Engineering Management
Field Project

Integrated Project Delivery: Managing Liability Risks for the Design Professional

By

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Fall Semester, 2010

An EMGT Field Project report submitted to the Engineering Management Program
and the Faculty of the Graduate School of The University of Kansas
in partial fulfillment of the requirements for the degree of
Master's of Science

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Acknowledgements

I would like to thank my committee members Herb Tuttle, Diana Fiddick, and Ray Dick for their willingness to serve as my Field Project Committee. Their feedback and assistance was fundamental in the success of my project.

I would also like to thank Angie Lowry for her efforts with the review and the feedback she provided on my paper.

Most importantly I would like to thank my family for their understanding during the process of attending classes and the associated coursework. Their constant positive attitude and encouragement, especially from my wife Natalie, will be cherished forever.

Executive Summary

In today's construction industry a paradigm shift is happening and along with it a complete new way of thinking. This paper was written to help identify the liability changes design firms in the construction industry may expect to face through the use of Building Information Modeling (BIM) and Integrated Project Delivery (IPD).

The traditional delivery methods and tools utilized in the construction industry have led to an entrenched set of standards and legal precedents. Design firms have been able to rely on this when entering into agreements for their services and thus been able to anticipate the level of liability they may be accepting.

The use of IPD and BIM introduces a complete change in these standards and precedents previously set. The extent of these changes is too broad and largely unknown to address within the scope of this document. As part of the management of risk, the identification of the potential changes to the design firms' liability is crucial. This paper identifies the major areas of concern and provides some examples where a design firms' liability may change. The reader should use this information as a springboard for investigating how these changes may affect their business and how to address them to manage their risk. This paper does not identify all possible changes in liability or risk nor does it provide specific methods for addressing these risks as each firm will need to individually evaluate the potential changes based on their business model and services offered.

Given the potential impact, adjustments will likely be required in all areas of the design firms' business. Each firm will not only need to identify all the potential risks due to

the changes in liability but they will also need to identify what procedures will need to be modified to mange the risks. Once these procedures have been identified they will need to be implemented in the design firms' culture. Since the necessary modifications extend beyond a trivial modification of a single process, a change management model should be followed. This paper provides the reader with a suggested change management model and approach to identify design firm specific risks from liability changes and incorporate the proper procedure modifications to address these risks in the design firms' culture. The suggested model employs an 8-step process based on John Kotters' book Leading Change, and utilizing a committee approach as part of the process.

If implemented properly the change management model and committee approach suggested should provide the reader the tools necessary to help ensure a successful transition is achieved from traditional methods to the use of BIM and IPD.

Construction Design Process Definitions

A/E (Design Firm)- The term used to designate the Architect and/or the Engineer that contracts with the Owner to provide the Architectural and Engineering services for the Project.

American Institute of Architects (AIA) – The leading professional membership association for licensed architects, emerging professionals, and allied partners since 1857

Building Information Modeling (BIM) -Building information modeling covers geometry, spatial relationships, light analysis, geographic information, quantities and properties of building components (for example manufacturers' details). BIM can be used to demonstrate the entire building life cycle, including the processes of construction and facility operation. Quantities and shared properties of materials can be extracted easily. Scopes of work can be isolated and defined. Systems, assemblies and sequences can be shown in a relative scale with the entire facility or group of facilities.

Computer-aided design (CAD)- also known as computer-aided drafting and design (CADD), is the use of computer technology for the process of design and design-documentation. Computer Aided Drafting describes the process of drafting with a computer. CADD software, or environments, provide the user with input-tools for the purpose of streamlining design processes; drafting, documentation, and manufacturing processes. CADD output is often in the form of electronic files for print or machining operations. The development of CADD-based software is in direct correlation with the processes it seeks to economize; industry-based software (construction, manufacturing, etc.) typically uses vector-based (linear) environments whereas graphic-based software utilizes raster-based (pixelated) environments.

Change Order – A change order is work that is added or deleted from the original scope of work of a contract, which alters the original contract amount or completion date.

ConsensusDOCS-Are a collection of contracts documents that have been developed by a coalition of 29 leading industry associations representing owners, contractors, subcontractors, designers and sureties.

Construction - The term used to include new construction, reconstruction, renovation, restoration, major repair, demolition and all similar work upon buildings and ancillary facilities, including any draining, dredging, excavation, grading or similar work upon real property.

Contract Documents – The Contract between the Owner and Contractor signed by the Owner and the Contractor and any documents expressly incorporated therein. Such incorporated documents customarily include the bid submitted by the Contractor, General Conditions, any Supplemental General Conditions, any Special Conditions,

the plans and the specifications developed by the A/E, and all modifications, including addenda and subsequent Change Orders.

Design-Bid-Build - A Project Delivery Method defined by the following characteristics:

- Design and Construction are separate contracts (versus Design-Build, in which the contracts are combined)
- The only criterion for final selection is lowest total construction cost

Design-Build - A Project Delivery Method defined by the following characteristics: Design and Construction contracts are combined (versus Design-Bid-Build and CM at-Risk, in which contracts are separate

Engineers Joint Contract Documents Committee (EJCDC) - A joint venture of four major organizations of professional engineers and contractors. Since 1975, EJCDC has developed and updated fair and objective standard documents that represent the latest and best thinking in contractual relations between all parties involved in engineering design and construction projects.

Integrated Project Delivery (IPD) - Integrated Project Delivery is the general term applied to a new project delivery system that utilizes highly collaborative, cross functional teams composed of all project lifecycle stakeholders including the owner, architect, general contractor, engineers, suppliers and security. Keys to success require the team to be assembled early in the process, that all team members have open and equal access to information, and that they share equally in the risks and rewards of a given project. Relying on technical advances in BIM (Building Information Modeling) software and information sharing through the World Wide Web, empowered teams, often at great geographical distances, work together to create designs, solve problems and complete projects faster and less expensively

Means and Methods -A term used in construction to describe those operations of a contractor that arise normally in the course of construction but might be viewed as constituting "professional" services. Incidental design procedures, such as the rigging of scaffolding for a particular purpose, or incidental modifications of plans to solve on-the-spot construction difficulties, are examples of "methods and means." Such methods and means are ordinarily understood not to expose the contractor to professional—as opposed to general—liability.

Owner – An individual, corporation or governmental entity that owns a real property and has contracted work associated with the design and/or construction of a project.

Scope – Known also as the scope of work which is a written range of view or action; outlook; hence, room for the exercise of faculties or function; capacity for achievement; all in connection with a designated project.

