White Paper

BIM (Building Information Modeling): A Marketing Primer and Call to Action

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BIM (Building Information Modeling): A Marketing Primer and Call to Action

By Ted Sive, FSMPS

Executive Summary

Building Information Modeling (BIM) is a significant new technology that is revolutionizing the A/E/C industry. BIM is transforming the roles of professional service firms and how people work together, bringing remarkable new capabilities that can improve the speed and efficiency of projects, creating new challenges and potential liabilities, and potentially changing A/E/C marketing like nothing since the advent of the desktop computer.

This paper attempts to define what BIM is from a high-level standpoint, discuss how different disciplines view BIM technology and processes, and begin to analyze the implications for the industry and for marketers in the A/E/C industry. This paper seeks to educate the uninitiated, to reinforce the expert, and to engage all in this important dialogue in the industry. BIM is very much a moving target, with new understandings and applications coming out daily. Because so many of the details evolve and change daily, this paper is focused on basic fundamentals and patterns of action, rather than detailed specifics, so the findings will be of longer value.

A key goal of this paper is to address the many views of the many varied participants in the creation and maintenance of the built environment: architects, engineers, fabricators, facility managers, etc. One of the great strengths of the SMPS organization and community is its *inter-disciplinary* makeup, which is rare in the A/E/C world, and our unique ability to analyze and communicate topics with many inter-disciplinary dimensions. This is particularly so because as marketers—as strategists and communication experts—it is our job to ensure understanding, to foster communication, and to enable strategic thought and action, both within our own companies and in the broader industry.

To support these goals, the author sought publicized writing from each key discipline. The bibliography identifies almost 50 articles about BIM from a variety of professional periodicals and journals, and provides a short summary of each article, plus a web link if available.

BIM will significantly impact the marketing process and collaterals. With proper preparation, marketers can help their companies anticipate and prepare for these changes, address "message" strategically, potentially learn to operate in the BIM environment to the extent that it is helpful for marketing, and produce the communications required. As communications professionals and “big picture” thinkers, marketers can also take an active role in the strategic planning and operational implementation of BIM in their firms: they can educate technical and management staff, coordinate with consultants and collaborators, and help bridge the gap between the capabilities of BIM and the “real world” of communication, design, and project management.

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Most significantly, BIM will affect delivery models, contractual relationships, and the very way in which firms are hired and engaged in projects. Marketers should understand and anticipate this, and help firms envision, plan, and position for the long-term effects of these changes.

This is all an evolving topic. There are likely nuances and implications this paper has missed. We look forward to your comments, additions, and critiques, and welcome your emails!

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What is BIM

A Paradigm Shift

Perhaps the best way to define BIM is to go back in history. Designers and builders (the second oldest profession?) have long worked in two main phases: first the designer imagines the project and designs the details, completing work with a drawn and written road map (the contract documents and specifications). This process changed incrementally over the centuries until just over two decades ago, when CAD (computer-aided drafting) quickly entered the mainstream. CAD software has grown into a robust tool for A/E/C firms, with an impressive amount of coordination, efficiency, and workflow improvements, but CAD is still an enhancement of what has been done for centuries: draw lines to represent objects in buildings. The lines themselves don't have further meaning.

BIM is much more of a change for the industry than CAD: it reorganizes the sequence, timing, and duration of the design process, ushers in a new model of constant, detailed communication, puts a geometrically larger amount of information into one place, and might even change the fundamental roles of each participating company.

At its highest level, a BIM model is an "intelligent digital representation of … physical and functional characteristics about a capital facility". (NBIM Standard [1]) A BIM model has the following characteristics:

1 *A BIM model is a parametric, relational database that ties together multiple layers of information about specific objects—every object in the building.*

"Clicking" on a door in a BIM model reveals not only the door's dimensions, but distinct information about the door's material, color, fire rating, cost, and manufacturer. The model also provides parallel detailed information about every item it "touches," such as the doorframe and hardware. The model can also store information far beyond design and construction details, and become the owner's central building operations and maintenance data source. For example, it can include maintenance and replacement information for this door or any piece of the building. Click on that door in the BIM model, and you're not clicking on a line that delineates the edge, you're clicking on a graphic representation of a "living" three-dimensional object, with access to a rich supporting database of specifics about that object.

2 *A BIM model is "smart." A change to a component is reflected in all the components it relates to.*

For example, an interior wall might be lengthened. So, too, will the structure behind that wall, and the quantity of studs, sheetrock and so on. Though you might see only the longer wall in the view you're taking, all

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views and analyses that use that object will change (or are flagged for change by their "owner") as well. By making the change not only the view changes but also the information in the database which drives the model, and those views and analysis all use the same database.

3 *A BIM model offers a constant 3D representation of the building.*

Because all the information in a BIM model is three-dimensional, a 3D view of the building, from any angle, at any section (or "slice" through the building), can be generated at any time during the design process, and in the same program the designers and engineers are already working in. Data does not need to be exported to a rendering program and "colored up."

4 *A BIM model is an intelligent tool that can be used for study and analysis across multiple disciplines.*

Because these elements are smart (the walls and glazing contain information about thermal conductivity, the mechanical equipment relating to energy use, etc.), the BIM model can be used to simulate a building's behavior, and be the basis of numerous analyses, such as energy calculations. For another example, an acoustical engineer, with information about geometry and surface materials, can use BIM to model acoustic performance.

5 *A BIM model is a permanent, living document.*

Before BIM, the owner of a new building would receive a set of as-built drawings and a shelf of operations binders, all of which would often gather dust until needed. With BIM all the information is not only in one place, but can be an active management tool and even adapt with the building. The model can contain the same information about a new data cabling system installed in 2027 (and all of its relationships) as it does for the data cabling originally installed in 2007.

Examples and Stories

A number of project teams and facility managers have used BIM and shared their experiences with industry publications. Following are some highlights selected from the publications reviewed for this paper, and are summarized to highlight the key advantages of BIM:

1 *Provide visualization tools to improve the owner's understanding of the design.*

Sometimes, the "client" includes empowered (but not necessarily design savvy) users such as doctors and nurses, or a skeptical and passionate public, and 3D animations can appeal to different learning types and build understanding. The Washington State Department of Transportation (WSDOT) plans to replace the deteriorating Alaskan Way Viaduct in downtown Seattle, and both established options, viaduct and tunnel, are

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extremely controversial. WSDOT has used BIM's visualization capabilities to display what the options actually look like, not only upon completion but during the work, as a means of building public support and to aid decision-making. The initial public product--two technically-accurate, photorealistic 4.5-minute animations—drew 63,000 web hits in the first week. (Sawyer [2])

2 *Reduce interdisciplinary coordination errors and changes.*

For a major addition at Swedish Hospital in Seattle, NBBJ and its consultants saved hundreds of hours during design using BIM. A collision-detection program was run early and often, and the team essentially "pre-built the project," allowing problems to be resolved as they were found throughout design. (Dallam, Buchanan [3])

3 *Enable more strategic use of prefabricated materials and systems to speed construction, increase quality, and reduce schedule.*

On the same hospital project, Sellen Construction needed to build a utilidor to connect the new building to the existing building. BIM allowed off-site fabrication of racks to hold chilled water, electrical services, emergency power, and medical gases, enabling the project's aggressive schedule while maintaining quality. (Condit [4])

4 *Achieve complex architecture because of a seamless connection between design and fabrication, expediting the manufacturing and/or fabrication of engineered building components.*

At the Daniel Lebeskind-designed Denver Art Museum addition, with its geometric, cantilevered, "wildly irregular" design, Mortenson's use of the BIM model and the team's drawing coordination and communication with subcontractors were credited for not only achieving the demanding architecture, but reducing the steel erection schedule by three months and saving $400,000. (Post [5])

