

# Application of Building Information Model (BIM) for Metro Rail Project

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**Abstract**— This paper analyzes various models and levels of implementation used in building information model suitable for metro rail project. This paper proposes workflow and process flow to be implemented in complex projects like metro transit rail. In India, BIM implementation in transportation project follows traditional approach and construction sector is conservative for implementation at planning stage. Also, study refers to the case study of Nagpur metro for 5D level of BIM with successful outcomes.

**Index Terms**— Building information model (BIM), construction, infrastructure, lifecycle, metro rail, processflow, workflow

## 1 INTRODUCTION

BIM is a platform with integrated set of software, 3D models and databases. As per the Autodesk, BIM is defined as “an intelligent 3D model-based process that gives architecture, engineering and construction professionals the insight and tools to more efficiently plan, design, construct and manage buildings and infrastructure”. BIM model starts with 2D drawings with representation of plan of a particular structure with detailed design. It gets developed to a 3D models incorporating geometry and textures to the design as per the design requirements. At this stage, various sections are developed in the form of prototype of the actual structure to test functional behavior of the structure without building it. BIM consists of all the engineering data, contractual provisions, scheduling, cost estimates, resource allocation and all required design parameters. BIM provides wide range of functions such as co-ordination over workflows, estimation, documentation, modeling and planning. This information is not only useful during the design and construction phase of a building project, it can be used throughout the entire building life-cycle representing a reduction of the operation and management cost of the building which is significantly more than the entire cost of construction. The nature of the components that make up a BIM (3D models and project information) will evolve throughout the development phase of a project. Duly resulting in a major change in the nature of both the 3D models and the linked information. This observation particularly serves to reinforce the importance of the process, rather than the model itself; building information modelling is a dynamic process.

## 2 KEY FACTORS FOR SUCCESSFUL IMPLEMENTATION OF BIM IN METRO PROJECTS

### 2.1 organization level

This is easier with communication across all the departments and project teams. Effective training programs for staff and project coordinators helps to build confidence levels and support throughout the disciplines. Long term vision from planning stage till operations and maintenance stage will reflect successful project management.

### 2.2 Project level

Detailed planning and implementation plan of proposed designs will help to implement desired project in time. Using BIM systems, cost and time parameters can be incorporated in projects like metro rail where huge investments and timelines are at stake. 3D models helps to visualize working of structure before actual construction.

## 3 FACTORS FOR COST SAVINGS

Following are some key factors which leads to cost savings

throughout the project lifecycle:

- Effective design review for information compared to manual processes
- Automated quality assurance and flaw detection mechanism
- No-site validation of documents and online review
- Dynamic dashboard for periodic project updates

## 4 CENTRALIZED PLATFORM

Metro rail projects consists of components like viaduct, rolling stock, piers, signalling, MEP, etc. Also, design phase consists of engineering, architectural and detailed drawings in 2D format. Integration of all these components is critical. Coordination of all project teams and stakeholders will be required to avoid timely delivery of project without cost overruns. Centralized platform helps to integrate all the system and flow of data across disciplines without any conflicts. All the stakeholders will follow a process flow with defined approval levels to finalize the best suitable design option. Digitization of workflow and processflow helps to standardize process for minimum delays.

## 5 CONCLUSION

This study proposes integrated system to be implemented for metro rail project. This system should be implemented from conceptual stage of project till operations and maintenance stage. Overall approach should be from organization level to project level. Roles and responsibilities of each member of the project shall be well defined for successful results. Metro rail projects shall be implemented in stage wise manner where financial models are integrated with realistic schedules. Projected budgets and approvals with contractual documents should be incorporated at the earlier stage post which required formats of drawings shall be included.

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