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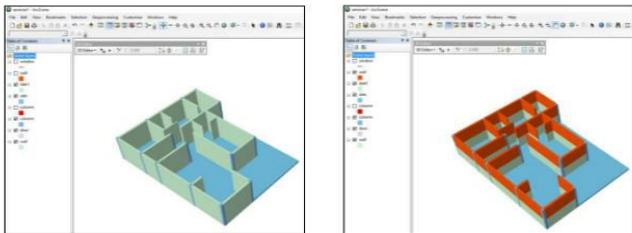


Schedule prepared in primavera



Integration of model and schedule

Revit data can be transferred into ArcGIS, which is a module of GIS. Revit model is to be exported into an IFC file and then data interoperability is used to import that into the geodatabase. Detailed schedule prepared for the activities of the building has to be imported to ArcGIS software for the purpose of interlinking it with the 3D simulation output. The prepared schedule is to be saved in Excel format and it is to be exported with the help of exporting option in PRIMAVERA. The detailed schedule which is prepared in PRIMAVERA software is to be exported and stored in GIS database. The attribute data in the Excel file may get lost if it is imported into the GIS software in Excel workbook format. CSV (comma-delimited) format is able to transfer data from one application to another application without losing any data. This imported schedule can be updated at any stage of the project. The most crucial step in the overall simulation of the project involves the integration of 3D drawings which are transferred in ArcGIS and schedule prepared in PRIMAVERA to provide better visualization of construction progress of the project. The dynamic linkage helps in detecting deficiencies and logical errors in the scheduled project. Every activity in the project is provided with a time component. Interlinking between scheduled data and drawings can be done only if the activity layer names and IDs for activities are the same. It will keep only the matching records in both digital data. Unmatched records will be left as null values for all the remaining fields in the attribute table. After interlinking of spatial and non-spatial data of the building, 4D view of the building can be presented in a single screen environment.



3. CONCLUSIONS

Conventional techniques of scheduling fail to link information pertaining to spatial aspect of a construction project. The methodology adopted in this study integrates construction schedule with corresponding spatial component to increase the understandability of the construction sequence. This link provides great understanding in the project sequence and helps in detecting early possible problems in the schedule. Conventional schedule only conveys what is built when and schedule linked in GIS conveys what is being built when and where.

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