A Practical Evaluation of an OEM’s STEP Implementation for MBD

Finds, help needed, and victories

Author: Melissa K. Harvey
• Abstract
How does Boeing ensure our internal STEP implementations are a full solution to meet business needs and how do we manage the change?

– This presentation will describe the approach Boeing has taken to pause, ask this question, and systematic approach taken to start to answer it. This includes the process to define our company’s baseline of use cases and MBD requirements for STEP, evaluating the path to production, gap analysis approach, and outlines a proposed path partnering forward for a complete implementation within the company.

• Agenda
– Project Summary
– Results Evaluation
– Feedback Request
– Projected Next Steps
Melissa Harvey

1 Mechanical & Electrical Drafter– Shah Smith & Associates
   • 2007 - 2008:
     • Supported the designing and creation of CAD drawings for HVAC system schematics and riser diagrams under
direct supervision of Master Drafters.

2 Tech Designer- Boeing
   • Aug 2008 – Oct 2009:
     • Performed regression testing for engineering systems used to validate engineering package process for BCA.
   • Oct 2009 – June 2012:
     • Defined engineering requirements for Change Orders- to improve and optimize solutions for complex engineering
processes.

3 Product Data Management Specialist– Boeing
   • Jun 2012 – Oct 2012:
     • Assisted in the analysis of engineering design for manufacturing build and inspect processes. Analysis resulted in
contributions to the value stream mapping of fit-for-use requirements for the development of the 3DPDF for MBD in
REDARS|EID.
   • Oct 2012 – Sept 2014:
     • Led outsourcing project for manual engineering packages to supplier management including authoring best
practices and authoritative documentation, and conducting training.
   • Sept 2014 – Jan 2022:
     • Analyzed future state impact of transition from proprietary format to industry standards in BCA MBD supplier
distribution. Resulted in implementation proposal for high value targets to transition.

4 Computing/System Architect – Boeing
   • Jan 2022-Present:
     • Analyzing MBD CATIA V5 & 3DX to STEP AP242 interoperability. This supports Enterprise/BCA use of STEP
AP242 in the design and manufacturing processes.

Education:

2008 Computer Drafting & Design AS (Valedictorian/Honors)
   ITT Technical Institute
2017 Business Administration BS
   City University
2021 Masters in Information Systems (Computer Technology) (Honors)
   University of Phoenix

Certification in Model Based Systems Engineering
   2017 MIT
Certification in Product Lifecycle Management
   2018 Purdue University
Certification in Additive MFG
   2018 MIT
Certification in Business Analytics
   2021 University of Phoenix
• ISO 10303 STEP
  – **STandard for the Exchange of Product** model data between different CAD systems or between CAD and downstream application systems.

• Boeing Use Cases
  – Design Collaboration
  – Manufacturing Build & Inspect
  – TDP Fulfilment
  – Long Term Archival (LOTAR)

• Scope
  – BCA MBD Programs

• Project Questions
  – Question 1 - Where are we at with implementing STEP?
  – Question 2 – What will it take to be done?
Question 1: What needs implemented? (the approach)

What MBD commodities do we create?
What min info do we require at release?
What max info do we allow at release?

Decompose (Current activity)

Decompose (future activity)

Use Cases
- Design Collaboration
- Manufacturing Build & Inspect
- Certification TDP Fulfilment
- LOTAR

Internal Policies & Processes

Commodity
- Commodity
- Commodity
- Commodity
- Commodity
- Commodity
- Commodity
- Commodity
- Commodity

Min Info
- Min Info
- Min Info
- Min Info
- Min Info
- Min Info
- Min Info
- Min Info
- Min Info

Max Info
- Max Info
- Max Info
- Max Info
Question 1: What needs implemented? (the results)

![Diagram showing Use Cases and their relationship to Business Information Data Objects]

- **Use Cases**: Design Collaboration, Manufacturing Build & Inspect, Certification TDP Fulfilment, LOTAR
- **Business Information Data Objects**: Internal Policies & Processes
  - **Part Types & Specializations**: 10 Part Types & Specializations
    - 121 Business Information Data Objects
    - 36 Shared
    - 85 Unique

- **Decompose (future activity)**
  - **Attributes**
  - **Properties**
  - **Relationships**

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What MBD commodities do we create?

