Legal Considerations in the United States Associated with Building Information Modeling

Lonny Simonian[1] and Thomas Korman[1]

[1] California Polytechnic State University,
Construction Management Department
San Luis Obispo, CA 93407-0284, USA

Email: lsimonia@calpoly.edu; tkorman@calpoly.edu

Abstract:

Building Information Modeling (BIM) offers the potential for significant savings in the cost and time required to construct a building; however, there are several legal issues associated with its use:

- ◊ Ownership of the BIM model and data - An owner may believe that they are entitled to own the model; however the rights of the architect, design engineers, equipment suppliers need to be protected as well.

- ◊ Allocation of Risks - Taking responsibility for updating BIM data and ensuring its accuracy involves a significant amount of risk. Issues of complicated indemnities by BIM users and limited warranties and disclaimers of liability by designers will need to be resolved.

- ◊ Privity of Contract and Third Part Reliance - The use of a collaborative model lessens the likelihood that a designer may claim the lack of privity of contract as a legal defense.

- ◊ Professional Design Responsibility - It will be very difficult to ensure that licensed design professionals will always in charge of the creation and modification of the data that forms a digital model.

- ◊ Standard of Care - While it appears that the author of each individual design element should have ownership of the copyright to the information and documentation within the model, many different parties may have the ability to change the design created by another party.

- ◊ Spearin Doctrine - The BIM collaborative process during the design phase of the project could deprive the contractor from the protection of design errors provided by this doctrine.

- ◊ Economic Loss Rule - The use of a collaborative building model will be a factor tending to support a contractor's claim that it should be able to recoup its economic losses absent a contract with the defendant.

This paper will examine the current literature to date on the legal implications associated with the use of BIM, and propose an implementation plan to transition to BIM.

Keywords:

Building Information Modelling, Privity of Contract, Standard of Care, Spearin Doctrine, Economic Loss Rule

1) Introduction

There are several different definitions for Building Information Modeling (BIM). These definitions vary by type of organization and their specific work emphasis. For example, from a design perspective, the American Institute of Architects[1] (AIA) defines BIM as the digital representation of the physical and functional characteristics of a project, and that Building Information Modeling refers to the process and technologies used to create a Building Information Model (also abbreviated as BIM). From the construction side, The Associated General Contractors of America[2] (AGC) defines BIM more narrowly, as "the development and use of a computer software model to simulate the construction and operation of a faculty"

Another definition for BIM includes that proposed by Van Nederveen[3]:

> "a model of information about a building (or building project) that comprises complete and sufficient information to support all lifecycle processes and which can be interpreted directly by computer applications. It comprises information about the building itself as well as its components, and comprises information about properties such as function, shape, material and processes for the building life cycle".

Finally, the National Institute of Building Sciences[4] (NIBS) offers the following definition:

> "Building Information Model or BIM utilizes cutting edge digital technology to establish a computable representation of all the physical and functional characteristics of a facility and its related project/life-cycle information, and it is intended to be a repository of information for the facility owner/operator to use and maintain throughout the life-cycle of a facility".

---

[1] American Institute of Architects (AIA), 2008. *Document E202 – Building Information Modeling Protocol Exhibit*. Washington DC: AIA

[2] Associated General Contractors of America (AGC), 2006. *The Contractor's Guide to Building Information Modeling*, AGC, Arlington, Virginia

[3] Van Nederveen, S., Beheshti, R. and Gielingh, W., 2009. Modeling Concepts for BIM. *In:* Underwood, J., and Isikdag, U., eds., *Handbook of Research on Building Information Modeling and Construction Informatics: Concepts and Technologies*, Hershey, PA: Information Science Reference, 1-18.

[4] National Institute of Building Sciences ("NIBS"), 2007. *United States National Building Information Modeling Standard: Version 1 – Part 1: Overview, Principles and Methodologies*. NIBS.

Typically BIM uses three-dimensional, real-time, dynamic building modeling software to increase productivity in building design and construction. BIM is a process which goes far beyond switching to new software. It requires changes to the definition of traditional architectural phases and more data sharing than most architects and engineers are used to performing. The process produces the Building Information Model, which encompasses building geometry, spatial relationships, geographic information, and quantities and properties of building components.

