ASME MBE Committee & Y14/MBE Harmonization Committee Update

Evan Kessick, MBE Customer Development Lead

GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2024

Evan Kessick – Bio

Evan Kessick
MBE Customer Development Lead
Belcan

- Joined Belcan in 2023
- Helping organizations bridge strategy and execution to achieve digital visions
- 16+ years working in engineering and design
- Led MBD and MBE Implementation at large consumer goods OEM
- Industry Standards Involvement:
  - ASME MBE Committee Chair
  - ASME Y14/MBE Harmonization Committee Co-Chair
  - ASME Y14.41 Member
  - ASME Y14.5-2009 GDTP Senior Certified
  - Involved with the DMSC, and DEDMWG

Belcan

- 65 years of Engineering Better Outcomes
- Global Delivery Network
- 10,000 Professionals
- Annual Revenue of ~$1B

Aerospace
Defense
Space
Marine
Automotive
Government
Off-Highway
Industrial

Agenda

Agenda

01 Why Industry Standards Matter?

02 Review MBE Committee

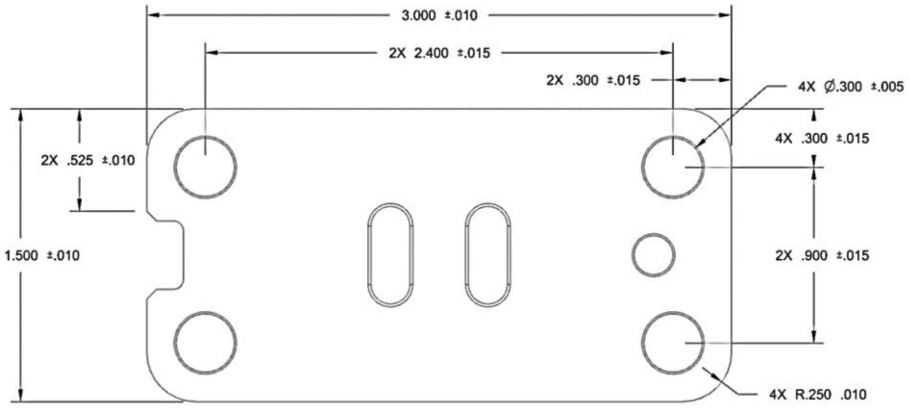
03 Review Y14/MBE Harmonization Committee

04 What have we been up to?

05 How To Get Involved!

Why do Industry Standards Matter?

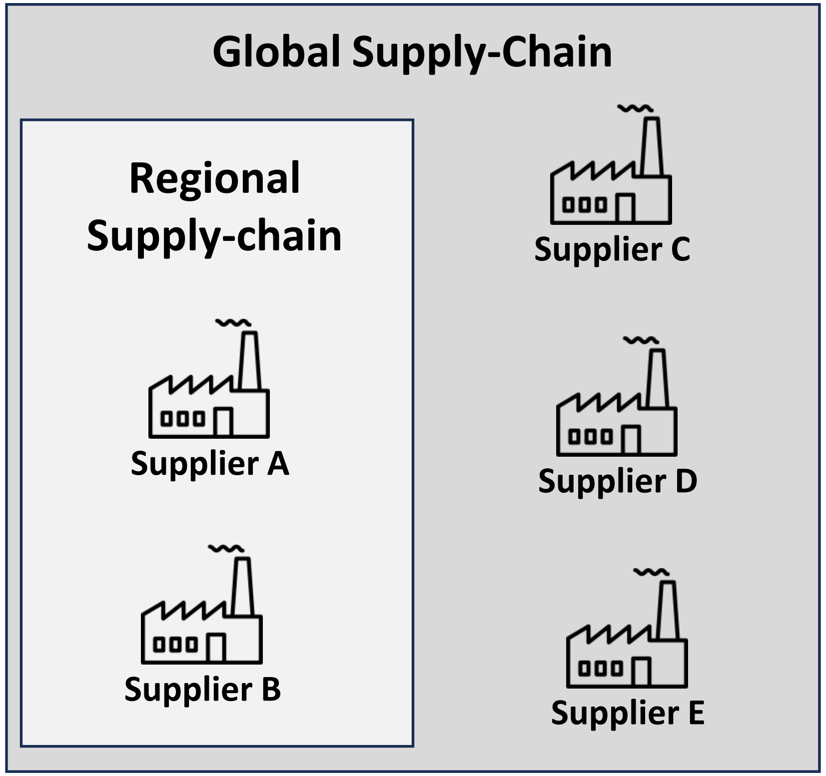
Product Definition <u>Without</u> Industry Standards



Product Definition
(2D Drawing)

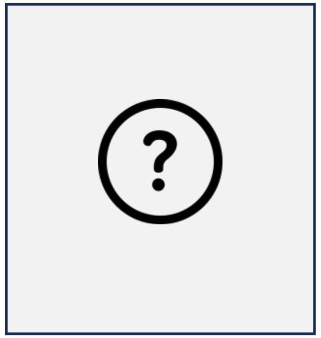
- Non-functional Product Definition
- No Datum System (Implied Datums)
- Ambiguous Requirements

Interpretation Across the Supply-Chain



- Multiple Languages
- Multiple Interpretation
- Multiple Inspection Methods

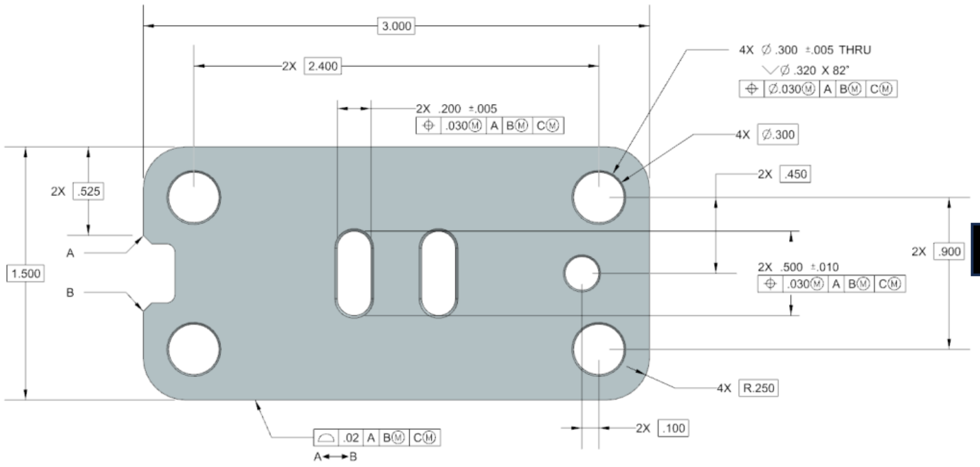
Part Acceptance?



Why do Industry Standards Matter?

Product Definition With Industry Standards

ASME Y14.5 | ASME Y14.41 | ASME Y14.100

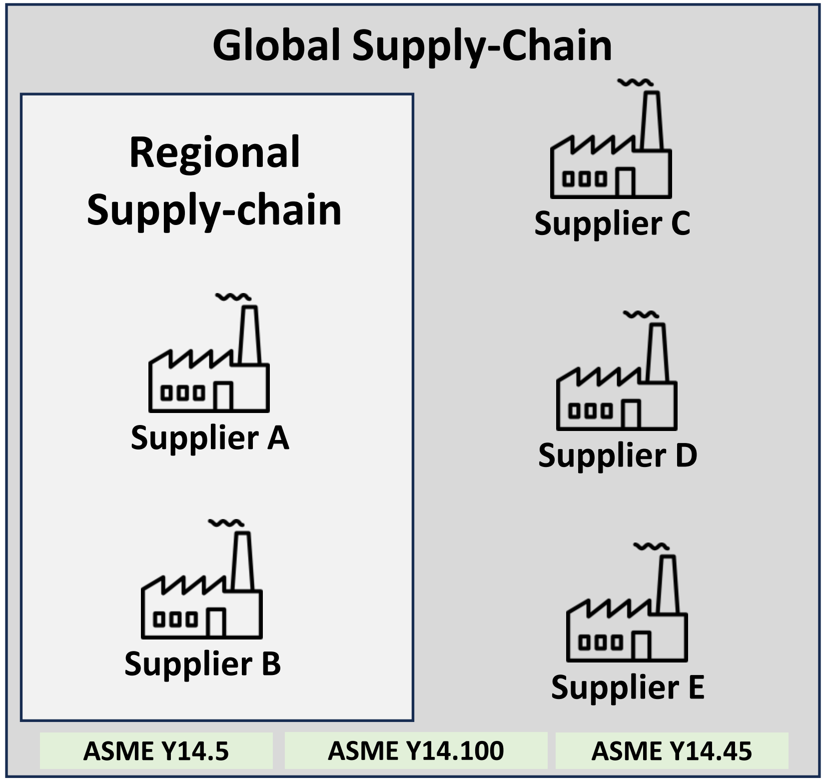


Product Definition

(2D Drawing or MBD)

- Functional Product Definition
- Datum System
- Clear and Understood Requirements

Interpretation Across the Supply-Chain

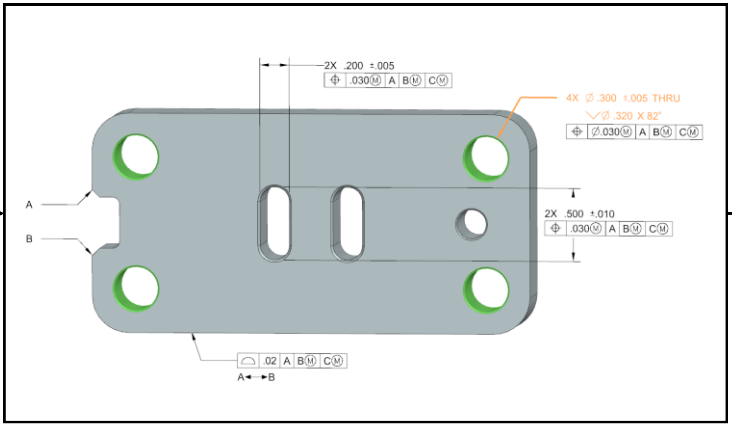


- Global Symbolic Language
- Single Interpretation
- Single Inspection Methods

Industry Standards Drive Common Interpretation:

