

# Building Strategies

FALL 2007

Providing Greater Value to Construction Project Design & Delivery

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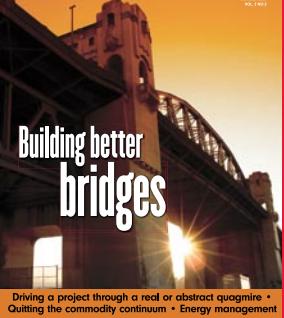
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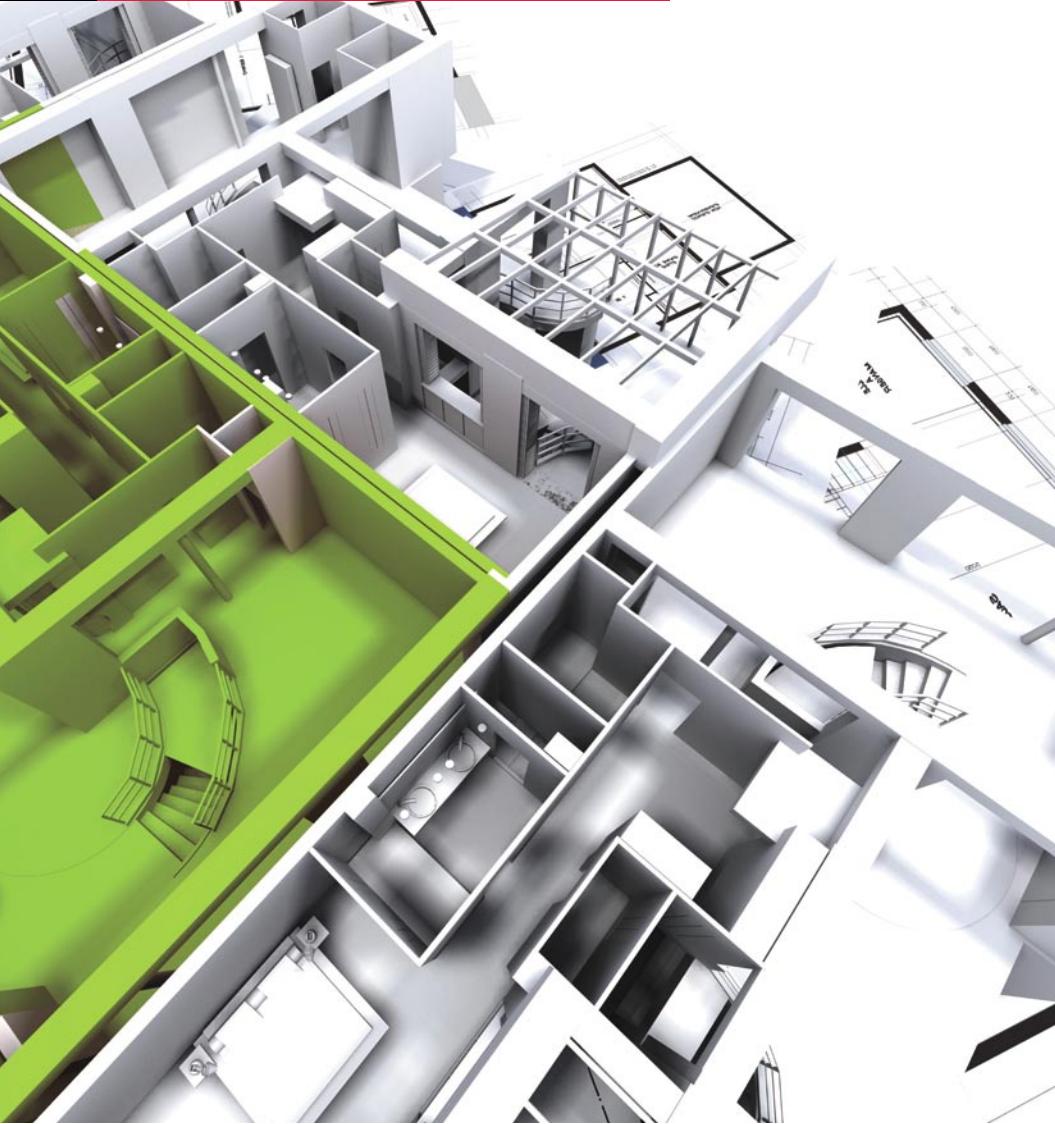
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# Is BIM set to transform the design and construction industry?

