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Policy Brief

OWNERSHIP AND INTELLECTUAL PROPERTY RIGHTS OF CONNECTED CONSTRUCTION TECHNOLOGY FOR INFRASTRUCTURE

Task Force 8

Inclusive, Resilient, and Greener Infrastructure Investment and Financing

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Abstract

The concept of connected construction requires multidisciplinary collaboration and generates a problem of intellectual property protection for creators of infrastructure models and elements. Therefore, this policy brief determines the ownership of models and intellectual property rights (IPRs) in the connected construction of infrastructure technology. While an employer has the right to own the technology developed in the form of a license, with limited use for operation and maintenance, they do not have the right to reuse the model for future projects.

The design, engineering, construction and operation (DECO) of infrastructure is considered as lacking productivity with low efficiency due to its fragmented processes. This has driven the DECO industries to adopt building information modelling (BIM), which is recognised for optimising processes across the construction value chain, including capital budgeting, capital structure, cost of capital, energy and lifecycle costs.

Suppose an infrastructure database is developed collaboratively. For example, the designer creates the initial infrastructure element. The engineer adds the element to the model, while in the implementation of the project the contractor also adds an element. By the end of the project, the question is, who made and owns the digital representation of the physical and functional characteristics that contain the product information related to the infrastructure?

If not addressed with proper policy, the issue of model ownership and IPRs can lead to conflict and legal problems at the end of the project. Therefore, defining who owns a model and the IPRs of infrastructure technology is necessary.

Challenges

1. Connected construction centralises project-related information in a digital platform and requires the massive transmission of and access to datasets during the design to operation of an infrastructure project. This data is widely accessible to all project participants involved, and project participants can also utilise the model, including updating, inserting, extracting or modifying information during the process. Therefore, the final model of a project has significant value for owners to be reused in improving infrastructure management. This may cause one party using the co-created model to inadvertently infringe on the intellectual property rights of the another party.

2. The collaborative product risks intellectual property infringement by others that is accidental or intentional when using the model. Therefore, intellectual property protection is required to prevent conflicts and legal problems at the end of a project. The issue of model ownership and intellectual property rights is much-overlooked in research, even though it is a critical issue and requires scientific attention. The point of ownership is not just about who makes and who owns connected construction technology — it is also related to potential violations of the law.

3. The collaborative nature of connected construction technology in infrastructure poses intellectual property protection issues. A collaborative platform is widely accessible, modified and added to by all project participants. Connected construction technology covers the design, construction and operational stages. Interoperability stages along with the stakeholders will ensure the success of the infrastructure. Infrastructure designed and developed with attention to each stage will meet obstacles when investors secure the technology capital and stakeholders use it differently at each stage. Connected construction involves some interoperability, including design through connected construction technology and interoperability financing.

Literature Review

1. The DECO industry is experiencing problems surrounding technology implementation and collaborative work, as shown in Table 1.

Table 1. Challenges in collaborative work with BIM.

Challenges in collaborative work		References
Item	Sub-items	
Legal aspects	Copyright violation	[2,3,4]
	Ownership of data/model elements	[2]
	Intellectual property rights	[2,4,5]
Contractual aspects	Disagreements arising from BIM practices	[1]
	The allocation of responsibility and liability exposure	[1]
	Lack of BIM standards	[8]
Technical	Complexity in adopting collaboration tools	[1]
	Lack of compatibility between software	[1,2,6,9]
Socio-organisational	Distrust	[2,6]
	Discrepancies between interested parties regarding the definition of BIM	[7]
	Different organizational structures in multidisciplinary teams	[1]
	Lack of clarity on roles and responsibilities	[2]

2. Ownership of models and intellectual property rights in design technology is very important because the concept is to centralise project-related information into digital platforms that require transmission and access to datasets during the design to construction. Therefore, the data will be widely accessible and used by all project participants involved (Alwash et al., 2017). The transition process, starting with traditional delivery methods, has been widely criticised for exchanging data between multidisciplinary actors (Khosrowshahi, 2017) in conventional file-based projects, often resulting in a loss of data integrity and major errors (Khosrowshahi, 2017). The process of exchanging data from one actor to another results in a large amount of exchanged data and versioning problems that complicate tracking data together. The work of project participants will be entered into a collaborative platform. All stakeholders can share project-related information and can add components and elements to collaborative project models more efficiently and in a more integrated manner. At the end of the project, the collaborative nature can cause debate and conflict about who created the model and who retains the final model.

3. Working and exchanging digital data on a collaborative platform can cause problems related to intellectual property (Ho, 2021). The issue of ownership is not just about who makes it and who owns it, but also the potential violations of the law that may arise. For example, the final model of a project has significant value for its owner to reuse in improving facility management (Fan, 2014). The intellectual property of the data could be fully transferred to the owner, or could remain with its contributors. Furthermore, a singular platform strives to enable collaboration between all stakeholders from different stages of a project's lifecycle and enables stakeholders to update, include, extract or modify information during the process. According to Fan (2014), this may cause one party to use the model of another party and may inadvertently infringe the intellectual property rights of the latter. Therefore, we must consider the importance of intellectual property rights being protected and clearly defined in the early stages of development projects to avoid conflict and legal problems.

