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Building Information Modelling (BIM): Contractual Issues of Intellectual Property Rights (IPR) in Construction Projects

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Abstract: Building Information Modelling (BIM) is an emerging technology that provides a platform for a comprehensive digital representation of a facility to be created by integrating data from design conception until demolition. In seeking the optimum use of BIM, a large degree of cooperation and collaboration among multi-disciplinary contributors are required for the digital data exchange and sharing process to be deployed. This situation, however, brings up new issues in delineating liabilities and limitations of contributors as the demarcation line of each contributor becomes unclear. In Malaysia, there is no known BIM-enabled standard form of contract that preserves the intellectual property rights (IPR) of the BIM projects' contributors. Therefore, the present study attempts to investigate the issues pertaining to IPR in the context of BIM adoption in the construction project. Qualitative methodology involving literature review, analysis of existing IPR provisions and semi-structured interviews with the experts were conducted. The research identified two major issues related to IPR in BIM projects: copyright ownership of the BIM model and data infringement. This paper is substantial to deliver knowledge to the construction industry practitioners regarding the legal and contractual considerations in the adoption of BIM.

Keywords: Building Information Modelling (BIM), Intellectual Property Rights (IPR), contractual risk

1. Introduction

The process of procuring a facility in the construction industry is generally complex as it involves a myriad of multidisciplinary parties that contribute their expertise to confirm that the facility produced can give optimal benefits to its users. Thus, with the involvement of many contributors to a construction project, it is vital for intellectual property rights (IPR) issues to be addressed appropriately. Generally, any data or information created belongs to the contributors, which can come in various forms such as written documents, detailed specification for particular works, and even building plans (Larson & Golden, 2007). The contributors then receive a certain amount of fees in return for providing and permitting the use of such intellectual property. The rights of the intellectual property fundamentally remain with the contributors; however, the circumstances might be different depending on the arrangements in the contractual terms.

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Previously, all information of a facility is produced in physically printed version; thus, the original contributors of the data are easily traceable. Conversely, working with Building Information Modelling (BIM) is much more complicated due to the involvement of digital database consisting of proprietary information of graphical and non-graphical information from diverse disciplines, which instigates the ownership issue among the parties (Currie, 2014). Moreover, as the paymaster, the client may also claim to have the right as an owner of the completed model, hence adding to a more complex issue of IPR (Ming Jo, Siti Salwa, & Zul Zakiyuddin, 2018).

Therefore, this paper aims at investigating the issues concerning IPR in the context of BIM Level 2 implementation in the construction project. This study is considered as fulfilling the gap in realising the goals envisioned in the Malaysian Construction Industry Transformation Programme (CITP) 2016-2020, as particular concern and specific provision in addressing the issue of IPR infringement and copyright ownership in BIM implementation seems to be lacking in rigour.

2. Legal, Contractual and Technical Issues in Construction Projects Implementing Building Information Modelling (BIM)

Previous research such as in Salman Azhar, Hein, and Sketo (2008), and Mordue, Swaddle, and Philp (2015) elucidated the benefits of Building Information Modelling (BIM), which includes providing a fast-paced and more effective process; advanced process and a better design; better production quality and many more. Despite all the benefits offered through BIM, such brilliances are yet to be considered sufficient to cover some loopholes that could emanate in a project. The issues associated with the implementation of BIM are explained within the spectrum of legal, contractual, and technical context.

2.1 Legal Issues

In executing tasks within the BIM environment, concerns on the issue of confidentiality, data ownership and data security became apparent due to the integration of multiple proprietary information in the process of developing building models (Fan, 2014; Ming Jo *et al.*, 2018; Liou, Lee, & Chong; 2019). In this collaborative and integrative working condition, the use of copyrighted materials is inevitable for all parties involved including the employers who would want to utilise such intellectual property for post-completion work such as renovation, maintenance, and facility extension. These scenarios engender the concern on the preservation of the intellectual property of contributors (Foster, 2008; Devries, 2009).

Moreover, the IPR issue is also very much linked to the design liability issue, which is another complex issue associated with the adoption of BIM (Philp & Frise, 2014). The shift of working environment from an individually generated model BIM Level 1 to an integrated semiparametric BIM Level 2 and, finally, to a fully integrative and collaborative Level 3 causes a substantial change in the relationship among the contributors involved (Winfield & Rock, 2018). Such transformation of the working environment instigates the issue of accountability, which could lead to finger-pointing and adversarial relationship among parties where the person accountable for any defect in analysis, design, and datasets remain in question. The issue of trust would also appear regarding the degree of reliance on how accurate the data provided by others in a federated model (Currie, 2014; Alwash, Love, & Olatunji, 2017).