Industry Standards
- ASME Y14.5
- ASME Y14.41
- ASME Y14.47
- ASME Y14.45

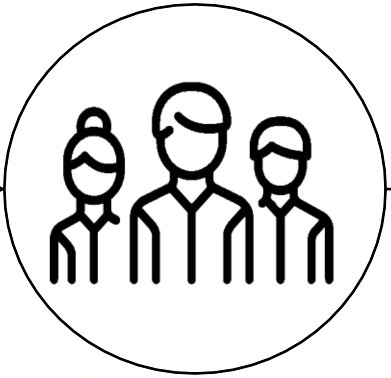
Model-Based Definition (MBD)

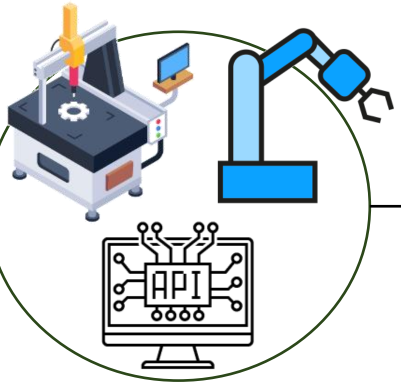


Human and Machine/Software-Readable

Industry Standards
- ASME Y14.5
- ASME Y14.41
- ASME Y14.47
- ASME Y14.45
- ASME MBE

Human Interpretation:





Machine & Software Interpretation:

Common Interpretation

Model-Based Enterprise

Model-Based Enterprise

Lifecycle Phase: Product Development → Plan, Source, Build → Operate and Maintain

MB-X

Digital Thread

MB-Definition

- Engineering PMI/GD&T
- Bill of Characteristics
- MBD Derivative Formats
- 3D Data Package

MB-Manufacturing

- 3D Process Planning
- NC Programming

MB-Quality

- Inspection Plans & Rules
- Program Creation & Execution

MB-Design

- 3D Tolerance Analysis
- Simulation & Validation

MB-Assembly

- Assembly Models
- 3D Work Instructions

MB-Testing

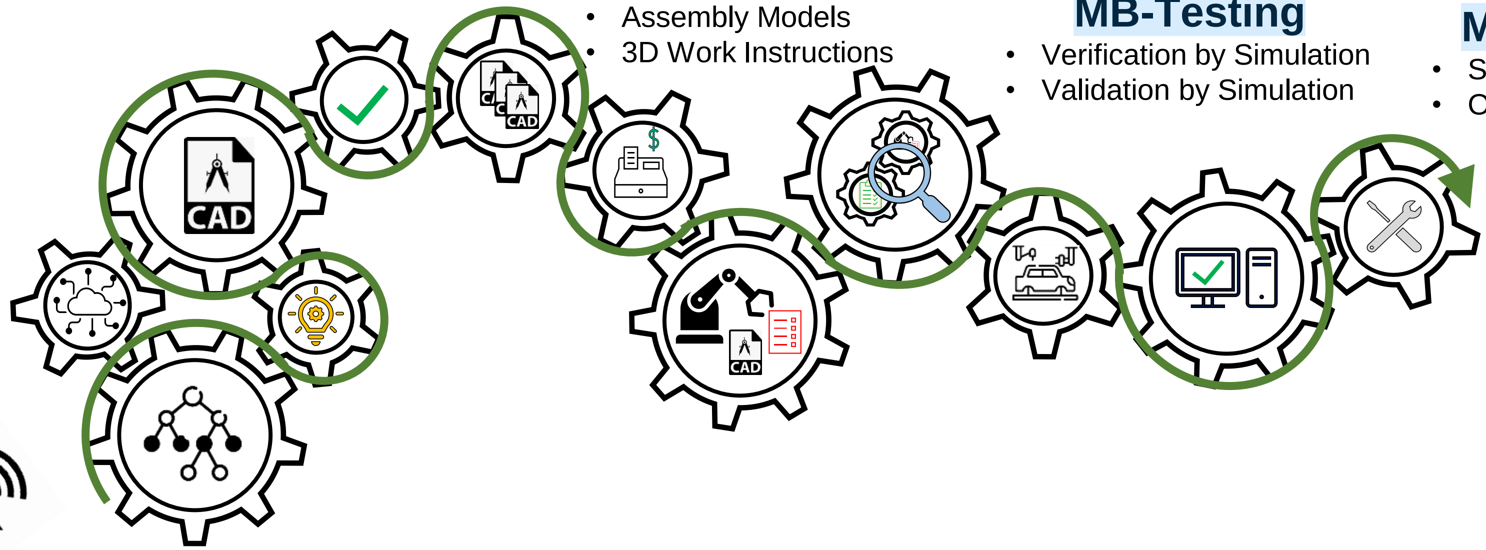
- Verification by Simulation
- Validation by Simulation

MB-Sustainment

- Service, Overhaul & Repair
- Operational Data

MB-Software

- Model Based Software
- Connected Systems



Voice of Customer

MB-Systems Engineering

- Requirements Engineering
- System Architecture Development

Industry Standards Landscape and MBE Committee Role

Model-Based Enterprise

Lifecycle Phase: Product Development → Plan, Source, Build → Operate and Maintain

MB-Systems Engineering
- Requirements Engineering
- System Architecture Development

INCOE | ISO 15288 | DoDI 5000.97

MB-Software
- Model Based Software
- Connected Systems

Standards

MB-Design
- 3D Tolerance Analysis
- Simulation & Validation

ASME Y14.5 | ASME Y14.41

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ASME Y14.5	ASME Y14.8	ASME Y14.100
ASME Y14.5.1	ASME Y14.47	ASME Y14.46
ASME Y14.41	MIL-STD-31000	

MB-Manufacturing
- 3D Process Planning
- NC Programming

ASME Y14.43

MB-Quality
- Inspection Plans & Rules
- Program Creation & Execution

ASME Y14.45	Emerging MBC ANSI Standard
ISO 23592 (QIF)	
ISO 9001	AIAG

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- 3D Work Instructions

Standards

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Standards

MB-Sustainment
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- Operational Data

Standards

Neutral Formats
- ISO 10303 (STEP)
- ISO 14306 (JT)
- ISO 23592 (QIF)
- ISO 14379 (PRC)

Industry Standards Landscape and MBE Committee Role

Global Product Data Interoperability Summit | **2024**

Model-Based Enterprise

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INCOSE | ISO 15288 | DoDI 5000.97

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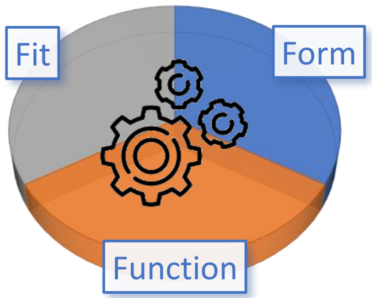
Interoperability of Technical Data

TDP
Technical Data Package

A **3D Technical Data Package** The complete authoritative technical description of a part comprised of artifacts that support the interoperability, traceability, and human-readability of technical data; ranging from engineering CAD data, specifications, standards, and more. ***-Belcan***

Contains Complete Product Definition

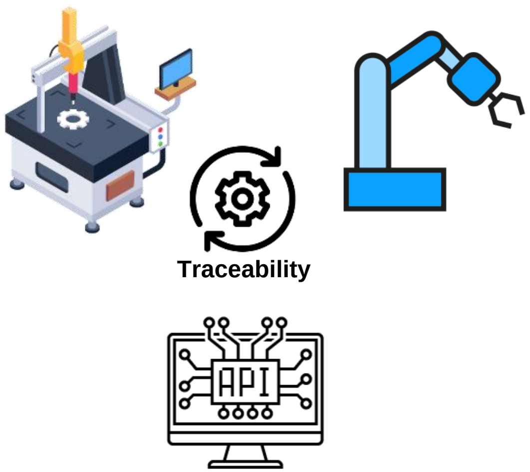
TDP Completeness



Support Downstream Audience

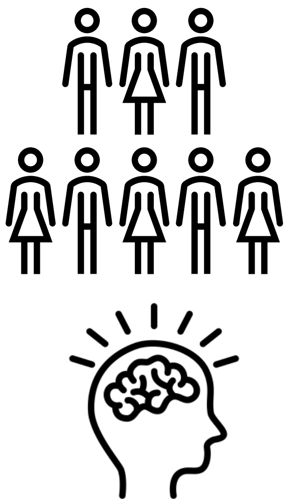
Machine/Software-Readable

Supports Interoperability



Human-Readable

Supports Human Readability



Why do Industry Standards Matter?

-Interoperability of Product Definition Without Industry Standards-

OEM Technical Data Package

Native CAD

Neutral CAD

3D Viewable

2D Specifications

Why do Industry Standards Matter?

