MBD SUPPLIER READINESS
Action Engineering Company Information

Model-Based Consulting and Training

TAKE ACTION TO BUILD YOUR DIGITAL ENTERPRISE™

Training

MBD/MBE EDUCATION – CAD Agnostic
Model Based Enterprise (MBE) Overview – What, Benefits, How
Introduction to MBD – What, GD&T, How

PLANNING
MBE Implementation
MBE Planning and Roadmap Building

IMPLEMENTING
Model Schema and Organization – CAD Agnostic
How to Write a Modeling Guide – CAD Agnostic
Reading, Commenting and Publishing 3D PDFs

CAD & PDM IMPLEMENTATION: SOLIDWORKS
Using SOLIDWORKS MBD
Administration, Set-up, and Best Practices for SOLIDWORKS and Enterprise PDM for MBD
Model Checking Automation for MBD
Reading, Viewing, and Reviewing MBD in SOLIDWORKS and eDrawings

CAD IMPLEMENTATION: Creo
Using Creo MBD
Model Checking Automation for MBD – ModelCHECK Administration and Best Practice
Reading, Viewing, and Reviewing MBD in Creo and CreoView

CAD IMPLEMENTATION: NX
Using NX MBD

Industry Organization Memberships

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Topics

Suppliers are Ready
Define Expectations
Enable Access to Data
Procurement Bridges Engineering and Supplier

MBD MBD MBD

ENGINEERING PROCUREMENT SUPPLIER
When 3D models are used, manufacturing is SMART

### Percent of Respondents Experiencing Benefits from Including and Not Including 3D Models in Manufacturing Instructions

<table>
<thead>
<tr>
<th></th>
<th>Do Not Include 3D Models</th>
<th>Include 3D Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average # of ECOs per development project</td>
<td>9.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Average # of non-conformances per development project</td>
<td>6.5</td>
<td>3.3</td>
</tr>
<tr>
<td>% of respondents reducing scrap</td>
<td>10%</td>
<td>49%</td>
</tr>
</tbody>
</table>

REFERENCE: [http://www.lifecycleinsights.com/study/the-design-and-documentation-study/](http://www.lifecycleinsights.com/study/the-design-and-documentation-study/)
Suppliers **AGREE** there are benefits to MBD

### INCREASE SPEED TO QUOTE

- **Strongly Agree**: 12%
- **Agree**: 56%
- **No Opinion**: 7%
- **Disagree**: 9%
- **Strongly Disagree**: 4%

**68% of respondents Agree**

### INCREASE ACCURACY OF QUOTE

- **Strongly Agree**: 25%
- **Agree**: 33%
- **No Opinion**: 17%
- **Disagree**: 9%
- **Strongly Disagree**: 4%

**58% of respondents Agree**
Today at least 50% of suppliers are ready for MBD in all areas

- **QUOTING**
  - 19% No plans to implement MBD
  - 46% Plan to implement MBD in 6 mo. – 2 yr.
  - 35% MBD Capable

- **MANUFACTURING**
  - 16% No plans to implement MBD
  - 46% Plan to implement MBD in 6 mo. – 2 yr.
  - 38% MBD Capable

- **TOOLING**
  - 12% No plans to implement MBD
  - 46% Plan to implement MBD in 6 mo. – 2 yr.
  - 42% MBD Capable

- **INSPECTION**
  - 12% No plans to implement MBD
  - 55% Plan to implement MBD in 6 mo. – 2 yr.
  - 33% MBD Capable
Evaluate if Your Suppliers Meet Trends

**SUPPLIERS are capable of adopting MBD methods.**

<table>
<thead>
<tr>
<th>Initiative</th>
<th>2014 Adoption Rate</th>
<th>2017 Adoption Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUOTING</td>
<td>40%</td>
<td>58%</td>
</tr>
<tr>
<td>NC TOOLPATHS</td>
<td>53%</td>
<td>38%</td>
</tr>
<tr>
<td>WORK INSTRUCTIONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOOLING</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>INSPECTION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ADPTION OF MODEL-BASED DEFINITION INITIATIVES**

- Drawing-Reliant Organizations
- Organizations Releasing Drawings, Models and MBDs
- Model-Based Organizations

- 2014 ADOPTION RATES: Findings from the 2014 Model-Based Enterprise Study
- 2017 ADOPTION RATES: Findings from the 2017 ROI of MBD Study
# How Did We Assess Current Capability?

