National BIM Standard - United States®
an initiative of the National Institute of Building Sciences buildingSMARTalliance®

National BIM Standard - United States® Version 3

5 Practice Documents

5.2 Minimum BIM – Second Edition

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5.2.1 Scope

This document revises NBIMS-US™ V2, chapter 5, Minimum BIM with edits to the text to provide a more succinct description of the Capability Maturity Model (CMM) along with updated figures that better display the CMM categories. This document also includes a matrix of other BIM Maturity evaluation tools indicating the purpose of each evaluation tool.

5.2.2 Normative references

None

5.2.3 Terms and definitions

None

5.2.4 Minimum BIM

The National BIM Standard-United States® (NBIMS-US™) is, by design, a standard of standards. Those who require specific information associated with the exchange of information at any time during a project's lifecycle may select those NIBMS standards that contain the information of interest. Formal or informal agreements between parties to provide standard information exchanges are used to implement these exchanges.

In this standard, the group of stakeholders in the BIM discussion is referred to as the architect, engineer, constructor, operator, owner, FM (AECOOFM) community.

From the point of view of traditional vertical construction (e.g. office buildings), NBIMS-US™ Version 1 - Part 1 defines a minimum standard providing a baseline against which additional, developing information exchange requirements may be layered. For the purposes of defining a Minimum BIM, there are different use types and data complexity as well as different levels of technical capability and organizational maturity of BIM processes. Use Types and Data Complexity can be viewed as:

- Conceptual
- Project
- Integrated Project Delivery
- Enterprise (Lifecycle) Integration

Many "so called" BIMs in existence do not meet the NBIMS-US™ definition of a BIM, since they are really only intelligent drawings, visualization tools, or production aides. The NBIMS-US™ Version 1 - Part 1 defined minimum BIM and used a Capability Maturity Model to give the capital facilities industry a spectrum of tangible capabilities by which to determine the current maturity of a BIM. The Capability Maturity Model provided industry with higher levels on the spectrum as developmental goals. Now, in version 3, the NBIMS-US™ "opens the aperture" and provides a more inclusive and comprehensive review of multiple maturity models used in industry and by owners in order to evaluate both information modeling and organizational processes associated with BIM.

Stakeholders may use the initial CMM as a tool to plot their current location, while looking to more robust parts of the spectrum as goals for their future operations. The NBIMS-US™ vision remains to improve the performance of facilities over their full lifecycle by fostering a common, standard, and integrated lifecycle information model for the capital facilities industry. Readers should recognize that the issue of

capability maturity models requires additional work as described in the 'Next Steps' section below. Also, version 3 now provides more tools and models that may be more applicable for readers' specific needs.

5.2.5 Using the capability maturity model

To meet the future needs of a more streamlined AECOO/FM community and build on existing best business practices, a Capability Maturity Model (CMM) has been developed for users to evaluate their business practices along a continuum or spectrum of desired information maturity. The concept of a CMM may be familiar to software developers who create, test, field, and update their software[1], but the CMM included here is not currently targeted at software designers. The NBIMS-US™ CMM targets the AECO industry and has been in use for over 5 years for evaluating BIMs in the industry.

There are two versions of the BIM CMM included in NBIMS-US™:

- Tabular CMM
- Interactive CMM

For complete, unabridged information regarding the CMM, look to NBIMS-US™ version 1 and 2 or to the extensive literature and research published on its use. NBIMS-US™, version 3 contains an executive summary of this now well-established and user friendly tool.

NOTE: The Capability Maturity Model workbook may be downloaded at:

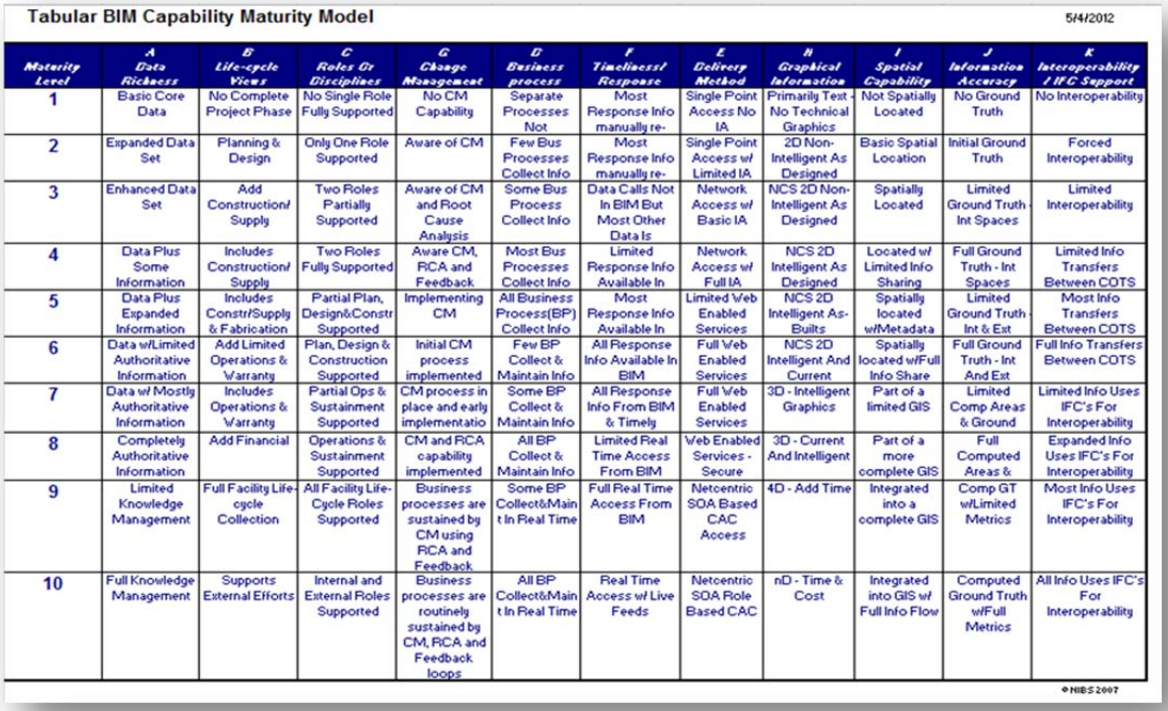
http://www.buildingsmartalliance.org/client/assets/files/bsa/BIM_CMM_v1.9.xls

5.2.5.1 Tabular CMM

As seen in the screen capture, Figure 5.2-1, the CMM is a matrix with an x-axis and a y-axis. On the x-axis, you see 11 areas of interest, in no particular order. On the y-axis, you see maturity levels from 1 to 10 with 1 being the least mature and 10 being the most mature. The body of the matrix puts into words varying levels of maturity describing the areas of interest in an organization or on an individual project.

Since the words are subjective and open to interpretation, it is possible that people will not always agree on all the possible divisions or descriptions of the varying levels of maturity, but they represent a simplified consensus-based approach. The CMM provides an evaluation tool in which a large number of items are structured in a format that people can use as a launching point for classifying themselves on a somewhat standardized continuum. Finally, it is understood that these descriptions will be updated as the community progresses and greater levels of BIM adoption dictate.

[1] For specific information, see http://www.sei.cmu.edu/cmm/ or read *Capability Maturity Model: Guidelines for Improving the Software Process*, Software Engineering Institute, Carnegie Mellon University, ISBN: 0-201-54664-7, 1995. Hardcover, 464 pages, 2006.