-Interoperability of Product Definition Without Industry Standards-

OEM Technical Data Package

Native CAD

SIEMENS NX · CATIA · SOLIDWORKS · creo

Neutral CAD

QIF · STEP · IGES · JT

3D Viewable

3DPDF · HTML5 · creo view · JT2Go SIEMENS

2D Specifications

PDF · W · TXT

Supply-Chain Software Soup

Supply-Chain Look Across

CAD System	CAM Tools	Inspection Tools
SIEMENS NX	SOLIDWORKS	ZEISS
CATIA	NX CAM	HEXAGON
SOLIDWORKS	Mastercam	RENISHAW
creo		PolyWorks Inspector

Standardized Model-Based Dataset

ASME
SETTING THE STANDARD

Technical Dataset Standardization

Model-Based Data Exchange

Data Exchange to Perform Standard Work
- Governance
- Rules
- Standardization

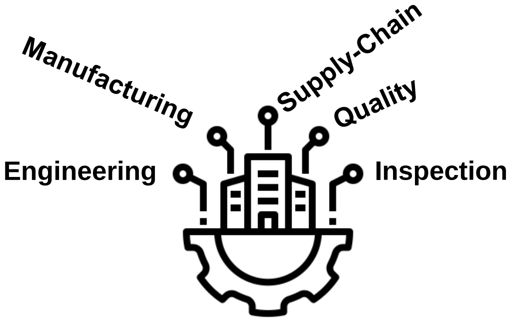
Information and Data Exchange

Interoperable Technical Data

OEM Technical Data Package

Human and Machine-Readable

Model-Based Enterprise (MBE)



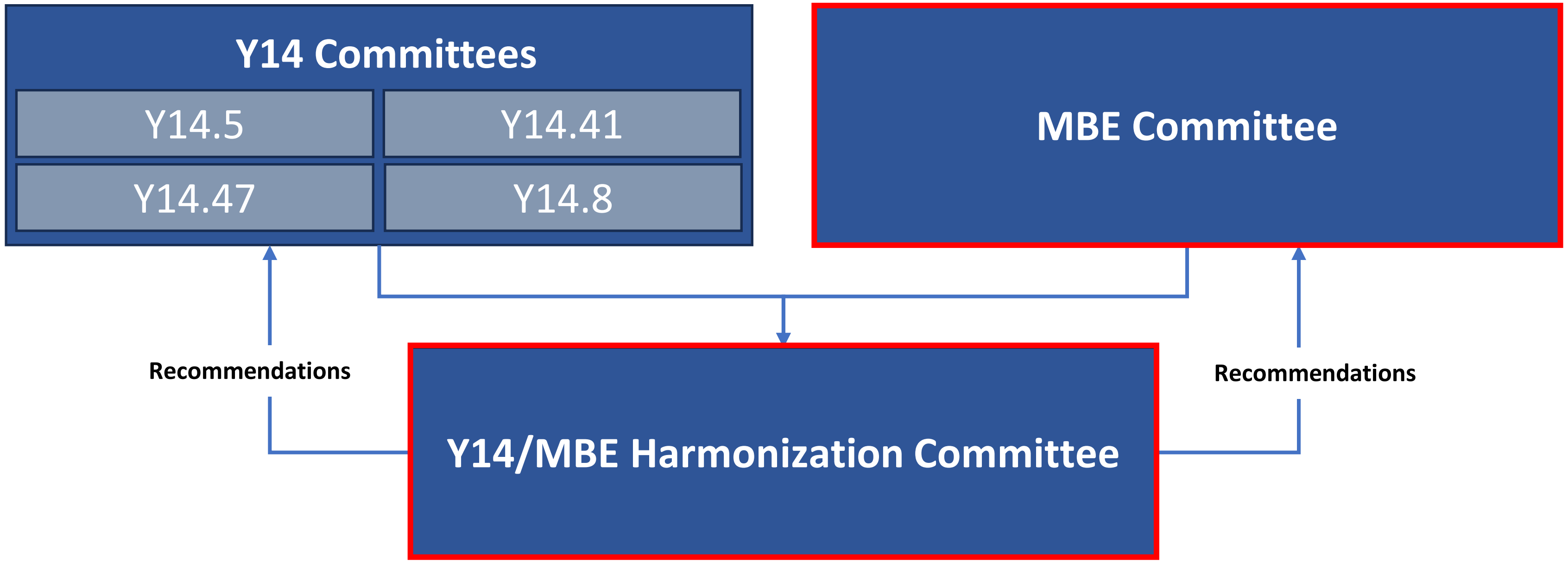
Human and Machine/Software-Consumption

Leverage Industry Standards → Standard Compliant Technical Datasets → Enterprise Reuse - Single Interpretation

Provide standardization, governance, and rules to perform standard lifecycle activates:

- Providing industry guidance for authoring interoperable Technical Data Packages
- Standardizing the information exchange with consumption software, systems, and tools

ASME Committee Overview



Agenda

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01 Why Industry Standards Matter?

02 Review MBE Committee

03 Review Y14/MBE Harmonization Committee

04 What have we been up to?

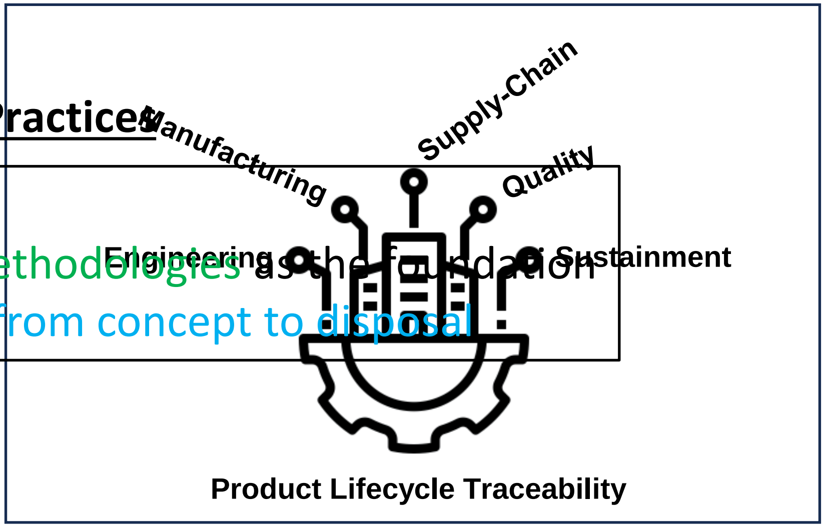
05 How To Get Involved!

Model-Based Enterprise (MBE) Committee

Charter:

Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

Model-Based Enterprise (MBE)



Y14.47-2023: Model Organization Practices

Model-Based Enterprise (MBE):
An organization that uses digital methodologies as the foundation to enable deployment of products from concept to disposal

Model-Based Enterprise (MBE) Committee

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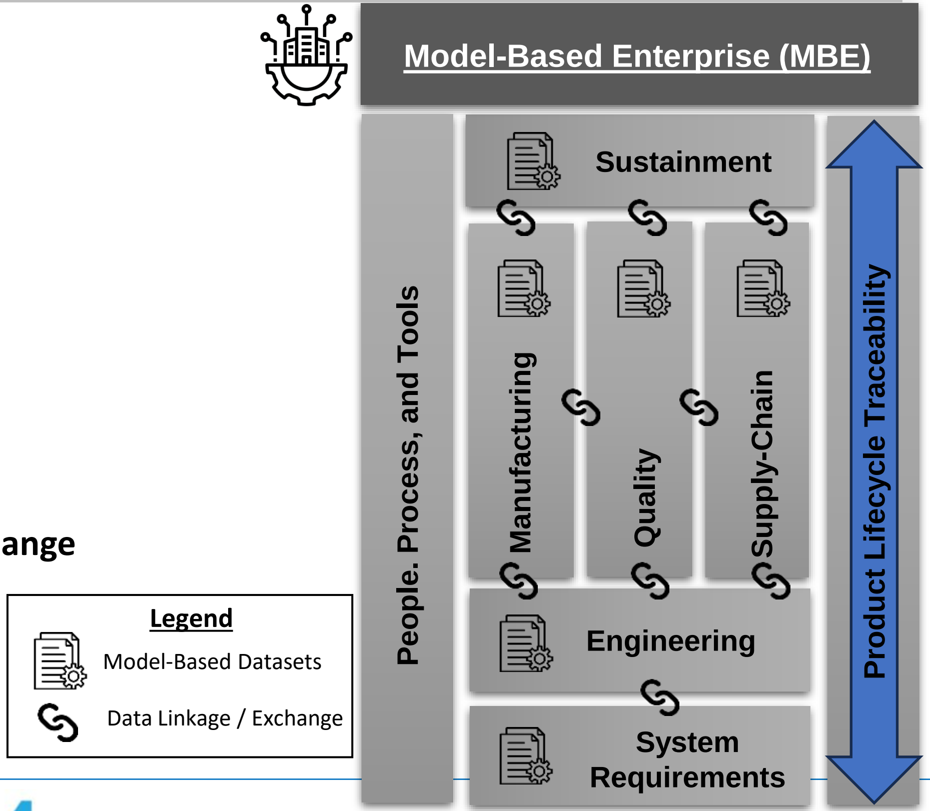
Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

Focus Areas:

- Identify model-based datasets across the enterprise
  - Identify the origin of creation, reuse, and augmentation
- Identify the common information exchange to perform product lifecycle standards work
  - Identify and digitally connect the information exchange between enterprise domains
- Identify interoperability challenges of model-based datasets and technical data
  - Internal OEM Focus, Supply-Chain (External) Focus
- Manage gaps and concerns between existing standards affecting MBE/MBD adoption
- Manage model-based datasets, linkages, and dataflow between enterprise domains
- **Establish Industry Standardization, Governance, and Rules for common Information Exchange**



Model-Based Enterprise (MBE) Committee

Charter:

Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

Leadership:

Chair: Evan Kessick
Vice Chair: Mark Morreale
Technical Secretary: Blake Gorowsky

Members:

13 Members

Meetings:

Virtual: Bi-Weekly Oct 3rd 12-1EST
In-Person: Oct 23rd 9-12pm – Las Vegas

Focus Areas:

- Identify model-based datasets across the enterprise
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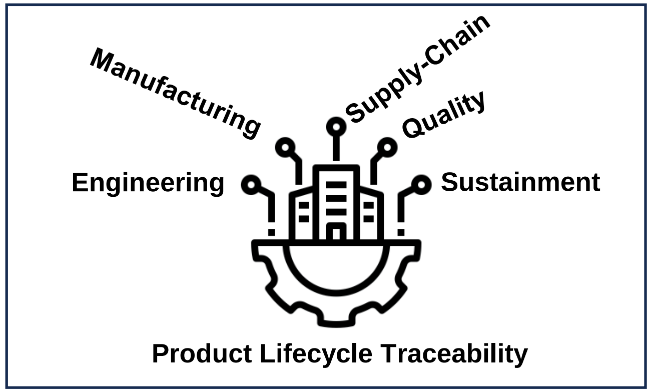

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01 Why Industry Standards Matter?

