Ethics and Data Privacy in BIM

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Abstract

The rapid advancement of Building Information Modeling (BIM) has revolutionized the construction industry, enabling collaborative workflows among architects, engineers, contractors, and clients. However, it has introduced critical ethical and legal challenges related to data ownership, intellectual property rights, and privacy. This thesis explores these issues by analyzing legal frameworks, contractual agreements, and ethical considerations governing BIM data ownership. It examines stakeholder roles, recurring disputes, and the impact of BIM's collaborative environment, with a focus on global and regional contractual adequacy. Findings reveal frequent conflicts between engineering teams and clients over intellectual property, highlighting the need for explicit contractual provisions and ethical guidelines addressing privacy, consent, and data control. The study proposes actionable recommendations to establish a robust framework for equitable, transparent, and sustainable data management in the construction sector.

Keywords: Legal / Contractual frameworks; Stakeholders in BIM projects; Contractual issues; Intellectual Property Rights (IPR); Model ownership; BIM contract practices; Contractual governance; Contractual / Legal risks; Contract requirements

1. Introduction

Amid the rapid advancements in Building Information Modeling (BIM), data ownership has emerged as a significant ethical concern for all stakeholders in the construction industry. BIM has facilitated unprecedented collaboration among architects, engineers, contractors, and clients, generating vast amounts of data throughout the project lifecycle (1). However, the creation, sharing, and utilization of this data across multiple platforms and phases have rendered data ownership increasingly complex, raising legal questions regarding who holds the rights to this information. This complexity has positioned data ownership as a critical issue in BIM practices (2).

This research aims to explore these complexities by examining the legal frameworks and agreements among stakeholders that govern data ownership during the design, construction, and management phases. By analysing existing studies on data rights disputes, the study investigates broader implications for collaboration and proposes an ethical framework for data management that promotes transparency, fairness, and accountability. It offers recommendations to ensure responsible and equitable handling of data, thereby fostering sustainable and ethical practices within the construction industry.

Additionally, the research highlights how unclear ownership can lead to collaboration challenges and affect project success. A focus is placed on addressing these issues during key phases such as design, construction, and long-term management, with the goal of improving ownership clarity and protection. By addressing these ethical challenges, this study aims to enhance collaboration and establish more reliable data management practices within the construction sector.

DOI: https://doi.org/10.54216/IJBES.110103
Received: February 04, 2025 Revised: February 25, 2025 Accepted: March 26, 2025

2. Research scope and limitations

Geographical Boundaries: The Syrian Arab Republic.

Human Boundaries: Experts, including engineers and professionals with experience in the BIM system across various engineering disciplines.

3. Literature Review

- **Overview of Building Information Modeling (BIM)**

Building Information Modeling (BIM) is a revolutionary technology and process that has rapidly transformed how buildings are conceptualized, designed, constructed, and operated. While its origins can be traced back to parametric modelling research conducted in the United States and Europe during the late 1970s and early 1980s, its practical application in Architecture, Engineering, and Construction (AEC) projects began gaining momentum in the mid-2000s. Over the years, BIM has evolved from being a mere buzzword to becoming a technological cornerstone in the AEC industry (3).

Initially, BIM represented new methodologies for building representation, moving beyond implicit meanings conveyed through lines to explicit meanings defined by objects and their attributes (4). It also introduced the concept of leveraging digital models of buildings throughout the entire lifecycle of a facility—from early conceptual design and detailed planning to construction and operation. By facilitating seamless information flow among stakeholders across all phases, BIM significantly improves efficiency by reducing manual data re-entry, a tedious and error-prone task in traditional paper-based workflows (5).

BIM can be seen as the modern extension of a centuries-old process of creating and managing information about buildings, both present and future. This historical perspective is acknowledged in BIM maturity levels. Level 0 refers to traditional building representation through paper drawings. Level 1 involves the use of 2D and 3D computer-aided design (CAD), while Level 2 and beyond represent object-oriented models and their associated processes (4).

In essence, BIM has become a transformative approach that not only enhances collaboration and accuracy but also integrates digital innovation into every phase of the construction lifecycle, offering a structured and sustainable means of managing building information.

