

Integration of Building Information Modelling(BIM) in Civil Engineering Project: A Literature Review

Panjpour¹

Department of Civil Engineering, INTI International University, Malaysia

Research Article

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Abstraction

Building Information Modelling (BIM) has revolutionized the construction industry by introducing new concepts in project planning and development. BIM makes it possible to integrate project data that is comprehensive, such as 3D design, material information, walk-on structures, and digitally angterpusat models.

Introduction

The purpose of tinjauanpustakaini is to investigate BIM integration in sipil projects with an emphasis on benefits, challenges, and implementation. The purpose of this study is to examine Building Information Modeling (BIM) integration via a comprehensive review of literature. BIM is a technology that enables the creation and analysis of digital representations based on the functional and physical characteristics of a construction project. The study's findings indicate that BIM enables more accurate and efficient design by identifying design flaws and potential shapes at the project's inception, hence reducing time and costs. KataKunci: TeknikSipil, TinjauanPustaka, Building Information Modeling (BIM)Abstraction By offering a new method for project design and construction, Building Information Modelling (BIM) has completely changed the construction sector. BIM makes it possible to integrate all project data, including 3D design, material information, and construction

schedules, into a single digital model. With an emphasis on its advantages, difficulties, and application, this literature study attempts to investigate the incorporation of BIM in civil engineering projects. By conducting a thorough literature analysis, this research seeks to investigate how Building Information Modelling (BIM) is incorporated into civil engineering projects. BIM is a technology that makes it possible to create and manage digital representations of a construction project's functional and physical aspects. According to the study's findings, BIM makes design more precise and efficient by identifying possible conflicts and mistakes early on in the project, which saves money and time. Overview The digital technology known as Building Information Modelling (BIM) is transforming the design, construction, and management of buildings. Throughout the course of a project, BIM facilitates better collaboration and data-driven decision-making among architects, engineers, contractors, and owners by generating a digital duplicate of the actual building (Haron et al., 2017). In the

construction industry, the growing importance of BIM stems from its ability to improve project delivery, reduce risks, and improve sustainability (Bui et al., 2016). As the industry continues to evolve, the demand for BIM is increasing due to its numerous benefits, including improved collaboration, enhanced data management, and increased accuracy. This collaborative approach improves communication, reduces errors, and streamlines the construction process, which ultimately leads to increased efficiency, cost savings, and improved quality. By requiring its usage on public projects, governments and regulatory agencies are also encouraging the use of BIM. Because of this, the construction industry is adopting BIM as a common practice, allowing experts to design more cost-effective, sustainable, and efficient structures that satisfy the demands of contemporary society (Santos et al., 2017). In order to improve the overall quality and sustainability of civil engineering projects, the literature review focuses on the integration of Building Information Modeling (BIM) with project management, highlighting its applications and benefits in enhancing project management and sustainability. The study presents a thorough analysis of the current state of BIM adoption in civil engineering, highlighting its potential to improve collaboration, reduce errors, and increase efficiency (Wang & Chen, 2023). A framework for effective BIM implementation is intended to be provided by the review of BIM with project management. The review specifically looks at how BIM can be integrated into structural projects, project management, and sustainability, among other areas of civil engineering. It looks at the opportunities and challenges that exist today in adopting BIM, as well as how it might be used to address problems like waste reduction, energy efficiency, and environmental impact (Yalcinkaya et al., 2016). The research intends to make it easier to integrate BIM in civil engineering projects by providing a framework for BIM capabilities and summarizing the main findings. This will