Specifications: The part of the Contract Documents containing written requirements and the technical descriptions of equipment, products, materials, standards, workmanship, and execution which describe the proposed Work in sufficient detail and provide sufficient information for the Contractor to perform the Work.

Submittals -All shop, fabrication, setting and installation drawings, diagrams, illustrations, schedules, samples, and other data required by the Contract Documents which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the Contractor to illustrate material or equipment conformance of some portion of the Work with the requirements of the Contract Documents.

Vendors -One that sells materials or equipment not fabricated to a special design.

Chapter 1: Introduction

According to a study done in 2004, industry statistics had shown the only non-farm industry that had actually decreased in productivity since 1964 was the construction industry (Teicholz 2004).

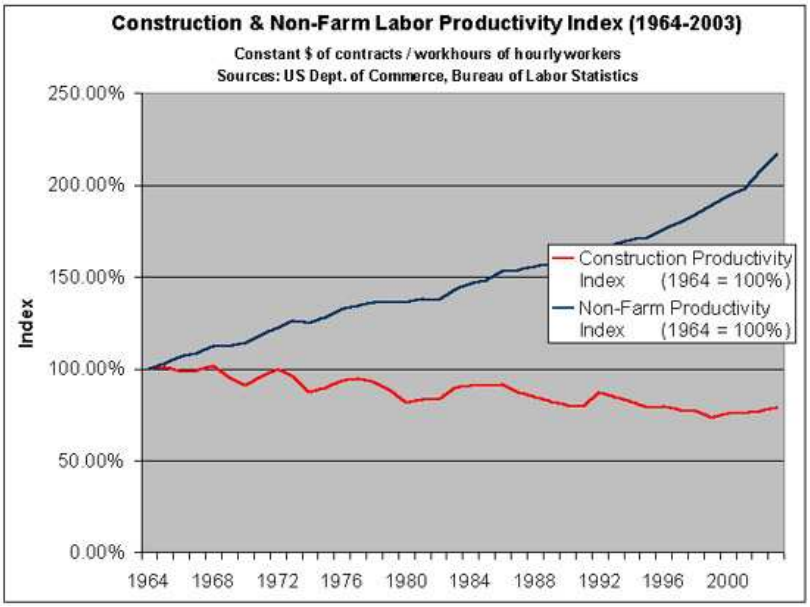

Figure I.1 – Labor Productivity Index

The building construction industry, further referred to as the construction industry, has been slow to adopt new technology and has relied on traditional delivery methods such as Design-bid-build and Design-build that have been inefficient both in overall cost and schedule. Over time, Owners have demanded improvements in the process by requiring a reduction in schedule and project costs while increasing their expectations. Until Building Information Modeling (BIM) was developed, the process had seen few advances allowing these needs to be met. Though a thorough history and background in the construction industry and its delivery methods are beyond the scope of this document, a brief history is provided to illustrate the issues being presented.

History

Though there are variations between projects, delivery methods, and the overall contractual obligations, the construction industry relies on two basic contractual structures as the primary delivery method for a new construction project. These delivery methods are known as design-bid-build (D-B-B) and design-build (D-B) projects. For the purpose of this document the primary focus will be on the impact BIM and the use of a new delivery method may have on the design firm (A/E) and its use of the traditional design-bid-build delivery method.

In a traditional D-B-B project, the contract structure is such that the Owner holds two separate contracts, one with the design firm and another with the contractor (see figure I.2). This method of delivery has been employed for many years with the leading industry groups such as American Institute of Architects (AIA), ConcensusDOCS and Engineers Joint Contract Documents Committee (EJCDC) developing standard form agreements following this structure to be used by the Owner.

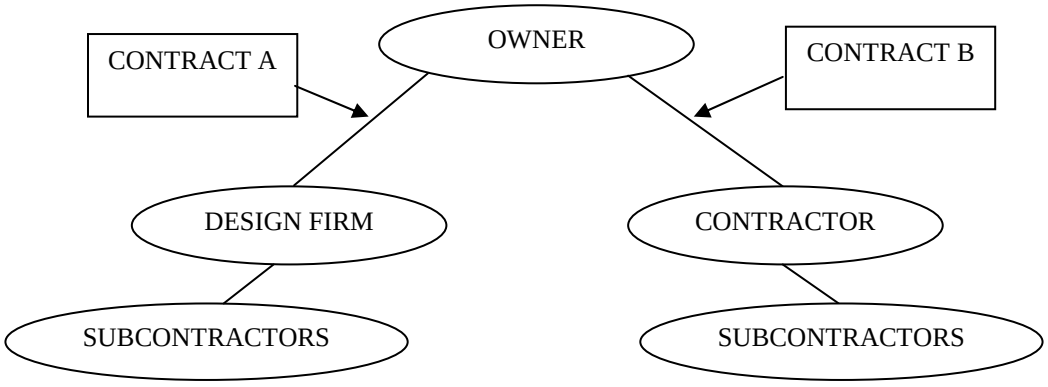

Figure I.2 Typical Design-Bid-Build Contractual Structure

These contractual relationships have become common place and have been relied on for legal arguments and establishing case law which have, in turn, set precedent.

These legal arguments have formed understandings among the different contract parties in terms of roles and responsibilities, as well as helping establish the standard of care that can be expected of each party. These set precedents are a major contributor to the risk a designer can assume when entering into a contract for their services.

Background

A relatively new delivery method to the industry has been gaining traction with Owners known as Integrated Project Delivery (IPD.) This new method no longer allows the traditional lines of separation to be maintained. IPD relies on an integrated and collaborative process from the beginning of the project, most notably the design phase. With traditional delivery methods, the contractor is generally not determined until after the design is complete. This does not leave much opportunity for input from the contractor and the design is generally under the control of the design firm until completion. This is no longer the case with IPD as it relies on the use of BIM and a collaborative process of all team members from the beginning of the project.

BIM is a multi-dimensional modeling software tool that allows a collection of objects and embedded data to be included in a three-dimensional model of a building that was previously unavailable in traditional computer aided drafting (CAD) tools. Traditional CAD tools allow drafting to be done in a 2-dimensional state which are printed in plan form and submitted as part of the construction documents. This requires a combination of multiple views such as floorplans (figure I.3), elevations (figure I.4), sections, details, etc. in order to communicate the intent and give a full description of what is expected of the construction.