The fluidity of working patterns in BIM, which is unrigid, allows both contractors and the design team to produce their models depending on the degree of collaboration among the two parties. Within this condition, possibly, the design team would rely upon or anticipate the contractor to produce a model for their area of specialty or trade, which depicts a reversal of the traditional process (Dwyer, 2014). Hence, in response to this situation, it is essential to have a comprehensible process controls and regulations to ensure the proper use of models in all stages of development.

2.2 Contractual Issues

In a BIM project, the BIM model is frequently used alongside the 2D drawings where references are made between these two sources interchangeably. The involvement of two sources of information may result in some confusion, inconsistencies, and data disarray, which would cause some conflicting issues among the parties involved. Since the contractual status of the BIM model in a project is also uncertain and probably stands powerless below the written contract document, the adoption of BIM in a project seems flawed and it might hinder the intention of having extensive digital collaborative and integrative working environment (Philp & Frise, 2014). It is important for the BIM digital data to be accurate and trusted as it is capable of being used to the extent of linking the data with intelligent building system for the purpose of building performance information and life-cycle cost estimation (Siti Nora Haryati, 2017). Therefore, comprehensive contract documents that oversee issues related to data usage and data reliance emanating from BIM adoption should be considered as a prerequisite before executing BIM in construction projects (Siti Nora Haryati, 2017).

The issue of contractual responsibilities and liabilities also need to be considered. The engagement of multiple disciplines in creating multiple data, information, and models creates a grey area in the dividing line of responsibility among the parties, thus calling for the need of a comprehensive management protocol. The issues of responsible parties

to manage the federated data and model, as well as the dependency on Information Manager (IM) concerning the security of data is of utmost importance to be addressed at the project set (Currie, 2014; Philp & Frise, 2014; Salman Azhar, Hein, & Sketo, 2008). The situation could be worsened as the higher the degree of collaboration among parties, the more complicated these issues would turn out, and therefore, requires a clear contractual provision to address these risks.

BIM Level 2 requires an Information Manager (IM) to be appointed to manage the data transmission among the parties from the beginning until the operational stage of a project. Fundamentally, IM is tasked to protect all BIM data and information in connection with confidentiality, availability, integrity, non-repudiation, and authentication (McAdam, 2010; Construction Industry Council (CIC), 2013). Such appointment, either by appointing an independent consultant throughout the project duration or vesting the role within any of the existing position of the project team members, should be made clear in the contract. The IM's rights, duties and responsibilities are also important to be spelled out as this position might cause additional risks to the appointed party (Siti Nora Haryati, 2017).

2.3 Technical Issues

Implementation of BIM requires diverse technical expertise especially in the area of Information Technology (IT). The lack of skilled technical expertise not only puts the digital data at risk but also hinders BIM from providing optimum benefits to its users. Plenty of studies reported the issue of software interoperability that stems from the use of various software that comes with different formats that are incompatible with each other, thus causing difficulties during the process of exchanging data among the team members (Philp & Frise, 2014; Mzyece, Ndekugri, & Ankrah, 2019; Costa & Sicilia, 2020; Utkucu & Sözer, 2020). This issue is severe particularly when a single integrated model working environment is involved, which is from BIM Level 2 and above when high level of interoperability is required during the data exchange process. An example is where any alterations done in a particular area of a design that supposedly can be interlinked, shown and viewed by the others cannot be performed due to different BIM software formats that are incompatible with one another. Thus, it is imperative to agree unanimously among the team members regarding the software to be used during the project outset to ensure their compatibility (McAdam, 2010; Memon, Rahman & Harman, 2014; Rokooei, 2015).

Besides, in order to ensure a smooth interaction that allows crucial information to be delivered successfully and integrated in an organised manner, comprehensive strategies that are proven to be practical must be established. The effort, however, hinges on BIM experts to manoeuvre the BIM process which is considered scarce. The circumstances resulting in the non-preferable of BIM adoption in some firms under the perception of unworthy return of investment (ROI) (Asri Abdul Hamid, 2017). Furthermore, the adoption of BIM requires a full-fledged investment in terms of compatible BIM software with high interoperability, hardware upgrades, and most important of all, an all-inclusive BIM training for all staff. Such requirements and upgrades are not only perceived as not ROI guaranteed, but it also requires a lot of time and commitments which some big companies might find easy; however, it might be a different narrative for SMEs. Moreover, taking a leap of faith without a strong foundation and consideration regarding the long-term effects seems to be unfit for a profit-oriented company in the current economic condition.