Tabular BIM Capability Maturity Model 5/4/2012

Maturity Level	A Data Richness	B Life-cycle Views	C Roles Or Disciplines	G Change Management	D Business process	F Timeliness/ Response	E Delivery Method	H Graphical Information	I Spatial Capability	J Information Accuracy	K Interoperability / IFC Support
1	Basic Core Data	No Complete Project Phase	No Single Role Fully Supported	No CM Capability	Separate Processes Not	Most Response Info manually re-	Single Point Access No IA	Primarily Text - No Technical Graphics	Not Spatially Located	No Ground Truth	No Interoperability
2	Expanded Data Set	Planning & Design	Only One Role Supported	Aware of CM	Few Bus Processes Collect Info	Most Response Info manually re-	Single Point Access w/ Limited IA	2D Non-Intelligent As Designed	Basic Spatial Location	Initial Ground Truth	Forced Interoperability
3	Enhanced Data Set	Add Construction/ Supply	Two Roles Partially Supported	Aware of CM and Root Cause Analysis	Some Bus Process Collect Info	Data Calls Not In BIM But Most Other Data Is	Network Access w/ Basic IA	NCS 2D Non-Intelligent As Designed	Spatially Located	Limited Ground Truth - Int Spaces	Limited Interoperability
4	Data Plus Some Information	Includes Construction/ Supply	Two Roles Fully Supported	Aware CM, RCA and Feedback	Most Bus Processes Collect Info	Limited Response Info Available In	Network Access w/ Full IA	NCS 2D Intelligent As Designed	Located w/ Limited Info Sharing	Full Ground Truth - Int Spaces	Limited Info Transfers Between COTS
5	Data Plus Expanded Information	Includes Constr/Supply & Fabrication	Partial Plan, Design&Constr Supported	Implementing CM	All Business Process(BP) Collect Info	Most Response Info Available In	Limited Web Enabled Services	NCS 2D Intelligent As-Builts	Spatially located w/Metadata	Limited Ground Truth - Int & Ext	Most Info Transfers Between COTS
6	Data w/Limited Authoritative Information	Add Limited Operations & Warranty	Plan, Design & Construction Supported	Initial CM process implemented	Few BP Collect & Maintain Info	All Response Info Available In BIM	Full Web Enabled Services	NCS 2D Intelligent And Current	Spatially located w/Full Info Share	Full Ground Truth - Int And Ext	Full Info Transfers Between COTS
7	Data w/ Mostly Authoritative Information	Includes Operations & Warranty	Partial Ops & Sustainment Supported	CM process in place and early implementatio	Some BP Collect & Maintain Info	All Response Info From BIM & Timely	Full Web Enabled Services	3D - Intelligent Graphics	Part of a limited GIS	Limited Comp Areas & Ground	Limited Info Uses IFC's For Interoperability
8	Completely Authoritative Information	Add Financial	Operations & Sustainment Supported	CM and RCA capability implemented	All BP Collect & Maintain Info	Limited Real Time Access From BIM	Web Enabled Services - Secure	3D - Current And Intelligent	Part of a more complete GIS	Full Computed Areas &	Expanded Info Uses IFC's For Interoperability
9	Limited Knowledge Management	Full Facility Life-cycle Collection	All Facility Life-Cycle Roles Supported	Business processes are sustained by CM using RCA and Feedback	Some BP Collect&Main t In Real Time	Full Real Time Access From BIM	Netcentric SOA Based CAC Access	4D - Add Time	Integrated into a complete GIS	Comp GT w/Limited Metrics	Most Info Uses IFC's For Interoperability
10	Full Knowledge Management	Supports External Efforts	Internal and External Roles Supported	Business processes are routinely sustained by CM, RCA and Feedback loops	All BP Collect&Main t In Real Time	Real Time Access w/ Live Feeds	Netcentric SOA Role Based CAC	nD - Time & Cost	Integrated into GIS w/ Full Info Flow	Computed Ground Truth w/Full Metrics	All Info Uses IFC's For Interoperability

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Figure 5.2-1 – CMM Chart, courtesy NIBS

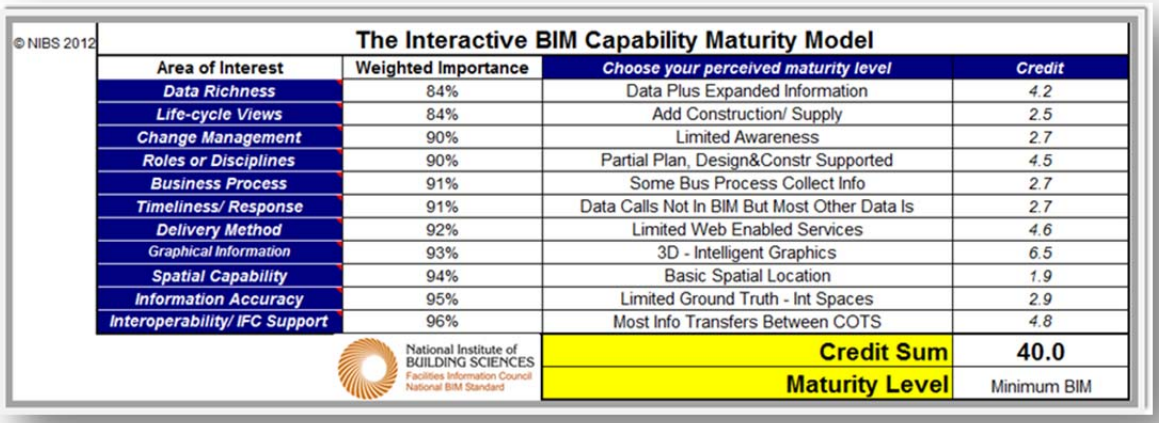
5.2.5.2 Interactive CMM (I-CMM)

The interactive CMM is based off the tabular CMM and, as such, it contains all the same information as the tabular CMM, but it centers on a graphical user interface that makes the static information come to life, in a way that may be more easy to digest and understand for some users.

5.2.5.2.1 Interactive Capability Maturity Model

The first, and primary, tab of interest (Figure 5.2-2) in the interactive maturity model workbook is the tab, "Interactive Maturity Model." This interface's mission is to turn the tabular chart, which is successful in showing all the information at once in a matrix format, into an interface that users can interact with to self-evaluate their own processes or BIMs. The areas of interest are listed in the first column, in increasing order of perceived importance. Hovering over each area of interest will elicit a comment with the full description of that area of interest.