By Brian Watkinson

As more and more design and construction companies adopt Building Information Modeling (BIM), many industry observers are predicting that it is going to completely transform the way we design, build and maintain buildings.

**W**hat is Building Information Modeling (BIM)? BIM is not “the next version of CAD” as many have incorrectly assumed. Even the most powerful CAD solutions that feature 3D and “fly-throughs” are really just an automated way of doing what we did in a paper world, using lines and symbols to represent a building, or parts of it.

BIM software is a leap forward in the application of information technology to the design and construction of buildings. Many liken it to, in effect, building the project inside the computer before trying to construct it in the field. BIM creates a rich, digital database of information about the building and its components. This is much more than a computerized 3D representation of the building. It does indeed include 3D geometric data, but also contains detailed information about the attributes of all of the building components being modelled such as the manufacturer, life cycle performance, maintenance requirements, cost, installation requirements and schedule implications.

Project participants all contribute to the database, share the information in it, and access it to do their work. It facilitates a robust design process and provides a smoother and more comprehensive transfer to the builders of the information they need for construction. Post-construction, it serves as a valuable resource for the facilities managers and operators over the lifecycle of the building.

### Benefits of BIM

BIM software can save time and money and reduce risk by minimizing the kind of coordination issues that plague many construction projects. Allan Partridge of HIP Architects in Edmonton, a 25-person “early adopter” of BIM, says: “After seeing repeated projects where, despite valiant coordination efforts, we still had unresolved and uncoordinated details that resulted in reams of RFIs and change orders, we realized something had to give.” He goes on to say, “We asked

ourselves, why can't we create a virtual copy of the building long before it is built and solve the problems that nag us in the 2D world?"

BIM software can perform interference checks to identify, for example, conflicts between ductwork and structural members. A change in one view is automatically coordinated throughout the project, eliminating the laborious and imperfect manual process. Everyone accessing the database is tapping into exactly the same information, greatly improving communication and coordination between members of the design and construction team. HIP now uses BIM on all of its projects.

BIM software can support automated generation, directly from the database, of the 2D and 3D documents required for approvals, bidding and construction. Proponents of BIM say that time and money saved during the document production phase of a project can be shifted to the design phase – a much higher value application of the designer's expertise – and contribute to increased profit margins.

It can make possible the design and execution of very complex shapes – think of Frank Gehry's Disney Concert Hall in Los Angeles. Hariri Pontarini Architects of Toronto chose the same

analysis and modeling, an increasingly important requirement for every building project.

Many companies are saying that BIM opens new business opportunities for them, the potential of new revenue streams, and greater profitability.

### What's holding BIM back?

So, with all of these obvious benefits, why does the adoption of BIM seem to be moving so slowly? It's been at work at Stanford University since 1988. Autodesk introduced its Revit software to the market in 2002. Graphisoft and Bentley also have suites of BIM software.

### Early adopters list a number of reasons.

First, it's a change; a change to the way we think about design and construction and about buildings. Remember that Vanoverbeke's staff had to adjust to visualizing their work in 3D. As we all know, change often leads to anxiety.

Then there are the risks associated with being an early adopter such as concerns that the software is not sufficiently advanced, or that costs will dramatically decrease if we just wait a bit longer. Many worry that they cannot take advantage of

– "Monday morning this is a BIM office!"

