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AIA-TAP BIM Repeat Award Winners: Strengths and Opportunities

By Major Patrick Suermann, PhD, PE, LEED AP, and Tammy McCuen, LEED AP

IN 2005, THE AMERICAN INSTITUTE OF Architects Technology in Architectural Practice (AIA-TAP) recognized its first annual BIM Award winners. After five installments, these award winners have come to represent the very best BIMs in the world. Of this elite group, some firms have been honored more than once, making them the "best of the best." This article will discuss three repeat award winning firms and the evaluation of each using the National BIM Standard's® (NBIMS) Interactive Capability Maturity Model (I-CMM) as a basis for objective analysis of their information management maturity strengths and opportunities. Note: You can start using the I-CMM to evaluate your own BIMs right now! Visit: www.buildingsmartalliance.org/docs/ BIM_CMM_v1.9.xls

The three "best of the best" firms highlighted here are Morphosis, KieranTimberlake, and Mortenson Construction. Each firm's approach and project execution in BIM differs, but all represent a common characteristic of innovation and creativity.

MORPHOSIS

Morphosis was recognized with awards in 2005 and 2008, for federal projects in San Francisco and Eugene. In 2009, Morphosis received two awards, a Citation in the "Creating Stellar Architecture Using BIM" category along with the top "Jury's Choice" honor. Both awards were for a new academic building in New York, the Cooper Union for the Advancement of Science and Art. In an interview with Marty Doscher, Morphosis IT Director, he discussed the firm's approach to architecture and its signature style of complex structure and cladding assemblies. Morphosis uses BIM as a tool to engage and educate clients and constructors using model information about the design and structure.

Morphosis believes using BIM as a tool to optimize building performance and streamline the construction schedule is well known. Doscher encourages architects to use BIM as a tool to optimize architecture. The Morphosis philosophy is that BIM is as much about making 'architecture' an expression of art and the conveyance of poetic architecture as it is about the technical information within the model. BIM affords architects the opportunity to push the boundaries, improve design, and test out many design alternatives instead of using BIM solely for drawing production. Particularly interesting is the Morphosis belief that architects should not just use BIM as a way to optimize "the box" but rather as a way to improve the "DREAM."



Cellophane House, KieranTimberlake. Photo © Peter Aaron/Esto.

Doscher noted that over the last few years there have been both advances in the technology and an increase in contractors adopting BIM as they see its value in construction. He did point out that there appears to be a lag in the evolution of traditional business processes necessary to work more effectively in BIM and that this should be addressed by organizations such as buildingSMART allianceTM in the near future.

KIERANTIMBERLAKE

KieranTimberlake won two awards in 2007 for "Loblolly House" and another in 2009 for the Cellophane House. In an interview with David Riz, Principal, and Marilia Rodrigues, Associate, both from KieranTimberlake, they noted that while Loblolly House was a revolutionary project



Wayne L. Morse U.S. Courthouse, Courtesy of Morphosis Architects.

built with revolutionary software, they felt that the Cellophane House project represented greater adoption, knowledge and comfort levels with the BIM process. Riz noted that Cellophane House was revolutionary because it pushed the capabilities of a structural aluminum framing system beyond what was thought possible, allowing the house to be rapidly assembled and disassembled.

The project was fabricated directly from the BIM, assembled in modules and stacked into a 5 story showpiece hosting over 500,000 visitors in six months. Although the superstructure went together in less than a week, a model handoff data error led to a 1" discrepancy that had to be ameliorated on site, which led the team to question, "how do you truly collaborate when 40 percent of your project team is not using the same software?"

MORTENSON CONSTRUCTION

Winning one award as a contractor from the world's leading architectural organization is a tremendous honor. Winning four times is staggering. However, Mortenson can take pride in their accomplishment as the only contractor to ever accomplish this feat. They have won four AIA-TAP BIM citations or honorable mention awards.

In an interview with Derek Cunz and Ricardo Khan, Mortenson's approach to projects in BIM revealed innovation in construction and facility management. Focusing on two specific research facilities which have won awards, the 2007 award winner, Benjamin D. Hall Interdisciplinary Research Building at the University of Washington (UW) and the 2009 honorable mention winner, Research II (or R2) facility at University of Colorado – Denver (UC-D), helps provide an insight to Mortenson's information management approach over time.



University of Colorado at Denver – Health Sciences Research II. Photo courtesy of Mortenson Construction.