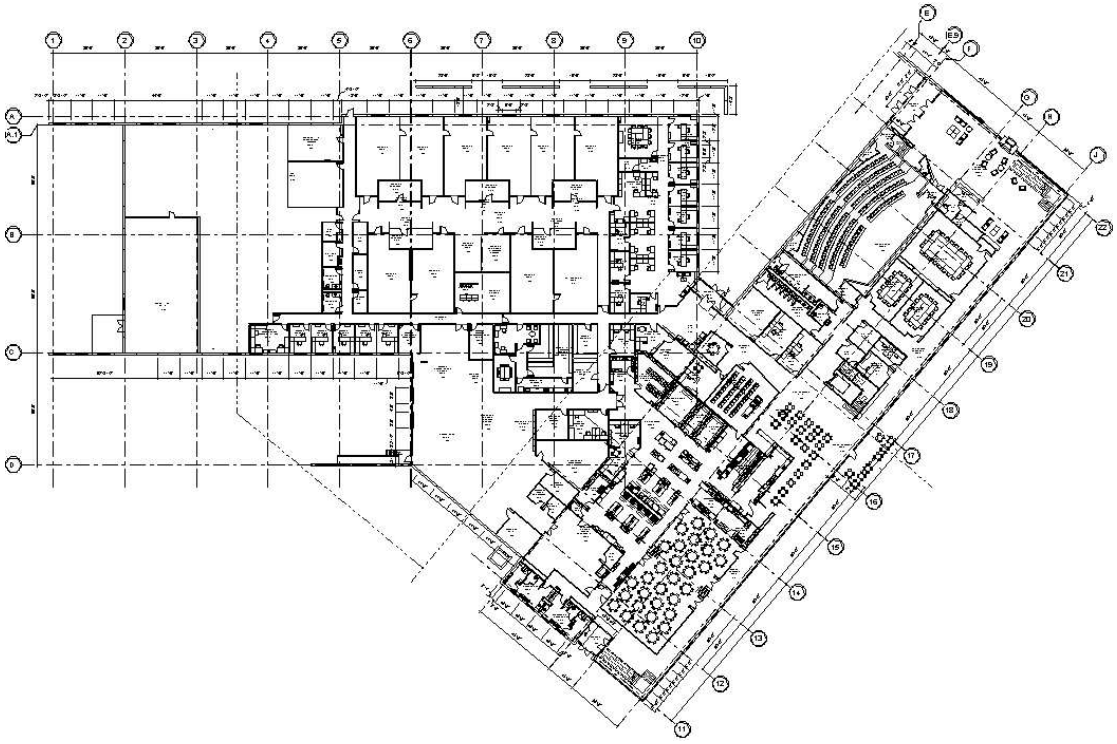

Figure I.3 2-Dimensional Floorplan Utilizing Traditional CAD Software

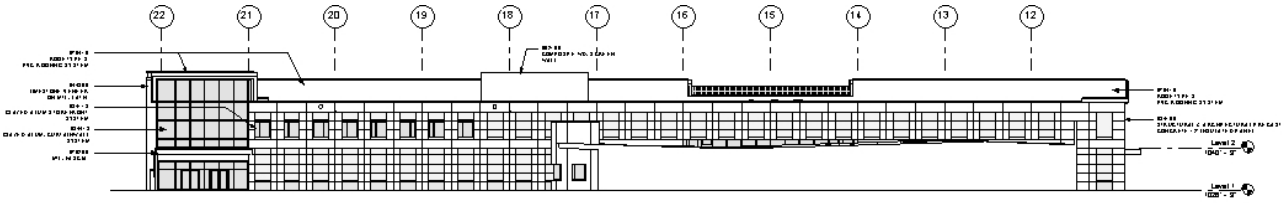

Figure I.4 2-Dimensional Elevation Utilizing Traditional CAD Software

With BIM, 3D models can be created (figure I.5) that contain objects within the model to include embedded data, known as 4D and 5D, reflecting a depth beyond a 3rd dimension. This data can include items such as fan speeds for a mechanical unit, weight of a particular piece of equipment, cost, life cycle data, maintenance schedules, production lead times, etc. An example of an object and its embedded data is provided in figure I.6.