Despite the significant benefits associated with BIM, there are several legal issues and risks which the design and construction industry has not addressed properly. In the United States, the legal system principally is concerned with individual rights and responsibilities, whereas BIM is essential a collaborative effort amongst several different entities, This difference in focus between personal versus collective betterment results in a tension between an individual firm's need to tightly define their responsibilities and limit their reliance on others, and the need to promote collaboration and encourage reliance on information stored within a shared building model.

These issues have been categorized[5] into three major groups: commercial, technical, and legal. This paper examines some of the legal issues and risks associated with the use of a BIM.

2) Ownership of the BIM Model and Data

The relationship between engineering and construction firms can vary widely, depending upon past working relationships. In general, however, engineering firms are reluctant to supply reference information, such as take-off data, to a contractor[6]. There is no gain for an engineering firm to share this information, and if there is a problem with the data, this exposes the engineering firm to liability. Therefore, contractors typically perform their own quantity take-offs even though the engineer already has this information. This creates needless duplication of work.

The sharing of information can also enable the reuse of data throughout the life cycle of a project. An investment in BIM software could actually add value to a model, by including space planning, quantities, facility maintenance records, furnishings, and inventory, as well as recording changes throughout the facility life cycle[7]. This includes providing a digital owner's manual of the building upon completion, so facilities managers can take that building and use it to help budget and prepare reports for all maintenance work. Historically, a design remains the property of the designer following the completion of a project[8], but BIM is capable of providing a wealth of information

---

[5] Ashcroft, H. , 2006. Building Information Modeling: A great idea in conflict with traditional concepts of insurance, liability, and professional responsibility. Victor O. Schinnerer and Company, Inc. Chevy Chase, Maryland.

[6] Ireland, B., 2009. Barriers to BIM: Electrical Industry lags behind other trades in adoption of Building Information Modeling. *Electrical Construction and Maintenance, March 2009.*

[7] McGraw-Hill Construction, 2008. *Building Information Modeling Trends SmartMarket Report.* New York: McGraw-Hill

[8] Hurtado, K. A. and O' Connor, P. J., 2008. Contract Issues in the use of Building Information Modeling. *International Construction Law Review.*

which may be beneficial for the maintenance and operations of a building. Owners and building occupants therefore may want to continue to use and develop the model.

Some owners have contractually obligated the architect to treat the model as a deliverable. There are many reasons for this: the owner's desire to get what they believe they are paying for, to know more about the design as it progresses, and to use the model as a tool in management and operation of the facility during its lifecycle. This latter reason is cited as one of the benefits of using BIM for the design and construction of a facility. Obviously, this raises more concerns regarding a design professional relinquishing possession and control of an instrument that could serve as a basis for future liability.

This free flow of information is also a cause for concern, and Ireland[9] points out the critical issue of ownership of the design data. For example, a specialty mechanical, electrical, or plumbing (MEP) contractor who inputs detailed design into a model (which is shared with all team members) may want to maintain the right to that data when the project is over. If that data is now part of a building model used by an owner, proprietary information could find its way to a competitor upon completion of the project.

Many BIM-related issues stem from concerns about ownership of the model and use of the information that the model contains and generates. The ownership of the intellectual property generated in the BIM process has not been adequately addressed. In the shared design philosophy intrinsic in BIM, there are layers of intellectual property provided by design participants and others that are incorporated into the final model. With project stakeholders all being able to share project information and add details to the project model, disputes may arise over who owns the copyright if any of the design elements are used on future projects. To further complicate this issue, there may be inadvertent sharing of proprietary information, trade secrets, or patented processes. Confidentiality as well as ownership rights may be compromised.

3) Allocation of Risks

The use of BIM substantially alters the relationships between parties and blends their roles and responsibilities. The legal framework in the United States, however, assumes a less collaborative environment with clearer delineation of responsibility. As BIM projects become more commonplace, risks will need to be allocated rationally, based on the benefits a party will be receiving from BIM, the ability of the party to control the risks, and the ability to absorb the risks through insurance or some other means.