- **The Nature of the BIM Environment and Its Impact on Ownership Issues in Construction Projects**

The Building Information Modeling (BIM) environment inherently demands multidisciplinary collaboration, raising significant challenges related to the protection of intellectual property rights (IPR) for model creators (6). BIM's collaborative nature requires input from various project participants with diverse professional backgrounds, making BIM outputs a collaborative product (7). According to a study titled *"Design Copyright in Architecture, Engineering, and Construction Industry: Review of History, Pitfalls, and Lessons Learned"*, the shift to a digital design era with multiple contributors further complicates ownership issues. Collaborative design processes often lead to disputes regarding the intellectual property rights of the resulting designs (8).

For instance, a building model database may be jointly developed, starting with an architect designing the building's initial components, followed by engineers and contractors adding elements during the construction phase. At the end of the project, a critical question arises: who created the model, and who owns it? The model represents a digital depiction of the physical and functional characteristics of a facility, containing extensive product-related information (6).

BIM consolidates project-related data onto digital platforms, necessitating extensive data sharing throughout the design and construction stages. As such, project participants have broad access to the model, allowing them to update, insert, extract, or modify data throughout the BIM process. Compared to traditional 2D drawings and information systems, BIM holds vast quantities of electronic data that can be easily extracted and reused. This makes the final project model particularly valuable for project owners in facility management. However, such usage may inadvertently expose parties to intellectual property violations, either intentionally or unintentionally (6).

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Consequently, the collaborative nature of BIM poses significant risks of IPR infringement. Protection measures are essential to prevent disputes and legal conflicts at the project's conclusion. While BIM collaboration offers considerable value to projects, it also brings complex challenges. As the saying goes, "the greater the value, the greater the challenges." These challenges stem not only from technical and organizational aspects but also from legal and political dimensions, which are often overlooked. Intellectual property rights thus remain a central issue (7).

Ownership of models and intellectual property rights in BIM are critical considerations. BIM integrates project-related data into digital platforms, requiring data transfer and accessibility from design to construction. This results in broad access to data by all project participants (9), leading to large volumes of shared data and issues of version control, complicating accurate data tracking (10). In BIM, participants work within a collaborative platform where relevant project information can be exchanged, and components can be added to share models efficiently (6).

- **Model Ownership: Who Owns the Copyright in BIM**

The collaborative nature of Building Information Modeling (BIM) blurs the lines of copyright ownership as project stakeholders contribute information and add details to the project model. The key legal question becomes if one party uses a model contributed by others, who owns the intellectual property rights (IPR) of the final model? Moreover, who is the author when stakeholders collaboratively create and modify the model? (7)

The *ConsensusDOCS 301 BIM Addendum* addresses this issue by stipulating that each party retain ownership of its contributions. It seeks to prevent unintentional IPR transfers, emphasizing that no rights are conveyed or restricted unless explicitly licensed or permitted. The addendum also clarifies that the right to use the final model after project completion is subject to agreements between the owner and designer. Importantly, the owner's license to use the model can be revoked for non-payment to contributors (11).

The American Institute of Architects (AIA) is one of the few professional organizations globally to formalize legal guidelines for digital design systems. The *AIA E202 (2008)* document introduces the term "Model Element Author" to designate the party responsible for specific model content. Paragraph 2.2 of this document states that while contributors develop content for the BIM model, they do not transfer ownership rights in their contributions or the software used to create them. Unless separately licensed, the rights to use, modify, or transmit the model are limited to the project's design and construction phases, with no rights extending beyond the project scope. (12)

Similar to the AIA's position, a study titled *Virtual Design and Construction: New Opportunities for Leadership* argues that, because BIM is inherently collaborative, the final output (e.g., the design model) should belong to the client rather than individual contributors. This perspective aims to foster long-term client-project team relationships throughout the lifecycle of the model, even beyond the project's completion. In essence, the AIA E202 (2008) suggests that the final BIM product does not exclusively belong to the owner or designer. Instead, each author retains copyright ownership of their model elements, while all parties are granted rights to use, modify, or transfer the model within the project’s scope (13).

However, several studies challenge the AIA's philosophy. For instance, a study titled *Building Information Modeling: Contractual Risks Are Changing with Technology* notes that disclaimers in design outputs reflect a shift in risk distribution, where designers aim to avoid liability for design errors by transferring risks to clients, the ultimate owners of the project model. This highlights the multifaceted and legally complex nature of model ownership in BIM (14).