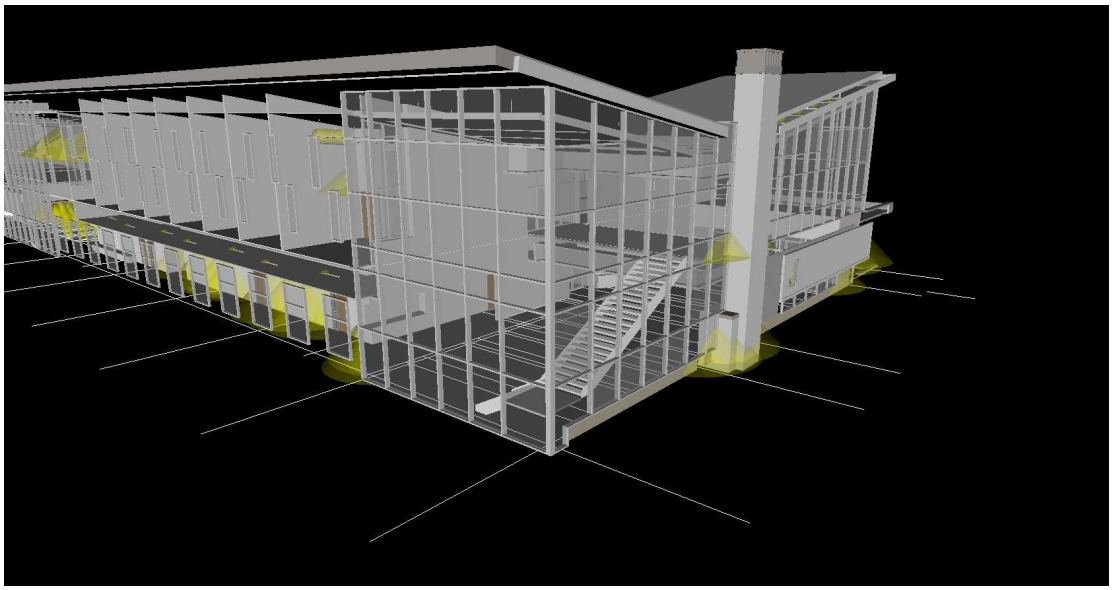

Figure I.5 BIM Model

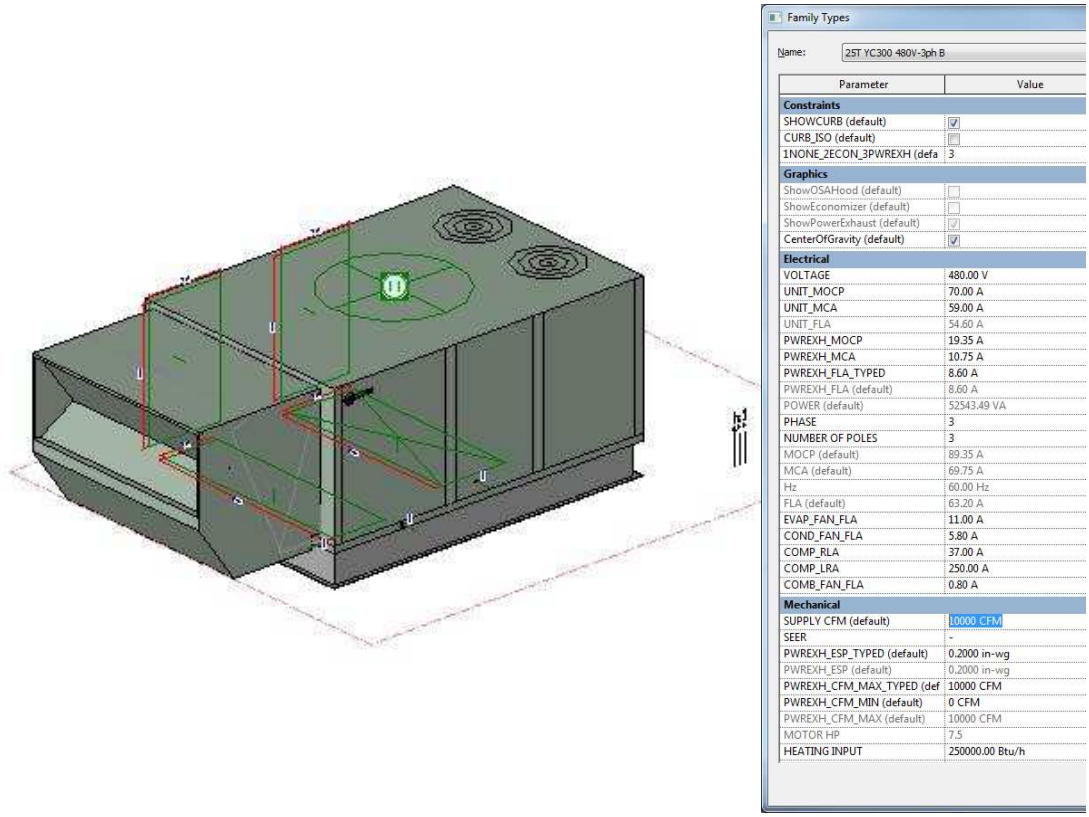

Figure I.6 BIM Object with Embedded Data Shown

This embedded data is what allows IPD to be a viable and desirable delivery option as it allows team members to rapidly locate pertinent information. For example, a cost

estimator would be able to simply open up a building model and have costing data for all objects within the model already embedded and computed. This would have traditionally taken extensive time and effort to review the construction documents before being able to assign pricing details. Research suggests that, through the use of BIM, design times could be reduced by 25% and post design activities reduced by 20%. (IDC 2009) It is this promise of reduced time, effort, and cost that causes BIM and IPD to become attractive to building Owners.

Due to the infancy of IPD, projects utilizing this method are a drastic minority to those delivered by traditional methods. However, they are being required of many very large and complex projects such as those at the state or federal government level.

Rationale

As new projects are encountered, design professionals are met with unrealistic expectations such as what is included in a model. In a meeting for a project utilizing BIM, an Owner's representative made the statement, "Everything is in the model," when describing what the Owner could expect to see in the model as the design developed. This statement is an alarming statement to those who have been involved with projects utilizing a traditional delivery method and should be for any design utilizing IPD because a standard of care has not truly been established within the industry. What does everything mean exactly? What happens if the expectation is not met?

Further illustrating these types of unrealistic expectations, the Texas Facilities Commission decided to require the use of BIM on all building projects for the state. The commission provided a video and supplemental commentary detailing how the use

of BIM would lead to a 100% reduction in change orders on their website. (Texas Facilities Commission 2009) At the time of writing this paper this reference has since been removed, but it served an important role in the genesis for this paper. The idea that a government entity responsible for several state funded projects believed that through the use of BIM they could expect a complete elimination of change orders is an alarming expectation for design firms that may become responsible for those costs as part of their contract.

Expectations such as these may be anticipated in an industry with its first opportunity for true change, especially when mired in a continued decline in productivity over the past few decades. The rationale for this project is to determine a method for identifying how this new technology and project delivery method can present new liability not previously seen in the traditional methods to a design firm and how to address them as a company.

Chapter 2: Literature Review

Locating books written on the specific topic of liability or risks related to utilizing IPD and BIM was not successful, nor was finding published literature related to the differences between traditional construction project delivery methods and those either present or anticipated by IPD and BIM. There were several articles, white papers and case studies by industry professionals and trade organizations, lawyers and legal firms, state and federal governmental agencies, insurance agents and companies, and other design professionals regarding various topics related to liability or risks the design professional may expect to encounter through the use of BIM and IPD. As one might expect, articles could be found regarding BIM concerns that were written much earlier and abundant than those related to IPD. This is likely due to the reliance on BIM for IPD and its development from BIM's use.

Though some of the articles reviewed dated back a few years, the concerns presented and discussed remain relevant today as precedent in the form of case law has yet to be established to allow further review and evaluation. Our legal system depends upon the early adopters of new technology to frame issues on a dispute-by-dispute basis in order to produce precedents that can guide those who follow. Unfortunately, there are no such reported decisions related to BIM. Consequently, at this point, more questions have arisen than answers. (Sieminski 2007) Until such time that legal precedent is set, new articles would only reaffirm or duplicate the discussion regarding the issues previously identified. In his article, "The Legal Worries Raised by IPD," Stephen Hilger points out that the lack of case law should not necessarily prevent the use of IPD but should be embraced as an opportunity to form the law and thus reduce unnecessary

risk by defining intent clearly prior to a ruling. The lack of judicial precedent on a particular subject matter will give a skilled and savvy attorney a clear slate to educate the judicial community on what the language means or should mean. If the industry is able to form these legal decisions based on sound education and what the language should mean, the design professional may find their current concerns are more manageable than expected. Until such time that these legal decisions are made it will be something design professionals' must protect themselves from.

The research suggests the risks are too broad for any one person to fully understand, but firms must rely on leaders in the industry with a background in each aspect of the construction process to identify the potential issues. One reoccurring theme observed during research was the author of each article would simply provide the reader with an analysis of the potential risks or where the industry could expect risks to present themselves. The author would stop short of providing solutions beyond suggesting each individual company or person evaluate the risks and formulate a plan to address them.