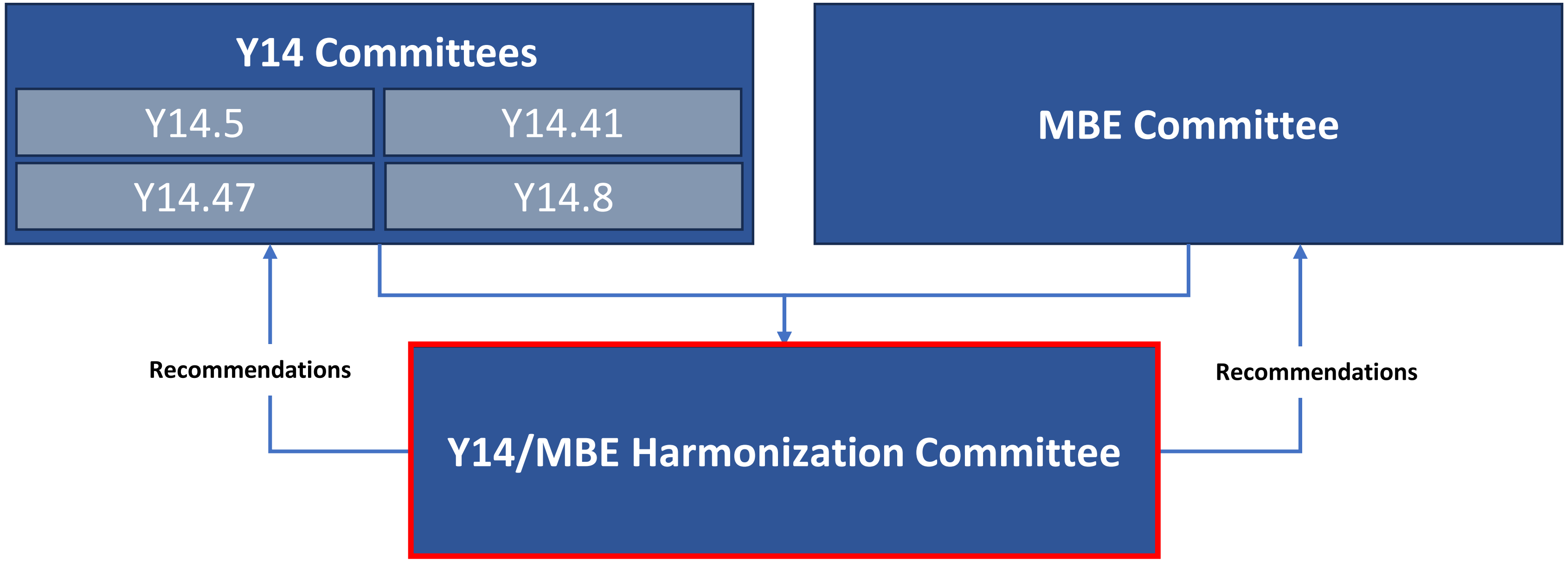
02 Review MBE Committee

03 **Review Y14/MBE Harmonization Committee**

04 What have we been up to?

05 How To Get Involved!

Y14 & MBE Harmonization Joint Working Group



Y14 & MBE Harmonization Committee

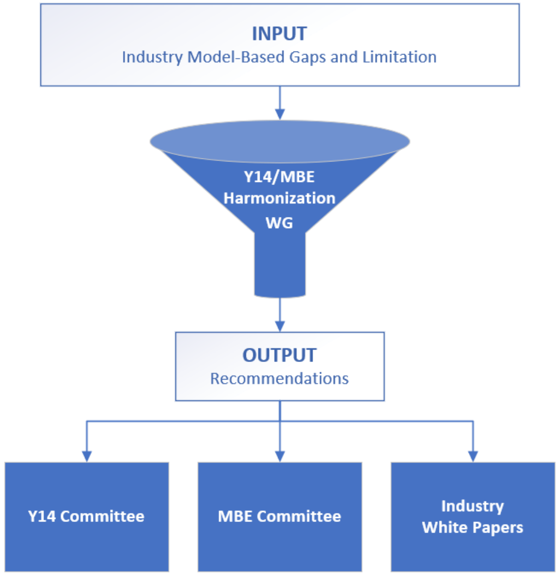
Charter:

Collect MBD/MBE concerns and ideas in relation to the current Y14 standards and where said standards need to be adapted to meet the emerging needs of Model Based Enterprise activities. Ensure MBE and Y14 harmonization, supporting the creation and the interoperability of MBD.

(Established: March 2022)

How:

- Develop ASME Y14 Recommendations
- Develop ASME MBE Recommendations
- Develop White Papers:
    - Best practices
    - Industry and Standards Gap Analysis
    - Industry awareness of activities
    - How to best implement harmonized Y14 or MBE



Y14 & MBE Harmonization Committee

Charter:

Collect MBD/MBE concerns and ideas in relation to the current Y14 standards and where said standards need to be adapted to meet the emerging needs of Model Based Enterprise activities. Ensure MBE and Y14 harmonization, supporting the creation and the interoperability of MBD.

(Established: March 2022)

Leadership: **Co-Chair Y14:** Ashley Schmidt
Co-Chair MBE: Evan Kessick
Technical Secretary: Dan Feighery

Members:
Y14: 10 Members
MBE: 10 Members

Meetings:
Virtual: Oct 30th 1-2:30 EST
In-Person: Oct 22nd 9-5pm – Las Vegas

How:

- Develop ASME Y14 Recommendations
- Develop ASME MBE Recommendations
- Develop White Papers:
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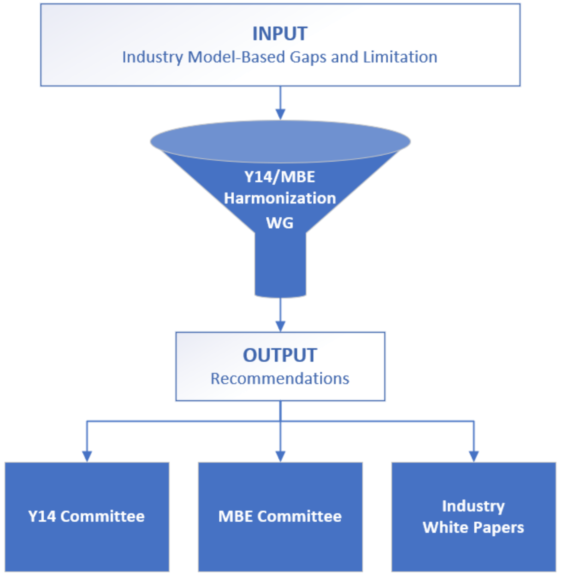
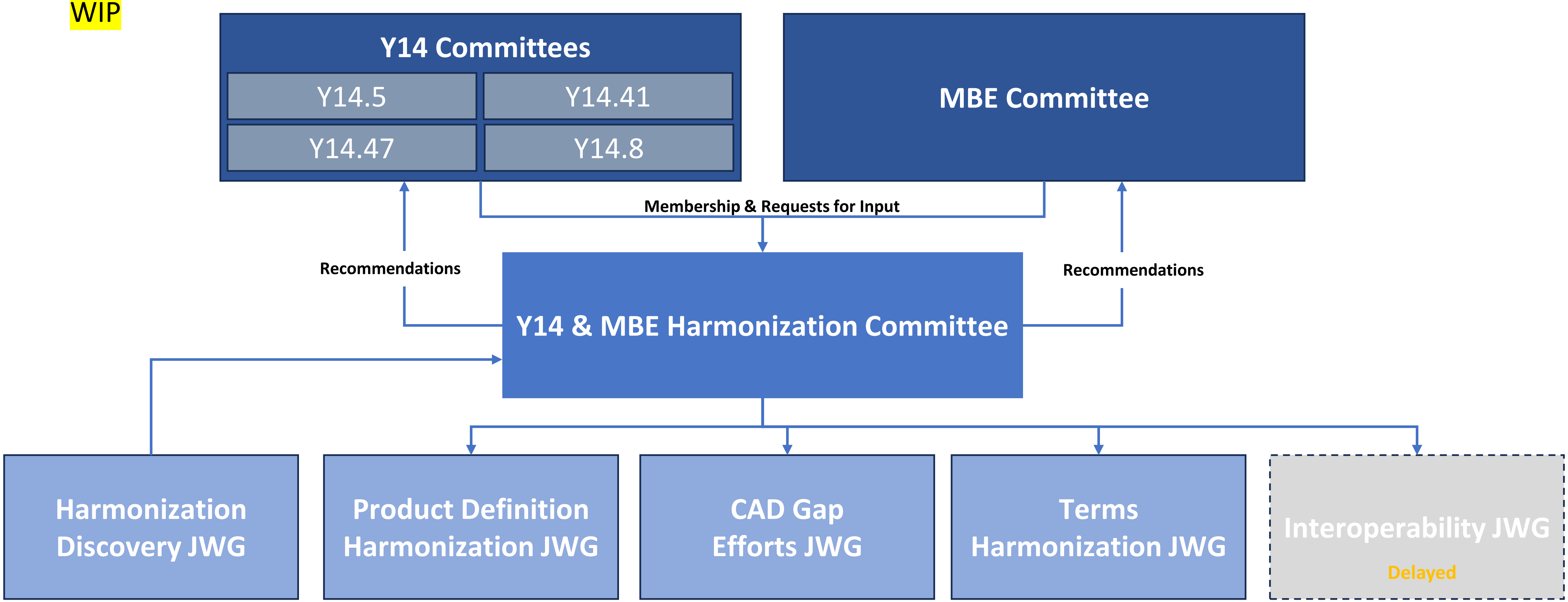


Y14/MBE Harmonization Committee – JWG’s

WIP



Y14/MBE Harmonization Committee – JWG’s

WIP

Y14 & MBE Harmonization Committee

Harmonization Discovery JWG
Open for Membership

Product Definition Harmonization JWG
Open for Membership

CAD Gap Efforts JWG
Open for Membership

Terms Harmonization JWG
Open for Membership

Harmonization Discovery JWG

•Collect and Prioritize Gaps/Concerns

•Define user stories/acceptance criteria

•Maintain gap matrix for initial impact across y14/mbe standards

•Provide gap recommendations to the Y14/MBE Harmonization Committee

Product Definition Harmonization JWG

•Focused on Y14/MBE gaps that affect the creation and consumption of product definition