5 *Become a tool for more efficient facility management.*

In addition to BIM's use for "macro" purposes, such as understanding and maintaining HVAC systems, it has proven useful for even fairly routine purposes. "How many times does the square footage get measured in the life of a building?" asks Deke Smith of the National Institute of Building Sciences. "Every time you renovate. Every time you clean the carpet, probably." An accurate BIM model provides this information, updated to reflect additions and/or modernizations, instantaneously. (Lorenz [6])

6 *Further sustainability goals with a robust platform for analysis.*

BIM was a great advantage to a cost and thermal performance analysis of exterior skin options by Anshen + Allen, Lawrence Berkeley National Laboratory (LBNL), and Webcor. Traditional energy analysis required 2D

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> drawings and 14 days. While also going through that process, LBNL used the BIM model and a simulation program to produce the same analysis in one day. After moving to another skin option, LBNL performed a full energy consumption analysis in two days. (Bedrick [7])

BIM in Practice

Disciplines, Perceptions, and Standards

Strategic understanding and application of BIM requires understanding the differing ways in which the technology is viewed, utilized, feared, and enjoyed. This is because the BIM model is (or can be) shared and depended upon by all participants in the continuum of building planning, design, construction, management, and so on. This is unlike CAD, where documents are intricately coordinated but data remains singularly owned. The matrix on the following page attempts to find lessons in the characteristics, definitions, and published examples above, and offers high level observations of how BIM is received by the various disciplines in the A/E/C and real estate world, including both the benefits and the concerns.

This shared "ownership" of BIM data is a core reason for the recent development of the first universal standard for BIM. Version 1.0 of the National Building Information Modeling Standard (NBIMS) was released on March 13, 2007, by the National Institute of Building Sciences (NIST). Acknowledging the power of BIM to speak across the entire lifecycle of a building (from conception to project to decades of use), the NBIMS addresses the need to create standards so that technology can be applied horizontally across the facility lifecycle, and not just separately within vertically integrated business functions. The team that wrote the NBIMS standard included a detailed list of stakeholders, going beyond the scope of the matrix of this paper and including, for instance, first responders who might use a BIM model to minimize life and property loss, and risk managers who can use the model to analyze dangers. (NBIM Standard [1])

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Discipline and Issue Analysis

	Owner	Architect	Structural Engineer	Mechanical Engineer	Electrical Engineer	General Contractor	Subcontractor	Manufacturer/ Fabricator	Facility Manager

Benefits	- Better tool for coordinated data across a broad consultant and contractor team.
	- Potentially, a faster and less expensive design/ construction process.
	- 3D tools to enable internal team decisions.
	- A “living model” for the central, adapting library for facility management.
		- Robust tool for enhanced owner and team understanding of design options, including 3D visualization.
		- Integrated platform for interdisciplinary coordination, with much stronger potential for catching conflicts and errors before construction.
		- Less rework, because everyone can understand the design earlier, costs are known earlier, and clashes are detected earlier.
			- Visualization tool enabling (and requiring) earlier collaboration with architect.
			- Significant capabilities and tools for inter-disciplinary coordination.
			- BIM model can the basis of (or exported to) analytical programs, speeding the design-feedback process.
				- Visualization tool enabling (and requiring) earlier collaboration with architect.
				- Significant capabilities and tools for inter-disciplinary coordination.
				- Ability to integrate mechanical systems and maintenance data.
				- BIM model can be the basis of (or exported to) analytical programs such as for energy studies, speeding the design-feedback process.
					- Significant capabilities and tools for inter-disciplinary coordination.
					- BIM model can the basis of (or exported to) analytical programs, speeding the design-feedback process.
						- Ability to “inherit” usable data which can be sorted as desired, and used for quantity surveys, estimates, project management/cost records, and more.
						- Platform for 4D modeling, construction scheduling, and constructability analysis.
						- Visualization tool for subcontractor marketing, bid packaging, and coordination.
							- More usable information during bidding, transferable to preparation of bids and work planning.	- Ability to integrate existing data with manufacturing/fabrication technology, saving significant data creation/input efforts.
								- Platform for 4D modeling, construction scheduling, and constructability analysis.
									- Construction ends with true, “living” as-builts.
									- BIM model becomes facility management database and management tool, flexible and changeable over time.
									- A living, more accurate tool for:
									  - Code compliance checking.
									  - Asset management.
									  - Capital cost projections.
									  - Square footage and space data.

Questions/Concerns	- Can the efficiencies of BIM truly provide budget/cost control? Will the “same ol” errors and problems still happen? - Will the data be maintained and remain at high quality? Was it 100% accurate to begin with? - Will my consultants, and then my in-house staff, know how to use and apply the technology? - How can the BIM model be used within the Owner’s organization for other activities, such as workflow/activity modeling in the built spaces?	- Will yet more project control ceded to other disciplines, particularly the GC? - How are traditional contract documents coordinated and produced? - Using BIM to its advantage requires more effort in early stages. Will this be paid, and if so how? - How does the architect manage efficiently so many additional collaborators in earliest design phases?	- Will the software programs be truly interoperable, allowing the link for analytical and calculation tools to be seamless? - Will the extra effort required in early stages (structural information in the BIM model required during conceptual design) be compensated? - If structural BIM data is transferred to manufacturers and fabricators, what are the contractual, risk, and compensation effects?	- With the migration of data responsibility to GCs, will engineers end up working for the contractors? - Will the software programs be truly interoperable, allowing the link for analytical and calculation tools to be seamless? - Will the extra effort required in early stages (mechanical information in the BIM model required during conceptual design) be compensated?	- As the “least three dimensional” of engineering disciplines, will coordination of the electrical scope be considered of less immediate value?	- Will the GC be able to obtain the model data in a usable format as a basis for further development (shop drawings, et al)? - What are the risks of owning the data, and will the GC be paid appropriately, especially given the “inheriting” of data from the A/E team and passing it on to the facility management team?		- Will fabricators be able to obtain the model data in a usable format as a basis for further development, especially given actual and potential legal barriers during the bidding and construction phases?	- Will the facility management team inherit a model that truly reflects as-builts and will they be able to keep the model updated? - How adaptable will the model be in future years as the model must incorporate renovations, maintenance, etc.? Will this be expensive?

For all disciplines:

- This creates a very large change in how my design and CAD production teams do their work. How do I integrate this new technology, in terms of cost, education, existing internal operations and standards, and more?
- What are the interoperability standards, and are all the firms I’m working with using the same?
- How are contracts and laws reflecting this paradigm shift? What new risks do I have and am I being compensated appropriately?
- For the BIM model to work at its best, there must be early team understanding/coordination re: project goals. Do we have the communication processes in place for this to happen?
- The basis for a legal “standard of care” may evolve as BIM becomes used more. Does this increase my liability exposure for errors and omissions, and are my fees and contracts properly reflecting this? Do I even want to take this on?
- What are the data security impacts of people accessing the BIM model from outside my office (hacking, participating in renovations and modifying “our” work, etc.)?

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A Tool or a Process?