The overwhelming consensus regarding the use of IPD and BIM is the industry is going to migrate to their use. IPD using BIM technology is becoming more prevalent with many predicting that it will become standard. (Pohl and Washburn 2010) With the expectation that the industry will migrate to this delivery method, most agree there is a paradigm shift in liability and risk involved in the use of IPD and BIM from traditional delivery methods. The research also suggests most do not have a very good grasp of the total impact on the liability and risk associated with the shift as noted by the following statements: "One of the biggest unknowns with BIM is how it affects your

professional liabilities and how the insurance industry will handle claims on these projects. BIM is indeed still in its infancy and there are few precedents to help insurers, attorneys, judges and juries sort out responsibilities in the event of a claim." (VanGilder 2006); and "Full implementation of all the functions available in a BIM system presents a substantial set of legal issues." (Sieminski 2007) It is for this reason companies must address their risk and determine how they must address those risks moving forward so that they enter into contracts and projects with an educated perspective.

The research also suggests there are certain main areas where liability and risk will need to be researched further and evaluated. As the primary professional membership organization for Architects, the AIA has taken a leading role in developing a knowledgebase of concerns for Architects and design professionals. The AIA has created a number of documents and articles related to the topic. Of particular note was an article as part of their best practices entitled "Liability and BIM" by John Sieminski which summarizes the main areas of concern. These areas include adoption of a new tool (implementation), ownership and control issues, copyright protection, contractual protection, insurance matters, licensure matters, and standard of care. Within each area there are subsets or specific risks that could lead to an increased liability which would need to be evaluated based on each company's particular need and field.

Adoption of a new tool

As with any new tool, training and education is necessary for those utilizing the tool. In this case the tool is not only a piece of software but a delivery method. This means anyone involved in its use will need to be trained and educated on its use and how to

manage its use. In the case of BIM all those involved from Management down to the drafters has to be aware of its capabilities and limitations so that each person can identify how to use the tool to their advantage as well as spot any potential issues before they arise. Becoming proficient in BIM can be a long and costly process. (VanGilder 2006) Further complicating the task of training and education, the design firm has to evaluate which BIM program or programs they are going to purchase. Since the inception of BIM the industry has seen several different software programs race to market without a true interoperability plan in place. This has made it very difficult for one firm to work with another firm if their software is not the same. It is for this reason certain projects may require the specific use of a software program the design firm does not have or is unfamiliar with, which could dramatically complicate the design process. Major strides have been made in the area of interoperability but the core issue of sticking with a specific program and training staff must be determined before projects are taken on.

When deciding which project to pursue it is important the owner understands that the use of BIM will likely require more work be done at the design phase and therefore likely require more fees for the designer. These new costs may be more than offset by efficiency and schedule gains, but they are still a cost that someone on the project team needs to be aware of and thus ensure proposals include fees for this additional work. (Thomson and Miner 2006)

Ownership and Control Issues

Trying to address who will control the entry of data into the model and be responsible for any inaccuracies in it becomes very complex when collaboration is relied on

between different parties outside the design firm. Taking responsibility for updating BIM data and ensuring its accuracy entails a great deal of risk. (Thomson and Miner 2006)

A design firm desires ownership of its documents and, in this case the model so that unauthorized changes are not made, or if made they are aware of the change. Unfortunately, BIM potentially lacks established protocols for determining responsibility when something goes wrong with a product into which all participants have contributed data. When a problem arises, it may be days, weeks or years after the data was altered in the model making it very difficult to identify the genesis or party making the change. Some owners have contractually obligated the design firm to treat the model as a deliverable. This could lead to a basis for future liability if the model is relied on for something the design firm had not intended it be used for. (Sieminski 2007)

Copyright protection

BIM and IPD introduce a unique complication as the model relies on input from so many different entities. It is difficult to identify who each part or item actually belongs to. The Architectural Works Copyright allows for registration and protection of a building design and the associated architectural drawings. Assuming the creation of a model through the collaborative efforts of many project participants, there is a question as to who will be deemed to own the information in the model and therefore be eligible for copyright protection. (Sieminski 2007)

Going beyond the copyright for the entire model there are additional concerns related to items or objects embedded in the model. For example, a specialized piece of

equipment may be developed for a particular project which is included within the model. In the case where the model contractually provided to the Owner as a deliverable, this propriety information needs to be protected. Thus, there is no simple answer to the question of data ownership; it requires a unique response to every project depending on the participants' needs. The goal is to avoid inhibitions or disincentives that discourage participants from fully realizing the model's potential. (Thomson and Miner 2006)

Contractual Protection

Theoretically, many of the risks associated with BIM use can be eliminated, limited, or managed by the use of BIM-specific contractual provisions. As with other risks, this requires identification and contemplation of the risk, crafting appropriate language to deal with it, discussion and negotiation, and ultimately agreement on specific terms. The construction industry is only beginning to catch up with the contractual liability issues that arise from the non-traditional roles played by the various project participants. For example, there has been the 2008 release of the ConsensusDOCS 300 Series for use on IPD projects using BIM technology. Also, the American Institute of Architects (AIA) has developed two IPD Agreements: AIA C196-2008, and AIA C197-2008. The AIA contractual agreements incorporate a separate Exhibit (AIA Document E202 – 2008) that might also be used with their other, more traditional contract documents on IPD projects using BIM technologies. The new AIA documents allow the parties to define the standard of care for BIM, as such would be difficult to define given the short history of this technology. They also attempt to allocate responsibility for managing the computer model, e.g. data storage, transferring model

files, granting and withholding access to model files, validating completeness and usability of files, among other things. Also, the Exhibit provides a chart listing standard building components that is to be filled out by identifying who will author each listed element of the model design. These contractual means of defining the standard of care and allocating responsibility may impact a design professionals' liability for professional negligence. (Pohl and Washburn 2010)

As the industry embraces the IPD delivery method, it will be important for design firms to balance the use of overbearing contractual language with the diminishing returns in utilizing the new technology and delivery method. For now, as a step in the transition to a full implementation, it is not uncommon for firms wanting to test the waters to enter into contracts that employ a 'dual' process. The contract documents follow the traditional process including 2D information but the project team is using the BIM data to reap its benefits. (Cunz and Larson 2006) This approach is no doubt a great opportunity for team members to evaluate the technology and delivery method, but until fully implemented the returns are not fully realized.

