

Overview: Implementing Building Information Modeling (BIM) Technology into Project Management, a Case of Ethiopian Construction Industry

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1. Introduction

Recently the construction industry trend is showing tendency to use technological solutions in order to increase efficiency, quality and timely completion in the project management process. However, the sector has been known as resistance of change and experiencing fragmentation of works without proper collaboration and integration [1]. Cost estimation, quantification, scheduling has been main critical decision-making factors in the history of project management [4]. BIM is a newly active digital technology tool focused on sharing and storing information during construction management process among participants of the project and other parties [2] and [3]. The main features in the BIM context are BIM execution plan, BIM coordination (clash detection), modeling (4D, 5D, 6D), level of details and common data environment. In addition to that, BIM technology tools, mainly Autodesk software products is being used in the implementation BIM. Therefore, BIM as a tool represents a new, collaborative environment in which the project team can work together for efficient use of various disciplines and available resources. This research is aimed to assess the awareness level in BIM and how to implement BIM technology in Ethiopian construction industry for better project management process.

2. Methods and materials

Since the BIM is a tool, incorporates various software systems to enhance collaboration and smooth information exchange between the users such as designers, project managers, employers, and final facility managers for various purposes [6]. The primary method used in the study was assessing awareness level of BIM considering different roles in the construction company. The software systems such as Autodesk Revit, Naviswork manage, virtual works were used to simulate and visualize the BIM modeling and implementation process from the start to end and facility management process. Moreover, literatures related with BIM awareness were properly assessed. Table 1 illustrate the BIM collaboration tool with its expected outcomes.

Type of document/material/tools	Process	Expected results
Rivet software, 2018 or 2019	Modeling for (Architectural, Structural and MEP)	Visualization and simulation, 3D, 4D,
Naviswork manager 2018	Project Management	Realization, Clash detection, quantification etc...
Design, Contract, tender documents	Conceptualization, collaboration and cooperation	Digitalization and proper data and information exchange

Table 1 BIM tools and working process

3. BIM simulation and visualization

Based on 3D models created during the design, the visualization and simulation is incredibly visible in a detailed manner and can be represented in geometric or nongeometric references in virtual environment [5] and [1]. Moreover, the level of detail promotes clarity, accuracy, and reliability of the content of a BIM project process. The figure 1 below is showing the visualization of the BIM model.

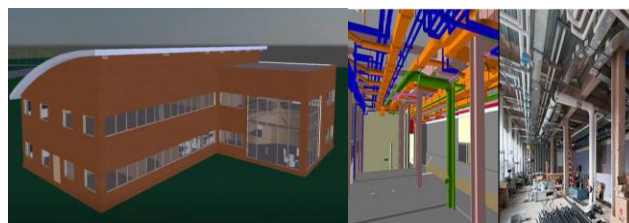


Figure 1 visualization and simulation of design works

According to [3], BIM can effectively integrate the various project teams and disciplines such as;

- architects and engineers (A/E) - starts at concept and design stages
- mechanical and electrical (MEP) – creation of possible modeling process for operation and maintenance
- contractor – builder based on modeling
- the owner - end user of the building for facility management

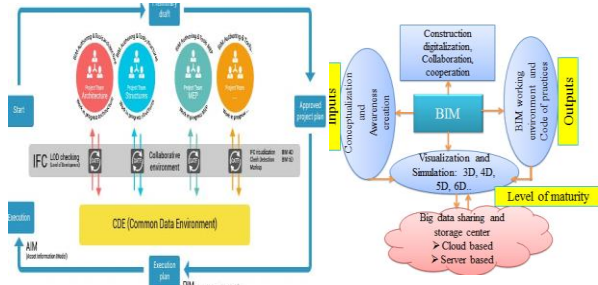


Figure 2 BIM collaboration environment[7]

4. Benefits of the BIM

The benefit of the beam is multifaceted in terms of efficiency, time, cost, energy, collaboration, digitalization, clash detection and quality of the projects. BIM execution plan also allows to manage various project delivery milestones in a collaborated platform. The following list of benefits are among many [8]:

- Better Collaboration and Communication
- Model-Based Cost Estimation
- Preconstruction Project Visualization
- Improved Coordination and Clash Detection
- Reduced Cost and Mitigated Risk
- Improved Scheduling/Sequencing
- Increased Productivity and Prefabrication
- Safer Construction Sites
- Better Builds
- Stronger Facility Management

5. Results and discussions

Implementing the BIM tool in construction sector has enormous potential in terms of reliability and validity in the project life cycle. In the figure 4 below shows the level of awareness related with BIM in various construction sector in Ethiopia. The findings indicate that it is far behind the current trend of BIM ecosystem.

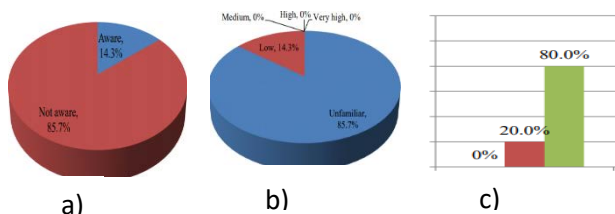


Figure 3: a) BIM awareness level, b) current level of knowledge in BIM c) Use of BIM in public projects in Ethiopia [8]

6. Conclusion

Indeed, the construction company cannot be simply flexible to embrace every new tool since it needs huge investment initially. As result, it remained change resistant. Japan is technologically advanced country in

many aspects including construction sector. In the other hand, Ethiopia is not well advanced and implementing highly complicated technology tools such as BIM might not be simple task. The skill gap and lack of properly synchronized system is challenging problem to adopt and use the BIM ad related tools. The study would conclude that,

- Increasing the cooperation and collaboration with various actors in construction insdutry
- Including BIM as project management tool in university and other education curriculum specilly for civil engineering discipline
- Promote digitalization of construction sector through automation and state of art technology
- Create joint cooperation with japanesse construction compines with Ethiopian counter part
- Develop awarness creation for users such as Architects, designers, construction profewssionals and government policy makers.

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