•Develop recommendations to resolve gaps and concerns

•Present resolutions to Y14/MBE Harmonization Committee

•Present to Y14 committees to communicate issue and resolution or to collect feedback

CAD Gap Efforts JWG

•Focused on Y14/MBE gaps that affect the creation and consumption of product definition for specific CAD Platforms

•Work closely with PD Harmonization JWG

•Develop recommendations to resolve gaps and concerns

•Present resolutions to Y14/MBE Harmonization Committee

Terms Harmonization JWG

•Focus on harmonizing terms and definitions for MBD and MBE

•Develop new terms and definitions required for MBD/MBE adoption

•Present terms and definitions to Y14/MBE Harmonization Committee

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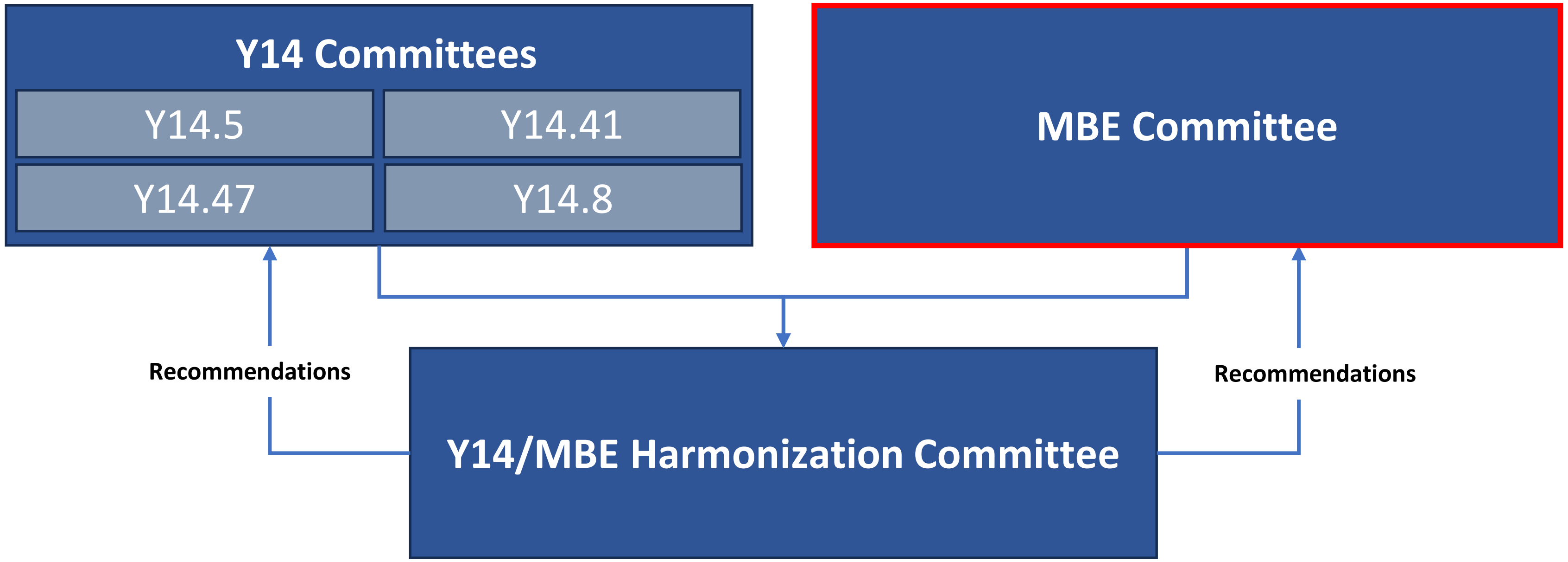

What have we been up to? – MBE Committee

MBE Capability Index: ASME Standard

- Proposal: Develop an MBE Capability Index for the industry
  - Use the NSE MBE Maturity Index as a starting point
  - Develop MBE Capability levels with linkages to:
    - ASME Classifications Codes
    - ASME Maturity State
    - ASME MBE1 Framework
  - Key differences:
    - Covering additional categories and disciplines
    - No scoring functionality based on maturity levels
    - Identify a maturity level that is related to current state industry capability

NSE MBE Maturity Index

#NAME?										AS-IS Level			TO-BE Level
Maturity Level / Name / Level / # / Categories (e.g., C1)	Description: How the organization . . .	Transition: As maturity increases, the organization's . . .	Drawing-Centric L0	Drawing Model-Centric L1	Validated Model-Centric L2	Formalized Model-Based Definition L3	Trusted Model-Based Definition L4	Integrated Model-Based Enterprise L5	Extended Model-Based Enterprise L6	Capability: Tools are Available?	Readiness: Processes are Ready?	Adoption: People are Using?	Target Adoption
										N/A	N/A	N/A	N/A
C1: Design Activities	Activities involved in designing a product.	Product definition becomes a trusted model-based definition dataset.	2D Drawings used for all activities	2D Drawings derived from models	2D Drawings and other derivatives from validated 3D model	Semantic PMI included within 3D model	Certified, Authorized MBD	MBD dataset made useable for all lifecycle activities within enterprise	Product definition system model made useable for all lifecycle activities	N/A	N/A	N/A	N/A
T1: Product Authority										N/A	N/A	N/A	N/A
F1: Authorized Definition	Identifies the authorized product definition (i.e. legal definition).	MBD data collection becomes the product authority.	Paper 2D drawing with support documents	Electronic 2D drawing with support documents	2D drawing from 3D model with support documents and support model	3D drawing (e.g. 3D Interactive Viewable) from MBD model with support documents and support model	MBD model with support drawing and support documents	MBD dataset containing all authorized product definition artifacts	Product definition system model communicating all authorized product definition artifacts along with their relationships	N/A	N/A	N/A	N/A
T2: Product Requirements Association										N/A	N/A	N/A	N/A
F1: Form	States the representation of the product requirements as data.	Product requirements become more discrete and digital.	Non-electronic document	Electronic document	Same	Uniquely identifiable digital objects/records	Same	Same	Same	N/A	N/A	N/A	N/A
F2: Associativity	States how well product requirements are linked to product definition.	Product requirements become more discrete and linked to distinct features of the model.	Disconnected	Manually linked to characteristic on 2D drawing	Replicated to part object in PDM system	Linked to part object in PDM system	Linked to product characteristics in 3D model	Bi-directional link	Automated bi-directional link	N/A	N/A	N/A	N/A
T3: Product Definition Description										N/A	N/A	N/A	N/A
F1: Shape Definition	States how to define the base shape definition.	Shape definition becomes more applicable, precise and unambiguous.	2D drawing	3D model as solid geometry	Same via feature-based design and parametric capabilities	Same with mixed modes of modeling (e.g., parametric, direct) techniques	Same with multiple feature-based disciplines (e.g.,. design, manufacturing, metrology, deburring)	Same with precise & unambiguous bounded complex surfaces & volumes	Same with generative design	N/A	N/A	N/A	N/A
F2: Non-Shape Information	States how to define visible non-shape product and manufacturing information (PMI) (e.g., annotations and notes)	PMI becomes more semantic, embedded in the model, and linked to model elements.	Textual annotations and notes on 2D drawing	Same with textual notes driven from 3D model	Annotations and notes in 3D model	Semantic annotations and notes in MBD model	Same with common notes across inter-organization	Minimum standard PMI including product characteristic tags with any criticality designators	Same, with augmentations to product characteristics (e.g., product requirement associations, quality requirements)	N/A	N/A	N/A	N/A
F3: Metadata	States where to record a product's metadata.	Metadata becomes digital and more complete, standardized, and managed.	As text on drawing	Parameters within 3D Model	Same	3D Model and PDM	Automatic syncing between Model and PDM	Model metadata stored with model; product metadata stored with part in the PDM system	Enterprise standardized metadata linked to external systems.	N/A	N/A	N/A	N/A
F4: Presentation Views	Identifies the types of	Views become more	2D drawing views,	Standard 2D drawing	Same	3D model presented in	3D model presented in	Same with product	Same with additional				

Benefits:

- MBE Audience is already focused on MBE capabilities (Lots of Interest)
- Develop MBE standard users can use immediately
- MBE Capabilities can be mapped through the MBE1 Framework to develop requirements models
- Align on MBE terms and definitions
- Use for capability roadmap building

MBE Capability Index – Next ASME MBE Standard

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			L0	L1	L2	L3	L4	L5	L6	N/A	N/A	N/A	N/A
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T2: Product Requirements Association										N/A	N/A	N/A	N/A
F1: Form	States the representation of the product requirements as data.	Product requirements become more discrete and digital.	Non-electronic document	Electronic document	Same	Uniquely identifiable digital objects/records	Same	Same	Same	N/A	N/A	N/A	N/A
F2: Associativity	States how well product requirements are linked to product definition.	Product requirements become more discrete and linked to distinct features of the model.	Disconnected	Manually linked to characteristic on 2D drawing	Replicated to part object in PDM system	Linked to part object in PDM system	Linked to product characteristics in 3D model	Bi-directional link	Automated bi-directional link	N/A	N/A	N/A	N/A
T3: Product Definition Description										N/A	N/A	N/A	N/A
F1: Shape Definition	States how to define the base shape definition.	Shape definition becomes more applicable, precise and unambiguous.	2D drawing	3D model as solid geometry	Same via feature-based design and parametric capabilities	Same with mixed modes of modeling (e.g., parametric, direct) techniques	Same with multiple feature-based disciplines (e.g.,. design, manufacturing, metrology, deburring)	Same with precise &	Same with generative				
F2: Non-Shape Information	States how to define visible non-shape product and manufacturing information (PMI) (e.g., annotations and notes)	PMI becomes more semantic, embedded in the model, and linked to model elements.	Textual annotations and notes on 2D drawing	Same with textual notes driven from 3D model	Annotations and notes in 3D model	Semantic annotations and notes in MBD model	Same with common notes across inter-organization						
F3: Metadata	States where to record a product's metadata.	Metadata becomes digital and more complete, standardized, and managed.	As text on drawing	Parameters within 3D Model	Same	3D Model and PDM	Automatic syncing between Model and PDM						
F4: Presentation Views	Identifies the types of	Views become more	2D drawing views,	Standard 2D drawing	Same	3D model presented in	3D model presented in						