Insurance Matters

BIM technology raises a number of legitimate insurance concerns for A/E firms. The first concern comes as a result of the collaboration with contractors and the integration of other players at an early stage of the design process. This concern is exacerbated even more by the potential for unauthorized access to a design model where minor changes are not communicated or authorized by the designer. It is not clear that this additional risk can change the designer's responsibility for its design services; instead it may just seriously increase the magnitude of such risk. (Hayes 2010)

In 2009 an independent, third-party survey was conducted by SmartRisk LLC, a risk management consultant group. In this survey of 17 insurance providers specializing in professional liability insurance in the A/E environment some key revelations were made:

- 82% of the A/E firms were accepting more risk
- 75% of the insurance companies are offering BIM in the policy language

These points illustrate the fact that firms are hoping to bridge gaps between contractual language and the new risks they are taking by including additional insurance coverage. The approach of including insurance in this manner would be a typical response when trying to manage these types of risks. Risk management theory dictates that one should insure those risks that cannot be borne by the practice or controlled through contractual protections. BIM is relatively new with respect to the legal and contractual issues affecting parties in construction project. (Sieminski 2007)

Most agree that one of the most concerning issues design professionals face are changes to the types of coverage that will be necessary. The collaboration of the design professionals in the means, methods and procedures of construction has the potential to create uninsured general liability risks for the design professionals. In fact, both professional liability and general liability risks may be difficult to insure in projects where BIM is utilized. (Holland 2009)

Until contractual language is tested and legal precedent has been set, companies will seek to cover their risk with insurance. For the design professional this means the professional liability insurance that traditionally excludes this type of coverage will no longer be sufficient and additional General Liability insurance will need to be secured

for negligent construction practices. (Pohl and Washburn 2010)

Licensure Matters

States, which regulate the professional practices of architecture and engineering, require that each project be under the responsible charge of a licensed architect or engineer. Additionally, they require that the seal of such individuals appears on all drawings, specifications, and other design documents issued by the firm for such projects. (Sieminski 2007)

With BIM and IPD, the collaborative process presents new issues when project team members other than the Owner contribute to the model. These contributions may include objects or data provided by equipment vendors for the convenience of the designer. The practice may be good for business but licensing issues can nevertheless arise if the vendor's design was produced by a designer not licensed in the location of the project. (Thomson and Miner 2006)

Standard of Care

Standard of care is the measure of the design professional's services in relation to other reasonable design professionals and their services. As the industry moves to adopt IPD there is a concern that 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 architect did not have a contract. (Sieminski 2007)

Change orders are often the measure for the standard of care to many Owners as they typically require additional funds and/or time for the project than initially planned.

Oftentimes Owners believe the issues presented by change orders could have been avoided by better or more thorough design. BIM and IPD have often led to expectations of perfection, as mentioned previously in the case of the Texas Facilities Commissions' expectation of 100% reduction in change orders. It is important to understand that BIM does not promise "perfect" drawings. The work of the architects and engineers is still subject to errors that can result in change orders during construction or future structural problems. The Owner still needs to set aside a contingency fund for coordination issues that arise during construction. What may change is the standard by which an architectural firm's competence is judged, with the "reasonable" architect being the one that uses BIM, while the one that does not is automatically considered to have acted in a manner that is not prudent given the availability of the technology. (Taylor 2008)

Chapter 3: Procedure and Methodology

Having identified the changes taking place in the industry and how they may affect a design firms liability and risk, we must identify how to adapt the firm's culture to work with the change not against it. The effects of the change will require a significant adjustment to how individuals work and the operations of the firm from top executives down to production staff. So how can such a change be made?

Since the change required goes beyond a trivial implementation of a process, the management of the change will be necessary to ensure initial and continued success is achieved. There are certainly many change management models available for evaluation and use when undergoing such a project but first we need to define some parameters to help guide that choice. The decision on which model to use may ultimately be dependent on the position of the person proposing the change. For the purpose of this paper we are assuming this task is being undertaken by someone who is not in the position of Owner or a top level executive in the firm who can simply demand the change take place and rely on others to make it happen. This paper assumes a grass roots campaign will be necessary to either convince others of the magnitude of change expected or that an approach beyond "wait-and-see" needs to take place.

Many of the change management models available have overlapping fundamental approaches while others differ greatly depending on the change needing to be made. A search for change management models reveals a broad spectrum too vast to evaluate

entirely. Many of these models are new or relatively new and gaining traction while others have been in existence for many years. In order to come to a decision on which to use, some guiding core principles were utilized. These principles are guided by the specific needs of the transformation of the design firm as well as fundamentals taught in the EMGT curriculum at the University of Kansas. The first desirable attribute for the model is simplicity; this is not to say the process will be simple just that the overall model is simplistic in its structure. Since we are faced with changing an entire firm from the top down, people will not be interested in an overly complex model and thus increasing resistance to the change. The next desirable attribute is the ability to track progress and make changes when hurdles are experienced. Lastly, one that relies on the buy in of stakeholders as the grass roots campaign will rely on this.

The following models were used as the basis for the decision:

- Kurt Lewin's change model which was one of the first change management models to be developed.
- John Kotter's change model which is a popular and highly used model
- McKinsey's 7-S change model which is also popular in strategic change management projects
- The ADKAR change model developed by Prosci which is gaining popularity and used in change management projects.

For Kurt Lewin's change model the process is simple. However, it is very short and does not allow the change anticipated or progress tracking during the process that is preferred. The McKinsey 7-S model does provide an ability to allow change as it is necessary, but it is quite complex in structure and tracking changes is difficult as each

part is interrelated and will change together. By the process of elimination the remaining choices are narrowed down to the ADKAR model and Kotter's 8-step approach. Though somewhat new, the ADKAR model was an attractive idea. The model is fairly simple in concept, allows change, and tracking is possible, however the successful implementation rests on having trained facilitators. Ultimately, the 8-step approach developed by John Kotter was chosen since it not only meets the overall requirements of the project, but it has been successfully utilized in past projects requiring similar change. The 8-step model is a fairly straight forward process and allows tracking by those involved. One of the key components to be successful is to obtain the support of management and employees.

8-Step Approach

The 8-step approach by John Kotter began as an article he wrote in 1994 for the Harvard Business Review based on an analysis of initiatives within businesses to provide significant change within their organization. This was followed by his book Leading Change in 1995 which provides a more in-depth review of the process and guidance by example.