Recent advancements in technology have made BIM both available and relevant to the work of all members of a project team. The prevalence of BIM will inevitably change the ways projects are conceived, designed, communicated and constructed. However, the core responsibilities of the members of the project team will not change.

---

[9] Ireland, B., 2009. Barriers to BIM: Electrical Industry lags behind other trades in adoption of Building Information Modeling. *Electrical Construction and Maintenance, March 2009.*

Whether the design is issued in the form of 2D printed documents or a 3D electronic medium, or in combination of both, the responsibilities of the members of the project team remain unchanged. It is very important to recognize the difference between design and coordination. The creation of a composite coordination model does not require or supplant a design that is conveyed in 2D printed documents. When a contractor or construction manager creates a "coordination" model, the BIM tool is completely similar to a light table used in the past to overlay mechanical and electrical drawings. Recognizing the validity and value of the information in any BIM is the responsibility of every project team member who utilizes it.

Contractors and construction managers need to understand that coordination, whether through BIM technology or a light table, is their core service to the project. As the leaders of construction coordination, contractors and construction managers have the responsibility to encourage and facilitate the sharing and distribution of BIM technology on a project. Appropriate contract language will guide the open sharing of information between team members. In addition, a design team also must recognize the benefits of sharing all available electronic information with the entire project team. Subcontractors are still responsible for fully conveying their interpretation of the design intent to the design team. They also must coordinate their work with that of other subcontractors by sharing electronic information they have developed in file formats that can be used and combined with the work of others.

4) Privity of Contract and Third Part Reliance

The extent to which third parties may rely upon a designer's work is a highly contested subject. The use of a collaborative model lessens the likelihood that a designer may claim the lack of privity of contract as a legal defense.

The model designer must be aware that there are other parties relying on the accuracy of the model. It is foreseeable that the main purpose of the model is to provide information for contractors' and subcontractors' to use in constructing a facility. Under the Restatement of Torts, Second, issued by the American Law Institute, a person negligently providing information is liable if it is intended that the plaintiff be able to rely on the information. Liability only requires that there be intent to influence and reach a group or class of persons[10]. For this reason, contractors' and subcontractors' relying on the model will likely be able to bring an action against the designer for damages caused by negligent errors. Therefore, considerations must be given to requiring a waiver of consequential damages as a pre-condition to using the model or otherwise limiting damages due to model errors.

Provisions used by design firms that treat electronic data as inferior representations of 2D drawings no longer makes sense. The idea of obtaining waivers or limitations of liability to control allegations of detrimental reliance is counter to the BIM process. Disclaimers may be ineffective since reliance is implicit. With BIM, there must be a free exchange of data and the ability to rely on such data when incorporated into the

[10] Ashcroft, H. , 2006. Building Information Modeling: A great idea in conflict with traditional concepts of insurance, liability, and professional responsibility. Victor O. Schinnerer and Company, Inc. Chevy Chase, Maryland.

final model. Harm can still occur, however, and whichever party is seen as controlling the information may be seen as the source of the harm. If the model becomes a tool to assist the client in operating or modifying the facility, the question of the rights of the client to use all the information in an unregulated way also becomes paramount.

5) Professional Design Responsibility

For the protection of the general public, many states regulate the professional practices of architecture and engineering. These states require that each project be under the responsible charge of a licensed architect or engineer, and that these personnel are designated as the architect or engineers of record. Additionally, these states require that the seal of such individuals appear on all drawings, specifications, and other design documents issued by the firm for such projects. These requirements are easily understood and followed in the creation of 2D drawings where the design documents are issued only in paper form; however, there are inherent problems when many non-licensed participants may have access to a BIM model.

It would be very difficult to ensure that licensed design professionals will always in charge of the creation and modification of the data that forms a digital model. Design elements are increasingly delegated to unregulated parties such as contractors, fabricators, and manufacturers. With BIM, parties who are supplying design information are not, by contract, under the responsible charge of a prime design professional. BIM may lead to increased decision making not by design firms using professional judgment, but rather by construction entities or by a computer program working on preset rules created by independent organizations not subject to registration laws.