BIM needs careful management to ensure that the level of detail is not taken to extremes. One user, for example, reported that he discovered one of his staff busily modeling every single bolt connection in a complex structural frame – because the software had the power to do it.

Challenges like these have meant that early adopters of BIM have tended to be large firms that have the resources and infrastructure to manage the implementation process. That noted, there are countless examples of small companies in addition to some cited in this article, which have successfully made the transition and are already enjoying the many benefits of BIM, including increased profitability.

So, is BIM set to transform the design and construction industry? Without doubt, BIM can deliver some very positive benefits such as improved productivity, accuracy, quality of design and profitability.

However, to truly transform the industry, we must also take advantage of its potential to foster and support a design and construction process that is less adversarial and much more collaborative than the current one. This is an integrated delivery model in which all of the project life cycle stakeholders come together as a team with the common goal of constructing the best building they possibly can. In this model, business relationships are structured to share risk and reward fairly among the participants and the varied expertise of all team members benefits the project from the outset.

BIM is the ideal tool to support that process. Dr. Martin Fischer of Stanford University said last year at the American Institute of Architects Annual Convention: "You could perhaps do the integrated process without BIM, but why would you bother?"

U.S. architect and management consultant Kyle V. Davy suggested recently to the annual meeting of Consulting Engineers of Ontario that he believes that the design professions in that country are "approaching the tipping point" in the adoption of BIM, after which we will quickly see much more widespread use.

As discussed earlier, BIM delivers solid value even in the absence of an integrated delivery model. With BIM apparently headed for mainstream use, it is clear that every design and construction business will need a strategy for BIM. Learn about BIM. Consider benefits like increased design quality, productivity and profitability in addition to the reduced risk that it is delivering for others. Then, develop your own unique plan to respond to the opportunities and challenges presented by BIM. **B**

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## “ BIM software can save time and money and reduce risk by minimizing the kind of coordination issues that plague many construction projects.

powerful BIM software that Gehry uses, called CATIA, for their award-winning Baha'i Temple for South America. "The Temple project began with very 'free form' methods of investigation – hand sketches, conceptual models, and an extremely sculptural software package called Maya," says architectural graduate Justin Ford. "Implementation became problematic when attempting to solidify the free form design into reality. CATIA enabled us to take the project through design development and into construction. Because the Temple has close to 3,000 unique cladding pieces per wing, this kind of robust power was critical."

Professional engineer Chuck Vanoverbeke shares his enthusiasm for BIM at Corche Technical Services Inc., a four-person firm in Cambridge, Ont. "I want technologists and technicians to design the structural, mechanical and electrical systems in a building – not just draw them. I want them to understand what they are drawing," he says, using HVAC as an example. "Since BIM creates a 3D version of the building, it is very easy to visualize the duct runs."

As a project moves into construction, bidders and builders can be given direct access to the database to help avoid information gaps. The model can include scheduling (4D) and cost (5D) data to facilitate project management and cost control, providing greater certainty in two aspects of a project that so often lead to conflict.

BIM software can directly support energy

BIM software until all of the others on the project team also use it. There is also some unease in the industry at this point in BIM's evolution about interoperability, the ability to seamlessly exchange data between different BIM software solutions. The International Alliance for Interoperability is working to address this issue.

It requires a significant investment of resources, including the cost of the BIM software; often, more powerful hardware to run it; training costs; and reduced productivity during the "learning curve." Many report that the investment to move from CAD to BIM is greater than the investment to move from paper to CAD. At the same time, though, case studies show that the payback period is very short even when only the productivity gains are considered – some report savings of 30 per cent and more compared to traditional methods.

The move to BIM requires the company to deploy a comprehensive implementation strategy. The common wisdom suggests training a small team and starting with one project, then migrating the knowledge and use of BIM to the rest of the firm. HIP Architects took about three years to fully implement BIM on all projects. On the other hand, other firms, usually smaller ones, made a successful switch literally overnight