BIM is not "just" a tool; it is the core of a different *process* for design and construction. It can perhaps best be understood as fueling what the AIA calls Integrated Practice (Pressman [8]) or Stanford University's Center for Integrated Facilities Engineering calls Virtual Design and Construction (Kunz, Gilligan [9]). Because BIM provides not just data, but the tools for prototyping components and buildings and then testing and estimating those prototypes, design concepts and systems can be tested and understood in a "real time" atmosphere. This is very different from how most architects and engineers work now, where work by individual disciplines is mostly sequential to other disciplines. At a symposium about building envelope design and performance, a speaker from Green Building Studio discussed BIM's capabilities for easily analyzing various design options using factors such as orientation, glazing options, envelope constructions, lighting, and HVAC—analyses that can be performed by the architect early in design, rather than consultants later in design. (Khemlani [10])

Achieving this quality requires the architectural and engineering disciplines to work together much earlier in design, and a different way of envisioning the building. "The team makeup in the early design stages has to be different," says Henry Tyler of Dewberry. "These people have to understand and have experience in all aspects of the project and not just the early design components. They have to design and develop something that can actually be built." (Yoders [11]) Furthermore, no participant can think of his or her work as a detail, but must think in terms of the whole project. "I'm always aware that I am working on a building, not just an isolated object or detail," shares James Huynh of Onyx Group. (Tardif [12]) Components of the BIM model must meet and interact correctly—the column designed by the structural engineer must meet the sheetrock that the architect defines, which must attach to the light switch from the electrical engineer, and all must start at high level early in design.

The change of BIM, then, is not just the technology, it is how the supply chain itself is shaped and projects executed. In this way, the A/E/C world may be entering a period of change that can be understood (if not necessarily predicted) by looking at industries where BIM technologies have been widely adopted and in full use for many years. "The aerospace, automotive, and naval industries are decades ahead of the construction industry in using virtual models to design, analyze, test, and fabricate their products," notes Rick Oehmcke, Principal with PCS Structural Solutions and a member of the Structural Engineer Institute BIM Committee. Many writers and commentators looking at BIM quote a NIST report in 2002 that focused on inadequate data interoperability standards and inefficiencies in the A/E/C procurement chain leading to errors, omissions, rework, loss of time, and, significantly, almost $16 billion in annual waste. (Lorenz [6]). Similar inefficiencies were at the root of fundamental changes in collaboration and procurement in aerospace and other industries.

Oehmcke summarizes by stating "We (the A/E/C industry) must acknowledge and accept that the process that we'll be using to design and construct buildings will now revolve around the information in a database instead of graphic representations on our drawings."

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Relationships, Risks, and Procurement Models

So where does this all lead? Virtually every professional organization in the A/E/C industry (led by the AIA, AGC, and others) is seeking to understand the impacts of BIM and develop standards and tools for their constituencies. They are seeking to understand and prepare for the technology and the changes it will bring, both in how companies work and how they interact. This work is falling into the following categories:

1. Developing standards for data inoperability and data management so that BIM models can be efficiently shared between different disciplines.

2. Revising contract language and legal standards to reflect the changes in data ownership, risk allocation, and procurement practices.

3. Ensuring that their discipline remains a valued part of the project team, without loss of status.

4. Helping make full use of BIM as a means for designing and building great projects.

A common theme of these working groups and industry leaders is that BIM speeds the progression to “alternative” delivery methods and away from the traditional design/bid/build process. These crystal ball readers are predicting design teams will procure work together rather than separately, more true design/build work, more integrated delivery and contracting, and more “alternative” ways in which disciplines share work and share risk to design and build a building. These developments are a result of the following factors that fundamentally change when disciplines do their work and how they work together, and subsequently change risk/reward formulas.

1. *BIM encourages (perhaps forces) a process where disciplines do more work early.*

   As the industry has long understood, changes early in design are easy, and changes become more complicated and expensive to implement as projects progress through schematics, design development, and construction documents. A BIM model, even in the earliest conceptual stages and with minimal detail, is a powerful tool for measuring the broad brush cost, constructability, and other ramifications of a particular design option, as well as illustrating those concepts visually. This enables many changes to happen early in design. It also means, though, that each discipline must have a certain base level of information in the BIM model for the analysis to be accurate, and for some disciplines this means more work early. A structural engineer can no longer just let the architect “figure out the schematic design and then come back to me for some single-line diagrams". With BIM the engineer must envision the design to the point where the basic components of the model can be assembled.

   This additional early work can require a significant change in the composition and timing of teams. Engineers will have substantial roles as soon as the BIM model is started, rather than being selected early but performing most work in the later design phases. In fact, the very

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definition of design phases (schematic, design development, construction documents) may well change, as those mileposts lose much of their reason and power. Historically, setting a deadline for creation of a significant publication product—the set of drawings, narrative, and specifications—has been necessary because that complete set of information, viewable at once, has been required by any participant (e.g. the owner, the acoustical engineer, the roofing manufacturer) to do their work. But now that data source is constantly shared and "viewable" by all parties at virtually any time. Certainly detail in the BIM model grows, and without defined junctures certain participants cannot do their work (such as a municipal plan reviewer or cost estimator), but there will be less need for the scheduled "publishing" thresholds.

2 *The BIM model "lives" and can adapt throughout the life cycle of a building; it can serve the needs of multiple participants, at different times, and each with different (but relating) needs.*

A powerful characteristic of BIM is the always-active nature of the model. The same database serves different users at different times for different reasons. Take the example of a rooftop mechanical unit: the architect in design wants to know its shape and volume as he details the roof parapet; the structural engineer wants to know its weight and connection points to coordinate the steel structure; the contactor wants the connection details to coordinate mechanical and electrical hookups; the commissioning agent wants the associated baseline technical data for testing and balancing; and the facility manager wants replacement details for the various components to purchase supplies and schedule maintenance. There are unlimited other examples. Even this example could be expanded to illustrate the living nature of the model (e.g. the first responders noted above, future building purchasers, historians...).

This characteristic is very different from current practice, where documentation is truly shared and jointly published only in printed form, and many details are recreated as information passes through these different participants from design to construction to facility management. (This recreation is a key component of the $16 billion noted in the 2002 NIS study). Current legal standards and contractual arrangements between and amongst the parties are mostly predicated on sharing static, proprietary information, and blocking the flow of "active" data that is at the core of the BIM model.

3 *BIM technology offers the potential for significant (perhaps radical) improvement in interdisciplinary coordination, leading to reduction in errors, and fewer coordination-based changes during construction.*

With accurate details about all components and systems, a BIM model offers both a powerful 3D visualization tool for coordination challenges (such as running multiple utilities and structural elements through congested ceiling space), and automatic clash detection built into the software. This capability may lead to a significant change in the standard-of-care definitions that underlie expectations for contractual

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deliverables and who is responsible for correcting errors. As the market sees BIM as a tool to reduce changes, it will mandate its use, thus forcing changes in definitions of working standards and deliverables. For example, the Army Corps of Engineers will require BIM for all projects starting in 2008, and already rates BIM users higher in capability during its team selections. (Buckley [13])

4 *BIM may change the very definition of the design/construction continuum and the diversity/complexity of what firms do what when.*

Just as traditional design deliverable definitions may lose relevance, so too may the definition of who provides design, construction, maintenance, and other services. Because of increased ability to share information over time, traditional barriers will decline. Specialization will remain important because buildings and their systems are inherently unique and complex. The existing (and different) expertise of a structural engineer or a construction manager will still be required, but how and when these types of expertise are involved may change.

An example of a process that would not have been achievable before BIM is the recent Loblolly House in Maryland by KieranTimberlake. The house is the prototype for one of a new generation of prefabricated houses on the market. Its design and construction process allowed the architects to test their theories about prefabricated, quick-assembly architecture on a new second home for the Kieran family. Specifically, they credit BIM for providing the precision and certainty to order materials directly, without the shop drawing process. The house, assembled in six weeks (Pearson [14]) with components produced mostly offsite by Bensonwood of New Hampshire, would not have been achievable (at even remotely the same schedule and cost) without the data and communication tools for the BIM model. (Fortmeyer [15]) In this example, an architectural firm (and others providing prefabricated designs) is becoming a source for completed buildings, taking on manufacturing and delivery responsibilities and risks, and presumably charging appropriately. Houses, due to their size and standard program components, are perhaps an easier project with which to illustrate this characteristic of BIM, but can the same process, and changes in risk and reward, be applied to office buildings or medical offices, for example?

