

# Perceptions of Construction Professionals in Addressing the Issue of Data Ownership in BIM

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DOI: <https://doi.org/10.30880/rmtb.2024.05.02.058>

## Article Info

Received: 30 September 2024  
Accepted: 1 November 2024  
Available online: 1 December 2024

## Keywords

Building Information Modelling (BIM), Data Ownership, Construction Professionals

## Abstract

Building Information Modelling is a collaborative process that enhances communication and productivity among construction professionals. If the data ownership is not recognised, this can lead to data ownership issues in BIM. This study attempts to identify data ownership issues in BIM faced by the construction professionals and to identify the strategies to overcome the issues. Qualitative research method through semi-structured interviews were conducted with five experts in this area. The interview conducted aiming to discover their understanding on BIM data ownership, issues faced by the professionals and strategies to overcome the issues of data ownership in BIM-enabled projects. It can be identified that the issues faced by the construction professionals are difficulties to determine the ownership of BIM model, no standardisation on company guidelines on BIM data use, and conflict among construction professionals. Therefore, the roles and responsibilities of construction team must be clearly distinguished, CDE's security should be enhanced and the current protocol and agreements on BIM data ownership in the project must be emphasized. By considering these issues and strategies, the project parties can work better with each other in the collaborative environment, hence, enhancing the work productivity during project and allow better communication among them.

## 1. Introduction

Building Information Modelling (BIM) is an emerging technology that allows collaboration work among the construction professionals in a project since it can act as the centre platform for data sharing and data exchange during real time. According to Asswad and Gomez (2021), data ownership refers to the individual who is in charge and accountable on the possession of the data including giving permit to others to use the data. The fundamental principle on BIM collaborative environment is the party that share the information in the platform has ownership towards the data. Therefore, when ownership of the data is not recognised by other collaborative parties, this can lead to data ownership issue. In reflection to that, this research aims to identify the issues concerning data ownership in BIM and to identify the strategies that can be implemented to mitigate the issues concerning data ownership for BIM. The BIM platform allow multiple parties to access and contribute to the model during the design process, but there is no clear understanding of who owns the generated data (Ardani *et al.*, 2021). It is crucial to have clear understanding on data ownership in BIM for smooth workflow, avoiding conflicts, and enhancing client trust in BIM-enabled projects.

## 2. BIM Data Ownership

In BIM collaborative working environment, it allows data sharing from each of the construction team member. The data gathered is crucial for the development of the BIM model. The construction team members can have access to the information; however, they are not allowed to use the data for their own interest. This is the loophole in BIM data ownership. Asswad and Gómez (2021) referred data ownership as a party, or an organization owning the ownership rights and has the authority to give permission for other team members to use the data under certain restrictions. Data ownership in BIM is closely tie to collaborative efforts, where construction professionals shared information through BIM platforms. Construction professionals working in BIM modelling have different roles and input throughout the modelling process. For instance, Architect will submit the architectural model to the owner for the purpose of operation, maintenance and marketing (Ardani *et al.*, 2021). When submitting the model to the owner, Architect need to grant a license for them to use the model. Failure to do that will prevent the owner to have access to the model provided.

Collaborative efforts among construction professionals are reviewed by other designers to ensure there are no conflicting elements in the model that could result in data infringement. One of the standard forms of contract applied in BIM-enabled projects is American Institute of Architects (AIA) from the United States of America. The AIA Document E203 under this standard form of contract emphasized on data ownership by specifying that the party transmitting the digital data must clearly indicate that they have obtained either the copyright holder's consent or permission from the author for its use. Thus, it is crucial to recognize the owner of the information and data shared to ensure issues related to copyright and intellectual property can be avoided.

### 2.1 Intellectual Property Rights in BIM

Intellectual property rights protect the owner's creation from being used by others without permission. There are few types of intellectual property including copyright. Intellectual property refers to the assets that were owned by a party that is legally protected that does not necessarily exist in physical form. Copyright provides authors with their rights to their property. In Malaysia, the copyright provision is governed by the Copyright Act 1987 (Act 332). This Act protects the original works of the owner as outlined in the Section 26 of Copyright Act 1987. BIM data and information are considered the property of the author. This elucidate that any person generates the data is the rightful owner. Under Copyright Act 1987, BIM data is classified as "artistic work". Therefore, the owner has the right to the data including sharing the data with others as stated in the Section 27 of the Copyright Act 1987.

