

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

Finds, help needed, and victories

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- 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

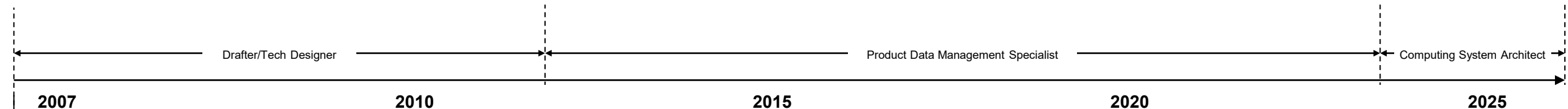
- Jun 2012 – Oct 2012:
 - Assisted in the analysis of engineering design for manufacturing build and inspect processes. Analysis resulted in contributions to the value stream mapping of fit-for-use requirements for the development of the 3DPDF for MBD in REDARS|EID.
- Oct 2012 – Sept 2014:
 - Led outsourcing 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	
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	Certification in Model Based Systems Engineering MIT	2017
	Certification in Product Lifecycle Management Purdue University	2018
	Certification in Additive MFG MIT	2018
	Certification in Business Analytics University of Phoenix	2021



- 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)

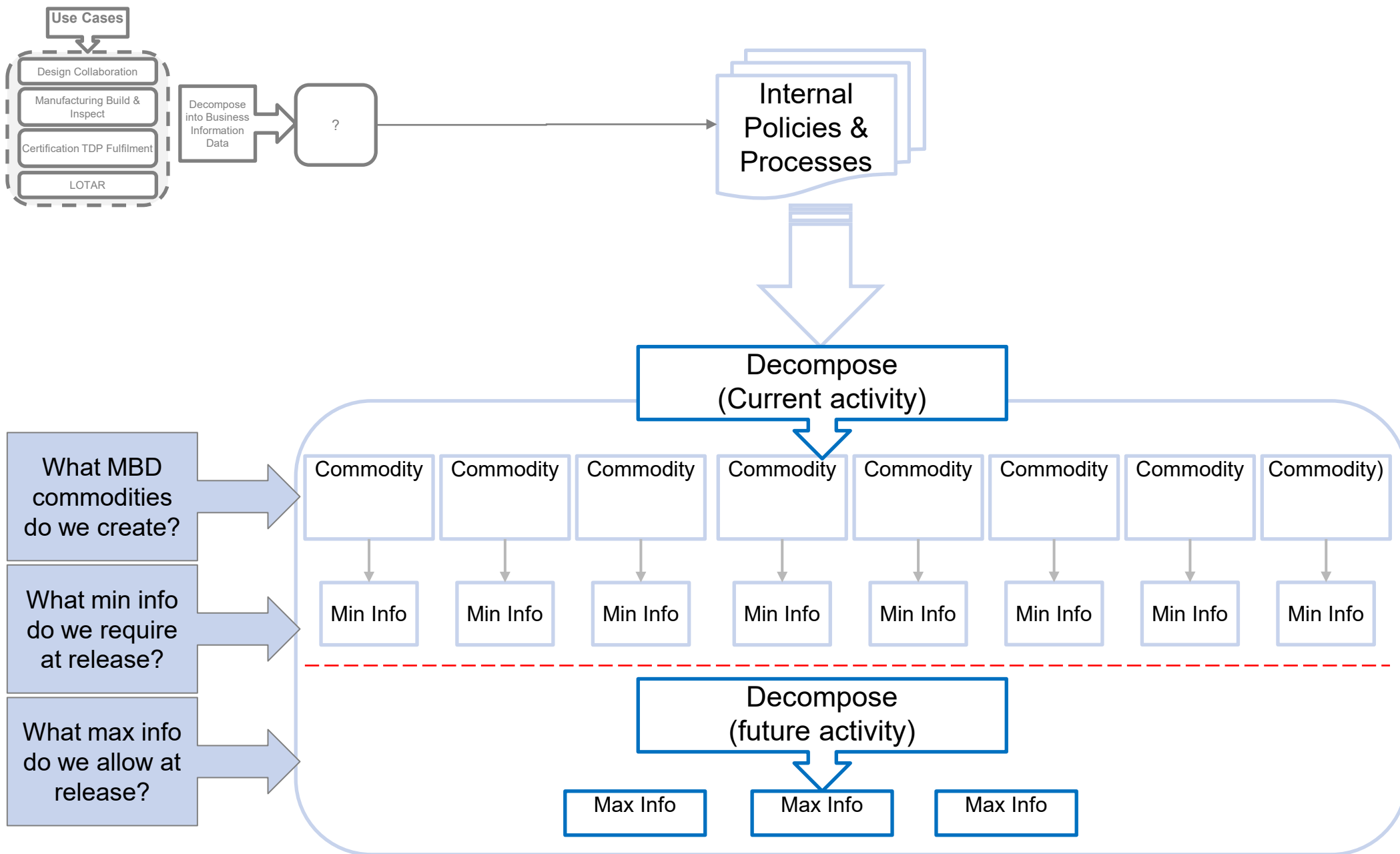
- Scope

- BCA MBD Programs

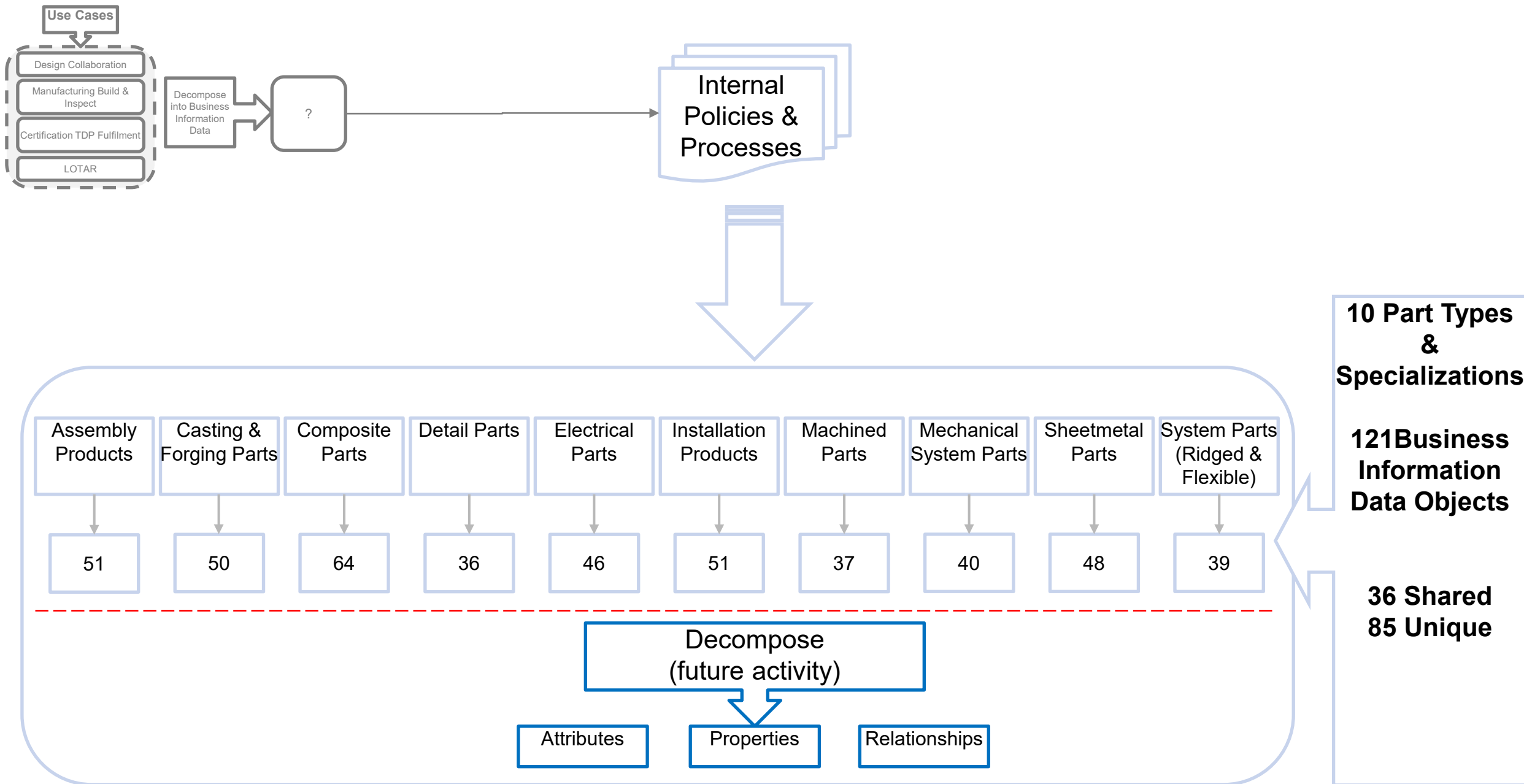
- Project Questions

- Question 1 - Where are we at with implementing STEP?
- Question 2 – What will it take to be done?