The next column shows the relative percentage out of 100% that each area of interest garners. After that, users will choose their own perceived maturity levels by employing the drop-down menus aligned with each area of interest. When clicking on this cell, the dropdown text reminds you of the definition of the area of interest, so that you may make an informed choice among ten levels of maturity. After choosing the correct level of maturity in the desired area of interest, the amount of credits automatically appears in the next column. Together, these credits are summed in the TOTAL box, which in turn determines the level of certification achieved.



© NIBS 2012

The Interactive BIM Capability Maturity Model

Area of Interest	Weighted Importance	Choose your perceived maturity level	Credit
Data Richness	84%	Data Plus Expanded Information	4.2
Life-cycle Views	84%	Add Construction/ Supply	2.5
Change Management	90%	Limited Awareness	2.7
Roles or Disciplines	90%	Partial Plan, Design&Constr Supported	4.5
Business Process	91%	Some Bus Process Collect Info	2.7
Timeliness/ Response	91%	Data Calls Not In BIM But Most Other Data Is	2.7
Delivery Method	92%	Limited Web Enabled Services	4.6
Graphical Information	93%	3D - Intelligent Graphics	6.5
Spatial Capability	94%	Basic Spatial Location	1.9
Information Accuracy	95%	Limited Ground Truth - Int Spaces	2.9
Interoperability/ IFC Support	96%	Most Info Transfers Between COTS	4.8
	National Institute of BUILDING SCIENCES Facilities Information Council National BIM Standard	Credit Sum	40.0
		Maturity Level	Minimum BIM

Figure 5.2-2 – Interactive Maturity Model diagram, courtesy of NIBS

5.2.5.2.2 Tabular Maturity Model/category descriptions

The Tabular Maturity Model and Category Descriptions tabs are the same information as described earlier in the Tabular CMM portion of this section. The same information is also included in this application so that users may see their information in multiple ways to help them establish a metric for establishing and evaluating their own maturity level.

5.2.5.3 I-CMM Testing and Evaluation

To ensure that the I-CMM could be used to successfully convert subjective case-by-case ratings into an objective quantitative score, the NBIMS-US™ Testing Team undertook a test bed validation of the NBIMS-US™ I-CMM in the summer of 2007. With the approval of the American Institute of Architects, Technology in Architectural Practice (AIA-TAP) Community of Practice, the winning 2007 BIM Award submissions were evaluated using the I-CMM. Six NBIMS-US™ Testing Team Members evaluated nine winning submissions. Because the test was focused on validating the I-CMM and not on the already proven superior quality of the building information models themselves, special attention was focused on the ability of the individual evaluators to replicate similar scores without any influences from the other evaluators. The results yielded no more than a 5% difference in the various scores of the evaluators on the same BIM, and normally resulted in a 1% (or only 1 point out of 100) difference when the evaluators used the I-CMM to analyse the different BIM BIM submissions[2].