In conclusion, both the *BIM Addendum* and the *AIA E202 (2008)* propose that contributors retain ownership of their respective contributions. Yet, the broader debate surrounding model ownership reflects differing interpretations of intellectual property rights in collaborative digital environments, revealing the need for clear contractual provisions to address these challenges (7).

In summary, modelers often have differing contractual objectives for projects, shaped by their professional backgrounds. In cases of integrated services, professionals appear to provide varying aspects of services at each stage as needed—a practice that has traditionally been the safest approach. In conventional systems, team members not only take responsibility for their inputs but also manage the use of those outputs after the project ends. Exclusively assigning models to clients may result in unauthorized use of these inputs, undermining the goals and intentions of the creators. Moreover, the absence of clear provisions outlining the rights and obligations of all

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parties involved in the development and implementation of BIM can lead to significant legal consequences, particularly where existing legal frameworks are ambiguous or require further interpretation (15).

4. Methodology

- **Research Design and Approach**

The research will adopt the descriptive method using a case study approach: This will involve collecting the necessary scientific data for the study, analysing it, and shedding light on the concepts, principles, and practices related to the research topic. Additionally, it will explore the causes and dimensions of the presented problem.

- **Data Collection**

The research will rely on theoretical tools, including references, articles, and scientific studies addressing the concepts of intellectual property rights, model ownership, and their relationship with the BIM system. It will also examine the impacts and risks associated with the absence of specific legal and contractual regulations for engineering sector projects utilizing the BIM system. Furthermore, practical tools will be employed through the design of a questionnaire to gather expert opinions, conduct quantitative measurements, and perform the necessary statistical tests to derive the results.

5. Questionnaire, Analysis of Responses, Findings, and Recommendations

- **Study tool**

After examining the research topic theoretically, a field study will be conducted on a representative sample to derive findings that either confirm or refute the research hypothesis based on scientific methodology. The practical application was implemented by distributing a questionnaire to a suitable research sample to perform quantitative measurements and necessary statistical tests for result extraction.

Based on the type of data required and the adopted methodology, the questionnaire was deemed the most appropriate tool for achieving the research objectives. The questionnaire was designed to measure the studied variables and was finalized in three main sections:

1. Section One: Includes demographic variables such as age, educational qualifications, job position, and years of experience.
2. Section Two: Contains statements assessing the level of knowledge about the BIM system, its contractual documents, and intellectual property rights.
3. Section Three: Focuses on statements evaluating the importance of defining intellectual property rights in engineering contracts and gathers expert opinions on the key stakeholders in a project and their respective intellectual property rights.

- **Research Sample**

The sample consisted of 32 responses, including experienced engineers from various engineering disciplines, as well as students and graduates of the Master's program in Building Information Modeling (BIM) Management.

6. Discussion

- **Results**

Upon analysing the survey, the following results were identified:

Section 2 analysis:

1. Are you familiar with all BIM-related contractual documents attached to engineering contracts?

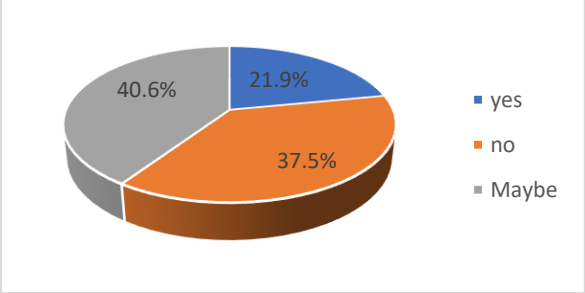

Figure 1. Indicates the results of having sufficient awareness of BIM-related contractual documents

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2. What is your level of knowledge regarding Intellectual Property Rights (IPR)?