<table>
<thead>
<tr>
<th>What</th>
<th>Question</th>
<th>Minimally Capable</th>
<th>Moderately Capable</th>
<th>Highly Capable</th>
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</thead>
<tbody>
<tr>
<td>People</td>
<td>Quoting personnel are trained to view and interrogate MBD in 3D CAD Model (CATIA or STEP)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>People</td>
<td>Quoting personnel are trained to view and interrogate lightweight 3D viewable formats like 3D PDF</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>People</td>
<td>Quoting personnel are trained in using mark-up capabilities in lightweight 3D viewable formats like 3D PDF</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Generate quote based on 3D DP</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Mark-up 3D PDF to convey questions to customer</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Tech</td>
<td>Company has Adobe Reader on every machine in quoting department</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech</td>
<td>Company can consume CATIA CAD if required for quoting purposes</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Tech</td>
<td>Company can consume STEP CAD if required for quoting purposes</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**EXAMPLE QUESTIONS**

Specify which of the following role-based capabilities currently exist within your company (check all that apply).
- Quoting personnel are trained to view and interrogate MBD in 3D CAD Model (CATIA or STEP)
- Quoting personnel are trained to view and interrogate lightweight 3D viewable formats like 3D PDF
- Quoting personnel are trained in using mark-up capabilities in lightweight 3D viewable formats like 3D PDF
- Quoting personnel have MBD quoting capability as described below (enter company capabilities not listed above).

Specify which of the following process-based capabilities currently exist within your company (check all that apply).
- Generate quote based on 3D DP
- Mark-up 3D PDF to convey questions to customer
- MBD quoting process capability as described below (enter company capabilities not listed above).

Specify which of the following technology-based capabilities currently exist within your company (check all that apply).
- Company has Adobe Reader on every machine in quoting department
- Company can consume NX CAD if required for quoting purposes
- Company can consume STEP CAD if required for quoting purposes
- MBD quoting technology capability as described below (enter company capabilities not listed above).
Executive Summary – Why are Suppliers Ready for MBD?

- Manufacturing is a no-brainer
  - Having models is better than drawings only

- Reduced time in quoting may yield significant savings

- How to accomplish digital inspection is still fuzzy. The following are needed:
  - Standard practices
  - Software tools
  - Training
  - Product definition that supports digital inspection

- A properly instantiated Digital Enterprise may lead to production cost savings
Topics

- Suppliers are Ready
- Define Expectations
- Enable Access to Data
What is MBD?

Model-Based Definition (MBD), is a model with Product Manufacturing Information (PMI) and consisting of:

1) **3D geometry** (serves as the basic dimensions)
2) **annotations** (displayed notes, dimensions and tolerances or GD&T)
3) **attributes** (metadata and queried data)
4) **presentation** (saved views, presentation organization)

*As defined in ASME Y14 Series*
Organizational Readiness: 3D Modeling Standard

Does your organization **have** a standard for 3D modeling?

- Yes
- No
- I don't know

Does everyone **understand** this standard?

- Yes
- No
- I don't know

Does everyone **use** this standard?

- Yes
- No
- I don't know

DEFINE EXECUTION

ACHIEVE ROI
Organizational Readiness: GD&T

How well do you understand GD&T?

BUILD PROFICIENCY

ACHIEVE ROI

GD&T = Geometric Dimensioning & Tolerancing
MBD Supplier Readiness

EVALUATE
- Internal and external supplier capability to quote, manufacture, create tooling, and inspect using MBD
- Flexibility to adapt to new procedures for receiving and delivering 3D information

SOCIALIZE
- Be careful – this is not a typical contractual relationship
- Build partners

TRAIN
- Define your Product Definition
- Explain your Product Definition
- Evaluate proficiency and understanding of your Product Definition
Determine MBD Usage by Function

- Quoting
- Manufacturing Toolpaths
- Tooling Design
- Work Instructions
- Inspection Instructions
- Inspection Operations
- Inspection Reporting

![Bar Chart]

**CAPABLE OF MBD**

<table>
<thead>
<tr>
<th>Function</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Quoting</td>
<td>40%</td>
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<td>Inspection</td>
<td>25%</td>
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</table>
Multi-CAD Data Exchange
Topics

 Suppliers are Ready
 Define Expectations
 Enable Access to Data
Overall MBE Capability
External Suppliers Require Extra Communication