3. Intellectual Property Rights (IPR) in Building Information Modelling (BIM) Construction Projects

Intellectual property (IP) can be defined as a valuable proprietary asset or information generated such as artistic works, company logo and symbols, material design, literature, and many more which are recognised under the law (World Intellectual Property Organization (WIPO),2004; Drahos, 2016). Intellectual Property Rights (IPR) allows the creator rights in terms of benefits and protection over the use of their intellectual property and to leverage from such assets by way of recognition, acknowledgment, or monetary benefit. In order to ensure that the intellectual property is well-protected against any abuse and unethical infringement, which would affect and reflect upon the reputation of the original owner, the intellectual property can be protected through patents, copyright, trademarks, trade secret, and industrial design (Devries, 2009; Thomas, 2013)

Similar to other industry sectors, the involvement of the intellectual property of parties is a necessity throughout the construction process and stages from the initiation phase until demolition. The intellectual property of contributors is produced directly or indirectly during the construction process such as the architect's plan, photos, drawings, written documents and includes the final output model of the project itself (Harling, Gard, & James, 2014). Furthermore, during the tender stages, proprietary information of companies is also perceived as a trade secret where the materialisation of skills into an idea or proposals is involved in winning the tender. In order to preserve the intellectual property rights of contributors over their intellectual property, section 3(b) of Malaysia Copyright Act 1987 (Act 332) provides that the IPR of contributors are protected under the terms 'artistic work', which is defined as "a work of architecture being a building or a model for a building" (Laws of Malaysia, 2012, p. 11).

The use of BIM raises the concern on IPR. This occurrence is foreseeable due to the integrative and collaborative working environment involving sharing and exchanging digital models produced by contributors. The adoption of BIM, which requires the sharing of data, could promote all parties to work collaboratively and allowing parties to jointly use

the model for the tasks to be executed efficiently. This collaborative working condition in BIM brings up concerns on the legal issue of intellectual property infringement and ownership of data, which is absent in the previous transactional-type contract and paper-based design (Alwash *et al.*, 2017; Ming Jo *et al.*, 2018; Mohamad Izani, Zulhabri & Norfashiha, 2019).

3.1 Copyright Ownership

Fundamentally, the creator has the right of ownership over information or any intellectual property provided (Larson & Golden, 2007). However, it is a different narrative for the BIM project as the collaborative working environment comprising the activities of generating, sharing, altering, and annexing details blur the lines of ownership among the contributors (Thomas, 2013; Mordue *et al.*, 2016; Siti Nora Haryati, 2017). The introduction of the federated BIM model through a wide implementation of BIM Level 2 started to exacerbate the issue of ownership and intellectual property among parties (Winfield & Rock, 2018). The project stakeholders are all able to share and add details to the BIM federated model; thus, it is not easy to separate the contributions of the parties. Such predicaments could be solved through the appointment of Information Manager (IM) who can administer all data entries and manage the federated model. Therefore, it may be relatively easy to trace the ownership of each data provided and to preserve the IPR of each contributor. However, the involvement of the Information Manager into the working structure opens the door for another issue as there might be some fraction of rights of intellectual property entitled by the Information Manager through providing the service of data administration and federated model generation (Currie, 2014). In another perspective, the use of BIM model in post-completion might require the client to own the BIM model for the purpose of facilities management, maintenance and further development of the facilities (Foster, 2008; McAdam, 2010; Salman Azhar, 2011; Chao-Duivis, 2011). However, without clear terms in the contract, the ownership remains with the contributors, which may open another cause of legal dispute in the future.

3.2 Data Infringement

Data infringement is another perennial issue associated with the use of BIM in a construction project. In BIM lingo, data infringement can be interpreted as an act of violation or transgression upon the protection of intellectual property by means of plagiarising or stealing any sensitive or valuable personal information or BIM model for the purpose of leverage, personal benefit, or monetary gain without the consent of the original creators (Fan, 2014).

All parties involved in a project from the top tier management, such as the client, to the lowest in the hierarchy such as material suppliers could be exposed to the risk of data infringement during the activities of sharing and exchanging proprietary information (Filho, Frame, Heneghan, Johansen, Moore, Vogel, 2016). With BIM, greater access is given to all team members which allows them to view and inspect the design or information provided. Thus, it is inevitable to stumble upon the issue of inadvertent infringement of another's intellectual property due to the use of proprietary information by various parties (Fan, 2014). This scenario normally happens when a contributor is preparing a model without any proper registration record, allowing others to discern it as a non-copyrighted freely accessible public model, and then leverage or exploit such model for personal benefits in the future (Fan, 2014). The issue could be aggravated as the infringement of data may cause a significant economic risk to the original creator and adversely affects the whole project due to conflicts and disputes (Reichard, 2018).