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BIM and Marketing

Now we take this paradigm shift into the marketing realm.

With What

Much of the power of BIM is in 3D visualization, for design and for coordination. Proposals will often include substantial graphic elements from BIM models, both during these early years of adoption and understanding as more owners request the process, and later as BIM diagrams become "basic" tools that are commonly used. This is a new source of data requiring new standards and systems for graphic use in brochures, proposals, websites, and presentations. Rather than relying on technical staff, some marketers may choose to become proficient enough in BIM to use or manipulate images, animations, specs, and background data and incorporate those into marketing materials.

Delving deeper into the technical nature of BIM, new proposal/marketing content will be required to discuss BIM in areas such as how a particular firm is different from the competition, company approach and capabilities, data standards, and interoperability, both as requested from the owner, and to help educate the owner and team. (Tietjen [16]) This will be particularly true in these initial years of widespread implementation of BIM by A/E/C firms, and especially since the term is (and may always be) used to mean different things to different people. The marketer will need to increase clarity in writing and graphic efforts.

As owners and the entire industry (in fact, the economy at large) become more focused on the complex issues surrounding sustainability, BIM will be required and requested more due to its ability to be the basis for sustainable analysis and decision making. This means increased proposal content not only about use of the BIM model, but about building components and systems, and not just their first costs but their operation, maintenance, and replacement costs and characteristics as well.

To Whom

We see changes to “who is the client” and thus to what audience the marketer is marketing. As the supply chain and contractual relationships change, so can the person making the buying choice. In the earlier example about the Loblolly House and KieranTimberlake, their clients now include the public buying prefabricated homes. The number of customers required is likely much larger than those for a traditional practice, requiring new venues and types of marketing materials. The buyers themselves change, as prefabrication and the cost benefits allow a new type of purchaser for the “architect designed” house; so too will the audience for the marketer’s writing and graphics.

In the commercial A/E/C world, many of the ramifications of BIM will be due to changes in the timing of data and communication flow, and associated responsibilities and decision-making. Some are predicting that as the owner seeks to benefit from the power of the BIM model, the owner will mandate who “owns” the model and data. If, for example, an owner hires an architect to work within the BIM parameters as defined by a general contractor, the architect may have to submit information about data standards, interoperability, etc., and market their BIM approach to that general contractor. Another example assumes that delivery models will change to include more design/build mechanical delivery. The owner, seeking to maximize the interdisciplinary coordination

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and time and cost savings nature of BIM communication, might seek to hire engineers and subcontractors together. For pure engineering firms this means marketing their services to mechanical construction firms. That is clearly a big change, not just in the audience for marketing materials, but the strategic direction of engineering firms and their business development strategy. (This is not intended to summarize such a complex topic as design/build delivery, which is well covered in industry journals, just to point out the BIM connection.) Yet another example, probably "further out," imagines an owner seeking the BIM enabled efficiencies of structural engineers working directly with material fabricators and installers. On most work, fabricators and installers currently work on a project "through" the general contractor. With BIM the structural engineer may be required to partner with the fabricator. This is another new client type, business development prospect, and audience for marketing materials. Once again, these examples may be especially true since BIM is in its initial "implementation years."

How

We've described immediately above new relationships and/or clients as a result of BIM. Within existing "typical" roles (e.g. an architect working directly for an owner and subcontracting with engineers) are the additional ramifications of risk/reward structures built to maximize the value of BIM. There may be new and tighter definitions of standard of care, different incentive fee structures based on implementation and effectiveness of BIM modeling and data, and new contract formats defining BIM deliverables and responsibility, and thus risk. (Brodsky [17]) For the marketer, this means different and/or new components to the Go/No Go model and analysis of the risks and financial rewards of a particular project pursuit.

The new relationships and new teaming models also mean potentially different competition. BIM, with its singular (or very closely related) database core, fosters more flexibility in teaming and enables A/E/C participants much greater flexibility in working around existing, intrinsically adversarial relationships. (Tardif [18]) A group of engineers from different disciplines may form a one-time partnership to pursue a specific project, and become a different form of competitor for the "typical" firm. In the same manner, an engineer might partner with a fabricator to supply critical BIM modeling and analytical skills in the pursuit of a building with complex geometry.

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Going Forward

More for Marketers

BIM is at its heart a communication tool, and marketers are at their core communications professionals. Beyond the impacts to their day-to-day work, there are a few clear roles for marketers to serve in their firms, especially in these first formative years of BIM adoption in the A/E/C industry.

1 *Facilitate and Educate*

Much as this paper attempts to do, marketers can serve a strong role in clarifying the who, what, when, and how of BIM. As a trend and as a buzzword, BIM is, and will continue to be, understood and used in many different ways. An architect may be speaking of the 3D capabilities and BIM as a tool for helping the owner to make decisions, while the contractor she's talking to may be hearing something about interdisciplinary coordination and reduced conflicts in interstitial space. The marketer can help these two—the architect and the contractor—with internal education and communication about BIM within their companies. Marketers should be involved with the internal discussion of BIM to ensure that the high level is addressed. The marketer should always work to clarify the topic by encouraging greater understanding of the biggest picture with consistency in language and use of the details.

2 *Partner and Collaborate*

Marketers, particularly in their business development function, have the opportunity to discuss BIM broadly with clients, subconsultants, vendors, partners, and even the competition. Marketers are conduits for information. Their active participation inside and outside of their firms will bring important perspective and additional data. Since many of the more broad reaching changes anticipated by BIM are to delivery method and "partnerships," the marketer's role in building substantive relationships will be key.

3 *Educate the Client*

The greatest changes in the industry driven by BIM will come as a result of market pressures: owners seeking greater efficiency, lower cost, stronger supply chain relationships, longer use of core data, and more. But this does not mean the client will always be right (apologies for potentially violating the sacrosanct!). Just as with the architect and contractor mentioned earlier, clients will tend to see BIM through their own lenses; marketers can and should take opportunity to educate clients, through industry events, company hosted events, and other marketing communications, about the benefits and whys and hows of BIM. Better educated clients will make better selectors of A/E/C firms with BIM capabilities.

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Close

BIM is without doubt beginning to revolutionize the A/E/C industry and how team members collaborate. Now it's your turn, as a marketer, to help your firm understand what BIM means for your business and your marketing, and ensure that you are positioned for success. What does BIM mean strategically, in terms of the roles your company will play on projects, the staffing you need, and who your clients are? What does it mean personally, in terms of the messages you will convey, how you will convey those messages, and your skill sets? The real answers will be unique to your firm, and you are the expert.

Acknowledgements

In the course of preparing and researching for this paper, I've chatted with a number of industry experts regarding their views about and experiences with BIM. Many thanks to: Eric Overton, CEO of Sparling; Graham Condit, Director of CAD Technologies at Sellen Construction; Rae Anne Rushing, President of Rushing Company; Chris Raftery, President of M.S. Cavoad Development; and particularly to Rick Oehmcke, Principal with PCS Structural Solutions.

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Footnotes

1. uncredited, “Press Release: National BIM Standard™ Version 1.0—Part 1: Out for Industry Review,” *National Institute of Building Sciences*, March 13, 2007.

2. Tom Sawyer, “Digital Modeling: Early Adopters Find the Best Models are Digital Virtuosos,” *ENR Magazine*, October 2, 2006.