6) Standard of Care

According to the American Society of Civil Engineers[11] (ASCE), an engineering standard of care is a relative term and its determination involves experience, insight and common sense. The law provides that an engineer performing professional services has a duty to exercise care and skill to the same degree as that used in like cases by reputable members of the profession practicing under similar circumstances. Also, the engineer has the duty to use reasonable diligence and best judgment in the exercise of skill and the application of learning. The failure to perform any one of these duties is defined as negligence.

Design professional liability is almost always based on the standard of care. Yoakum[12] defines a typical standard of care clause as follows: "The Design Professional's services shall be performed in a manner consistent with that degree of skill and care ordinarily exercised by practicing Design Professionals performing similar services in the same locality, and under the same similar circumstances and conditions". A design professional's agreement should explicitly permit reliance without detailed checking,

[11] Bass, Eugene (2006) The Standard of Care - A Moving Target, http://www.asce-sf.org, accessed July 1, 2010

[12] Yoakum, S. (2006). "Building Information Modeling (BIM) Risks and Liabilities.", Donovan Hatem, LLP, Builders Association, Kansas City, Missouri.

but the ability to rely on another's work may be limited by professional registration statutes. This may lead to using risk transfer devices, such as limitations of liability or indemnification agreements, as methods to decrease professional liability.

According to Sieminski[13] there is a concern that the general use of BIM will alter both the standard of care and historical protections afforded to design professionals by the doctrine of privity. Until recently in some jurisdictions, the doctrine of privity of contract shielded architects and engineers from negligence claims by parties with whom the design professionals did not have a contract. Recent case law has relaxed the privity requirements to a limited degree. Many jurisdictions now allow claims where no contract exists when it is clear that a contractor reasonably relied upon information that a design professional misrepresented, within a context in which it could be anticipated that the contractor would be using this information. This may cause the unraveling of the standard of care where no privity of contract exists.

7) Spearin Doctrine

The *Spearin* doctrine is generally used by contractors as a defense to an owner's claim of defective and non-conforming work. If a contractor builds a structure according to an owner's plans and specifications, and the structure does not function as intended, the contractor is not responsible. When defects in the plans and specifications are the cause of the problem, *Spearin* shifts the responsibility back to the owner, who may then pursue legal action against the project architect or engineer of record. This is often referred to as "the owner's implied warranty" of the adequacy of the plans and specifications. The original *Spearin* case, *United States v. Spearin* (1918), 248 U.S. 132, gave rise to the *Spearin* doctrine.

The implied warranty set forth in the Spearin case was twofold: first, that the information contained in the plans and specifications would be accurate, and second, that the plans and specifications, if followed, would be adequate to accomplish the purpose of the project. Most importantly, the Spearin case has also withstood challenges that the responsibility of the owner is overcome by the usual clauses contained in construction contracts. This includes requiring the contractor to visit the site, to check the plans, to inform him of the requirements of the work, or to assume responsibility for the work until completion and acceptance. Contractual language obligating the contractor to examine the site do not impose upon the contractor the further duty of making a diligent inquiry into local conditions to confirm whether the owner's representations in the plans and specifications were accurate. The contractor also is not obligated to second-guess the adequacy of the plans and specifications to accomplish the purpose of the project. The United States Supreme Court has emphasized that an owner's warranty was implied by law, and that this did not need to be expressly stated in the contract documents.

This raises two major legal questions that need to be further investigated as a result of the collaboration process enabled by BIM. First, from a contractor's point of view, does the BIM collaborative process during the design phase of the project deprive the

[13] Sieminski, J., 2007. Liability and BIM. *AIA Best Practices BP 13.01.08.*

contractor from the protection of design error provided by the Spearin Doctrine? Second, from the designer's point of view, does the collaboration enabled by BIM during the design phase erode a designer's traditional protection from responsibility for contractor means-and-methods?

The answer to these key legal questions remains in the construction contract itself. Therefore, as long as the parties' roles are appropriately defined and the appropriate control is exercised over the collaborative process, the use of BIM does not necessarily alter the traditional allocation of responsibility among project stakeholders. It is important to emphasize that there is no new legal issue here. Instead, the hypothetical merely involves the application of long standing legal principles to a new context.