4. According to Ho (2021), if a copyright violation of models and intellectual property enters the court process, it poses a great financial risk and can cause project delays that will result in losses to the project. Before a project is implemented, there needs to be a clear understanding not only of who owns the model but also of who is responsible for the model. Then, we must consider which actors have the potential to retain the collaborative product for its sustainability. Therefore, it is necessary to conduct a review and synthesis of the related studies to identify the model ownership and IPRs

Conclusion

1. The priority for infrastructure technology finance actors is the construction company. The construction companies involved, in meeting all the requirements of the employer (owner), must incur additional costs in terms of preparing human resources, the technology, necessary hardware, adequate infrastructure and prices for connected construction experts because these are already part of the investment and assets for the business development of the company. Therefore, the construction company should be the centre of financial responsibility.

2. The party that makes the model element is the main actor that owns the model and intellectual property rights. If a team's model is jointly designed and contributed to, each party and discipline will have all rights to its contribution. The owner and the party making the model can negotiate further to purchase additional related licenses to use the model on future projects.

3. Contractor involvement at the design stage provides an excellent opportunity to exploit connected construction technology in infrastructure with a more collaborative work process. An integrated contract model that incorporates all project participants, disciplines, systems and business structures into the collaboration process is most appropriate for technology implementation related to complex procedures.

References

Abd Jamil, A.H.; Fathi, M.S. Enhancing BIM-Based Information Interoperability: Dispute Resolution from Legal and Contractual Perspectives. *J. Constr. Eng. Manag.* **2020**, *146*, 05020007, doi:10.1061/(ASCE)CO.1943-7862.0001868

Adibfar, A.; Costin, A.; Issa, R.R.A. Design Copyright in Architecture, Engineering, and Construction Industry: Review of History, Pitfalls, and Lessons Learned. *J. Leg. Aff. Dispute. Resolut. Eng. Constr.* **2020**, *12*, 04520032, doi:10.1061/(ASCE)LA.1943-4170.0000421

Alreshidi, E.; Mourshed, M.; Rezgui, Y. Factors for Effective BIM Governance. *J. Build. Eng.* **2017**, *10*, 89–101, doi:10.1016/j.jobe.2017.02.006

Alreshidi, E.; Mourshed, M.; Rezgui, Y. Requirements for Cloud-Based BIM Governance Solutions to Facilitate Team Collaboration in Construction Projects. *Required. Eng.* **2018**, *23*, 1–31, doi:10.1007/s00766-016-0254-6

Alwash, A.; Love, P.E.D.; Olatunji, O. Impact and Remedy of Legal Uncertainties in Building Information Modeling. *J. Leg. Aff. Dispute. Resolut. Eng. Constr.* **2017**, *9*, 04517005, doi:10.1061/(ASCE)LA.1943-4170.0000219

Borges Viana, V.L.; Marques Carvalho, M.T. Prioritization of Risks Related to BIM Implementation in Brazilian Public Agencies Using Fuzzy Logic. *J. Build. Eng.* **2021**, *36*, 102104, doi:10.1016/j.jobe.2020.102104

Dao, T.-N.; Chen, P.-H.; Nguyen, T.-Q. Critical Success Factors and a Contractual Framework for Construction Projects Adopting Building Information Modeling in Vietnam. *Int. J. Civ. Eng.* **2021**, *19*, 85–102, doi:10.1007/s40999-020-00542-3

Fan, S.-L. Intellectual Property Rights in Building Information Modeling Application in Taiwan. *J. Constr. Eng. Manag.* **2014**, *140*, 04013058, doi:10.1061/(ASCE)CO.1943-7862.0000808.

Ho, P.H.K. Mapping out BIM Contract Conditions by Way of a Comparative Study. *J. Leg. Aff. Dispute. Resolut. Eng. Constr.* **2021**, *13*, 05020017, doi:10.1061/(ASCE)LA.1943-4170.0000446

Khosrowshahi, F. Building Information Modelling (BIM) a Paradigm Shift in Construction. In *Building Information Modelling, Building Performance, Design and Smart Construction*; Dastbaz, M., Gorse, C., Moncaster, A., Eds.; Springer International Publishing: Cham, Switzerland, 2017; pp. 47–64, doi:10.1007/978-3-319-50346-2_4

Lai, H.; Deng, X.; Chang, T.-Y. P. BIM-Based Platform for Collaborative Building Design and Project Management. *J. Comput. Civ. Eng.* **2019**, *33*, 05019001, doi:10.1061/(ASCE)CP.1943-5487.0000830

Oraee, M.; Hosseini, M.R.; Edwards, D.J.; Li, H.; Papadonikolaki, E.; Cao, D. Collaboration Barriers in BIM-Based Construction Networks: A Conceptual Model. *Int. J. Proj. Manag.* **2019**, *37*, 839–854, doi:10.1016/j.ijproman.2019.05.004

Porwal, A.; Hewage, K.N. Building Information Modeling (BIM) Partnering Framework for Public Construction Projects. *Autom. Constr.* **2013**, *31*, 204–214, doi:10.1016/j.autcon.2012.12.004.