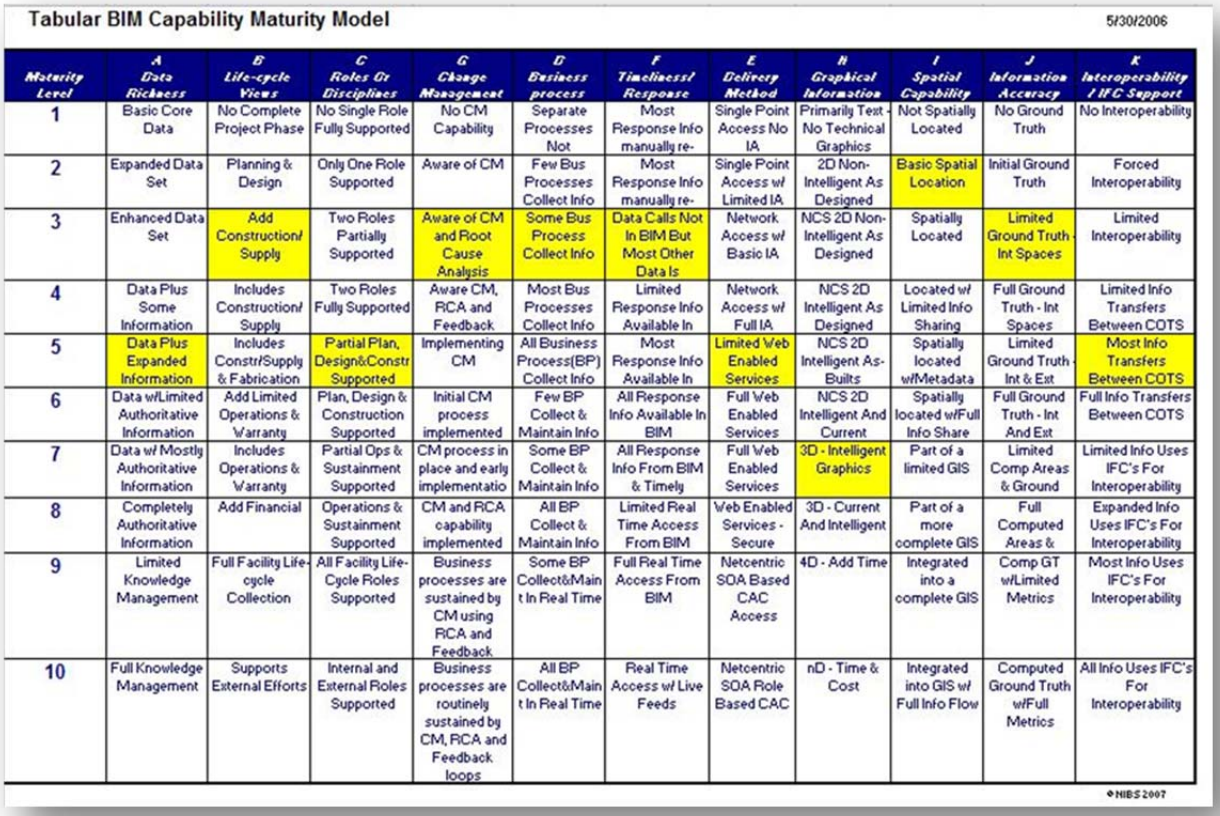
The team noted that the I-CMM is primarily focused on leveraging information management, rather than architectural, engineering, construction, or management metrics. Accordingly, the BIMs scored received a wide range of scores to commensurate with their project requirements. Logically, the highest scoring BIM submission was a test bed BIM pushing the edge of current interoperability, while the lowest scoring BIM (which received a 'Minimum BIM' rating) was for a custom-designed residential home. Therefore, it is important to note that the I-CMM is very effective at measuring BIM information management, but it should not be used as a benchmark for any other metrics. In other words, just as owners' needs do not

[2] For specific information, see McCuen, T., Suermann, P., and Krogulecki, M. (2012). "Evaluating award winning BIM projects using the National Building Information Model Standard Capability Maturity Model." Journal of Management in Engineering, 28(2), 224-230.

require that every building be built to LEED-Platinum standards, neither should any BIM be perceived as less successful if it does not achieve an I-CMM Platinum score.

5.2.5.4 Using the Capability Maturity Model to define a Minimum BIM

It is important to note that the NBIMS-US™ Capability Maturity Model (CMM) described provides a range of opportunities for BIM; however, in this section we are looking at what constitutes a minimum BIM. Thus, if you are not executing BIM at this minimum level, then you should not call what you are doing building information modeling. Visualization or some level of improved document production may be one output from a BIM; however, neither is in and of itself considered a BIM. We, therefore, define a minimum BIM as having the characteristics as highlighted in Figure 5.2-3. The highlighted characteristics represent the associated areas of maturity in the complete CMM:



Tabular BIM Capability Maturity Model 5/30/2006

Maturity Level	A Data Richness	B Life-cycle Views	C Roles Or Disciplines	G Change Management	D Business process	F Timeliness/ Response	E Delivery Method	H Graphical Information	I Spatial Capability	J Information Accuracy	K Interoperability / IFC Support
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6	Data w/Limited Authoritative Information	Add Limited Operations & Warranty	Plan, Design & Construction Supported	Initial CM process implemented	Few BP Collect & Maintain Info	All Response Info Available In BIM	Full Web Enabled Services	NCS 2D Intelligent And Current	Spatially located w/Full Info Share	Full Ground Truth - Int And Ext	Full Info Transfers Between COTS
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8	Completely Authoritative Information	Add Financial	Operations & Sustainment Supported	CM and RCA capability implemented	All BP Collect & Maintain Info	Limited Real Time Access From BIM	Web Enabled Services - Secure	3D - Current And Intelligent	Part of a more complete GIS	Full Computed Areas &	Expanded Info Uses IFC's For Interoperability
9	Limited Knowledge Management	Full Facility Life-cycle Collection	All Facility Life-Cycle Roles Supported	Business processes are sustained by CM using RCA and Feedback	Some BP Collect&Maint In Real Time	Full Real Time Access From BIM	Netcentric SOA Based CAC Access	4D - Add Time	Integrated into a complete GIS	Comp GT w/Limited Metrics	Most Info Uses IFC's For Interoperability
10	Full Knowledge Management	Supports External Efforts	Internal and External Roles Supported	Business processes are routinely sustained by CM, RCA and Feedback loops	All BP Collect&Maint In Real Time	Real Time Access w/ Live Feeds	Netcentric SOA Role Based CAC	nD - Time & Cost	Integrated into GIS w/ Full Info Flow	Computed Ground Truth w/Full Metrics	All Info Uses IFC's For Interoperability