The *Spearin* doctrine remains a powerful tool for contractors when faced with problems resulting from defective drawings and specifications. Applied in its basic form, the *Spearin* doctrine frees contractors from having to double-check a designers' work and enables contractors to concentrate solely on the construction's means and methods. Owners who wish to avoid the application of the *Spearin* doctrine need to think ahead and include very clear statements as to the risks that the contractor is accepting. All parties involved in a construction project need to study the contract language carefully to be sure they understand exactly what the contract says about liability for plans and specifications that don't reflect reality or that won't work as intended.

8) Economic Loss Rule

The economic loss rule is another highly contested defense to contractors' actions against design professionals[14]. The doctrine is very simple in concept; it provides that where a party sues for purely economic losses, the party that is suing needs to have a contract with the defendant. The utility of the defense varies among jurisdictions and is dependent upon specific facts, similar to defenses used with privity and third-party reliance.

The complexity comes in the application. In states where the economic loss rule holds sway, plaintiffs continually attack application of the rule. For example, many states hold that professionals who commit malpractice may be sued in both tort and contract. Some states require a contract; while other states permit a suit without a contract where the plaintiff could be reasonably expected by the professional to rely upon the professional's information. The ability to sue professionals without a contract has an obvious potential impact on construction projects where information is often provided by architects, civil engineers, geotechnical engineers, land surveyors and other licensed professionals. Furthermore, the use of a collaborative building model will be a factor tending to support a contractor's claim that it should be able to recoup its economic losses.

[14]Ashcroft, H. (2006). Building Information Modeling: A great idea in conflict with traditional concepts of insurance, liability, and professional responsibility. Victor O. Schinnerer and Company, Inc. Chevy Chase, Maryland.

9) BIM Implementation

Architects, Engineers, and Constructors must remember that BIM is not just software, but should be considered a process. It must be thought of as a business decision, and the impetus of transition must be a management decision. A recommended course of action implementing BIM is to start by using the BIM process to produce faster, more accurate construction documents. Then, transition to model coordination/collision detection.

A transitioning roadmap must be a commitment from management. A BIM "champion" should be selected. This should be someone who is passionate about implementing the change. Next, an implementation plan should be developed and a pilot project selected. Additional formal training may be necessary initially. Using an implementation plan, a company-specific BIM Manual should be developed based on the experience of those involved in the pilot project. The process should then be repeated on future projects, one by one, until all new projects are using the BIM process. Finally, an ongoing training program should be developed to improve the process.

In developing an implementation plan, it is important to evaluate the current staff's skills and knowledge and to set measurable milestones. The selection of the pilot projects should be based on size. It may make sense to focus on a particular construction market as well, such as medical office buildings, or science and health care labs, before deploying to other markets. It should not be too big, or too small. It should be a typical project for the company. Additionally, it should be a project that will benefit from the use of three-dimensional modeling.

The creation of a BIM Manual should document BIM procedures that work for the company. These procedures will not be the same for each company. The creation of templates will assist in formalizing office standards and encourages efficiency for future projects. The manual and template can then be used as a basis for training current employees who will transition with future projects, as well as new employees.

By implementing BIM it is conceivable that some participants, such as contractors, will find that they are able to expand their services: providing detailed feasibility studies (pre-design), programming and planning (pre-design), early cost estimating, value engineering (design development), offering pre- and post- construction services, reselling the model data for public relations animation or marketing, model coordination and collision detection, and facilities management. At the very least, the implement of BIM will enhance the delivery and value of their core expertise; streamline their workflow; improve communication with clients, consultants, and contractors; broaden the services they offer to clients; and ideally, increase net revenue per employee.

The work process evolves as information is shared rather than isolated – new possibilities emerge. The ability to model coordination/clash detection with minimal delays increases as design iterations are sent back and forth to engineers as well as other specialty contractors, such mechanical and plumbing. Scheduling and estimating can be imbedded and revised concurrently with the BIM model-work, ultimately allowing the ability to provide for improved construction.