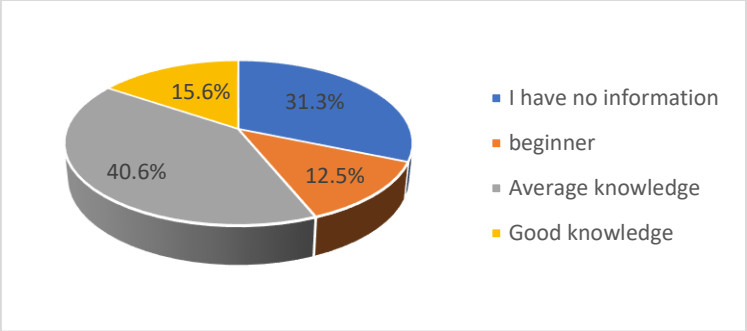

Figure 2. Indicates the level of knowledge regarding IPR

The figures indicate that the majority of the sample possesses a good understanding of Building Information Modeling (BIM) and actively participates in projects utilizing the BIM environment. However, a significant portion lacks adequate knowledge of BIM-related contractual appendices, with 78.1% demonstrating limited familiarity. Additionally, awareness of Intellectual Property Rights (IPR) is relatively low, as 43.8% of respondents have little to no knowledge, while 40.6% possess only a moderate understanding. This implies that 84.4% of the sample, despite their experience with BIM, lack comprehensive awareness of intellectual property rights.

Section 3 analysis:

1. Defining clear intellectual property provisions within the project contract document during the contracting phase regulates communication and data exchange among project stakeholders.

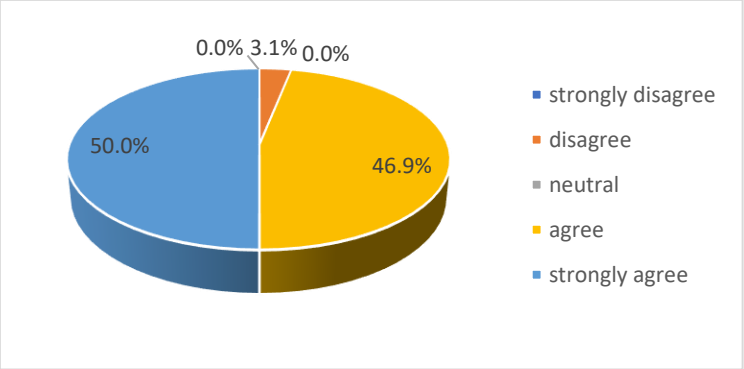

Figure 3. Indicates the importance of defining clear IPR provisions within the project contract document

2. Establishing explicit intellectual property provisions in the project contract during the contracting phase determines each party's access to and use of model information, thereby reducing the risk of data infringement.

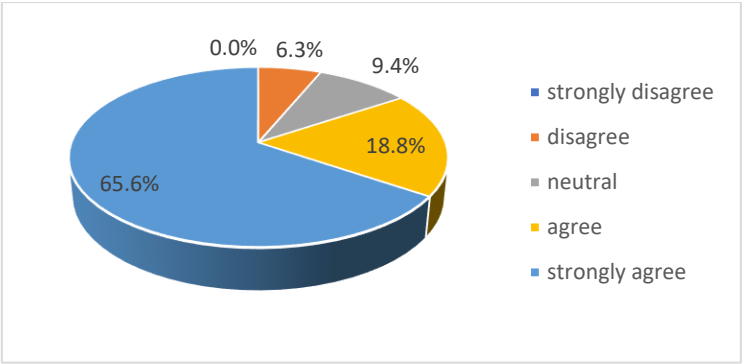

Figure 4. Indicates the importance of clear IPR provisions in reducing the risk of data infringement

The analysis of the previous figures indicates that the majority of the sample supports the inclusion of clear intellectual property provisions in the project contract during the contracting phase, as it facilitates communication and data exchange while reducing the risk of data breaches. The results show an approval rate of 96.9% for statement (1) and 84.4% for statement (2).

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These findings reflect a consensus among the respondents that the presence of explicit legislation and provisions for intellectual property rights and data exchange, as stipulated in the engineering contract, helps regulate the relationship among key project stakeholders, ensures their rights, and mitigates potential negative impacts associated with the implementation of the BIM system in engineering projects.

3. The architect/engineer (design team) holds full intellectual property rights to the model, including all architectural, design, physical, and engineering information contained within it. The design team grants other project stakeholders a license to use the model solely for project-related purposes and only throughout the project's lifecycle.