### 2.2 Issues Concerning BIM Data Ownership

Issues concerning the BIM data ownership often occur when the construction professionals are uncertain about their ownership status of the model. This uncertainty led to disputes among parties over who created the model and who holds ownership of the completed BIM model. Normally, when the project has completed, the BIM model is given to the owner or party who has the right of the data. Developing the BIM model demands the construction professionals to work in in a collaborative arrangement. Technically, every professional has the right to the data. However, according to Baharom *et al.* (2021), since client paid for the project, they are the rightful owner of the BIM data and model developed.

Another issue related to BIM data ownership is to determine the ownership of the data incorporated into the BIM model. The contractual status of the BIM model can be ambiguous when not clearly defined in contract documents (Baharom *et al.*, 2021). Due to that reason, it hinders collaboration work to be performed effectively. Additionally, it is claimed that there are no standardized guidelines in Malaysia on data ownership and limited BIM standards to define BIM process in collaborative works (Aizat *et al.*, 2019). Ardani *et al.* (2021) further highlight that, in a BIM collaborative environment, issues of data ownership can lead to conflict among the construction parties over the identification of creator of the model and the owner of the completed model.

## 3. Research Methodology

The study on data ownership in BIM collaborative works aims to identify issues and determine strategies to mitigate them. This study adopts a qualitative approach where the data is collected through semi-structured interviews with the construction professionals such as architects, engineers, quantity surveyors, clients and

contractors that have experience in BIM-enabled projects. The interview will be conducted through online and physical meetings with the respondents due to the geographical proximity and time limitation. The time taken for this interview was between 45 minutes to an hour. There are four sections in the interview which consists of demographic information, general information on data ownership in BIM, issues concerning data ownership in BIM and strategies to mitigate data ownership issues. The interview is recorded with the permission of the respondents. The selection of the respondents was done through purposive and snowball sampling. The criteria of the respondent needed for this interview is must have experienced in BIM-enabled project and working in Selangor, Johor or Sarawak only. The summary of interviewees background is presented in Table 1. below.

**Table 1.** Interviewees' Background

Interviewee		Work Location	Years Involved in BIM-Enabled Project	Interviewees' Role in BIM-Enabled Project
IV1	Engineer	Selangor	More than 10 years	BIM Manager
IV2	Contractor	Selangor	More than 10 years	BIM Manager
IV3	Developer	Selangor	More than 10 years	BIM Manager
IV4	Contractor	Johor	Less than 5 years	Project Manager
IV5	Architect	Selangor	More than 10 years	BIM Manager

### 3.1 Data Analysis

The method of data analysis chosen for this study is through content analysis. In content analysis, it involves coding and categorising content to identify patterns, themes, and biases. The audio recorded during the interview sessions were transcribed and uploaded in NVivo software for data analysis purposes. The data is categorized following their themes and patterns related to challenges in data ownership and potential of mitigation strategies. Next subsection will be discussed on the findings of this study.

## 4. Findings and Discussion

As mentioned earlier, this study has two main objectives which are to identify data ownership issues in BIM faced by the construction professionals and to identify the strategies to overcome the issues. The discussion commences with the first objective. From the interview, there are three primary issues in BIM data ownership which are difficulty in determining the data ownership, lack of standardized guidelines, and conflicts among construction professionals. The discussion on each of the issue will be elaborated below.

### 4.1 Issues Concerning BIM Data Ownership

The literature review and interviews identified three primary categories of BIM data ownership issues faced by construction professionals in BIM-enabled projects: difficulty to determine the ownership of the BIM model, no standardised company guidelines and conflicts among construction professionals. The issues can be summarised as represented in Table 2.