Lifecycle Activities

(C) Categories

(T) Topics

(F) Facets

MBE Maturity Index

C# is a broad category of activities (e.g., C1: Design Activities)
T# is a topic (e.g., T1: Product Authority) within a category
F# is a facet (e.g., F1: Authoritative Source) of a topic

Maturity Levels L0-L6

Level	Level Name	Level Themes
L0	Drawing-Centric	2D Drawings Only; Disconnected
L1	Drawing Model-Centric	2D Drawings & STEP Derived from 3D Models; Drawings Managed, Disconnected from Models
L2	Validated Model-Centric	2D Drawings & Equivalent Derivatives from Validated 3D Models; Drawings Managed, Disconnected from Models
L3	Formalized Model-Based Definition	3D Models with Semantic PMI Added; Producing 3D Interactive Viewables, Managed as Part-Centric
L4	Trusted Model-Based Definition	Digital Model-Based Definition (MBD) , Certified & Authorized; Managed & Sourced as Part-Centric
L3	Integrated Model-Based Enterprise	Enterprise Integrated from Trusted Digital Product Definition Dataset; Process Data Managed with Part-Centric
L6	Extended Model-Based Enterprise	Enterprise Extended with Optimized Capabilities and Extended Partners

NSE MBE Maturity Index References:

- White Paper: HERE
- MBE Maturity Index: HERE

MBE Committee – MBE Capability Index WG's

WIP

ASME MBE Capability Index

Index Formatting and Phasing

- Index formatting
- Integration into MBE1 STD
- Release Phases

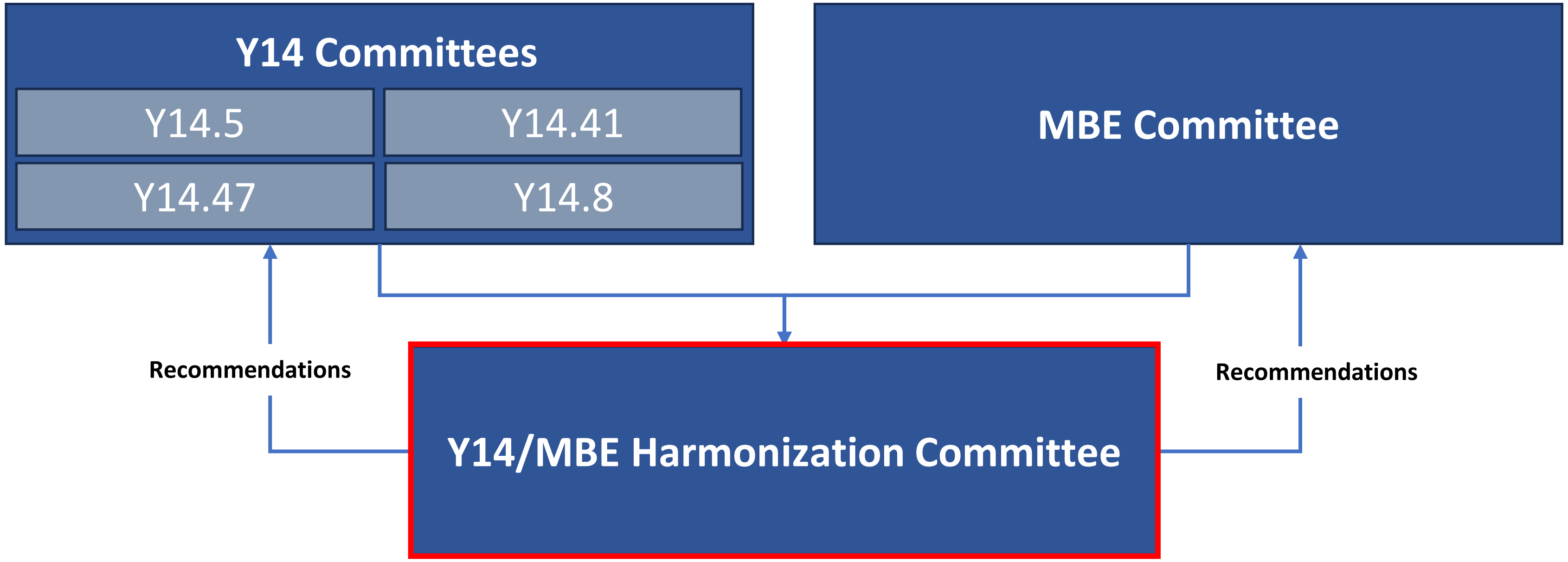
Index Capabilities and Maturity Level Harmonization

- Validation of existing index
- Harmonize Capability definition
- Identify Dependencies and relationships to other capabilities

Terms and Definitions

- Define New Terms and Definitions
- Harmonize Across Y14/MBE

ASME Committee Overview



Charter:

Collect MBD/MBE concerns and ideas in relation to the current Y14 standards and where said standards need to be adapted to meet the emerging needs of Model Based Enterprise activities. Ensure MBE and Y14 harmonization, supporting the creation and the interoperability of MBD. Present collected concerns in recommendation format to existing standards for incorporation.

Industry Standards

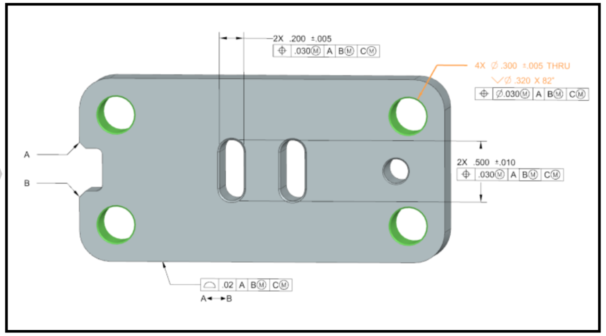
ASME Y14.5
Geometric Dimensioning and Tolerancing

ASME Y14.41
Digital Product Definition Data Practices

ASME Y14.47
Model Organization Practices

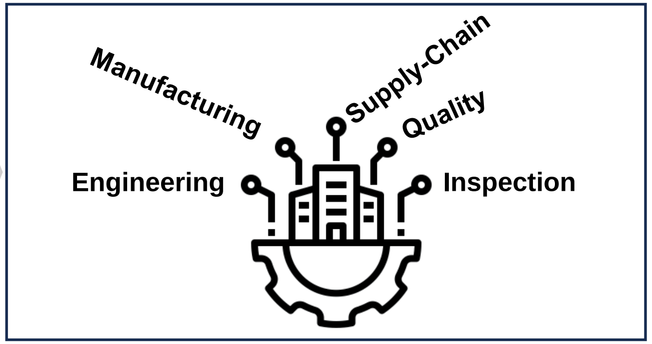
(Example Subset of Standards)

Model-Based Definition (MBD)



Human and Machine-Readable

Model-Based Enterprise (MBE)



Human and Machine/Software-Consumption

Leverage Industry Standards → Standard Compliant Product Definition → Enterprise Reuse - Single Interpretation

Industry Standards

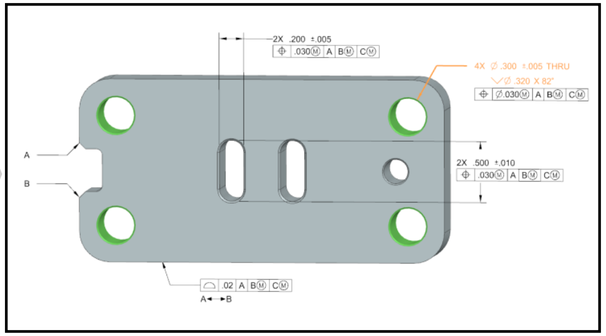
ASME Y14.5
Geometric Dimensioning and Tolerancing

ASME Y14.41
Digital Product Definition Data Practices

ASME Y14.47
Model Organization Practices

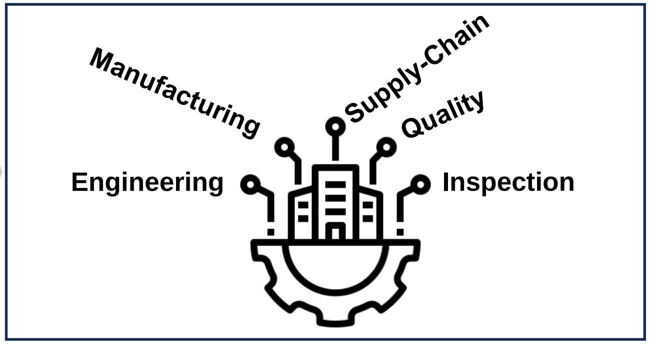
(Example Subset of Standards)

Model-Based Definition (MBD)



Human and Machine-Readable

Model-Based Enterprise (MBE)



Human and Machine/Software-Consumption

Leverage Industry Standards → Standard Compliant Product Definition → Enterprise Reuse - Single Interpretation

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Y14 Standard Committees ⟵ **Y14/MBE Harmonization Working Group** ⟶ **MBE Standard Committee**

Recommendations

Y14/MBE Harmonization Working Group Overview

Y14/MBE Harmonization Working Group

MBD & MBE Adoption Gaps:

- 100+ Model-Based Gaps Have Been Identified By Group Member

ID	Votes	Sub-Group Run By	Gap	Interest Originated From (Conference, company, etc.)	Context
G1	X		Scope of Y14 seems focused on the Engineering Intent, while the enterprise value stream includes many more roles.	Jennifer's Stormboard	Interoperability
G2	16	Evan Kessick (Grouped)	INDICATED (Not machine-readable) This pattern syntax is not machine readable due to the symbol indicating what feature are within the patter Also, if the features of size within the INDICATED pattern are not the same size, this has issues with downstream software.	GE Applinaces	Pattern Syntax (Product Definition)
G3	14	Andrew Pierce (Grouped)	Improved definition of a feature of size with and without draft We constantly have discussion internally and with our suppliers on the definition of a feature of size with draft (mold release draft vs taper) cylinders vs cones....	GE Applinaces	Product Definition
G4	13		Improved definition of a feature or an “individual feature” and how they should be interpreted and translated within downstream software Open to translation issues and modeling practices	GE Applinaces	Product Definition & Interoperability
G5	13	Evan Kessick (Grouped)	Between Symbol is ambiguous and is not machine Readable	GE Applinaces	Pattern Syntax (Product Definition)
G6	13		Geometric Tolerances that require supplemental geometry for interpretation (how to make machine readable?) -Straightness with direction -Profile of a line -Other	GE Applinaces	Product Definition