The eight step approach involves the following steps:

- Establishing a Sense of Urgency
- Creating the Guiding Coalition
- Developing a Vision and Strategy
- Communicating the Change Vision
- Empowering Employees for Broad-Based Action
- Generating Short-Term Wins

- Consolidating Gains and Producing More Change
- Anchoring New Approaches in the Culture

The remainder of this section will outline how to implement these steps within a design firm with the goal of reorganizing or restructuring their business to allow them to fully implement the use of BIM and IPD in the projects they take on. It is important that those interested in making such a transition evaluate these steps based on their needs.

Step One: Establishing a Sense of Urgency

As indicated in previous sections, it is clear the use of BIM and IPD is expected to be used by design firms, Owners, and other team members as a standard approach. Those not embracing them will either be left behind or catching up to those that do. The risks and liability that will change, along with the industry, are of sufficient magnitude that the sense of urgency should be relatively easy to communicate, not to mention the learning curve expected. If nothing else, the idea that design firms can expect to be involved more in a project, not less. This suggests their fees may increase as a result and should generate as much interest to the business minded individuals as those focused on the technical and legal aspects of the change.

The goal of this step is to gain the support of at least 75% of the executive level or upper level management (depending on the firm's organizational chart) and should include the CEO. By creating a sense of urgency, the project has a much better chance of overcoming those who are complacent or comfortable with where the company is. This step is successful if these executives are convinced it would be more alarming to stay with the status-quo than it would be to venture into the unknown. Often times this

is accomplished by convincing them a crisis exists or to allow a crisis to occur.

It would be desired to gain support by simply convincing these upper level managers a crisis exists by presenting the research and data to support the concerns. However, relying simply on data and the written word to communicate this point is unlikely to be successful. Therefore utilizing more engaging tactics will be necessary. Often upper level management or executives facing issues such as these will want to blame the bearer of bad news, so relying on outsiders to deliver unwanted information is a good way to begin the process. This can be achieved by inviting industry leaders familiar with the changing landscape in to discuss the changes and what it means to those who do not prepare. Prime candidates for such presentations are legal counselors, insurance agents, and AIA trade presentations. Focus will need to be placed on the potential issues and what could happen if those issues are not addressed up front. Once these industry leaders have generated genuine interest among these managers, the data supporting the concerns can be presented to them for their hopeful buy-in following their review.

Step one is imperative before moving on to step two and ultimately being successful in implementing the change. If convincing them of the crisis is not successful, a more drastic measure can be utilized which is to allow a crisis to occur. If a crisis identified in the research actually occurs, it will be difficult for those managers who were complacent to ignore them any longer and thus providing the sense of urgency necessary to move on to step two. This crisis may occur as a result of not addressing a liability or risk within the firm or for one to occur within the industry that could have been avoided if addressed beforehand.

Once 75% support of the upper level managers is secured, including the CEO, the process can move on to step two.

Step Two: Creating the Guiding Coalition

Beginning with this step the use of committees, a format most engineering firms and design professionals are familiar with, will be used as a suggested method for achieving the desired outcome. By utilizing committees, the process can be adapted to serve two purposes; creating the change necessary and mentoring for those involved and not yet at the upper management level. This will ultimately create a base of leadership in the future as the use of BIM and IPD becomes more widely used. Committees are not necessary to achieve success under this model but the steps and their requirements remain identical no matter the format used.

Within step two, the guiding coalition will be made up of several key personnel arranged in different committees and levels. At the highest level, a steering committee will be setup comprised of the most senior leadership with strong influential capabilities. Where applicable this highest level, or steering committee, may be the board of directors. It is this steering committee that will task different sub-committees with the research and ultimate suggested action in specific areas of concern. These sub-committees would be comprised of a mix of senior leadership and those employees interested in learning more about the specific area being investigated. The involvement in these committees could be a paid opportunity to elicit a continued interest if necessary.

Each subcommittee would be responsible for the research within a certain area such as those identified in previous sections; the implementation of a new tool (technical

requirements), ownership and control issues, copyright protection, contractual protection, insurance matters, licensure matters, and standard of care. The goal would be to have 5-7 individuals on each committee with backgrounds strongly suited to the specific task of the committee. For example, it would be advisable that the CIO or director of IT be involved in the implementation committee, or in-house counsel be involved in the contractual protection committee. By implementing this multiple committee approach several distinct advantages are realized. First, each committee can focus on a specific area and specific topics without finding themselves "in-the-weeds," not making progress as a whole. Second, this type of approach will allow some delegation of the work so that no one is overwhelmed on top of their normal work activities. Finally, each one will realize some recognition for their efforts and can associate their input with changes they will see once implemented within the firm.

Step Three: Developing a Vision and Strategy

This step requires the executives of the firm to collectively determine a goal for the firm that can be communicated to its employees. Developing a vision exists so that all members of the firm are aware of the desired outcome. This step is important to the success of the overall change as it communicates a common goal and allows each person to work toward accomplishing that goal. It is not meant to be a detailed directive on how to accomplish the goal, nor is it meant to be an edict, but more of an illustration of a specific idea on what needs to be accomplished to be successful. In order to maintain interest, the vision should be able to be communicated to others in five minutes or less.

The vision created needs to provide commentary on why people should strive to create that future. A good vision serves three important purposes; clarifying the general direction for change, motivating people to take action in the right direction, and finally, it helps coordinate the actions of different people.

Creating a vision can be a time consuming process in which the firm will experience periods of disagreement, anger, conflict and overall turmoil. If weathered correctly these periods can ultimately be turned into a positive experience by causing true and underlying issues to surface which can be addressed to meet the vision. Often times this process can be cut off prematurely and pressures to create something lead to a less than ideal product being accepted.

In order for this step to be successful, it is important that the proper amount of time is allocated to the task and that the concerns raised be evaluated and addressed as part of the vision. Once this vision has been properly defined moving to the next step where it is communicated to the employees can occur.

Step Four: Communicating the Change Vision

A vision does not serve any purpose if the intended audience does not hear it or if they hear it and it is not being demonstrated by those delivering the message. In order for this step to be successful, executives must seize all opportunities to continually relate corporate messages with the vision. An almost assured sign of failure is the reliance of stating the vision in a company meeting and/or putting it out in a memo only. Every opportunity should be utilized, such as corporate meetings, to discuss how profits or some other measure directly relates to the effort of the vision. Employee reviews are another opportunity where discussions can be about what the employee has

done over the preceding year that either supports the vision or is counterproductive to it, and possibly tying incentives based on performance related to the vision. Other methods of communication such as quarterly meetings, newsletters, training sessions, weekly email updates, etc. should be lively and go beyond the ordinary to illicit a legitimate desire among employees to join in the effort. These communications should showcase positive strides and highlight setbacks both internally and within the industry. In the committee instance, employees participating as part of the coalition will help tremendously by having their efforts recognized, which generates a desire to be part of the overall change.