The Interactive BIM Capability Maturity Model			
Morphosis I-CMM 2008 Score Wayne L. Morse U.S. Courthouse			
Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	84%	Data w/Mostly Authoritative Information	5.9
Life-cycle Views	84%	Includes Constr/Supply & Fabrication	4.2
Change Management	90%	Full Awareness	3.6
Roles or Disciplines	90%	Plan, Design & Construction Supported	5.4
Business Process	91%	Some Bus Process Collect Inco	2.7
Timeliness/Response	91%	Most Response Info Available in BIM	4.6
Delivery Method	92%	Network Access w/Basic IA	2.8
Graphical Information	93%	3D – Intelligent Graphics	6.5
Spatial Capability	94%	Spatially Located	2.8
Information Accuracy	95%	Full Computed Areas & Ground Truth	7.6
Interoperability/IFC Support	96%	Full Info Transfers Between COTS	5.8
		Credit Sum	51.8
		Maturity Level	Certified

The Interactive BIM Capability Maturity Model

Morphosis I-CMM 2009 Score – Cooper	r Union for the Advancement	of Science and Art	
Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	ness 84% Completely Authoritative Information		6.7
Life-cycle Views	84%	Includes Constr./Supply & Fabrication 4.2	
Change Management	90%	Limited Awareness 2.7	
Roles or Disciplines	90%	90% Plan, Design & Construction Supported 5.4	
Business Process	91%	Some Bus Process Collect Info 2.7	
Timeliness/Response	91%	Limited Response Info. Available in BIM 3.	
Delivery Method	92%	Network Access w/Full IA 3.7	
Graphical Information	93%	4D – Add Time 8.4	
Spatial Capability	94%	Spatially Located 2.8	
Information Accuracy	95%	Full Computed Areas & Ground Truth 7.6	
Interoperability/IFC Support	96%	Full Info Transfers Between COTS	5.8
		Credit Sum	53.6
		Maturity Level	Certified

22 Journal of Building Information Modeling

The UW facility was a Design-Build-Operate-Maintain (DBOM) facility investment by Mortenson. The researchers leasing space in the facility reimburse Mortenson's capital construction expenditure, so longterm sustainability was integral in the facility's BIM creation. Differing from this project, the UC-D facility focused on superior value for the owner in a traditional project. Rather than focusing on maximizing leasable space, the team focused on integrating the design and construction models to ensure superior quality for the complex placement and installation of the structure and MEP systems in the facility, resulting in a more productive construction project.

THE NBIMS I-CMM

In chapter four of the NBIMS, Version1 – Part 1, the concept of evaluating information management maturity is discussed via



Cooper Union for the Advancement of Science and Art. Photo © Roland Halbe.



Cooper Union for the Advancement of Science and Art, as modeled.

The Interactive BIM Capability Maturity Model			
KieranTimberlake I-CMM Score 2007 - Loblolly House			
Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	84%	Data w/Limited Authoritative Information	5.0
Life-cycle Views	84%	Includes Constr./Supply & Fabrication	4.2
ITIL Maturity Assessment	90%	Limited Awareness	2.7
Roles or Disciplines	90%	Partial Plan, Design & Constr. Supported	4.5
Business Process	91%	Separate Processes Not Integrated	0.9
Timeliness/Response	91%	Limited Response Info. Available in BIM	3.6
Delivery Method	92%	Single Point Access No IA	0.9
Graphical Information	93%	4D – Add Time	8.4
Spatial Capability	94%	Not Spatially Located	0.9
Information Accuracy	95%	No Ground Truth	1.0
Interoperability/IFC Support	96%	Limited Info Transfers Between COTS	3.8
		TOTAL	36.0
		Certification Level	Minimum BIM

The Interactive BIM Capability Maturity Model

KieranTimberlake I-CMM Score 2009 - Cellophane House (Note: This was a temporary project that was disassembled, so the score may represent a higher level of information management maturity than warranted.)

Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	84%	Completely Authoritative Information	6.7
Life-cycle Views	84%	Includes Constr/Supply & Fabrication	4.2
Roles or Disciplines	90%	Partial Ops & Sustainment Supported	6.3
Business Process	91%	Some Bus Process Collect Info	2.7
Timeliness/Response	91%	Most Response Info Available In BIM	4.6
Delivery Method	92%	Web Enabled Services – Secure	7.4
Graphical Information	93%	4D – Add Time	8.4
Spatial Capability	94%	Spatially Located	2.8
Information Accuracy	95%	Full Computed Areas & Ground Truth	7.6
Interoperability/IFC Support	96%	Full Info Transfers Between COTS	5.8
		Credit Sum	62.7
		Maturity Level	Certified



Benjamin D. Hall Interdisciplinary Research Building at the University of Washington. Photo courtesy of Mortenson Construction.



