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## **BUILDING INFORMATION MODELLING (BIM)**

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### **Why Does there Seem to be Resistance to this New Technology?**

**By Lynn McGregor**

If BIM actually assists in executing projects faster, more accurately and more cost effectively - Why are more firms not using this approach to the design and construction of structures? Is it as Mr. Roger Willoughby (IRAP, ITA, Mississauga, Ontario) suggests: "The construction culture in this country makes it hard to make changes." Possibly. To answer this question, we must first understand what BIM technology is, and what benefits it might offer the building industry.

#### **An Introduction to Building Information Modelling:**

We are all hearing a lot about the benefits of new technologies that are available to those involved in the design and the creation of things.

Industrial Designers of elements such as automobiles or medical devices, have been using computerized modelling for quite some time. They would not think of designing an item without the benefit of modelling. Mistakes would be far too expensive to not use this technology.

Now the Designers of architectural structures can also benefit from three dimensional modelling. Building Information Modelling, (or BIM) is not just a software, but an approach to doing architectural projects. Rather than drawing lines, design drawings are prepared by placing objects that have intelligence. And that intelligence comes with an intuitive quality. So when one wall is positioned to intersect another wall, the wall intuitively know



how to connect the studs and terminate the base trims, and they automatically make those assumed connections. Which can save a lot of time.

BIM technology can be used many ways, from the very basic to the most robust version of use. According to John Stevenson, (a Partner with Kuch Stephenson Gibson Malo Architects & Engineers in Thunder Bay), even basic BIM software use still produces construction contract documents more cost effectively than AutoCAD can. And it produces drawings that are more accurate, and more useable. The more functionality one wants from the modelling - the more time it takes to prepare the model, and therefore, the more expensive the process of modelling.



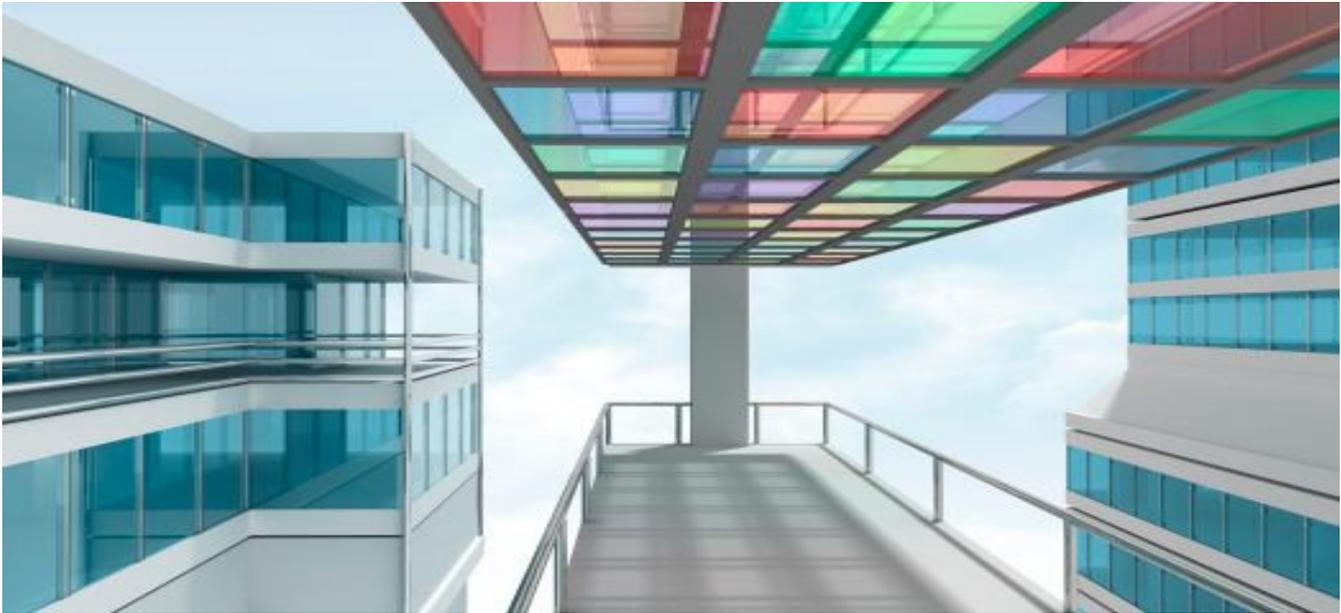
The eventual ideal model of BIM involves the sharing of the electronic data file (or >model=) with all the experts that work on a project, to allow all involved to benefit from the 3 dimensional views and inherent intelligence; and allow each to better enhance the design, using their expertise.