Y14/MBE Harmonization Working Group Gaps Overview

Theme	Top Ranked Gaps
Product Definition	Pattern Syntax Authoring in MBD (i.e., Indicated, Individually, Between Symbol, From-To Symbol, Multiple Leader Lines)
	Multi-Featured Hole Definition (i.e., Spotface, Threads, Counterbore, countersink)
	Geometric Tolerances That Require Supplemental Geometry for Interpretation (i.e., Profile of a line, Straightness with direction)
	Improved Definition and Interoperability of a Feature of Size w/ and w/o Draft
	Improved definition of feature or “Individual Feature”
	Torque Validation (sequence if required) and Standard Torque Spec and Symbols
	Block tolerances in MBD – Title block tolerancing
	Tabular Tolerances
	Simplified representation of geometry (300 hole pattern, only modeling a portion)

Theme	Top Ranked Gaps
Manufacturing / Supply-Chain	Processing engineering changes, How to better understand changes in MBD?
	Commenting and Markups in 3D MBD
Quality	Assigning Characteristics ID’s (and augmentations) and traceability through enterprise
	MBD authoring that supports a Bill of Characteristics (BOC)
Inspection	Associating inspection results to model features
	Downstream users want access to inspection data
	Visual Inspection Symbology - For non-critical features
	Flexible part inspection/requirements in MBD. Restrained/as-installed inspection in MBD.
Customer Logistics	Manuals are not digitally connected to product definition
	Documentation of hazardous materials within digital datasets

In-Flight Model-Based Gaps

Active Gaps	Gap Owner
Pattern Syntax Authoring in MBD (Between Symbol, From-To Symbol)	Evan Kessick
Multi-Featured Hole Definition (i.e., Spotface, Threads, Counterbore, countersink)	Dan Feighery
Improved Definition and Interoperability of a Feature of Size w/ and w/o Draft	Andrew Pierce
Commenting and Markups in 3D MBD	Mark Morreale

Gap Chart Framework

***GAP NAME* – GAP Chart** **Y14/MBE Harmonization WG**

Breakout Group Attendees: (Name, Company, Committee (Y14 or MBE))

Problem Statement(s) (shortcomings)(User Story)
List All Problem Statements and Shortcomings surrounding the Gap

Industry Standard(s) and Section(s), and/or lack of Standardization
List All Current Standards and Sections Related to the Gap, List Lack of Standardization

Y14, MBE, White Paper Recommendation(s)
Document Recommendations to either Y14, MBE or Both. List any White Paper Recommendations.

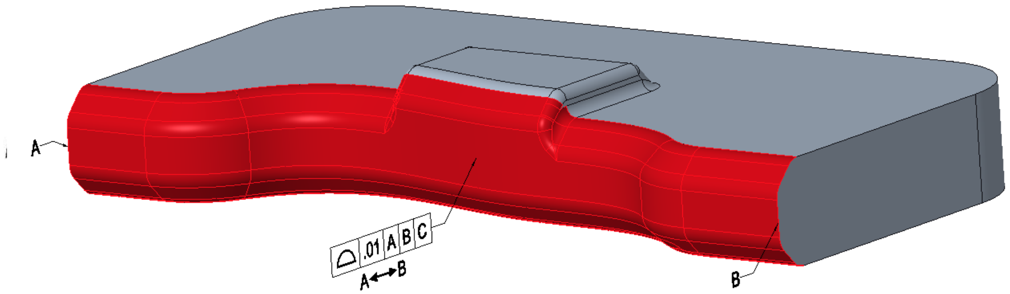
Next Steps:
List all Next Steps Related to Gap

Pattern Syntax in MBD – Between Symbol

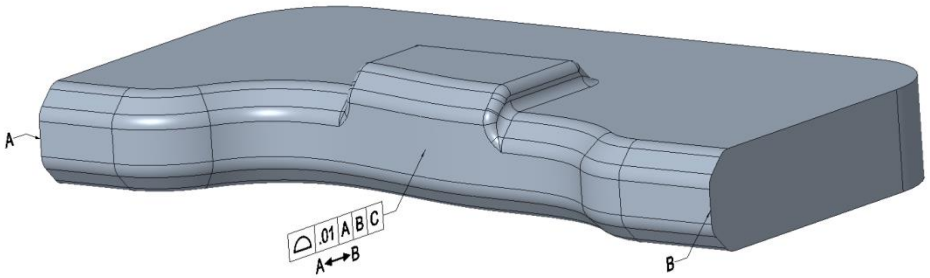
User Story:

As an **MBD Author, and MBD Consumer,**
I want clear definition of features controlled by a feature control frame across an associated group of surfaces with common semantic requirements that clearly delineates the start and end limits for machine-readable application without the use of supplemental information
so that the MBD-authored design intent is clear and that the human and machine interpretation match and is non-ambiguous.

Human Interpretation

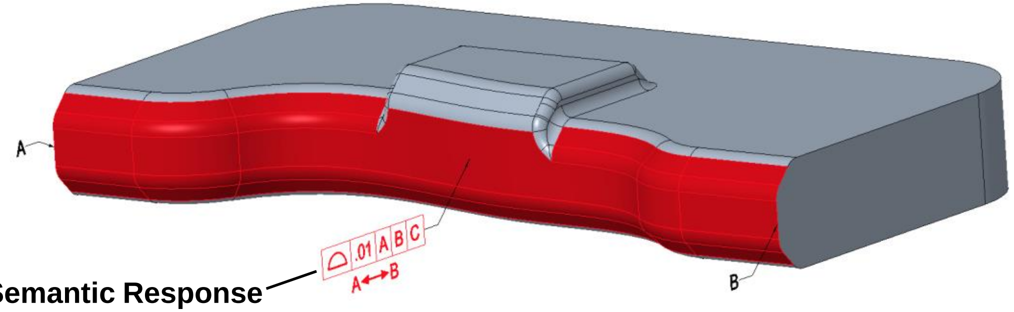


MBD Graphical Representation



Machine/Software Interpretation

-Semantic Association



Semantic Response
(Associated Group)

Pattern Syntax in MBD – Between Symbol

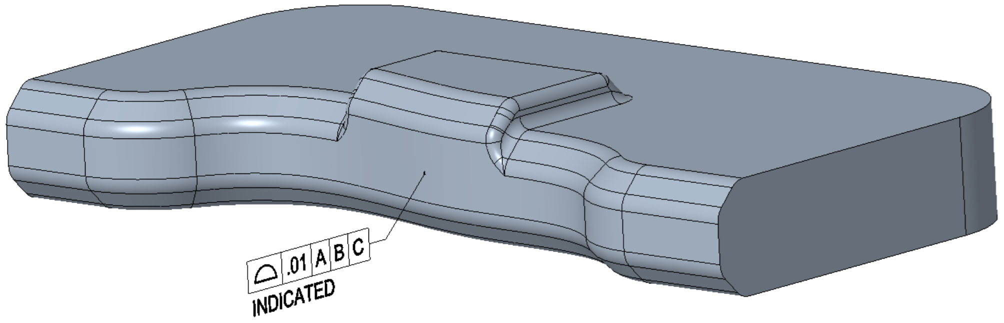
WIP

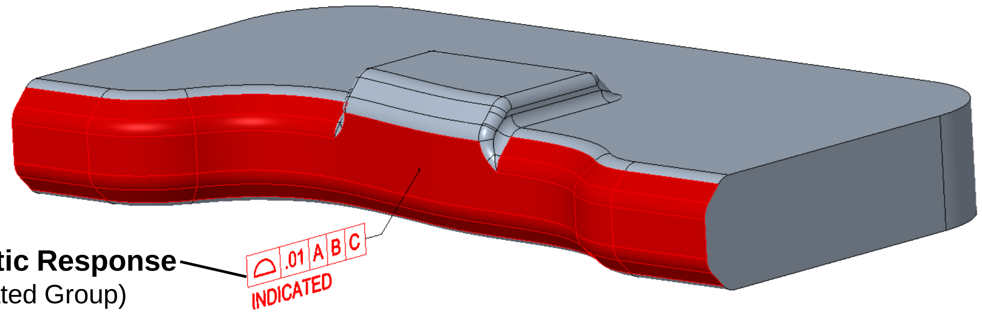
SC41

Current Proposal: Classification Codes 4 & 5 (MBD)

- **Pattern Forming Mechanism for MBD:** Associated Entities (Group)

- In addition to the methods listed in y14.5-2018, Associated Entities (Group) shall be a method of grouping two or more features to which a position or profile tolerance is applied.
  - Machine-Readable, Human-Discoverable
- As an optional practice, "INDICATED" may be used as a human queue to query the associated group
  - Human-Readable Only
- When using the between symbol w/ associate group:
  - The associated group shall take precedence for establishing the extent of the tolerance applicability





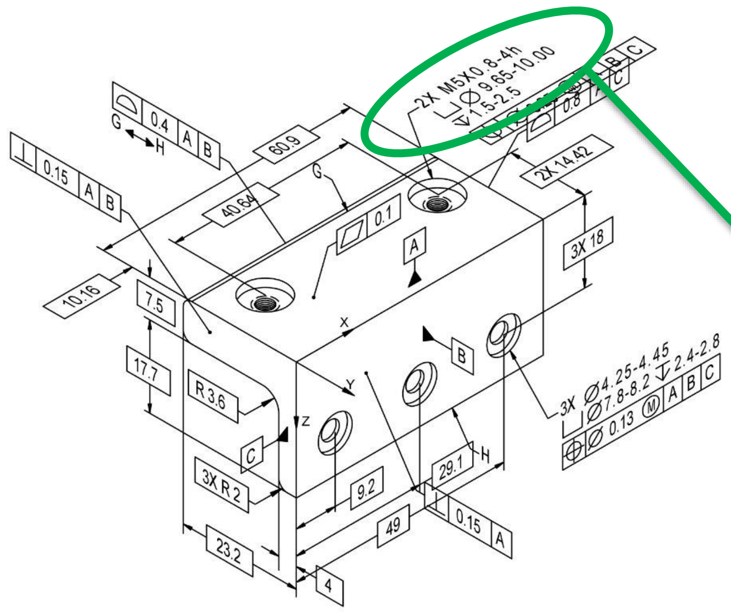
Semantic Response
(Associated Group)

GAP: Multi-Featured Hole Definition

Gap Leader: Dan Feighery

User Story: As an ***MBD Author***,
I want ***a framework to define complex (multi-featured) holes in my product definition data***,
so that ***I can produce an extensible machine and human readable requirement***.