3. Richard Dallam and Todd Buchanan, of NBBJ, “Build a Better Building with 3-D Modeling,” *Seattle Daily Journal of Commerce*, November 16, 2006.

4. Graham Condit, of Sellen, “Complex projects call for virtual construction,” *Seattle Daily Journal of Commerce*, November 16, 2006.

5. Nadine Post, “ 'E-Construction' as the Norm Is Still 10 to 15 Years Away,” *ENR Magazine*, February 20, 2006.

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7. Jim Bedrick, AIA, of Webcor, “BIM and Process Improvement,” *AEC Bytes*, December 13, 2005.

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11. Jeff Yoders, “The Merry Road to BIM,” *Building Design and Construction Magazine*, July 1, 2006.

12. Michael Tardif, Assoc. AIA, “One Hundred Percent BIM,” *AIA Architect*, March 9, 2007.

13. Bruce Buckley, “Federal Agencies Look for Speedy BIM Implementation,” *ENR Magazine*, November 13, 2006.

14. Clifford A. Pearson, “On a Wooded Site on Taylors Island, Maryland, KieranTimberlake Tested a New Way of Building with the Loblolly House,” *Architectural Record Magazine*, April 2007.

15. Russell Fortmeyer, “Loblolly House: In Stock and Ready to Ship,” *Architectural Record Magazine*, November 2006.

16. Renee Tietjen, GSA, “Visionary property owners try some new tools,” *Seattle Daily Journal of Commerce*, December 15, 2005.

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17. Matthew Brodsky, “Learning to Build From Scratch: Architects and Designers Need a New Perspective as their Structured World of ‘Apportioned Liability’ Crumbles Under their Feet Because of New Technology,” *Risk & Insurance Magazine*, November, 2006.

18. Michael Tardif, Assoc. AIA, “BIM 2011: A Five-Year Forecast,” *Face of the AIA*, January 5, 2006.

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Jim Bedrick, AIA, of Webcor, "BIM and Process Improvement," *AEC Bytes*, December 13, 2005, http://www.aecbytes.com/viewpoint/2005/issue_20.html

> *BIM is fundamentally different than CAD, not just a better drafting tool, but "an enabler of significant process improvement in the design and construction of buildings." An example is BIM's facilitation of contractor estimate feedback throughout each design phase, which avoids costly redesign, and possibly speedier and more accurate estimates at the major stages.*

Matthew Brodsky, "Learning to Build From Scratch: Architects and Designers Need a New Perspective as their Structured World of "Apportioned Liability" Crumbles Under their Feet Because of New Technology," *Risk & Insurance Magazine*, November, 2006, http://www.riskandinsurance.com/story.jsp?storyId=13405624

> *BIM means new roles and responsibilities on the project team, and this has major implications for the risk management industry. Positives include BIM helping teams avoid many of the simple errors in projects, and greater communication. Threats include the potential for some disciplines losing influence, such as when a contractor's value engineering role becoming dominant over the design team's role, the potential for a computer crash or hacking, and the lack of "definite responsibility" for errors that is the basis of our legal system. Until the questions are sorted out, the insurance industry, and legal ramifications of errors, will be in flux.*

Bruce Buckley, "Federal Agencies Look for Speedy BIM Implementation," *ENR Magazine*, November 13, 2006, http://www.construction.com/NewsCenter/TechnologyCenter/Headlines/archive/2006/ENR_1113.asp (subscription required)

> *Federal GSA projects already require basic BIM: 3D models with certain mandated information. GSA is looking to expand the use of BIM, and other federal agencies (such as the Army Corps of Engineers) are also increasingly favoring or requiring BIM.*

Graham Condit, of Sellen, "Complex projects call for virtual construction," *Seattle Daily Journal of Commerce*, November 16, 2006, http://www.djc.com/news/co/11184025.html?query=BIM&searchtype=all (subscription required)

> *BIM on a hospital project from contractor's perspective. The Director of CAD for a construction firm discusses the advantages of BIM from the perspective of a contractor for an occupied hospital project – helping analyze phasing, communicate with the occupants about disruptions, show future occupants to comment about planned layouts in virtual form, generate schedules, identify design clashes, and provide full information for building operation.*

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John Cronin, "BIM Will Create More Demand for "Content Brokers," *The Blueprint* (blog), April 27, 2006, http://theblueprint.typepad.com/theblueprint/2006/04/bim_will_create.html

> *BIM has significant implications for the AEC commercial reprographics industry, which the writer does not specifically predict. More broadly, BIM involves someone being the custodian of the model long-term. This role is difficult for the architect due to their partial role in the model's creation and due to the heavy IT requirements.*

Richard Dallam and Todd Buchanan, of NBBJ, "Build a Better Building with 3-D Modeling," *Seattle Daily Journal of Commerce*, November 16, 2006, http://www.djc.com/news/co/11184026.html?query=BIM&searchtype=all (subscription required)

> *The perspective of a large architecture firm that adopted BIM early, with a hospital project as case study. BIM can result in reduced errors, cost, and timeliness for a project, and improved quality, safety, and operations for a finished building. For BIM to work properly, every team member must be on-board. The current Swedish Hospital Orthopedic project is a case study. Visual representations help the hospital staff comment on the design, and understand and plan for their new spaces. The model can also be used for staff orientation and even fundraising. Later, the facilities manager can use the model to help resolve building questions.*

Jim Duncan, of Sparling, "Try integrated 3-D design for better buildings," *Seattle Daily Journal of Commerce,* November 10, 2005, http://www.djc.com/news/ae/11173378.html (subscription required)

> *Collaboration and integrated design are fundamental to designing great buildings. 3-D design and BIM advance both. Key stat: Older design and delivery methods might cost owners up to 20% of construction dollars in lost productivity, wasted materials, building operation costs, etc.*

Mohammad El-Mashaleh, William J. O'Brien, and Richard Minchin Jr., "Firm Performance and Information Technology Utilization in the Construction Industry," *Journal of Construction Engineering and Management / Copyright ASCE*, May, 2006, http://www.pubs.asce.org/WWWdisplay.cgi?0602929 (subscription required)

> *This paper examines the impact of IT on construction firm performance. Based on data from 74 construction firms, IT is positively associated with schedule and cost performance, and no relationship was found between IT and customer satisfaction, safety, and firm profitability.*

Martin Fisher, Stanford University, "For BIM's Sake." *AIA Knowledge Communities*, June 2005, http://www.aia.org/tap2_template.cfm?pagename=tap_a_200506_bim

> *Design community should adopt BIM. Using BIM from the beginning of the design process is easier for the architect, identifies design clashes much earlier, and allows various disciplines to share information much earlier.*

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Russell Fortmeyer, “Loblolly House: In Stock and Ready to Ship,” *Architectural Record Magazine*, November 2006, http://archrecord.construction.com/resources/conteduc/archives/0611edit-2.asp (subscription required)

> *Architects KieranTimberlake tested their theories about prefabricated, quick-assembly architecture on a new second home for the Kieran family. They credit BIM for providing the precision and certainty to order materials directly, without the shop drawing process.*

Joann Gonchar, AIA, “To architects, building information modeling is still primarily a visualization tool,” *Architectural Record Magazine*, July 2006, http://archrecord.construction.com/features/digital/archives/0607dignews-2.asp (subscription required)

> *Firms were surveyed about their BIM usage by AIA and AGC ending in January 2006. While BIM was commonly used, much of the use was simple functions only, with a minority of users performing more robust functions. Almost 3/4 of firms used BIM for at least something. Many used BIM mostly for massing and for graphics related to conceptual design. About 34% used BIM for intelligent modeling. The writer also notes that BIM could be useful in the future for first responders and insurers as well as property owners.*