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Figure 5.2-3 – Minimum BIM diagram, courtesy of NIBS

5.2.5.5 Existing implementations

As of version 2's publication, the NBIMS-US™ Interactive Capability Maturity Model (I-CMM), the AIA Model Progression Specification, and Indiana University's BIM Proficiency Matrix were primarily used within the AECOO/FM community to aide in defining a Minimum BIM. However, a number of alternative Maturity Models and IT performance measurement tools have been developed that may offer additional features or elements for a future Minimum BIM. Some of the existing tools suggested in the IT and Construction domains include:

- BEACON, Benchmarking and Readiness Assessment for Concurrent Engineering in Construction – Khalfan et al. (2001)
- COBIT, Control Objects for Information and related Technology - Information Systems Audit and Control Association (ISACA) and the IT Governance Institute (ITGI) – Lainhart (2000)
- CMMI, Capability Maturity Model Integration – Software Engineering Institute/ Carnegie Melon, http://www.sei.cmu.edu/cmmi/
- Knowledge Retention Maturity Levels – Arif, Egbu, Alom and Khalfan (2009)
- LESAT, Lean Enterprise Self-Assessment Tool – Lean Advancement Initiative (LAI) at MIT, http://lean.mit.edu/downloads/cat_view/94-products/204-lesat.
- P3M3, Portfolio, Programme and Project Management Maturity Model - Office of Government Commerce (UK), http://www.p3m3-officialsite.com/.
- P-CMM®, People Capability Maturity Model v2 - Software Engineering Institute / Carnegie Melon, http://www.sei.cmu.edu/reports/09tr003.pdf.
- (PM), Project Management Process Maturity Model – Kwak & Ibbs (2002).
- SPICE, Standardized Process Improvement for Construction Enterprises - Sarshar et al. (2000)
- Supply Chain Management Process Maturity Model and Business Process Orientation (BPO) maturity model – Lockamy III & McCormack (2004)
- VERDICT, Verify-End User e-Readiness using a Diagnostic Tool – Ruikar et al. (2006)

5.2.5.6 BIM maturity evaluation tools compared

More importantly, there have been several BIM maturity assessment programs and tools suggested since 2007 which may aid the AECOO/FM industry's quest to define a minimum BIM standard. To complement the I-CMM, other referenced models which may be useful to evaluating the maturity of organizations implementing BIM and to establishing BIM performance metrics include: The BIM Excellence (BIMe) program, the bimSCORE program, the BIM Quickscan, and the BIM Proficiency Matrix.

BIM Excellence (BIMe) is a BIM performance assessment and improvement program which may be customized to assess individual and team BIM competency, organizational capability and maturity and overall project performance. The program offers both online and onsite assessments as well as personalized consulting services. Though now delivered through the consulting organization Change Agents AEC, some of the core ideas behind BIMe's many indexes are rooted in the initial research of Dr. Bilal Succar. For more information, please see further publications regarding his BIM Framework[3], BIM Maturity Matrix[4], and BIM Competency Index[5]. To learn more about BIM Excellence see: http://bimexcellence.net.

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[3] For specific information, see Succar, B. (2009). "Building Information Modeling framework: a research and delivery foundation for industry stakeholders." Journal of Automation in Construction, 18(3), 357-375.

[4] For specific information, see Succar, B. (2010). "Building Information Modeling maturity matrix." Chapter in Handbook of Research on Building Information Modeling and Construction Informatics: Concepts and Technologies, 2nd Ed., Information Science Publishing, Hershey, PA., 65-103.

[5] For specific information, see Succar, B., Sher, W., and Williams, A. (2013). "An integrated approach to BIM competency assessment, acquisition and application." Journal of Automation in Construction, DOI: 13-00047 Retrieved from: http://dx.doi.org/10.1016/j.autcon.2013.05.016

Similarly, bimSCORE is an interactive and scalable decision dashboard which provides organizations executing BIM the ability to evaluate their BIM maturity, benchmark their BIM-assisted projects in comparison with industry trends and to advise project team members regarding BIM decision making and investments. bimSCORE is now delivered through a private consulting company, but its core framework is rooted in the research work of Dr. Calvin Kam[6] and Stanford's Center for Integrated Facility Engineering (CIFE) VDC Scorecard program[7]. The scorecard evaluates BIM practices across 4 areas including: Planning, Adoption, Technology and Performance which are further are subdivided into 10 dimensions and multiple individual innovation measures. A free online assessment is available in addition to customized consulting services for a fee. To learn more please see: https://www.bimscore.com.

