


Chapter 14

The Implementation of BIM Software in Different Construction Stages

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ABSTRACT

BIM enhances construction industry outcomes by connecting people, technology, and processes by incorporating extensive additional information and facilitating information exchange with project stakeholders. However, BIM software has limitations that have led to reluctance in its adoption. This research aims to explore the positive impacts and limitations of BIM software in various construction stages (pre-construction, design, construction, handover, and closeout), and seeks to improve understanding and find solutions for improvement. The research employed quantitative method by survey approach using questionnaires distributed to consultant parties in the industry. Results show that BIM has brought different unique functions that help assist the respondents. Despite that, limitations of BIM implementation found from the results are due to the lack of knowledge, high cost, and software capabilities to be further improved on. Respondents believed that the most effective solutions to tackle the limitations were mainly involved with education, enhancing BIM tools, and training.

INTRODUCTION

In the construction industry, digitalization and evolving technology have revolutionized work processes. To efficiently handle data in design, construction, and operation stages, the industry has adopted new technology (McPartland, 2017). Building Information Modeling (BIM) software, a key tool in integrating these technologies, is crucial for the industry (GeoSLAM, 2021). BIM aids the construction industry in all stages of infrastructure development. It offers benefits like material analysis, predictive maintenance, and improved efficiency (The Geospatial, 2019). BIM software ensures accuracy, cost-effectiveness, and standardized data throughout the project (Proforma Construction Inc, 2019).

Computer Aided Design (CAD) revolutionized engineering and architecture by replacing manual drafting with faster design creation. However, BIM as an advanced software, offers AI-driven generative design and superior features compared to CAD. BIM utilizes AI to generate multiple innovative projects starting points by manipulating design tools and parameters, leading to a significant increase in quality data (Storrier, 2021). Czmoach & Pekala (2014) described BIM as a 3D virtual model with project information that has expanded to include 7D dimensions, outperforming competitors. BIM provides enhanced scheduling, estimating, sustainability, and facility management. Despite limited adoption, BIM software showcases its advanced capabilities and benefits for construction parties.

Limited BIM understanding persists in the construction industry (Latiffi et al., 2013). Architects and engineers use BIM for accurate 3D modeling, error prevention, and cost control during design (Reyes, 2019). BIM software aids engineers in advanced analysis, simulations, and risk assessment (Aung, 2022). BIM engineers combine software and engineering expertise for improved project safety and efficiency (Latiffi et al., 2013; Aung, 2022). BIM software benefits all construction stages, improving design insight, ROI, cost control, and reducing waste (Singh & Gajjar, 2022). It minimizes rework, streamlines processes, and simplifies data transition, enhancing efficiency (Vinzero, n.d.). BIM enables collaborative project management for successful execution (TeamSystem, 2021).

This research has 3 main objectives. The first objective is to discover the positive impacts that BIM software brings towards different construction stages. The second objective of this research is to identify the limitations that BIM software has during different construction stages. The third objective is to examine the possible solutions that can be done to overcome the limitations.

BACKGROUND

The use of BIM software in the construction industry has greatly impacted all parties involved in construction projects (Liu, 2021). It provides construction engineers with increased protection during site visits and analysis accidents and offers a more intuitive and convenient experience for architectural design and construction. BIM software also performs various calculations, including 3D modeling, rendering, load computation (e.g., wind, snow, self-weight), and analysis of energy use and daylighting.

During the pre-construction stage of a project, initial ideas are considered, and the location and feasibility of the project are assessed. The design phase involves collaboration between architects, engineers, and other stakeholders to develop contemporary concepts. A cost estimate is prepared by the project team, considering factors such as labor, materials, and legal requirements, with input from Quantity Surveyors. The construction stage is led by the main contractor, who oversees resources and project updates,

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