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the "Capability Maturity Model" concept. Starting in 2007, before the NBIMS was published, the NBIMS testing team validated the NBIMS I-CMM by employing a panel of practicing professionals as scorers. The panel ensured consistency while using the tool to score the 2007 AIA-TAP BIM award winners like KieranTimberlake and Mortenson Construction. The double-blind approach resulted in a valid tool, worthy of publication for the NBIMS, and adoption by industry stakeholders. Within this arricle are the results from the NBIMS I-CMM evaluation of the projects featured.

It is important to note that a higher score only represents a higher level of information management maturity—not a better design. All the projects were already AIA winners, and they all stand alone on their own merit. The data shown in each of the charts in this article is from the National Institute of Building Sciences.

In summary, the firms highlighted here—Morphosis, KieranTimberlake and Mortenson—have demonstrated continued BIM execution and received recognition from the AIA TAP BIM Awards committees over the last five years. In addition, results from the evaluations using the NBIMS I-CMM indicate that, overall, each of these "best of the best" firms' information management approaches has improved in some areas. However, there is still room for improvement in other areas as firms seek to optimize the benefits of BIM across all categories.

As BIM becomes less "revolutionary" and more deeply entrenched in the industry, information management approaches will advance through interoperability, resulting in improved sharing, collaboration, and analysis capabilities.

Major Suermann is a graduate of the U.S. Air Force Academy with a B.S. in Civil Engineering. Recently, he successfully defended his dissertation and received his Ph.D. in Design, Construction, and Planning at the University of Florida as the first ever Rinker Scholar at the M.E. Rinker, Sr. School of Building Construction.

Tammy McCuen is an Assistant Professor of Construction Science at the University of Oklahoma, College of Architecture. Her research and teaching emphasis is in BIM and the information exchange necessary between the members of an integrated BIM team.

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Cellophane House, KieranTimberlake. Photo © Peter Aaron/Esto.



Loblolly House, KieranTimberlake. Photo © Halkin Photography, LLC.

The Interactive BIM Capability Maturity Model			
Mortenson Construction I-CMM Score 2007- Benjamin D. Hall Interdisciplinary Research Building			
Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	84%	Completely Authoritative Information	6.7
Life-cycle Views	84%	Includes Operations & Warranty 5.9	
ITIL Maturity Assessment	90%	Limited Control	4.5
Roles or Disciplines	90%	Operations & Sustainment Supported	7.2
Business Process	91%	All BP Collect & Maintain Info.	7.3
Timeliness/Response	91%	Real Time Access w/Live Feeds	9.1
Delivery Method	92%	Web Enabled Services-Secure7.4	
Graphical Information	93%	4D – Add Time	8.4
Spatial Capability	94%	Integrated Into a Complete GIS	8.5
Information Accuracy	95%	Computed Ground Truth w/Full Metrics	9.5
Interoperability/IFC Support	96%	Full Info Transfers Between COTS	5.8
		Credit Sum	80.1
		Maturity Level	Gold

The Interactive BIM Capability Maturity Model

Mortenson Construction I-CMM Score 2009 - Research II (Note: This traditional project scored slightly lower than the 2007 submission which shared more information over time because of the DBOM approach)

Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	84%	Limited Knowledge Management	7.6
Life-cycle Views	84%	Includes Constr/Supply & Fabrication	4.2
Change Management	90%	Limited Integration	6.3
Roles or Disciplines	90%	Partial Ops & Sustainment Supported	6.3
Business Process	91%	Some BP Collect & Maintain Info	6.4
Timeliness/Response	91%	All Response Info Available in BIM	5.5
Delivery Method	92%	Full Web Enabled Services w/IA	6.4
Graphical Information	93%	4D – Add Time	8.4
Spatial Capability	94%	Spatially Located	2.8
Information Accuracy	95%	Full Ground Truth – Int Spaces	3.8
Interoperability/IFC Support	96%	Full Info Transfers Between COTS	5.8
		Credit Sum	63.4
		Maturity Level	Certified