Kim Hogan, “Technology Drives Flexible, Cost-Efficient Interior Design,” *Texas Construction*, October 2006, (no link available – printed from website and pdf’d)

> *The article is broad reaching regarding technology, with a partial focus on BIM. BIM can help architects and interior designers quickly and efficiently communicate with the client through 3D imaging, previously possible only by separately creating a 3D model.*

J.G., “Report Touts Benefits of Integrated Design and Tackles Obstacles Hindering Adoption,” September 2006, *Architectural Record Magazine*, http://archrecord.construction.com/features/digital/archives/0609dignews-3.asp (subscription required)

> *The construction industry is in the midst of transformation, and architects run the risk of becoming irrelevant unless they adapt. This is the message of AIA’s Report on Integrated Practice. The report is a collection of essays that explore the problems of fragmentation in the construction industry and the benefits that can be achieved from BIM. (Summary from ProQuest database.)*

Peter Katranuschkov, John Haymaker, Engin Ayaz, Martin Fischer, Calvin Kam, John Kunz, Marc Ramsey, Ben Suter, Mauricio Toledo, “Managing and Communicating Project Information, Design Processes, and Decisions on the Stanford Living Laboratory Project,” *Stanford University*, December2005, http://www.stanford.edu/class/cee243/ITCON.pdf

> *Paraphrasing the article summary: A/E/C projects require multidisciplinary solutions. A/E/C professionals have formal methods to manage their own disciplines’ information, but lack the methods to manage and communicate information among multiple disciplines. The authors are designing and*

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implementing three methodologies to help: With POP methodology, professionals can organize information models in terms of the functions, forms, and behaviors of the design products, organizations, and processes. With Narrative methodology they can communicate and manage the integration of design processes by defining and controlling the dependencies between information models. With Decision Dashboard methodology, they can consider tradeoffs among options and document decisions. This paper presents case studies from the feasibility study of these method, using the Stanford University "Living Laboratory" project.

Lachmi Khemlani, "AIA CBSP Symposium on BIM for Building Envelope Design and Performance," *AECbytes* (by AutoDesk), November 15, 2006, http://www.aecbytes.com/buildingthefuture/2006/AIA-CBSP_BIM.html

The capabilities of BIM. This symposium focused on how BIM can facilitate the design of energy efficient, high performing buildings. Speakers discussed BIM's capabilities and inadequacies, with examples of how BIM has allowed earlier or better performance analysis and design collaboration – for example a building where thermal and airflow analysis allowed the team to delete a chimney and save $1,500,000. The author discusses the presentations and provides commentary on BIM technology and advocates for its further implementation.

Lance Kirby, "BIM Transition in a Small Firm," *AIA Best Practices*, January 2007, http://www.aia.org/SiteObjects/files/bestpractice_13_01_06E.pdf

The best practices for implementation of BIM, if used, should smooth the BIM transformation for small firms. The typical concerns about BIM implementation – disruption, costs, etc. – are magnified with small firms, which have no extra staff to pick up the slack while others are learning BIM, no IT groups, etc. However, planning and preparation can smooth the process, with a key element including involvement of the affected staff.

John Kunz and Brian Gilligan, "CIFE/CURT Survey of BDC/BIM Use," *Stanford University Center for Integrated Facility Engineering*, 2006, http://www.stanford.edu/group/CIFE/CURT1115jk.pdf

Survey results are presented in great detail, including BIM and VDC, which includes BIM but has additional functions. A few highlights: BIM/VDC is more common for "communicating with non-professionals" than for cost estimating. Architects are the leading users. It is used somewhat less by general contractors, engineers, subcontractors, and owner (user side) and much less by owners on the financial side. Much of the data regards VDC rather than BIM specifically, and the show is written to support a persuasive presentation about VDC.

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Brandon Lorenz, "The Case for Data Interoperability," *Building Operating Management Magazine*, May 2006, http://www.facilitiesnet.com/bom/article.asp?id=4094

> *The lack of central, interoperable data is costing facility managers substantial time and money. The article is primarily about interoperability, with a section on BIM. BIM gives the building manager a vast amount of information in one place for easy use. If kept updated, it also includes renovations and changes that occur over time.*

Harry Mashburn, AGC, "President's Message — A Look at the Future-BIM Transforms the Industry," *Constructor Magazine*, September/October 2006, http://constructor.construction.com/insideAGC/archives/2006-09presMsg.asp

> *The author discusses the usefulness of BIM for early clash detection, identifying errors (such as an example of non-aligned footings), and helping the client visualize the finished product earlier in the process for quicker decision-making. The author dispels the "misconception" that BIM raises project costs, and notes "I think it will eventually cost the client less."*

Craig Park, FSMPS, Associate AIA, "The Interoperable Future," SMPS Marketer, February, 2007, (link requires SMPS membership)

> *The author presents a short primer on BIM and its use by his firm on a project. He also includes a rare look at BIM from a marketing-focus. His primary advice to marketers is to convince their firms to adopt BIM before they get left behind, and show how your firm's use of BIM is a differentiator in the industry, providing clients great value.*

Clifford A. Pearson, "On a Wooded Site on Taylors Island, Maryland, KieranTimberlake Tested a New Way of Building with the Loblolly House," *Architectural Record Magazine*, April 2007, http://archrecord.construction.com/residential/recordHouses/2007/07loblolly.asp (subscription required)

> *One of two Architectural Record articles about the Loblolly House, this one is included here because it specifies the construction duration of six weeks.*

Nadine Post, " 'E-Construction' as the Norm Is Still 10 to 15 Years Away," *ENR Magazine*, February 20, 2006, http://enr.ecnext.com/free-scripts/comsite2.pl?page=enr_document&article=nebuar060220 (subscription required)

> *While BIM's potential is already being shown, virtual building as the norm is still 10-15 years away according to the industry pioneers at an e-building roundtable in February 2006. Architects' support for BIM is in part a reaction to erosion of their typical role on teams, with contractors often in the role of BIM coordinator, and there is tension about who will "run the show." There is concern that AIA isn't acting fast enough, with model contract documents for 3D not scheduled to be published until 2007.*

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Nadine Post, "Team Members Seek Ways Out of the Building Modeling Haze," *Buildings Magazine*, June 5, 2006, http://enr.ecnext.com/coms2/summary_0271-28504_ITM (subscription required)

> *Today's visions for comprehensive BIM might actually be real in 2020, with better buildings, faster, at lower cost, with fewer claims, and with different job descriptions for most people in design and construction. In the meantime, says a BIM consultant, "start small and add complexity as you gain confidence." The author discusses numerous positive and challenging aspects of BIM, from the steep learning curve to reduced RFIs.*

Nadine Post, "First Standard for 3D Modeling Due by Year-End," *Buildings Magazine*, June 5, 2006, (no link available – printed from website and pdf'd)

> *The National Institute of Standards and Technology is establishing national standards for 3D modeling so that models will be sustainable and long-term, and interoperable based upon open standards. The first portion of the standard will be precast concrete. Sponsors are needed for some parts of the standards, such as the CAD-GIS interface.*

Nadine Post, "E-Construction Hampered By Inability to Share 3-D Models," *ENR Magazine*, April 30, 2007, http://enr.construction.com/news/informationtech/archives/070425.asp (subscription required)

> *Boosters of collaborative virtual design and construction at the American Institute of Steel Construction are concerned that the industry is focusing too much on BIM and too little on interoperability, and advocate "neutral" data files. BIM programs can be cumbersome – one engineer complains of 8-minute waits to save each change on the central BIM model; another talks about the need for "workarounds" to overcome use and sharing difficulties, and the need to have BIM specialists on staff.*

Andrew Pressman, FAIA, "Integrated Practice in Perspective: A New Model for the Architectural Profession," *Architectural Record Magazine*, May, 2007, http://archrecord.construction.com/practice/projDelivery/0705proj-1.asp (subscription required)

> *Integrated Practice (IP) is a more collaborative, interactive approach to projects. BIM is enabling, and some say forcing, the emergence of IP, with its frequent information exchange. BIM has many consequences that affect firm culture, contracts, insurance and risk, compensation, and professional education. The article discusses each of these areas in detail. "Those who think critically and innovatively about these new business practices will lead the way and prosper."*

Rick Rundell, AIA, of Cadalyst, "How Can BIM Benefit Facilities Management?," *Prime Edge Asbuilt Services website*, November 6, 2006, http://primeedge.com/asbuilt_news/BIM_FM.htm

> *This Editorial article focuses on methods for facility managers and FM applications to take advantage of the consistent, coordinated building information*

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that comes from a BIM, such as interoperability between information sources and users, and ready access to information that is otherwise often difficult to find.