**Just a few examples of what Building Information Modelling can assist with:**

- The ability to see the design in three dimensions, rotated as necessary to get good views of all and any corners of the design.
- The related identification of potential construction problems inherent in schematic designs, before construction starts. (In other words, designs are more accurate as they can be better thought through).
- Preparation of photographic quality Renderings,
- Faster, accurate, quantity take-offs of a design, to assist in quote preparation, quantity verification, etc.
- A 4 or 5 Dimensional, intelligent >As-Built= model file, from which a building owner can maintain the structure.
- And so much more...



There have been accusations that the North American building design and construction industry has been slow to adopt this approach to doing architectural project work. Many question why this is the case. Some speculate that there exists a construction culture that resists change. But others say that it's because when many individual parties, working in collaboration, work off of a common data set, the line between design and construction starts to blur, causing the professionals involved to be concerned about risk and liability.



### **Responsibility Allocation:**

Architects build erection sequences into their designs, and contractors add constructability analysis into the design selection. As collaboration increases, the traditional lines of responsibility dissolve, and industry standard form contracts do not adequately allocate risk and responsibility between the parties.

*Dean B. Thomson and Ryan G. Miner*  
[www.aepronet.org](http://www.aepronet.org) (Guest Essay)

Developers of specialized software envision a world where electronic files are openly shared and contributions into design changes flow freely. But it is the responsibility of contracting parties and their lawyers to create contractual language that will foster collaboration and appropriately allocate risk and compensation for a project utilizing BIM Technology. For this to happen, we may well need to change the way we all think about industry roles and delivery systems.

In today's world, BIM is more easily used on Design/Build types of projects, as collaboration naturally flows more freely when all players are already established as compensated team members. Project Owners who want the



benefits of 3D modelling, could logically select Team members for not just their talent and appropriate experience - but for their ability to work from a BIM platform. (This would limit the field in today-s world, as not many professionals are yet proficient with BIM.)

### **Legal Issues:**

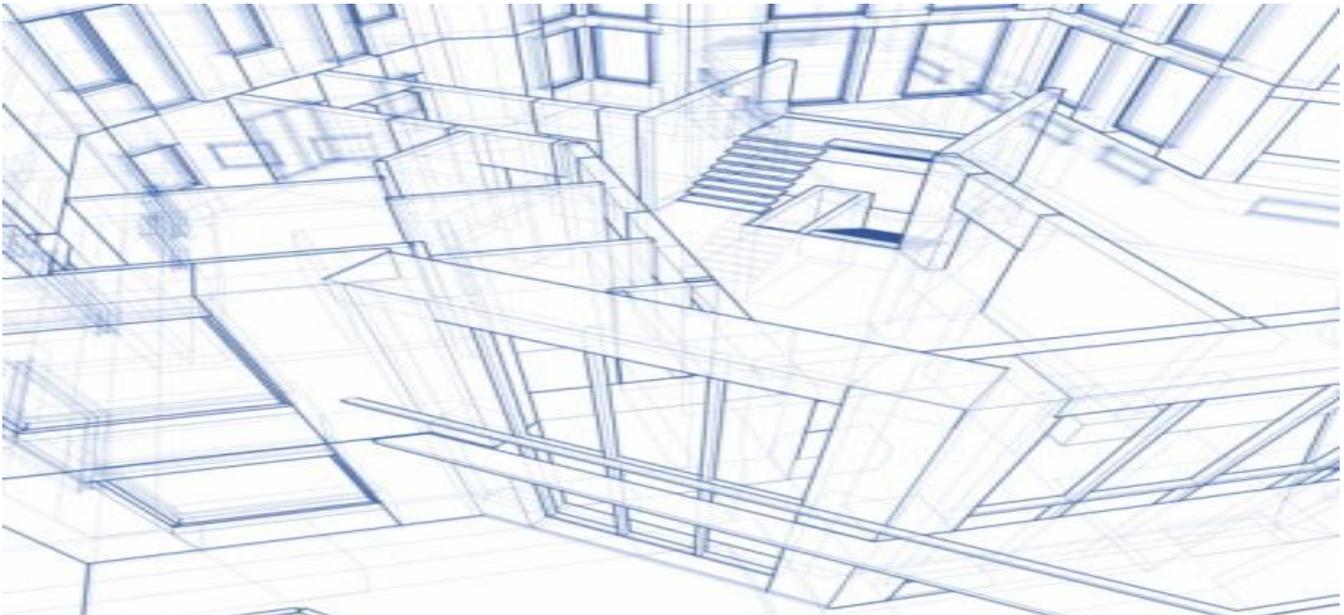
One also needs to consider the Legal Issues involved with this new way of working. For all the efficiencies and savings that BIM technology can provide, its use is not without risk. One of the first issues to determine is Ownership of the BIM data and how to protect it through copyright and other laws.