The Netherlands Organization for Applied Scientific Research (TNO) also offers a benchmarking instrument to assess the BIM performance of organizations executing BIM called the BIM QuickScan. It scores BIM service providing organizations based on four distinct chapters (categories) of criteria including: Organization and Management, Mentality and Culture, Information Structure and Flow and Tools and Applications. Each chapter is comprised of weighted key performance indicators (KPIs) that are addressed in the form of a multiple choice questionnaire which is conducted by a BIM consultant based on observation and interviews with BIM management personnel[8]. A free online survey called the "self-scan" is also available to the public with a less detailed report output available. For more information please visit: http://www.bimquickscan.nl/.

Finally, Indiana University (IU) developed a BIM Proficiency Matrix as part of their selection process for designers and contractors on campus building projects. The matrix is used to score applicants based on eight general categories including: physical accuracy of the model, the presence of an Integrated Project Delivery (IPD) methodology, calculation mentality, location awareness, content creation, construction data, as-built modeling and FM data richness. Potential project team members must provide in an MS Excel template a description and concrete example of past projects that they have participated in which addressed each BIM proficiency category. The BIM Proficiency Matrix may be particularly useful to Owners' seeking to evaluate the BIM experience of organizations providing BIM services. It is freely available for download at: http://www.iu.edu/~vpcpfndards/bim-standards.shtml.

In addition to these programs whose intended user group includes predominantly BIM service providers; there have been two suggested tools for evaluating the BIM maturity of facility owners independently. Penn State's Computer Integrated Construction (CIC) research program's Facility Owner's Guide[9] provides suggestions for how owner organizations can assess and improve their maturity of BIM execution strategies through the use of a template matrix provided in the comprehensive guide. For more information, please see: http://bim.psu.edu/Owner/Resources/contact_info.aspx.

Similarly, Dr. Brittany Giel and Dr. Raymond Issa have suggested a BIM Competency Assessment Tool (BIMCAT) for facility owners to evaluate their BIM competency level which is now available for testing. For more information please contact Britgiel@gmail.com or Raymond-issa@ufl.edu.

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[6] For specific information, see Kam, C., Rinella, T. and Oldfield, J. (2013). "Using objectified measures to realize the promise of BIM." Journal of the National Institute of Building Sciences JBIM Edition, 1(1), June 2013.

[7] For specific information, see CIFE (2013). "VDC and BIM Scorecard." Center for Integrated Facility Engineering, Stanford University. Retrieved from: http://vdcscorecard.stanford.edu

[8] For specific information, see Van Berlo, L., Dikkmans, T., Hendriks, H., Spekkink, D., and Pel, W. (2012). "BIM QuickScan: benchmark of performance in the Netherlands," Proceedings from CIB W782012 the 29th International Conference on Applications of IT in the AEC Industry Conference on Computing In Civil and Building Engineering, October 17-19. Beirut, Lebanon, paper 30.

[9] For specific information, see Computer Integrated Construction (CIC) Research Program (2012). "BIM planning guide for facility owners." Pennsylvania State University: University Park, PA. Retrieved from: <http://bim.psu.edu>

To summarize these available resources, Table 5.2-4 compares these BIM maturity and performance measurement programs in terms of their intended users, rating context, evaluation style, measurement categories, and maturity levels. Although many of the programs listed utilize commercialized tools, most offer a free trial assessment of some kind. Links to the service providers' websites or the primary contact for these tools are also listed. Please note that this is not an exhaustive list of the tools available. It is not the intent of the NBIMS-US™ to endorse any singular commercial product, but rather to provide suggestions for available options to evaluate BIM maturity and benchmark BIM performance.

Finally, Table 5.2-5 compares some of the evaluation criteria being used among these assessment tools. While each tool is unique in terms of its evaluation context and intended users, similarities exist between their assessment criteria at the macro level. As shown, the six most common areas of evaluation being measured include:

- BIM Planning and Strategizing Efforts
- the Use of Technology and/or Tools
- BIM Personnel's experience, competency, and culture
- BIM Management Practices, Infrastructure and Administrative Policies
- BIM Processes and Operational Uses for BIM
- Information Requirements
- Geometric Requirements