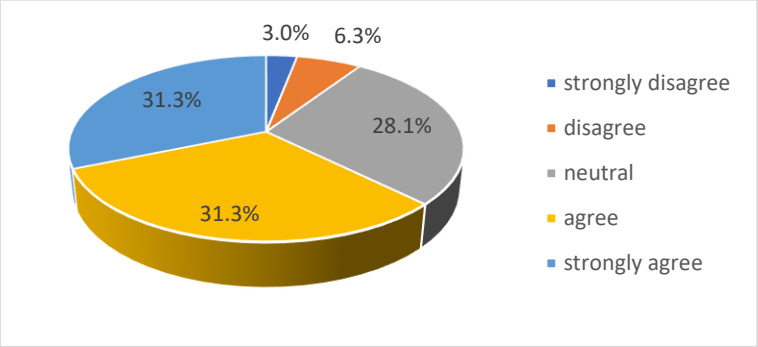

Figure 5. Indicates the results of the analysis regarding the architect ownership of the model's IPR

4. The contractor holds full intellectual property rights to the model, including all financial and economic information contained within it. The contractor grants other project stakeholders a license to use the model solely for project-related purposes and only throughout the project's lifecycle.

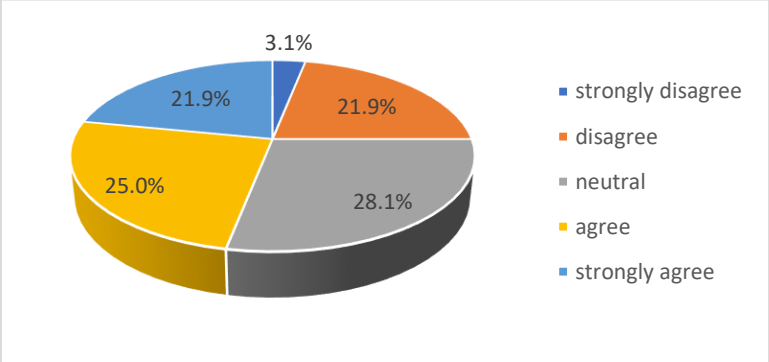

Figure 6. Indicates the results of the analysis regarding the contractor ownership of the model IPR

The results derived from the figure corresponding to statement (3) indicate that 62.6% of the sample supports the engineering team's ownership of the intellectual property rights for the final model, while 28.1% remain neutral, and only 9.3% express opposition. These percentages reflect a relatively clear acceptance of this perspective, as the neutrality rate does not signify explicit rejection but rather a balanced stance on the issue.

In contrast, the figure corresponding to statement (4) reveals greater variation in opinions. Here, 46.9% of the sample supports the contractor's ownership of intellectual property rights, while 28.1% remain neutral, and the rejection rate rises to 25%. This disparity suggests a relative division of opinions within the sample regarding this concept, with a considerable rejection percentage indicating a lack of clear consensus on the contractor's entitlement to the ownership of the final model.

5. Each project stakeholder holds intellectual property rights over their specific contributions to the project's BIM model. All parties must reach an agreement and establish a decision regarding the ownership of the final model, ensuring that this agreement is documented in the contract before project completion to prevent future disputes.

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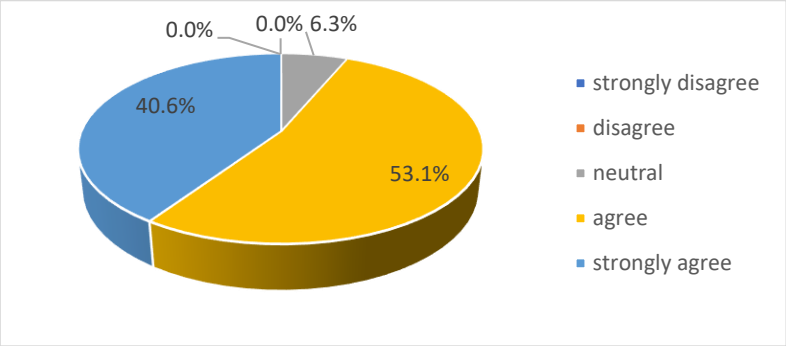

Figure 7. Indicates the results of the analysis regarding each project stakeholder holds IPR over their contributions to the BIM model

6. The project owner holds ownership of the final BIM model; however, the party holding the intellectual property rights to the model grants the owner a limited license. This license does not include access to the proprietary information within the model but allows its use strictly for operations, management, maintenance, and marketing purposes. The owner is not permitted to use the model for developing other projects.