- If an Owner pays for a design, they may feel they also have ownership rights to the electronic model. But if professional consultants have contributed proprietary information to that model, their propriety rights need to be protected. This means the issue of Ownership is not an easy one to resolve, and would possibly need to be unique to each project, depending on the involved contributors. The objective of resolving this issue would be to avoid disincentives for each participant to realizing and using the full potential of the BIM model.
- Licensing of Design contributors may be another issue, that complicates the use of BIM. For example: A vendor of mechanical equipment contributes the offer of an equipment design to a design professional, in an attempt to both save that professional time - and to make a sale. But if that contributor is not licensed to practice in the region of the project - who assumes responsibility for that piece of the model, and it-s compliance with local codes, etc? Is the contribution adequately attributed to the correct individual?
- Another issue is the control of the entry of data into the model. Who should be controlling this, and assuming responsible for any inaccuracies in it? Taking responsibility for updating BIM data and ensuring its accuracy entails considerable risk. Legal minds have suggested that requests for complicated indemnities by BIM users and the offer of limited warranties and disclaimers of liability by designers will be essential negotiation points that need to be resolved before BIM technology can be truly utilized comfortably.
- Responsibility for the accuracy and coordination of cost and specification data must also be contractually addressed. BIM is designed to provide electronic support to the individual charged with the cost estimation of a project. Unit Costs are carried into the model, with the insertion of intelligent objects - but those unit costs need to be provided by someone who contributes to the model, (i.e.: sub-trades or vendors). But the Cost Estimator of a project is often required to be ~~third party~~-to the designers on a project. Who then takes responsibility for the accuracy of the cost quotation, if the BIM model is used?
- BIM facilitates fast changes to a project-s model file. And indeed, this speed can be a very attractive feature. But this speed can also be a potential concern. If electronic data on a project is constantly changing and evolving, control over the acceptance or rejection of proposed changes, could be made even more difficult than it is using traditional project processes. And from a legal perspective, is an agreement to a change over the internet,



binding? In order to avoid disputes, a system and protocol for sending binding communications must be developed in the industry.

Standard Industry Contracts need to be modified to address all of the above legal issues, to allow participants to comfortably work collaboratively with BIM.



### **Financial Issues:**

Some users of BIM software have found a lack of compatibility with AutoCAD - meaning that project files that come back to life for a next phase - can not be used easily with BIM software. Designers would potentially need to convert client files - which may well be cost prohibitive.

It has also been suggested that some BIM software is changing so quickly that a new version must be purchased each year, for each workstation, to keep a firm current. And it has been explained by a distributor of the software that one Release can not work with models created in a lower release. This sparks fears of constant additional operating costs that most likely, will not be recouped. Especially in our current marketplace.

If it was possible for the creators of BIM software to create both upgrade patches- that could be offered to prescribers at no or low cost; and ensure BIM software comes with lower versions included - to allow Users to work with Base Building models, developed the previous year - it would do so much to allay these financial fears.



### **Insurance Related Issues:**

Although some design professionals, such as Architects, are ensured of the provision of professional liability insurance; others obtain insurance coverage based on their track record. Architects in California use a work system called an »Integrated Delivery System« (IDP), developed before BIM, but it works in a similar way. They form a project team of consultants, owners, contractors, etc., who all agree to share the »pain and gain«. All problems are considered to be mutual issues that are resolved together.