eventually lead to more effective, sustainable, and superior construction results. In order to provide a thorough understanding of the advantages and disadvantages of BIM adoption, including its potential to improve project management, reduce errors, and increase efficiency, the primary goal of this literature review is to examine the benefits and challenges of implementing Building Information Modeling (BIM) in civil engineering projects (Latiff et al., 2013). By analyzing the current state of BIM implementation in civil engineering, the study aims to identify the key factors influencing its adoption and the strategies that can be employed to overcome the challenges. Additionally, by showcasing best practices and insights from successful projects, the study seeks to examine BIM deployment tactics in civil engineering (Chonget al., 2020). The research is to provide a framework for successful BIM implementation by examining the advantages and difficulties of BIM, consequently improving the general caliber and sustainability of civil engineering projects. In order to better understand how BIM might improve the construction sector, the study will look at how it integrates with project management, sustainability, and other pertinent areas of civil engineering (Vilutiene et al., 2019). The use of Building Information Modeling (BIM) in civil engineering has the potential to greatly increase project management accuracy and efficiency (Hashim Mohammed et al., 2022). Nevertheless, adoption and integration of BIM in civil engineering projects are frequently hindered by a number of issues, such as a lack of knowledge and comprehension of the advantages of BIM, reluctance to depart from traditional practices, and technological infrastructure limitations. Furthermore, there is a dearth of research that thoroughly examines how BIM may be successfully incorporated into all facets of civil engineering projects, from design to completion. This results in a substantial knowledge vacuum that must be filled in order to fully use BIM's

potential to enhance the caliber and efficacy of civil engineering projects. For this reason, this research intends to examine the integration of Building Information Modeling (BIM) in civil engineering projects. Methods of Research This literature review's approach entails a thorough examination of previous studies on the use of Building Information Modeling (BIM) in civil engineering projects. The study will concentrate on a thorough analysis of the merits, difficulties, and implementation methods of BIM as it stands in the field of civil engineering. To find relevant research, articles, and papers, a thorough search of scholarly databases and pertinent periodicals will be carried out. The search will include keywords like "BIM," "civil engineering," "construction," "project management," and "sustainability." The chosen studies will be assessed according to their quality, relevance, and influence on the field of BIM in civil Engineering. The literature review will use a qualitative approach, concentrating on the analysis and interpretation of previous research to find trends, patterns, and themes in the integration of BIM in civil Engineering projects. The methods employed in the chosen studies will also be critically evaluated as part of the review to determine their advantages and disadvantages. The results of the analysis will be presented in an understandable and straightforward way, emphasizing the main advantages and difficulties of incorporating BIM into civil engineering projects. In order to guide future studies and practices in this field, the review attempts to present a thorough assessment of the adoption of BIM in civil engineering as it stands today. Findings and Conversation Implementing BIM in Civil Engineering Projects: Difficulties The lack of standardization and compatibility across various software and systems is one of the main obstacles to the use of BIM in civil engineering projects. Compatibility problems, data loss, and higher expenses as a result of the need for extra software and training might result from this (Yang et al., 2021). Additionally, some users

may find the complexity of BIM software overwhelming, especially those with no prior experience. Another major obstacle is the necessity for major adjustments to construction enterprises' organizational structures and work processes (Abanda et al., 2015). In addition to the need for more data management and storage, BIM necessitates a collaborative and data-driven strategy that may be challenging to execute in conventional, compartmentalized organizations, especially for businesses with limited IT resources. Lack of training and qualified professionals is another significant barrier to BIM implementation: Many construction professionals lack the skills and knowledge needed to use BIM software effectively, and training programs are frequently limited or nonexistent (Yin et al., 2019). This can result in delays, errors, and higher costs because more training and support are required. Another challenge is the need for significant changes in the construction process and project management. Implementing BIM in conventional, linear project management procedures may be challenging since it calls for a more data-driven and collaborative approach. Furthermore, the need for more data administration and analysis may be quite difficult, especially for businesses with less IT support (Abbasnejad et al., 2020). Lastly, a major obstacle to the deployment of BIM is the absence of defined standards and laws. Even though BIM is now a common practice in many nations, there are still unclear rules and laws governing how it should be used. Construction professionals may get confused and hesitant as a result, which might hinder the effective and efficient use of BIM (Jung & Joo, 2011).