Where previously, the issue of IPR arises only when the final model output is provided to the client, with the adoption of BIM it also requires the team members to be transparent regarding the working methods adopted. Thus, cautionary measures must be practiced among parties since the activities of sharing and opening up work are considered a double-edged weapon and the adoption of BIM is a mixed blessing for the construction industry. While it is undeniably true that BIM increases the overall project quality, it also comes with consequences that cannot be overlooked (Mordue *et al.*, 2016). Therefore, precautionary measures must be practiced to strictly assure that design decision and methods lie only with the original owner and any valuable intellectual property generated, including but not limited to the proprietary model, must come with proper registration and record.

4. Research Methodology

The present study employed qualitative survey research methodology using semi-structured interviews. Although survey research requires a reasonably large sample in order to adequately represent a community at large (Kelley, Clark, Brown & Sitzia, 2003), the study managed to acquire data from only seven respondents due to the low number of BIM and IPR experts in Malaysia. This situation calls for the adoption of qualitative survey research method which does not emphasise on frequencies but the diversity of interest within a reasonably small sample (Boyatzis, 1998; Jansen, 2010). Despite the low number of respondents, the criteria of qualitative survey research are fulfilled where all respondents are experts in the areas of construction disputes and BIM, as well as having between 8 and 30 years of experience in the construction industry as shown in Table 1. Therefore, interacting with these experts through semi-structured interviews is considered sufficient to gather high-quality information needed for this research to be carried out (Saunders, Lewis, & Thornhill, 2016).

Table 1 - Demographic data of respondents in semi-structured interviews

Type of organisation	Position	Work background	Experience in the construction industry	Experience in BIM and legal
Software company	Product Expert	Quantity surveyor, BIM coordinator	9 years	2 years in BIM research and practice; 4 years in contract administration
Architect firm	Principal Architect	Designer	8 years	5 years in BIM practice
BIM consultant company	Executive	BIM coordinator	13 years	10 years in BIM research and practice
Law firm	Assistant Director	Construction lawyer	8 years	2 years in BIM research; 5 years in construction law
University	Lecturer	Construction lawyer; academician	8 years	6 years in BIM research; 5 years in construction law
Consultant company	Director	Quantity surveyor, adjudicator	30 years	5 years in BIM projects, 17 years in construction contract and dispute
Consultant company	Director	Quantity surveyor, adjudicator	35 years	4 years in construction contract and dispute

5. Research Findings

5.1 Issues of Copyright Ownership

In the previous discussion, there are various interpretation given regarding the copyright ownership of an intellectual property among construction experts and scholars. Larson and Golden (2007) asserts that the right of ownership falls on the original creator while Thomas (2013), Mordue *et al.*, (2016) and Siti Nora Haryati, (2017) argued that the same concept could not be easily applied due to the current collaborative working environment which involves a high degree of information sharing. The involvement of Information Manager further complicates the situation as it is indicted that the IM also has a fragment of rights over IP through the service provided (Currie, 2014). Then, the case of client entitlement over copyright ownership came into the scenario as the IP is important to execute post-completion work (Foster, 2008; McAdam, 2010; Salman Azhar, 2011; Chao-Duivis, 2011).

Based on the interviews with the experts, all respondents agreed that limitations on the use of intellectual property (IP) must be agreed upon during contracting in order to protect the IPR of the contributors during the construction phase. However, the copyright of the final federated BIM model should be given to the client in accordance with section 26 subsection 1 and 2 of the Malaysia Copyright Act 1987 amendment 2012. Moreover, all respondents were against the narrative that the transfer of copyright ownership to the client results in zero rights entitlement to the contributors. Therefore, at the project outset, the respondents proposed for all parties to realise and be aware of their rights and achieve a unanimous decision regarding the copyright ownership to prevent any conflict as the project progresses. There are two suggestions given by the respondents to achieve a win-win situation between the clients and contributors, which are: (1) the copyright ownership of the completed BIM model retained by the client for a certain period or a limited time and transfer the ownership to the original contributor when it is due; and (2) the ownership retained by the client is absolute; however, the original contributors are entitled to use their model in accordance to the specified conditions outlined in the contract, such as for a case study or justified personal usage.