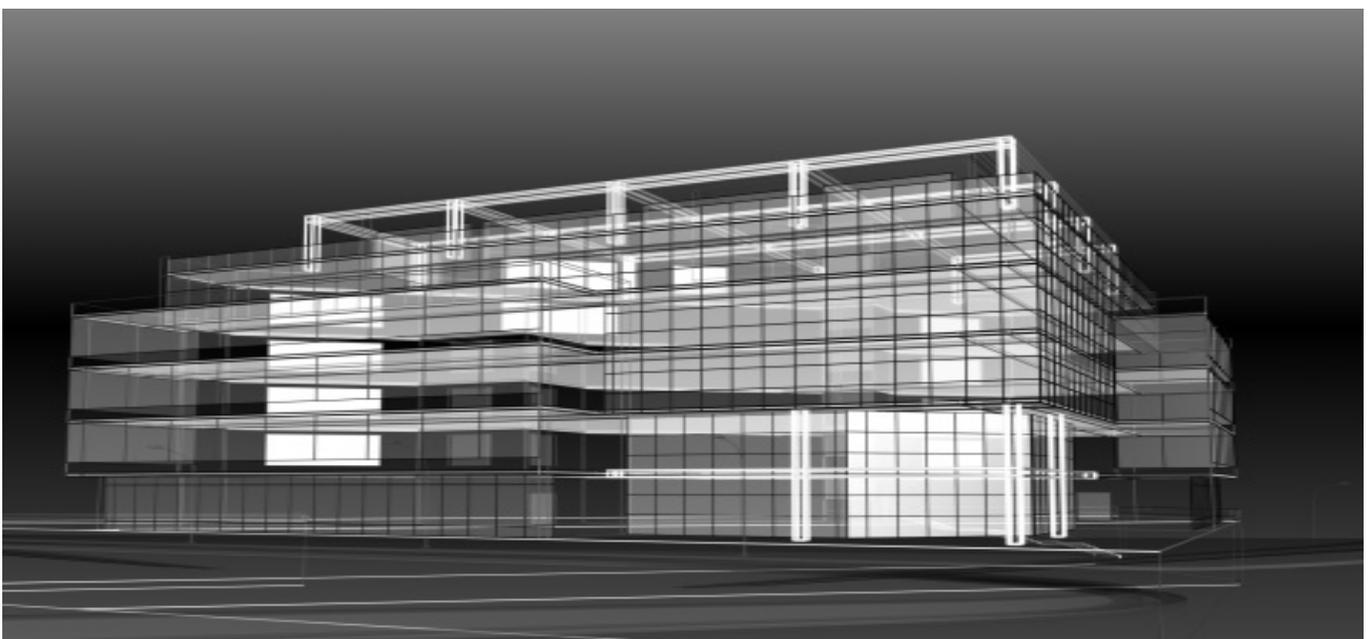
But for those who obtain good insurance rates based on how many problems or errors & omissions happen in a year - they run the risk of having their insurance providers back away from them. In today's world, this is a real risk that needs to also be addressed by the industry, before BIM teams can completely share open electronic models.

### **Conclusions:**

The benefits of using Building Information Modelling are well recorded and obvious - there is no disputing this. Projects can be executed more cost effectively, more accurately and more quickly.

But it is clear that construction contract law for the professionals involved has not kept up with advancements in project processes - such as »Building Information Modelling«. And this does, legitimately create concerns about legal liability and insurance coverage retention. Professionals in the position of Prime Consultant are not yet able to contractually share open electronic models with others.

But this does not mean that those involved in the design and construction of structures in Ontario need to live without the benefits of BIM. Until construction law catches up, all project participants need to understand each others concerns and legitimate risk factors; and develop protocols to allow them to participate while keeping themselves protected.





### **Just a few ways to add safety around new Users participation in BIM:**

- A. Changes to the BIM electronic model should be approved, before being downloaded into the model, by one AConductor® of the project. The electronic model should not be altered by anyone who just has an idea - and has access to the file. After all, not all project participants understand the approved functional requirements of the project Owner, or the promises that have been made to the Owner. Without this necessary gate control, there would be a great deal of risk that the original project might >run off the rails<, and miss its objective. At this point, the logical >conductor< would be the design professional that has ultimate responsibility in the province, for the project's compliance with codes and regulations. The person that the client holds responsible for the project's quality.
- B. One individual should be charged with making all approved changes to the model, following the formal approval of the change. To reduce the risk for this individual, a protocol should be established for the recording of each accepted change - with the suggestion maker getting full credit and assuming clear responsibility for the appropriateness of the changes, and the accuracy of the data provided. This will help ensure insurance providers do not use BIM as a reason to pull coverage from participants.
- C. Modeling Files could be shared with other team members who have been asked to contribute and enhance the project, but in a >locked state<. This would allow anyone to utilize the benefits of the electronic 3D model, in the development of their suggestions. But it would protect the model and its already approved content, from contamination with non-approved content. This would help maintain the control our current industry needs to feel comfortable enough to pursue this new technology.
- D. Software firms could also participate by assisting in removing some of the concern professionals have with transferring over to BIM software from AutoCAD. The current cost involved with mandatory annual upgrades of some software are very difficult to rationalize, especially given our current economy.

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If software firms assured subscribers of resolution of these concerns, increased the compatibility of the new software with both AutoCAD and other modelling software - and if they assured users the cost of using BIM software was more inline with using AutoCAD - it would go far to promote confidence in a move



to this more advanced technology. NB: The Author of this report understands that one software company is aware of this problem and is looking into selling lower priced annual subscriptions to users, instead of selling higher priced licences for software. Problems still exist in this proposed model with connectivity and security - but it is definitely a move in the right direction.



#### **RECOMMENDATIONS FOR IMPLEMENTATION:**

Building Information Modelling can be seen as a specific new service - for Project Owners who understand the benefits and want to enjoy them. Selling this service and its benefit of adding value through three dimensional due diligence would be made much easier for all team participants if the above suggested safety measures, are implemented by the full project team, and protocols agreed to by all team members.