TAKE ACTION
What did you learn?
Find Out More…
Re-Use Your CAD™

**Model-Based Business Process Coaching & Planning**
- Model-Based Engineering & Enterprise (MBE) Planning
- PDM & PLM Process Implementation
- Tailor Business Practices and PDM/PLM Workflows to include 3D CAD
- Apply Configuration Management Directly to 3D Model Data Sets
- Strategies to Create and Consume MBD Models

**Model-Based Training and Education**
- Basic Training is CAD Agnostic and Focuses on MBE Philosophy
- Intermediate and Advanced Training is Software-Specific and Customized to Your Organization
- Understanding Model-Based Definition (MBD) and Technical Data Packages (TDP), per ASME Y14.41 and MIL-STD-31000A
- CAD Modeling Best Practice for MBE

**CAD, PDM, PLM Software Selection Consulting**
- Software Beta Testing
- User-Based Feedback and Improvement for Software Tools
- Assess and Recommend Software Tools for Compatibility with 3D Model-Based Engineering (MBE)
## CAD Agnostic Course Listings

<table>
<thead>
<tr>
<th>MBD/MBE EDUCATION</th>
<th>Course Number</th>
<th>Suggested Format</th>
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<tbody>
<tr>
<td>Model Based Enterprise (MBE) Overview – What, Benefits, How</td>
<td>101</td>
<td>Live or Online</td>
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<tr>
<td>Introduction to MBD – What, GD&amp;T, How</td>
<td>102</td>
<td>Live or Online</td>
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### PLANNING

<table>
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<th>Suggested Format</th>
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<tr>
<td>MBE Implementation</td>
<td>103</td>
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<tr>
<td>MBE Planning and Roadmap Building</td>
<td>104</td>
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### IMPLEMENTING

<table>
<thead>
<tr>
<th>Course</th>
<th>Suggested Format</th>
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<tbody>
<tr>
<td>Model Schema and Organization – CAD Agnostic</td>
<td>105</td>
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<tr>
<td>How to Write a Modeling Guide – CAD Agnostic</td>
<td>106</td>
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<tr>
<td>Reading, Commenting and Publishing 3D PDFs</td>
<td>107</td>
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## CAD Specific Course Listings

<table>
<thead>
<tr>
<th>CAD &amp; PDM IMPLEMENTATION: SOLIDWORKS</th>
<th>Course Number</th>
<th>Suggested Format</th>
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<tr>
<td>Using SOLIDWORKS MBD</td>
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<td>Live or Online</td>
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<tr>
<td>Administration, Set-up, and Best Practices for SOLIDWORKS and Enterprise PDM for MBD</td>
<td>202</td>
<td>Live or Online</td>
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<tr>
<td>Model Checking Automation for MBD</td>
<td>203</td>
<td>Live or Online</td>
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<tr>
<td>Reading, Viewing, and Reviewing MBD in SOLIDWORKS and eDrawings</td>
<td>204</td>
<td>Live or Online</td>
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<table>
<thead>
<tr>
<th>CAD IMPLEMENTATION: Creo</th>
<th>Course Number</th>
<th>Suggested Format</th>
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<tbody>
<tr>
<td>Using Creo MBD</td>
<td>301</td>
<td>Live or Online</td>
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<tr>
<td>Model Checking Automation for MBD – ModelCHECK Administration and Best Practice</td>
<td>303</td>
<td>Live or Online</td>
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<tr>
<td>Reading, Viewing, and Reviewing MBD in Creo and Creo View</td>
<td>304</td>
<td>Live or Online</td>
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<table>
<thead>
<tr>
<th>CAD IMPLEMENTATION: NX</th>
<th>Course Number</th>
<th>Suggested Format</th>
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<tr>
<td>Using NX MBD</td>
<td>401</td>
<td>Live or Online</td>
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</table>

*Courses listed are not official SOLIDWORKS, DASSAULT, PTC, or SIEMENS sanctioned courses.*
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Re-Use Your CAD
Online Resources

Blogs
- www.action-engineering.com/blog
- blog.grabcad.com
- MCAD Café.com

LinkedIn Groups
- Model Based Enterprise
- Model Based Definition

Events
- 3D CIC + QIF Summit, October 3-5, 2017, Golden, CO
Part Layout Example
Identifying Product Characteristics with MBD

7. PRODUCT CHARACTERISTICS (PC) SHALL BE VALIDATED PER AS9102B AND QIF 2.1 AND ARE IDENTIFIED AS: [PC-###].
Creating a Data Package (DP)