**Table 2.** BIM Data Ownership Issues

Bim Data Ownership Issues		
Category	Code	Explanation
Category 1: Data Ownership	Code 1: Lack of Trust (IV2)	Unclear roles and responsibilities, use of data without permission.
	Code 2: Lack of Understanding (IV1, IV2, IV5)	Difference of mindset (IV1, IV2), unclear understanding on BIM collaborative works (IV5).
	Code 3: Team Coordination	Coordination not well defined (IV1), BIM data authorship not clearly defined. (IV2,

Category 2: Stakeholders' Conflicts	(IV1, IV2, IV5)	IV5)
	Code 1: Communication Problem (IV1, IV2)	Refuse to understand each other (IV1), difference in mindset (IV2)
	Code 2: Doubting Project Team (IV2)	Bad previous experience when working collaboratively, unclear understanding on roles and responsibilities
Category 3: Standard Guidelines	Code 3: Unclear Workflow (IV2)	Wrong work coordination, arguments on file originality
	Code: Standards Guidelines (IV1, IV5)	Unsure on the right method to do data transfer and sharing (IV1), hinder collaboration works (IV5)

## 4.2 Strategies to Mitigate Issue of Data Ownership

To mitigate these issues, interviewees emphasized the importance of the BIM manager's role in managing access and security within the Common Data Environment (CDE), enhancing guidelines and policies, and promoting training and seminars to raise awareness about data ownership. Effective communication, clear agreements, and understanding roles and responsibilities are crucial to improving collaboration in BIM projects. Overall, overcoming these challenges requires a shift in attitude and mindset among construction professionals to foster better collaboration. This can be summarised as shown in the Table 3.

**Table 3.** *Strategies to Mitigate BIM Data Ownership Issues*

Strategies To Mitigate Bim Data Ownership Issues		
Category	Code	Explanation
Category 1: Data Ownership	Code 1: BIM Manager's Roles (IV1, IV3, IV5)	Hold the permission for data sharing and data transfer (IV1, IV5), CDE administrator, controlling access to data (IV3), IV5)
	Code 2: Enhancing Security (IV1, IV3)	Managing the CDE
	Code 3: Organizing Training and Seminar (IV1, IV3)	Topics specifically on BIM data ownership
Category 2: Stakeholders' Conflicts	Code 1: Clearer Communication (IV1, IV2, IV5)	Applying the right mindset during collaboration (IV1), BIM coordination meeting to clarify on roles and responsibilities (IV2, IV5)
	Code 2: Refer Agreement (IV3)	Address ownership rights, roles and responsibilities, intellectual property rights in written document
Category 3: Standard Guidelines	Code: Policy Protocol (IV1, IV2, IV3, IV4, IV5)	BIM Execution Plan (BEP) as primary reference guide (IV1, IV2), policy prepared in detailed and no ambiguity (IV3, IV4, IV5)

## 5. Conclusion

The research on BIM data ownership issues highlighted several key findings and recommendations. It is identified that construction professionals' attitudes and limited understanding of BIM data ownership are significant issues as this can lead to misunderstandings and conflicts among team members. To mitigate these issues, the study emphasises the importance of team openness to collaboration and the use of existing guidelines

such as the BIM Execution Plan (BEP). The BEP is crucial for establishing clear data ownership protocols and ensuring steady workflows to protect data ownership rights. The study also highlights the importance of trust and understanding among construction professionals. A critical issue identified is the lack of trust and a superficial understanding of BIM data ownership among professionals, which affects collaboration. Proficiency in managing BIM data ownership issues often requires extensive experience in BIM collaborative work, highlighting the need for ongoing professional development.

The study recommends that future research focus on detailed roles and technological advancements in BIM, aiming to enhance understanding and management of data ownership among construction professionals. Specifically, future research areas include investigating the role of BIM managers in managing data ownership, assessing the effectiveness of BIM data ownership policies, and exploring the role of technology in resolving data ownership disputes. Overall, the study emphasizes the importance of clear guidelines, trust, and understanding among construction professionals to effectively manage BIM data ownership issues.

## Acknowledgement

I would like to express my deepest gratitude to all my respondents for their invaluable participation in this research project.

## Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

## Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Christabelle Jemin James, Naqiyatul Amirah binti Mohd. Said; **data collection:** Christabelle Jemin James; **analysis and interpretation of results:** Christabelle Jemin James; **draft manuscript preparation:** Christabelle Jemin James, Naqiyatul Amirah binti Mohd. Said. All authors reviewed the results and approved the final version of the manuscript.*

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