One of the keys to the success of this step is not having leaders that undermine the effort by doing things contrary to the vision, which is often the case when trying to preserve their own self-interests. This will almost certainly sink the effort by those who observe this as they will no longer believe in the vision or the ability to be successful.

Step Five: Empowering Employees for Broad-Based Action (Removing obstacles)

As mentioned previously in the last step, having self-interests working against the process will prove disastrous, so removing them as an obstacle will be necessary. This may be done by edict by those in power such that efforts not in line with the vision are not welcomed or the more desired approach of venturing back to the foundation established in step 2 and gaining their support as part of the coalition.

Corporate structure can become an obstacle when certain departments or individuals are blocking the way for others interested in assisting in making a successful change.

The committee scenario would assist in removing such barriers as a cross-pollination can occur. Bringing different departments and individuals together outside the typical corporate structure allows them to work on a common goal to meet the vision.

Lack of empowerment is an obstacle for most employees or individuals involved in the change process. If an individual's efforts are met with resistance before full discussion or explanation is heard it can irreparably damage their faith that the vision is real or that the executives are not just giving "lip service." With committees, there is an important reliance on suggestions made by the sub-committees with minor overseeing and perhaps push back by the steering committee or board of directors if significant obstacles remain. If these suggestions are not implemented, an obstacle may appear in the form of doubt. If legitimate suggestions are not implemented or given sufficient consideration, the members of that committee and other committees will lose desire and focus as trust or belief in the vision will be lost. The board may ultimately delay implementation or stop short of fully implementing suggestions based on the overall vision but they will need to tread carefully with the suggestions provided by those who have spent their time and effort to develop them.

Step Six: Generating Short-Term Wins

Short term wins is a key to the successful transformation as they drive the sense of urgency forward. By creating sub-goals that ultimately lead to achieving the vision, employees become focused on achieving these goals. Without these sub-goals, the urgency can be lost over the course of the change, especially if the change takes place over a long period of time such as years. It is not uncommon to fail at this point because morale can wane as people begin to lose sight of the goal and overall urgency

is lost. These short term wins can be as simple as having a new tool that has been in development come on line for use in the firm. One way to establish a short term win would be to have a board or steering committee request resolution from a sub-committee on a particular outstanding issue. This request provides an intermediate goal for those individuals serving on the sub-committee to achieve. Once the committee has researched the issue and can provide their recommendations, they would present their findings to the board or steering committee for final approval. Upon final approval the sub-committee would achieve an intermediate or short term win necessary to keep them on track and focused.

Step Seven: Consolidating Gains and Producing More Change

Proclaiming victory at the completion of the first project utilizing the new changes is often times the first step to reversing the work done by the coalition. It takes time to succeed in transforming a culture and thus the first project is merely a stepping stone. Granted the project and efforts of the team may have led them to the desired outcome but efforts cannot stop there. The coalition needs to continue hammering out any unfinished tasks or open topics needing resolution. After each subsequent project is completed, lessons learned needs to be evaluated and tweaks need to be made. As projects are completed and changes are observed, a process for sharing will need to be developed for communicating these updates with the firm and its' employees.

As a sub-committee completes its tasks and ultimately finds themselves without major tasks, they may be placed into a "hibernation" state awaiting further tasking by the steering committee or board of directors as necessary. It is important the overall structure and members remain intact as issues may present themselves in the future

thus requiring them to be recalled to address these issues. By keeping the committee intact, the urgency can be maintained among the individuals since the committee is not disbanded and thus does not give the indication the goal has been met.

Step Eight: Anchoring New Approaches in the Culture

The final step in the process is to anchor the new approaches in the culture. This step can be considered successful when the response to a task or question is, "It's the way we do things around here."

The first important part of this step is to impress upon how new processes, approaches, attitudes, etc. have positively affected the firm performance. In communications within the firm and among employees, it will be important to recognize how the things they are doing or have done helped achieve the vision.

The second important part of the step is to ensure incoming or new executives and leaders personify the vision. The efforts of the firm and its employees can be reversed if a leader is not a champion of the change and is committed to carrying the vision forward.

By employing the committee scenario this step can be successful by looking to those employees who have assisted within the sub-committees and worked with other leading executives along the way. This experience will have established several potential leaders who have demonstrated a commitment to the change and the overall vision.

Summary

A dramatic paradigm shift from traditional construction delivery methods and tools exists with the use of BIM and IPD. These paradigm shifts will affect most, if not all,

aspects of a design firm's business. While no one can anticipate all the changes, nor can they anticipate how the legal system will address these changes, a plan can be prepared for how to manage the changes. What has been presented is a way a firm can effectively manage the process with such a considerable amount of change expected. Each design firm will have different and unique considerations to take into account but if each step of the change management model is followed, they can reduce their risk by identifying potential risks, evaluating those risks, determining how to address those risks, and incorporating the necessary changes to protect from those risks.

Chapter 4: Conclusion

A design professional offers knowledge to its clients and as part of this are held to a standard of care. It is the design professionals' duty to ensure they meet the standard of care. As such, the design professional, must become educated on how these standards of care are changing along with the industry and what it means to the liability and risks they are accepting by offering their services.

The issues identified and discussed within this document are provided as a glimpse into some of the most significant topics for design firms looking to stay relevant in the construction industry. These firms need to recognize the paradigm shift taking place around them and become an active participant in the change. It is not enough to take a passive "wait and see" stance or allow themselves to believe the lines of responsibility will remain intact from the traditional delivery methods they have grown accustomed to.

Each firm faced with this change will need to evaluate the proper approach to allow for such change. The first step will be realizing the industry will change with or without them and along with that change the traditional liability and risk they face.

Chapter 5: Suggestions for Additional Work

As a design firm in the construction industry, it will be important to monitor the evolution of the use of IPD and BIM. It will be most important to take an active role in this evolution through education of external stakeholders such as Owners and their agents, clients, State and Federal government agencies.

Firms will need to monitor the legal precedents being set as part of case law at the local, state and federal levels. Education will be necessary for all internal staff from firm Executives down to production staff to ensure the proper protocols and quality control is being done for every project. As precedent is set, or case studies become available, firms will need to review and adjust for current and future projects and contracts. As changes occur they will need to be communicated to all involved to ensure necessary changes are made both internally and externally, such as legal counsel and insurance carriers, to ensure all are working in concert with each other and protections are being maintained for the firm.

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