Effective BIM Implementation Strategy

A thorough grasp of the organization's aims and objectives is the first step in developing a successful BIM implementation plan. This entails figuring out the precise advantages that BIM may provide the company, such enhanced productivity, less mistakes, and better teamwork. Establishing a strong project

team with the requisite skills and expertise is the next step. This includes identifying key stakeholders, such as project managers, engineers, and architects, who will be responsible for implementing BIM. The team should also include IT professionals who can provide technical support and ensure the smooth operation of BIM software. By establishing clear goals and objectives, organizations can create a customized implementation strategy that aligns with their specific needs and priorities (Liu et al., 2019). The creation of a thorough training program is an essential part of a successful BIM implementation strategy. This includes training on BIM software as well as the workflows and processes required for successful BIM implementation. Training should be customized to meet the needs of each user group and should incorporate practical experience and feedback. The creation of a clear data management plan is another essential component of a successful BIM implementation strategy (Sarietal, 2020). This entails determining the kinds of data that will be used in the BIM model as well as setting up protocols for data management, storage, and sharing. Protocols for data backup and disaster recovery should also be included in a data management strategy. A detailed change management plan is necessary to guarantee the effective adoption of BIM. This entails determining the possible effects of BIM on the workflows and procedures of the company and creating plans to lessen these effects (Shaaban & Nadeem, 2015). Plans for change management should also include training and communication initiatives to assist users in adjusting to the new technology. Lastly, a plan for continuing support and maintenance should be part of any successful BIM adoption approach. This entails monitoring and assessing the success of the BIM implementation in addition to offering continuing training and technical assistance. To guarantee that the company keeps reaping the rewards of BIM over time, a strategy for continuing support and upkeep is necessary.

BIMon's Effect on the Civil Engineering Sector

By offering more effective and efficient digital tools for infrastructure design, construction, and management, Building Information Modeling (BIM) has completely transformed the civil engineering sector. BIM helps engineers and architects visually depict the entire project before construction begins by enabling them to create precise and detailed 3D models (Baarimahetal., 2021). This not only enhances design quality but also enables conflict detection and improved interdisciplinary coordination, which lowers errors during the construction phase. Workflows in the civil engineering sector have become more efficient as a result of the use of BIM. All project participants may access and update the information in real-time thanks to the BIM model's centralized database for all project data (Babalola et al., 2023). This reduces the possibility of data loss or inadequate communication, which often results in project delays and unforeseen expenses. Additionally, since changes made to one area of the model are instantly updated across the whole model, BIM facilitates rapid and simple design alterations (Panah & Kioumars, 2021). BIM has been shown to be highly helpful in reducing costs. It helps anticipate possible issues that may arise during construction with more precise planning and better construction analysis. This reduces material waste and the need for expensive adjustments during the building process. Furthermore, BIM-enabled simulation makes it possible to optimize the use of building materials and techniques, which further reduces project costs. In civil engineering projects, BIM is also essential for environmental compliance and sustainability. Models created using BIM may examine how building affects the environment, including water usage, carbon emissions, and energy use (Yang et al., 2021). As a result, BIM facilitates better decision-making regarding the selection of eco-friendly materials and methods, which leads to more sustainable

growth. The use of BIM also creates chances for technological innovation in the building industry. The integration of BIM with other advanced technologies, such as the Internet of Things (IoT) and artificial intelligence (AI), can further improve efficiency and productivity. For example, IoT monitoring integrated with BIM can send real-time updates on construction status, whereas AI may aid in design optimization and resource management (Nushi & Basha-Jakupi, 2017; Abbasnejad et al., 2020). BIM deployment still faces obstacles, nevertheless, despite its numerous advantages. These include corporate cultural shifts and the need for proper training. The efficient use of BIM may be restricted by a lack of expertise. To guarantee that professionals in the civil engineering sector have the skills needed to fully use the potential provided by BIM, ongoing education and training are crucial (Yin et al., 2019).

In conclusion

According to this research, BIM provides a number of noteworthy advantages that raise industrial sustainability, accuracy, and efficiency. Better coordination, more effective conflict detection, and improved communication amongst project teams are all made possible by BIM integration, and these factors all help to lower project costs and timelines. Despite obstacles including the need for extensive training and a shift in organizational culture, the use of BIM is growing as technology advances and its usefulness in bolstering contemporary civil engineering techniques is recognized. In order to obtain more efficient and sustainable building outcomes, BIM integration in civil engineering projects is thus not only a trend but also a need.

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