Tom Sawyer, "Digital Modeling: Early Adopters Find the Best Models are Digital Virtuosos," *ENR Magazine*, October 2, 2006, http://www.construction.com/NewsCenter/TechnologyCenter/Headlines/archive/2006/ENR_1002.asp (subscription required)

Users are finding that the value of BIM is not the volume of data, but the right data, the right level of detail, and the right presentation, all based upon careful thinking and discussion. Seattle's proposed Highway 99 replacement by the Washington State DOT provides an example where investing in PIM (Program Information Management) has been a valuable communication tool during a major regional debate about the project, as well as incorporating 2D and 3D CAD, GIS, raster design, geotech, environmental, construction, controls, and related document management links for the entire project and its alternatives. The project incorporates a variety of design and construction software in proprietary formats, but makes the information visible, measurable, and analyzable to everyone. The writer also discusses the Federal GSA, which is gradually pushing its projects toward more comprehensive modeling. In particular, GSA uses BIM for modeling energy use.

Judy Schriener and Robert Carlsen, "AGC Unveils New Building Information Modeling Guide," *ENR Magazine*, October 9, 2006, http://www.construction.com/NewsCenter/TechnologyCenter/Headlines/archive/2006/ENR_1009.asp (subscription required)

The AGC's new BIM guide, free to AGC members, was unveiled September 29-30. It includes sections on risk management, software and hardware, training, and the benefits to contractors. The placement of risk, ownership of the model, and the ability to edit the work of other team members are all questions still in need of answers. Marketing is a primary reason to adopt BIM early, as a differentiator and as a visualization tool.

Scott Simpson, of KlingStubbins, "Architects Belatedly Move Toward the Light," *ENR Magazine*, March 3, 2007, http://enr.ecnext.com/free-scripts/comsite2.pl?page=enr_document&article=opviar070305c (subscription required)

Architects and engineers have been slow to adopt new technologies in their own work. But they are beginning to understand that innovations such as BIM can lead to improvement in how buildings are designed and constructed, and clients are pushing this change as well. The author details several examples of projects built through a BIM-based "hypertrack" method of constant rather than sequential team collaboration, each built substantially under budget and quicker than scheduled. "If adopted widely in the U.S., integrated delivery could easily produce savings of 5% to 10% per project..."

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CC Sullivan of NavisWorks, "Integrated BIM and Design Review for Safer, Better Buildings," *Architectural Record Magazine*, June 2007, http://construction.com/CE/articles/0706navis-1.asp (subscription required)

> *BIM's capabilities are expanding. For example, new "tools" allow the BIM models to be reviewed using simpler software platforms than the main BIM software. File-compression is helping manage giant model files. The article also provides an overview on the benefits of BIM.*

John Sullivan, Coordinator, "Transitioning to Building Information Modeling (BIM): A Federal Perspective," *Autodesk*, October 31, 2006, http://www7.nationalacademies.org/FFC/john_sullivan_bim.pdf

> *Implementing BIM requires careful planning and understanding of how BIM changes business practices. This paper focuses on strategies for the transition to BIM and on processes important to the Federal Government, including organizational strategies to consider when moving from CAD to BIM, how the government and partners can promote BIM modeling guidelines and interoperability, and success metrics by design firm BNIM on an IRS project. One of many considerations of using BIM is that design teams spend dramatically less time on documentation and more on early design.*

Michael Tardif, Assoc. AIA, "BIM 2011: A Five-Year Forecast," *Face of the AIA*, January 5, 2006, http://www.aia.org/aiarchitect/thisweek07/0105/0105rc_face.cfm

> *The writer discusses his predictions for what BIM will be in 2011. In lieu of the design-bid-build and design-build, delivery methods will gravitate toward team collaboration in continuum form. There will be less blame among team members for problems, and fewer claims. Design firms will be at more risk for the quality of their information. Some firms will be more specialized while others will be more vertically integrated. Successful firms must clearly define the services they offer. Multidiscipline teams will be form into LLC-like corporate entities for single projects. A labor shortage will be accentuated by a lack of up-to-date training at the college level.*

Michael Tardif, Assoc. AIA, "BIM Implementation: Applying Lessons Learned," *AIA Architect*, June 15, 2007, http://www.aia.org/aiarchitect/thisweek07/0615/0615rc_face.cfm

> *As FOX Architects implemented BIM, they ran into practical realities, making use of knowledge and experience gained to complete the implementation without disrupting their business. One issue was the Revit program's lack of the firm's graphic standard framework; after training part of their staff in the system, the firm decided to develop their own graphic standards before training other personnel. The firm also had capacity issues because only part of the staff was Revit-trained initially. Additional challenges include the potential for staff errors to damage the model, and need for new design pieces to be aligned and not in conflict to be incorporated into the model.*

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Michael Tardif, Assoc. AIA, "One Hundred Percent BIM," *AIA Architect*, March 9, 2007, http://www.aia.org/aiarchitect/thisweek07/0309/0309rc_face.cfm

> *One firm's experience becoming all-BIM. Rob Smedley, AIA, has turned Onyx Group's building design practice all-BIM. Challenges and limitations include the staff learning curve , the continuing need for 2D drawings, and the reluctance of engineering consultants to convert to BIM. Substantial benefits include a smoother design and team-coordination process, improved communication with clients, fewer RFIs, and an excellent win rate – at Onyx, Smedley has "never gone into a competitive presentation environment and lost the job."*

Eric Teicholz, of Graphic Systems, Opinion piece from *Graphic Systems* website, written to IFMA, July 29, 2005
www.graphicsystems.biz/gsi/html/articles.html

> *The author believes that 3D models are becoming a required standard for projects at a faster rate than he expected previously. BIM is a great opportunity for building owners, facility managers, and facility management software providers. Capital planning cost projections, asset data, and space data that are necessary for facility managers will be created in the design process. FM technology vendors will soon support BIM models and build applications on top of BIM technology, with interoperability.*

Renee Tietjen, GSA, "Visionary property owners try some new tools," *Seattle Daily Journal of Commerce*, December 15, 2005, http://www.djc.com/news/re/11174333.html (subscription required)

> *BIM's advantages for owners start with construction and continue through a building's life. BIM stores not just shapes, but also the minute details of every piece in a design – from color to fire rating to cost. With this vast database, a BIM model can be displayed or used in any number of ways. BIM helps reduce construction costs by improving communication and reducing errors. It helps reduce building operation cost by improving the owner's access to information that otherwise might be lost – assuming that the owner takes control of the BIM data. Used properly, BIM data is likely to remain accessible for the life of the building.*

Barbara Travers, for CBA, "8 experts take a look at real estate's future," *Seattle Daily Journal of Commerce*, December 14, 2006, http://www.djc.com/news/re/11184876.html?query=BIM&searchtype=all (subscription required)

