

# LITERATURE REVIEW OF BUILDING INFORMATION MODELLING (BIM) CHALLENGES IN THE DEVELOPMENT OF ARCHITECTURE, ENGINEERING, AND CONSTRUCTION (AEC) INDUSTRY

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## ABSTRACT

Infrastructure development is an important part of the economic transformation policy in the Industrial Era 4.0. However, there are still challenges in the Architecture, Engineering, and Construction (AEC) field in the Industrial Era 4.0, namely the need for technological development in sustainable construction, especially in infrastructure projects. The utilization of information technology is one of the strategies to improve performance and competitiveness in handling construction projects effectively and efficiently. Building Information Modelling (BIM) is an information system that processes input into information in the form of building Modelling as a tool in the decision-making process in every stage of a construction project. The research was conducted using the Literature Review method. This study concludes that BIM in Indonesia has been adopted on a limited basis and the majority of construction projects still use conventional methods. The advantages of using BIM technology are (1) able to detect conflicts/errors early or during the planning and be able to prevent them (2) makes the work process faster and minimizes human resources so that it saves costs (3) able to share information completely and quickly (4) assist in decision making during planning and design (5) help build trust and synergy between construction stakeholders and reduce risk. Obstacles in the implementation of BIM in Indonesia are (1) the regulation of governing state development does not regulate in detail the procedures and workflows and outputs of BIM implementation (2) there are still not many experts who have BIM certificates (3) The high cost of BIM investment.

*Keywords:* advantages, Building Information Modelling (BIM), construction, obstacle factor

## 1. INTRODUCTION

Infrastructure development is an important part of the economic transformation policy in the Industrial Era 4.0. However, there are still challenges in the AEC (Architecture Engineering and Construction) field in the Industrial Era 4.0, namely the need for technology development in sustainable construction, especially in infrastructure projects. The utilization of information technology is one of the strategies to improve performance and competitiveness in handling construction projects effectively and efficiently. Building Information Modelling (BIM) is an information system that processes input into information in the form of building Modelling as a tool in the decision-making process in every stage of a construction project. The government has made various breakthroughs to answer the challenges and problems of infrastructure development, among others by issuing regulations related to the implementation of Building Information Modelling (BIM), namely Undang-undang Nomor 2 Tahun 2017 tentang Jasa Konstruksi which states that the Central Government has the authority to develop standards for construction materials and equipment. as well as construction technology innovations and The Decree of Public Work and Housing Ministry number 22 the year 2018 tentang Pembangunan Bangunan Gedung Negara which state that BIM must be applied to non-simple State Buildings with criteria of the area above 2000 m<sup>2</sup> (two thousand square meters) and above two floors. In addition, Peraturan Pemerintah Nomor 16 Tahun 2021 states that the use of BIM is required up to the fifth dimension for types of technology-intensive activities and required up to the eighth dimension for types of mode-intensive activities. The government has issued many regulations related to BIM but there are still challenges faced today to implement BIM. This literature study aims to identify BIM topics and issues, especially in Indonesia.

## 2. LITERATURE REVIEW

Based on a case study of a 20-story building that compares the BIM method with conventional methods, it is known that the BIM method can save planning time by 50%, minimize the need for human resources by 26.66%, and save costs by 52.25%. BIM provides convenience with software integration, can detect design collisions, makes work processes faster, and minimizes human resources to save costs. However, BIM still has drawbacks, including an expensive license price, high hardware specifications required, and not being able to detail images on a fairly small scale. (Adhi et al., 2016)

Several factors support the use of BIM technology, namely BIM can detect conflicts early and can prevent them, BIM can share information completely and quickly, BIM helps in decision-making during planning and design, the use of BIM technology helps build trust and reduce risk, and BIM implementation builds synergy between construction stakeholders. (Nelson & Tamtana, 2019)

The main inhibiting factor in implementing BIM in building construction projects is the lack of management participation in providing motivation, training, and supervision set by the company. Motivation is one of the efforts to make the company more developed and advanced, by motivating employees, employees will contribute according to their abilities as much as possible. Employee training has a close relationship with the work results of employees, with the aim that employees have the knowledge, abilities, and skills following the tasks/jobs they do. Proper employee training can have a good effect on employees so that employees can develop themselves and can understand several things related to their work. Supervision is an activity to control the implementation that can go according to plan and ensure organizational goals are achieved if there is a deviation can find out where the deviation is and what actions are needed to overcome it. The main inhibiting factors can result in the implementation of BIM being ineffective. (Hutama & Sekarsari, 2018)

Based on the analysis of the use of BIM renovation tools in construction renovation projects in Kampar Regency, Riau Province, almost all Regional Work Units carried out renovation projects but did not use the BIM renovation tools method or still used conventional methods because stakeholders still did not understand the provisions stipulated in the Regulation Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor: 22/PRT/M/2018 tentang Pembangunan Bangunan Gedung Negara. Regional Work Units and construction project implementers do not use the BIM renovation tools method in renovation/ rehabilitation projects so the method used is the conventional method. (Husaini, 2021)

The results of the analysis of the implementation of BIM on construction projects in Palangkaraya City, Central Kalimantan Province, contractors' assessments of the implementation of BIM in order of rank are (1) lack of knowledge and education about BIM (2) there are still not many BIM technical experts (3) BIM is considered not yet necessary in small-scale projects (4) implementation of BIM depends on government policies and construction project owners (5) lack of socialization from the government as well as associations and management (6) high costs of the application, training and staff recruitment (7) waste of costs for small-scale projects (8) no the existence of BIM training from the government and associations for private contractors (9) the difficulty of BIM software maintenance (10) lack of motivation and training from the government, associations, and management. (Apriani et al., 2022)

BIM in Indonesia has been adopted by construction actors although it is still limited. The adoption process is carried out both bottom-up and top-down with varying motivations between companies. The advantages of BIM are that it can control construction projects, detect

conflicts during planning, reduce Requests for Information (RFI), reduce material waste, estimate costs, avoid rework, save human resources, simplify documentation and get new projects. The inhibiting factors in the adoption of BIM are the need for a large investment, communication between divisions within the organization, the availability of BIM specialists, the need for continuous training, and most importantly the transition of work culture from conventional to BIM. Apart from these inhibiting factors, the potential for BIM to be implemented in the future is very prospective with the emergence of industry awareness or market trends for BIM implementation (Mieslenna & Wibowo, 2019)

### 3. CONCLUSIONS

BIM in Indonesia has been adopted on a limited basis and the majority of construction projects still use conventional methods. The advantages of using BIM technology:

- a. Able to detect conflicts/errors early or during the planning and be able to prevent them;
- b. Make the work process faster and minimize human resources so that it saves costs;
- c. Able to share information completely and quickly;
- d. Assist in decision-making during planning and design;
- e. Help build trust and synergy between construction stakeholders and reduce risk.

Obstacles to the implementation of BIM in Indonesia:

- a. According to the Decree of Public Works and Housing Ministry Number: 22/PRT/M/2018 about the construction of states buildings, does not regulate in detail the procedures and workflows, and outputs of BIM implementation in several construction phases;
- b. Lack of BIM training and socialization from the government as well as associations and management so that there are still not many experts who have BIM certificates;
- c. The high cost of BIM investment.

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