The respondents were asked on the practicality of the existing provisions in the common standard form of contract in Malaysia. The respondents claimed that Clause 64 of PWD 203A (2010), which stated that all materials supplied by the contractor shall belong to the government, is appropriate to be applied in the BIM context. This is because the term 'materials' does not only refer to tangible medium, but the meaning can also be extended to digital data and electronic medium. This is based on Section 13A (2) of the Copyright Act 1987 which defines design document as “any record of

a design, whether in the form of a drawing, a written description, a photograph, data stored in a computer or otherwise" (Laws of Malaysia, 2012, p.30). However, for PAM 2018 standard form of contract, there is no specific provision mentioning the copyright ownership. Hence, the respondents suggested for the contract to be annexed with a supplementary condition such as BIM protocol to confirm the ownership of the BIM model.

With regard to the absence of copyright ownership provision in construction contracts, all respondents agreed that this situation would result in several repercussions to the industry in the long run as the implementation of BIM is foreseen to go far and wide in response to the Construction Industry Transformation Programme (CITP) 2016-2020. One of the long-term detrimental effects discussed by the respondents is design liability (Philp & Frise, 2014). Such absence may lead to difficulties in determining the responsible party(s) for design defects. The lack of copyright ownership provision may also lead to confusion and conflict on the issue of who should be entitled to retain the ownership of the model (Dwyer, 2014). As the paymaster, the client may argue that he should be entitled to keep the copyright, while the contributors would feel the same way since they have invested their time, skills, and idea. Furthermore, there might be occurrences where the contributors did not gain any rights or benefits from their intellectual property. This is due to the norms that a non-copyrighted material or model can be accessed to anyone to leverage such intellectual property, hence, leaving the original creators unable to earn anything from their product. Therefore, it is vital to have specific terms of copyright ownership of BIM model included in the contract.

5.2 Issues of Data Infringement

Intentional or inadvertent infringement may occur when the intellectual property has no proper registration record (Fan, 2014). In worse case, the original creator would suffer a significant loss that would further cause an economic risk affecting the whole project (Reichard, 2018). The experts were asked regarding the issue of infringement and suitable precautionary measures. According to the respondents, this issue is foreseeable and is expected to occur within an integrative and collaborative working environment of BIM Level 2, resulting from intense data sharing among the parties.

The remedy for data infringement is outlined in the commonly used standard forms of contract of PWD 203A and PAM 2018. Clause 64 of PWD 203A (2010) and Clause 7 of PAM 2018 provide similar remedy where the client is entitled to be indemnified if the contractor is proven liable for infringement of data, models, or any materials. The respondents agreed that these clauses are applicable in solving the issue of data infringement by the contractor; however, they are not enough to address the issue of 'privity of contract' among the project team members. As the issue of data infringement in the BIM environment is expected to be more severe, some alterations or additions to the clauses are required to preserve the IPR of contributors in the BIM project.

5.3 Issues of Information Manager (IM) Rights

Information Manager plays an important role in coordination, model management, and model federation which requires certain skills, expertise, and knowledge. This situation raises concern on the rights of IM over copyright ownership due to the role performed in BIM coordination process (Currie, 2014). All respondents agreed that the services provided by the Information Manager neither equate an entitlement for copyright ownership of the model nor result in data infringement since the portfolio does not involve any change of model and alteration. Nevertheless, the respondents agreed that the only rights eligible by the Information Manager is the right to receive payment over fulfilling the duties. This was aligned with Winfield (2015) where the role performed should not be extended to any other construction power or entitlement. Therefore, the involvement of the Information Manager in the BIM working structure is not a threat to the intellectual property of the contributors and unlikely to cause an infringement of data.

6. Conclusion

This paper reported the issues surrounding the adoption of BIM, specifically on the intellectual property rights (IPR) of model contributors which are categorised into two major headings: copyright ownership and data infringement. From both literature review and semi-structured interviews, various issues and strategies of IPR have been highlighted to be considered by the construction industry players in Malaysia, which are summarised as follows:

- The provisions on IPR in the existing local standard form of contract are not enough to cater to the needs in BIM environment, therefore modifications are required, especially regarding the issue of privity of contract among the project team members and the inclusion of copyright ownership.
- The implementation of BIM in a construction project blurs the demarcation lines of copyright ownership among the model contributors and the client, thus specific clauses to clearly address this issue need to be included in the contract. The copyright of the final federated BIM model should be given to the client to be further used during post-completion. However, some entitlement for the original contributors to use the BIM model such as for a case study or justified personal usage may be considered to be given subject to the conditions and agreement in the contract.

- It is important for the duties, rights and liabilities of the Information Manager regarding IPR to be clearly spelled out in the contract as the Information Manager is the central point and closest to the individual models and federated model, hence the conflict of interest could be avoided.

Further research is recommended to be carried out within this particular area with bigger sample size and coverage to enhance the aforementioned issues and findings.

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