	NBIMS-US™ I-CMM	BIMe	BIM QuickScan	VDC Scorecard/ bimSCORE	BIM Proficiency Matrix	Facility Owner's BIM Guide	Owner's BIMCAT
Intended User Group	A,E,C, O	A,E,C,O	A,E,C	A,E,C, O	A,E,C	O	O
Rating Context	Evaluates information management on *building projects*	Evaluates organizations, projects, teams, or individuals BIM maturity & performance	Evaluates BIM performance level of organizations providing BIM services	Evaluates organizational BIM performance and maturity	Evaluates designers & contractors' ability to perform BIM services	Evaluates owners' maturity of BIM planning strategies	Evaluates the BIM Competency Level of building owners
Evaluation Style	Self-evaluation of the model	Multiple types of evaluation offered	External evaluator or free online *self-scan* assessment	Multiple types of evaluation offered	Owners score stakeholders' responses to an MS Excel matrix	Self-evaluation	Self-evaluation
Measurement Categories and Weightings	*11 areas of interest* weighted based on importance	Multiple Indices with different categories based on the evaluation context	*4 chapters* and *10 different aspects* based on weighted KPIs	*4 areas* across *10* different *dimensions* and several weighted measures	*8 areas of interest* that are all weighted equally	*16 BIM planning elements* weighted equally	*3 Competency Areas* measured across *12 Competency* Categories and 66 factors
Number of Maturity Levels	10 Maturity Levels	5 Maturity/ Competency Levels across various indexes	None (based on weighted KPIS)	5 Percentile Ranges of increasing innovation	4 Maturity Areas	6 Maturity Levels	6 Competency Levels
More Information	See NBIMS-US™ v 1	http://bimexcellence.net	http://www.bimquickscan.nl/	http://vdcscorecard.stanford.edu https://www.bimscore.com	http://www.iu.edu/~vpcpfndards/bim-standards.shtml	http://bim.psu.edu/Owner/Resources/contact_info.aspx	Contact: britgiel@gmail.com or raymond-issa@ufl.edu

Table 5.2-4 – BIM Maturity Evaluation Models Compared

Key Evaluation Criteria	NBIMS-US™ I-CMM NIBS (2007)	BIM Competency Index (BCI) Succar (2013)	BIM Maturity Matrix (BIMMM) Succar (2010)	BIM Proficiency Matrix IU (2009)	BIM Quick Scan Van Berlo et al. (2012)	VDC Scorecard/ bimSCORE Kam et al. (2013)	Owner Maturity Matrix CIC (2012)	Owner's BIMCAT Giel and Issa (2013)
BIM Planning and Strategizing Efforts		•	•		•	•	•	•
Use of Technology and Tools		•	•		•	•	•	•
BIM Personnel: Mentality, Culture and Individual Competency		•	•		•	•	•	•
BIM Management Practices, Infrastructure and Administrative Policies	•	•	•	•	•	•	•	•
Processes and Operational Uses of BIM	•		•	•		•	•	•
Information Requirements	•		•	•	•	•	•	•
Geometric Requirements	•			•				•

Evaluation Context Used

Models — Organizations / Project Teams

Individuals — Owner Organizations

Table 5.2-5 – BIM Maturity Evaluation Criteria Compared Across Leading Assessment Tools

5.2.6 Conclusion

The purpose of the National BIM Standard Committee is to knit together the broadest and deepest constituency ever assembled to address the losses and limitations associated with errors and inefficiencies in the building supply chain. A BIM should access all pertinent graphic and non-graphic information about a facility as an integrated resource, but there are varying levels of maturity when pursuing this goal. The goals of the two Capability Maturity Models, both tabular and interactive, are to help users gauge their current maturity level, as well as plan for future maturity attainment goals through a commonly accepted, standardized approach. Since the original publication of the Capability Maturity Model, there is now a wealth of options available for measuring BIM Maturity as well as tracking metrics related to BIM performance. Readers can select the best tool for their needs based on their organization's desired goals and vision for BIM execution.

5.2.7 Next Steps

Preliminary BIM maturity research has proved that we are still in the early stages of BIM implementation in our industry. We are certainly seeking more than the minimum standard in order to realize the true potential of BIM. We see the following as the next steps in achieving improved BIM maturity within the AECOO/FM industry:

1. Identify a baseline level of BIM in the industry and create a system for actively measuring and maintaining the baseline as the industry progresses.

2. Continue developing a vision for more mature BIMs and develop a roadmap for raising the level of BIM robustness. Identify deadlines for achieving higher level and more mature implementation over the next 20 or more years.

3. Continue tracking BIM maturity and performance metrics so as to define a set of standard benchmarks for users to evaluate themselves against.

4. Continue to publish successful use-cases of mature life cycle execution of BIM to serve as exemplary standards for the AECOO/FM industry.

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Annex A

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