Figure 7-1 Display Management



(a) Annotated Model With All Annotation Displayed.

7.1.1

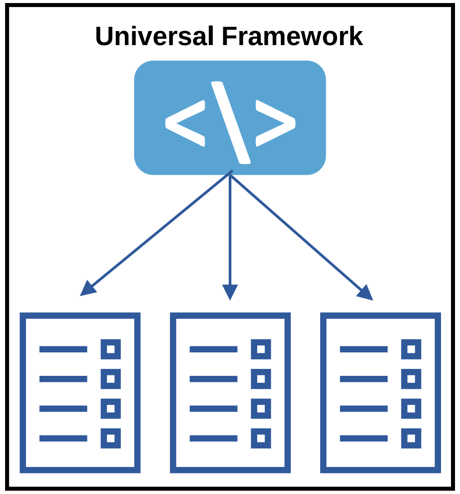
MULTI-FEATURED HOLE:

multi-featured hole: a hole containing more than one geometric digital element that can be characterized and toleranced.

Example:

Element 1: Screw Thread
Element 2: Counterbore Diameter
Element 3: Counterbore Depth

ASME Y14.6: Screw Thread Representation



GAP: Multi-Featured Hole Definition

Gap Leader: Dan Feighery

Multi-Featured Hole Definition GAP Proposal

SC6

1. Establish a Universal Attribute Framework (UAF) for threaded hole definition

SC41

2. Visual Response for Multi-Featured Hole Definition:
   Each digital element of a multi-featured hole **shall** exhibit its own visual response when queried.

SC6

3. Threaded holes depicted in the model with a cylinder as the simplified representation shall use the MINOR diameter for the cylinder diameter unless otherwise modified and indicated w/ an attribute mapped to an annotation.

Agenda

Agenda

01 Why Industry Standards Matter?

02 Review MBE Committee

03 Review Y14/MBE Harmonization Committee

04 What have we been up to?

05 How To Get Involved!

How to Get Involved!

Who Should Get Involved?

****All Experience Levels Wanted!****

- All Interested organization and Individuals
- Organizations that are implementing MBD/MBE
- Organization that are interested or investigating MBD/MBE
- Those who create, reuse, and consume product definition

How To Get Involved?

****Please Contact:****

- Evan Kessick: ekessick@belcan.com
- Fred Constantino: constantinof@asme.org

We Need You!

Upcoming Meetings:

Y14/MBE Harmonization Committee:

- **In-Person Meetings:**
  - ASME Fall Committee Meetings:
    - Tue Oct 22nd 9-5pm – Las Vegas
- **Monthly Virtual Meetings:**
  - Monthly Open Meetings:
    - Oct 30th @1-2:30pm EST
    - Nov 28th @1-2:30pm EST

ASME MBE Committees:

- **In-Person Meetings:**
  - ASME Fall Committee Meetings:
    - Wed Oct 23rd 9-12pm – Las Vegas
- **Monthly Virtual Meetings:**
  - Bi-Weekly Open Meetings: Oct 3rd 12-1pm EST

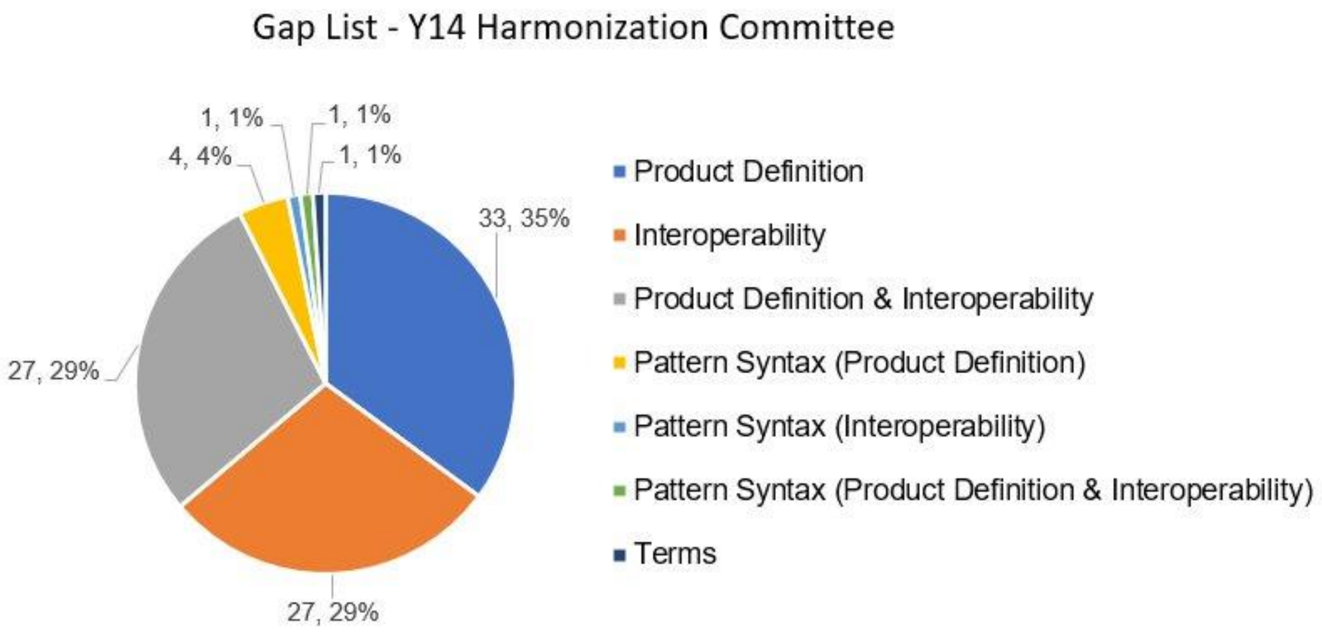
Thank You For Participating!

Y14/MBE Harmonization Working Group Overview

Y14/MBE Harmonization Working Group

MBD & MBE Adoption Gaps:

- 100+ Model-Based Gaps Have Been Identified By Group Member



GAP Chart Framework

GAP NAME – GAP Chart

Y14/MBE Harmonization WG

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List All Current Standards and Sections Related to the Gap, List Lack of Standardization

Y14, MBE, White Paper Recommendation(s)
Document Recommendations to either Y14, MBE or Both. List any White Paper Recommendations.

Next Steps:
List all Next Steps Related to Gap

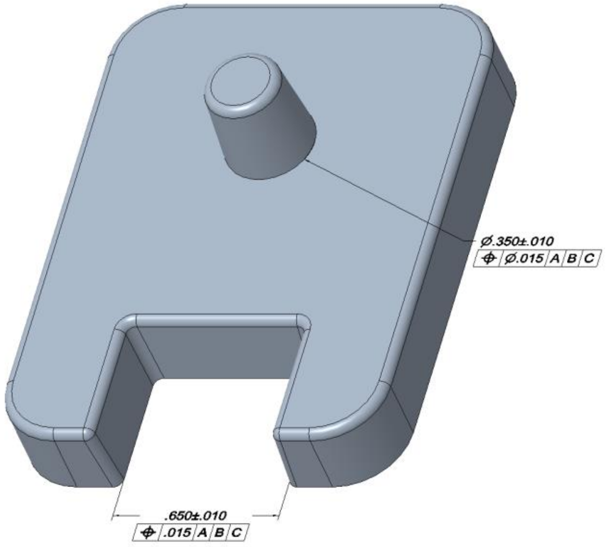
Improved Interoperability of a Feature of Size with Draft

<u>User Story:</u>

As an **MBD Author, and MBD Consumer,**
I want clear definition and interpretation of product definition applied to drafted features of size
so that the MBD authored design intent is understood and interoperable controlling the entire feature

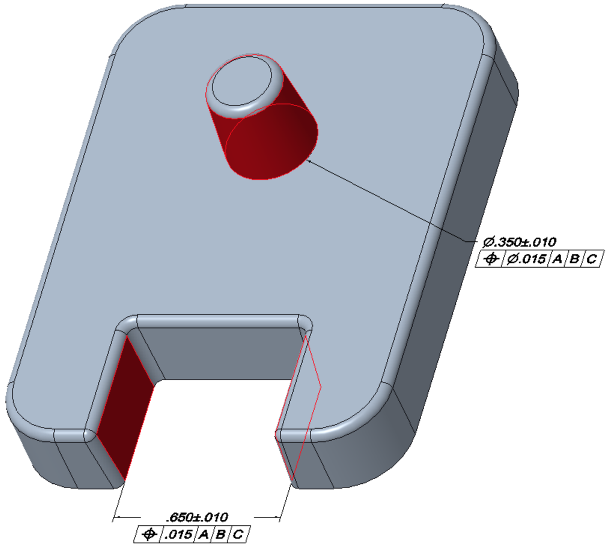
<u>MBD Graphical Representation</u>

(Features of size with Draft)



<u>Intended Interpretation</u>

(Controlling the entire 3D feature of size)



<u>Actual Software Interpretation</u>

(Controlling 2D Elements of the feature of size)