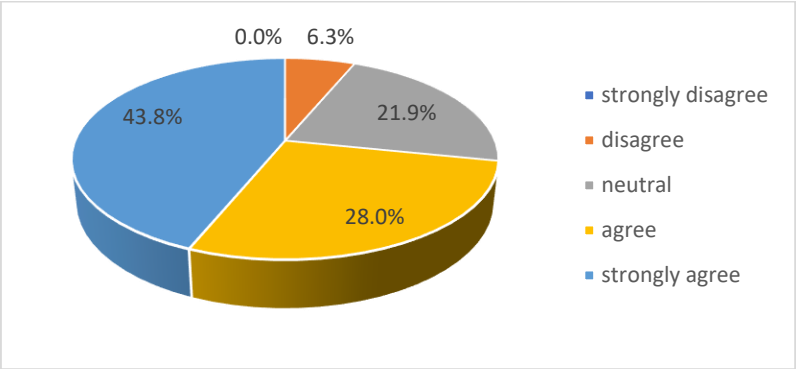

Figure 8. Indicates the results of the analysis regarding the project owner's ownership of the final BIM model

The results presented in Figures (5-6) indicate a clear consensus among the respondents on the necessity for all project stakeholders to convene and agree on the ownership of the final BIM model within the contract documentation, with an approval rate of 93.7%. Additionally, the findings reveal that respondents agree that the project owner should hold the final model under a limited-license agreement.

This aligns with conclusions drawn by leading global organizations and previous studies, which emphasize the importance of explicitly defining and agreeing upon the ownership of the final model within the contract. Such clarity ensures the regulation of stakeholder relationships and reduces disputes related to intellectual property rights.

- When analyzing the responses from the research sample regarding which party holds the rightful ownership of the intellectual property rights to the final BIM model in the project, it was found that the majority, at 62.5%, believe that the engineering team has the most right. This is followed by 28.1% who consider the client or project owner to be the rightful owner, 6.3% for the project team comprising of consultants and project manager, and finally, only 3.1% for the contractor.
- **Findings**

Level of Knowledge about the BIM System, Contractual Documents, and Intellectual Property Rights:

1. The majority of the research sample demonstrated a solid understanding of the Building Information Modeling (BIM) system and practical experience working on projects utilizing this system, thereby enhancing the reliability of the collected data.
2. The results revealed that most respondents lack comprehensive knowledge of BIM-specific contractual addenda and the intellectual property (IP) rights associated with them, underscoring the need to raise awareness in this area.

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Intellectual Property Rights for Project Stakeholders in the BIM System:

1. The overwhelming majority of the sample emphasized the importance of including clear provisions regarding intellectual property rights in contract documents, highlighting their role in organizing relationships among project stakeholders and reducing potential disputes.
2. Most participants agreed on the necessity for all project stakeholders to reach an agreement on the ownership of the final model as part of the contractual documentation, ensuring transparency and better regulation of contractual relationships.
3. The findings indicated that disputes over intellectual property rights are primarily concentrated between the engineering team and the client, while the role of other parties, such as contractors, is relatively minor. This is attributed to the low level of BIM adoption in the construction sector, where contractors only participate in BIM teams when the BIM maturity level is high.
4. The study results revealed that the design company, represented by the engineering team, is perceived as having full ownership of intellectual property rights to the model, with a high agreement rate of 62.5%.