What min info do we require at release?

What max info do we allow at release?

Use Cases

Internal Policies & Processes

MBD Design Guide Premier Programs
MBD Design Guide 787 Program
MBD Design Guide 3DX (in-work)

Design Collaboration

Decompose into Business Information Data

Detail Parts

Part Identifiers

- Approval Stamp
- IP/ECCN Marking
- Part #/Ver
- Tessellated
- Solid/Surface Wireframe
- Part Body
- Standard Notes
- Materials
- Etc.

Geometry

Properties & Notes

Capture & Views

Relational Data

What is the list of Business Information Data Objects needed to support Use Cases?

<table>
<thead>
<tr>
<th>Question 1: What needs implemented? (an example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What MBD commodities do we create?</td>
</tr>
<tr>
<td>What min info do we require at release?</td>
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<tr>
<td>What max info do we allow at release?</td>
</tr>
</tbody>
</table>
Question 1: What is implemented? (the approach)

Current Activity: Perform Gap Analysis

What came through right?  What came through wrong?  What is missing?

Create Test Models for Commodities we create.
Export to STEP.
Run through SFA or Import into CAD sys.

Use Cases
- Design Collaboration
- Manufacturing Build & Inspect
- Certification TDP Fulfilment
- LOTAR

Decompose into Business Information Data

Internal Policies & Processes

Assembly Products  Casting & Forging Parts  Composite Parts  Detail Parts (COMMON)  Electrical Parts  Installation Products  Machined Parts  Mechanical System Parts  Sheetmetal Parts  System Parts

51  50  64  36  46  51  37  40  48  39
Question 1: What is implemented? (the results)

Assembly Products 43%
Casting & Forging Parts 44%
Composite Parts 42%
Detail Parts (COMMON) 61%
Electrical Parts 48%
Installation Products 43%
Machined Parts 29%
Mechanical System Parts 55%
Sheetmetal Parts 46%
System Parts 56%

Gaps

43% 44% 42% 61% 48% 43% 29% 55% 46% 56%

43% 66% 39% 52% 57% 71% 54% 54% 44%

Positive coverage findings.
Are able to see where our remaining work is.
Allows us to prioritize efforts & resources.
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<thead>
<tr>
<th>Material</th>
<th>Material_identification_with_conceptual_Correction</th>
<th>Composite Materials</th>
<th>Recommended Practice</th>
<th>Associated CRRs</th>
<th>Associated Part Types</th>
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**Module/Resc:** 100303 ENTITY | **Language:** XML | **Object Type:** TYPE | **AP203:** | **AP245:**
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484 | ApplicationDomainSelect | XML | TYPE | 0 | 0
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38 | Applied_independent_activity_propert | EXPRESS | ENTITY | 32 | Applied_independent_material_propet | EXPRESS | ENTITY
32 | Applied_independent_property | EXPRESS | ENTITY | 32 | Applied_independent_property_rela | EXPRESS | ENTITY
162 | Applied_independent_resource_prope | EXPRESS | ENTITY | 431 | Applied_independent_test_result_pro | EXPRESS | ENTITY
136 | Applied_information_usage_right | EXPRESS | ENTITY | 431 | Applied_process_operation_occurren | EXPRESS | ENTITY
149 | Applied_state_assignment | EXPRESS | ENTITY | 431 | Applied_state_definition_assignment | EXPRESS | ENTITY
10 | Approval | EXPRESS | ENTITY | 431 | Applied_test_activity | EXPRESS | ENTITY
Question 2: Implementation Analysis (the workflow)
Question 2: Implementation Analysis (the tentative results)

Met with CAx-IF; finding schema can be unimplementable.
Question 2: Gap closure plan

• Finding(s):
  – Boeing BCA has 2 different installations of STEP in place

• Plan
  – Synchronize STEP implementation across Boeing
  – Boeing workshop to determine gap owners
  – Engage in external bodies to submit CRs
    ▫ Dassault Systems PERs
    ▫ ISO NWIs
    ▫ CAx-IF User Stories
    ▫ Boeing IT CRs
  – Continue requirement decomposition to
    ▫ Attribute
    ▫ Property
    ▫ Relationship
Contact Information

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