> *A construction Project Manager expects increased use of BIM in the next five years to enhance the design and construction process, requiring more collaboration among the project team. Projects will be built digitally first – allowing construction and sequencing challenges to be resolved or avoided altogether. This will allow more off-site material prefabrication.*

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Jeff Yoders, "The Merry Road to BIM," *Building Design and Construction Magazine*, July 1, 2006, http://www.bdcnetwork.com/article/CA6354606.html (subscription required)

> *Three dimensional BIM is helping building teams shrink design and construction times and build complicated projects with less time spent in planning meetings. The article addresses "who owns the model", and the fear among architects that design will be under the contractor's purview if the contractor owns the BIM model. Also addressed is the need to balance the level of detail – to meet the diverse needs of the various disciplines but to avoid overdoing the detail.*

Directors, Stanford University Center for Integrated Facility Engineering, "Message from the Directors," *Stanford University*, May 2006, http://www.stanford.edu/group/CIFE/bulletin/may06/may2006.pdf

> *The authors argue that Virtual Design and Construction (VDC) is more inclusive than BIM. VDC's broader scope better supports the tasks of design management – represented as a 3x3 matrix where product/organization/process intersect with function/form/behavior. BIM only covers the intersection of product and form.*

misc. commentators, *BIM Forum*, http://www.bimforum.org/forum/index.php

> *New online bulletin board for all types of discussions of BIM. Topics generally regard the minutiae of using BIM or the characteristics of competing software. There is also discussion of how to advocate BIM, and how to keep promises in line with capabilities.*

misc. commentators, "Reader Feedback," *AEC Bytes*, January 11, 2006, http://www.aecbytes.com/viewpoint/2006/issue_21.html

> *Selected points from numerous comments: David R. Scheer, AIA, Scheer & Scheer, Inc., comments that BIM should not be dominated by individual software firms, but should be interoperable with open standards. John Finkell, Design Technology/Information Systems, NBBJ, believes that BIM is not really new, and discusses his creation of a BIM-like model a decade ago.*

uncredited, "Press Release: National BIM Standard™ Version 1.0—Part 1: Out for Industry Review," *National Institute of Building Sciences*, March 13, 2007, http://www.facilityinformationcouncil.org/bim/story_031307php, Link to National BIM Standard Version 1.0: http://www.facilityinformationcouncil.org/bim/pdfs/NBIMSv1_ConsolidatedBody_11Mar07_4.pdf

> *The first version of the National BIM Standard (NBIMS) was released for a two month industry review period March 13, 2007. It provides the capital facilities industry with its first comprehensive look at the full scope of requirements for BIM. The NBIMS will provide the diverse capital facilities industry with a vision of how to support and facilitate communications throughout the facility lifecycle. The document provides both a snapshot of where this burgeoning capability exists today as well as identifies work still needing to be accomplished. This first*

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part of Version 1.0, which is now out for review, will be followed by Part 2 at the end of the year.

uncredited, "Transitioning to BIM," *Autodesk*, 2005, http://www.ideateinc.com/whitepapers/Revit%20-%20Transitioning%20to%20BIM.pdf

(This is an earlier, more broadly targeted version of Autodesk's "Federal Perspective" article.) This paper profiles best practices for implementing BIM solutions exploring success factors for BIM deployment, and process and staffing changes that can be expected, and BIM training needs. Some suggestions include a transition team comprised of progressive individuals who will act as evangelists for BIM, selecting an easier project as the first to use BIM, and using "just in time" training which supports learning by building in immediate use.

uncredited, "Interoperability for Facility Owners" (and other versions for other audiences), *International Alliance for Interoperability*, not dated, Facility Owners: http://www.iai-na.org/about/fact_sheet_fo.pdf; Architects: http://www.iai-na.org/about/fact_sheet_arch.pdf; Contractors: http://www.iai-na.org/about/fact_sheet_cntr.pdf; Engineers: http://www.iai-na.org/about/fact_sheet_engr.pdf; Facility Managers: http://www.iai-na.org/about/fact_sheet_fm.pdf; Government: http://www.iai-na.org/about/fact_sheet_gvt.pdf; Product Suppliers: http://www.iai-na.org/about/fact_sheet_prodspl.pdf; Software Developers: http://www.iai-na.org/about/fact_sheet_swd.pdf

All communication in the design, supply, building, and facility management process should be done electronically with open-source, interoperable software. Interoperability brings great advantages by enabling real-time communication, simulations, collaboration with distant team members, and the better maintenance and storage of information. The paper makes specific suggestions about integrating interoperability into the reader's projects (use interoperable systems, require use by team members, etc.) and getting personally involved in advocating interoperability.

uncredited, "Will BIM Be the Death of Design," *AIA Archblog*, October 4, 2006, http://blog.aia.org/aiarchitect/2006/10/will_bim_be_the_death_of_desig.html

Unnamed blog author contends that BIM is not "the death of design." Technology will never overcome human creativity, and BIM is just a tool. The entry centers on the advantages and opportunities BIM provides to architects. Comments from others follow.

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Author: **Ted Sive, FSMPS**
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Ted Sive believes all people—and all companies—have a unique voice, point of view, and value proposition. Working as a facilitator, strategist, and communicator, he helps organizations and individuals discover their voices and values, and then communicate powerfully.

The subject of BIM fascinates Sive because at its core BIM is a *communication* tool. Understanding the power and future of BIM requires understanding how different participants in the A/E/C industry view the beast and how they process information and make decisions. Sive sees a strong role for marketers in all of this.

An A/E/C marketer and SMPS member since 1988, Sive has a lifelong passion for architecture and construction that began when he was a child visiting the great buildings of the East Coast and the architectural melting pot of New York City. Before becoming a consultant, he was a partner and director of marketing for Lease Crutcher Lewis, a leading Pacific Northwest general contractor. Prior to that, Sive was director of marketing and an associate at Meng Associates, an architectural and value analysis firm. He currently provides strategic facilitation, communication training, and brand development for select architectural, engineering, construction, and development firms.

Active in a number of professional and non-profit community organizations, Sive is a Fellow of the Society for Marketing Professional Services (SMPS). He is also an accomplished lecturer on topics including client care programs, alternative delivery methods, leadership development, and marketing processes. He has spoken at numerous national conferences and regional education events for AIA, AGC, SMPS, and other industry organization.

Ted attended Hamilton College in New York, holds a bachelor's degree in English and Writing from the University of Washington, and has completed masters-level study in architectural design, theory, and history.

Researcher and Co-Editor: **Matt Hays**
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Matt Hays is fascinated by the growth of cities, and suffers from a lifetime infatuation with Seattle. Early symptoms included drawing buildings and city maps in his free time, and periodic library visits to read armloads of the *Seattle Daily Journal of Commerce*. Passion became a job in 1992 when he joined an organization that advocated a big park and revitalized neighborhoods. While the "Seattle Commons" didn't make it past the local voters, the experience was great training for an A/E/C marketer.

Matt was starting a consulting career in 1996 when a marketing position at Lease Crutcher Lewis, a regional contractor, fell from the sky. This new job mixed his passions in development, Seattle, and newspaper reading, plus his talents in writing and research. It began a collaboration with Ted Sive that continues to this day—one writes, the other edits, the writer finalizes, and the sum is greater than its parts.

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Matt's volunteer positions have included proofreading for *Arcade Magazine*, membership on the Seattle Pedestrian Advisory Board, and a column in the *Pike Place Market News*. He attended Seattle Central Community College. Today, Matt is proposals manager at Lewis, and occasionally consults as a copy editor for A/E firms.

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