7. Recommendations

1. The knowledge of legal contractual systems within the framework of Building Information Modeling (BIM) and the associated intellectual property (IP) rights remains limited and rudimentary. Given that current engineering contractual documents rely on traditional construction systems, it becomes challenging to analyze IP provisions compatible with these legal frameworks. Therefore, it is essential to intensify studies that examine various types of engineering contracts and adapt them to the unique characteristics imposed by BIM.
2. Enhancing awareness of intellectual property rights through training and the establishment of educational and professional development programs is crucial. These programs should focus on the ethical and legal dimensions of BIM, including IP rights, data privacy, and collaborative responsibilities, to adequately prepare engineers, architects, and contractors for practical applications.
3. Developing comprehensive, clear, and enforceable legal frameworks that address intellectual property rights and data privacy within the context of BIM is imperative. These frameworks should delineate ownership, data sharing, and usage rights to reduce ambiguity in contracts.
4. Detailed provisions regarding intellectual property rights and data privacy should be included in the appendices of BIM project contracts. This will ensure that all stakeholders are aware of their rights and obligations concerning the model and its associated data.
5. Clear mechanisms for resolving disputes related to intellectual property rights and data usage in BIM projects should be established. Mechanisms such as mediation or arbitration can help address conflicts efficiently without disrupting project progress.

8. Conclusion

In conclusion, the study highlights the critical gaps in legal contractual frameworks concerning intellectual property rights within Building Information Modeling (BIM). The findings emphasize the need for enhanced awareness, comprehensive legal frameworks, and contractual provisions to address ownership, data privacy, and dispute resolution. The lack of clear regulations poses challenges in defining rights and responsibilities among project stakeholders. Therefore, it is imperative to develop standardized contractual agreements, promote professional training, and establish effective legal mechanisms to mitigate risks. Addressing these issues will facilitate the adoption of BIM while ensuring transparency, collaboration, and protection of intellectual property rights in engineering and construction projects.

References

[1] H. W. Ashcraft, "Building information modeling: A framework for collaboration," *Constr. Law.*, vol. 28, p. 5, 2008.
[2] S. L. Fan, C. Y. Lee, H. Y. Chong, and M. J. Skibniewski, "A critical review of legal issues and solutions associated with building information modelling," *Technol. Econ. Dev. Econ.*, vol. 24, no. 5, pp. 2098–2130, 2018.

DOI: https://doi.org/10.54216/IJBES.110103
Received: February 04, 2025 Revised: February 25, 2025 Accepted: March 26, 2025

[3] S. Azhar, M. Khalfan, and T. Maqsood, "Building information modeling (BIM): now and beyond," *Australas. J. Constr. Econ. Build*, vol. 12, no. 4, pp. 15–28, 2012.
[4] Ž. Turk, "Ten questions concerning building information modelling," *Build. Environ*, vol. 107, pp. 274–284, 2016.
[5] A. Borrmann, M. König, C. Koch, and J. Beetz, *Building Information Modeling: Why? What? How?*, Springer International Publishing, 2018, pp. 1–24.
[6] J. A. Ardani, C. Utomo, and Y. Rahmawati, "Model ownership and intellectual property rights for collaborative sustainability on building information modeling," *Buildings*, vol. 11, no. 8, p. 346, 2021.
[7] S. L. Fan, "Intellectual property rights in building information modeling application in Taiwan," *J. Constr. Eng. Manag.*, vol. 140, no. 3, p. 04013058, 2014.
[8] A. Adibfar, A. Costin, and R. R. Issa, "Design copyright in architecture, engineering, and construction industry: Review of history, pitfalls, and lessons learned," *J. Leg. Aff. Dispute Resolut. Eng. Constr.*, vol. 12, no. 3, p. 04520032, 2020.
[9] A. Alwash, P. E. D. Love, and O. Olatunji, "Impact and remedy of legal uncertainties in building information modeling," *J. Leg. Aff. Dispute Resolut. Eng. Constr.*, vol. 9, p. 04517005, 2017.
[10] M. F. Arshad, M. J. Thaheem, A. R. Nasir, and M. S. A. Malik, "Contractual risks of building information modeling: Toward a standardized legal framework for design-bid-build projects," *J. Constr. Eng. Manag.*, vol. 145, no. 4, p. 04019010, 2019.
[11] R. H. Lowe and J. M. Muncey, "ConsensusDOCS 301 BIM addendum," *Constr. Law.*, vol. 29, p. 17, 2009.
[12] American Institute of Architects (AIA), *E202–2008 Building Information Modeling Protocol Exhibit*, 2008.
[13] J. R. Bedrick, "Virtual design and construction: New opportunities for leadership," *The Architect's Handbook of Professional Practice Update 2006*, pp. 33–45, 2006.
[14] D. B. Thompson and R. G. Miner, "Building information modeling-BIM: Contractual risks are changing with technology," available at: http://www.aepronet.org/ge/no35.html, 2006.
[15] O. Olatunji, "A preliminary review on the legal implications of BIM and model ownership," *J. Inf. Technol. Constr.*, vol. 16, pp. 687–696, 2011.
[16] M. Sohail and S. Cavill, "Accountability to prevent corruption in construction projects," *J. Constr. Eng. Manag.*, vol. 134, no. 9, pp. 729–738, 2008.
[17] E. Alreshidi, M. Mourshed, and Y. Rezgui, "Factors for effective BIM governance," *J. Build. Eng.*, vol. 10, pp. 89–101, 2017.
[18] R. Eadie, T. McLernon, and A. Patton, "An investigation into the legal issues relating to building information modelling (BIM)," in *RICS COBRA AUBEA 2015*, Royal Institution of Chartered Surveyors, 2015.
[19] K. Almarri, M. Aljarman, and H. Boussabaine, "Emerging contractual and legal risks from the application of building information modelling," *Eng. Constr. Archit. Manag.*, vol. 26, no. 10, pp. 2307–2325, 2019.
[20] T. M. Jo, S. S. M. Ishak, and Z. Z. A. Rashid, "Overview of the legal aspects and contract requirements of the BIM practice in Malaysian construction industry," in *MATEC Web Conf.*, vol. 203, p. 02011, 2018.
[21] A. H. Abd Jamil and M. S. Fathi, "Contractual issues for Building Information Modelling (BIM)-based construction projects: An exploratory case study," in *IOP Conf. Ser.: Mater. Sci. Eng.*, vol. 513, no. 1, p. 012035, 2019.
[22] A. B. Kiviniemi and R. Codinhoto, "Challenges in the implementation of BIM for FM—Case Manchester Town Hall Complex," in *Proc. CIB Facilities Manag. Conf.*, 2020.
[23] R. R. Berema, Z. Ismail, J. Brahim, and N. A. Nordin, "A systematic review of existing standard form of contract for building information modeling (BIM) public projects in Malaysia," in *IOP Conf. Ser.: Earth Environ. Sci.*, vol. 1217, no. 1, p. 012006, 2023.
[24] R. L. Ostergard, "Intellectual property: a universal human right?," *Hum. Rights Q.*, vol. 21, no. 1, pp. 156–178, 1999.
[25] S. K. Savale and V. K. Savale, "Intellectual property rights (IPR)," *World J. Pharm. Pharm. Sci.*, vol. 5, no. 6, pp. 2529–2559, 2016.
[26] International Bureau of WIPO, *World Intellectual Property Organization: General Information*, WIPO Pub. No. 400.
[27] International Bureau of WIPO, *What Is Intellectual Property*, WIPO Pub. No. 450, June 2003.

DOI: https://doi.org/10.54216/IJBES.110103
Received: February 04, 2025 Revised: February 25, 2025 Accepted: March 26, 2025

[28] A. Travaglini, M. Radujković, and M. Mancini, "Building information modelling (BIM) and project management: a stakeholders perspective," *Organ. Technol. Manag. Constr. Int. J.*, vol. 6, no. 2, pp. 1001–1008, 2014.

[29] A. Heravi, V. Coffey, and B. Trigunarsyah, "Evaluating the level of stakeholder involvement during the project planning processes of building projects," *Int. J. Proj. Manag*, vol. 33, no. 5, pp. 985–997, 2015.

[30] J. Ratajczak, G. Malacarne, D. Krause, and D. Matt, "The BIM approach and stakeholders integration in the AEC sector–benefits and obstacles in South Tyrolean context," in *Proc. 4th Int. Workshop Des. Civ. Environ. Eng.*, pp. 32–40, Oct. 2015.

[31] D. T. Hai, N. N. Trung, and K. D. Huyen, "Contract form for Building Information Modelling (BIM) projects applied on construction industry in Vietnam," in *IOP Conf. Ser.: Mater. Sci. Eng.*, vol. 869, no. 6, p. 062005, June 2020.

DOI: https://doi.org/10.54216/IJBES.110103
Received: February 04, 2025 Revised: February 25, 2025 Accepted: March 26, 2025