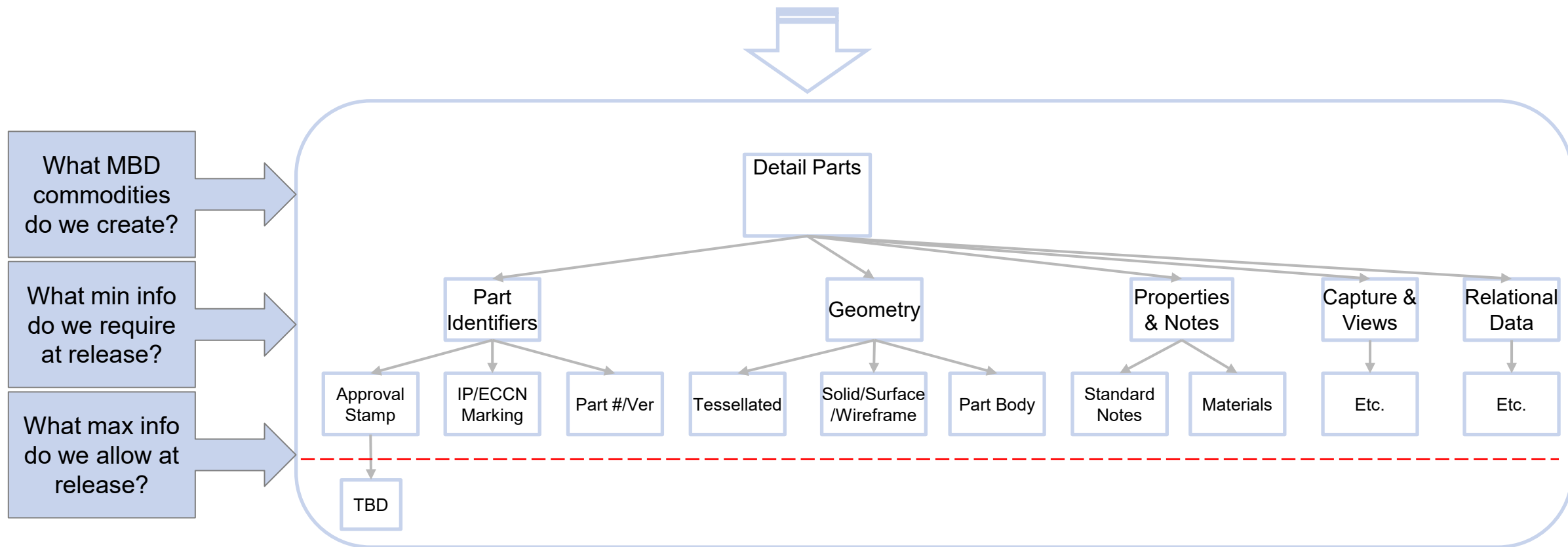
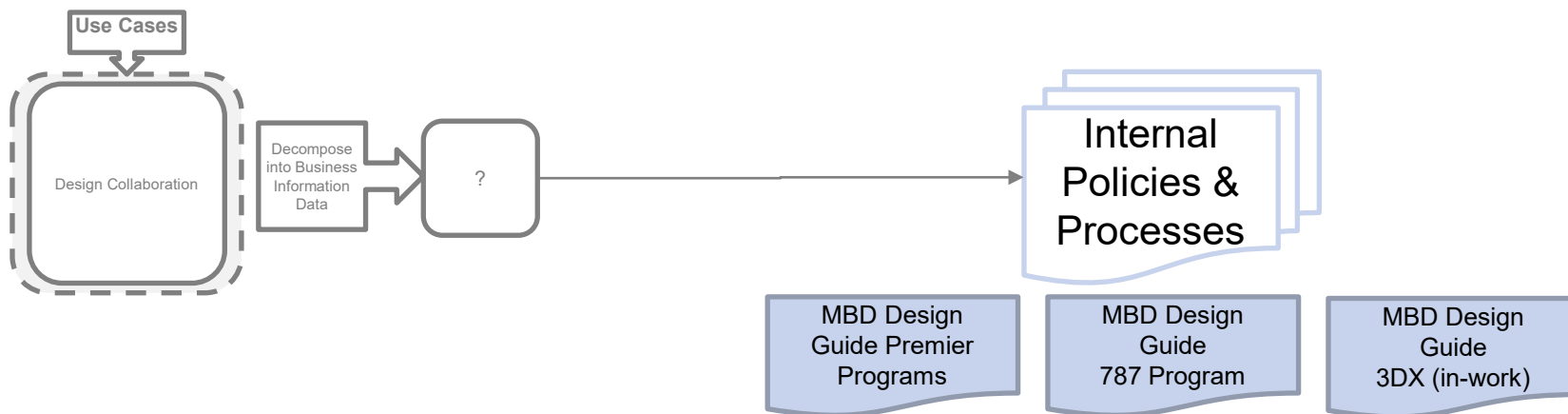
Question 1: What needs implemented? (the approach)



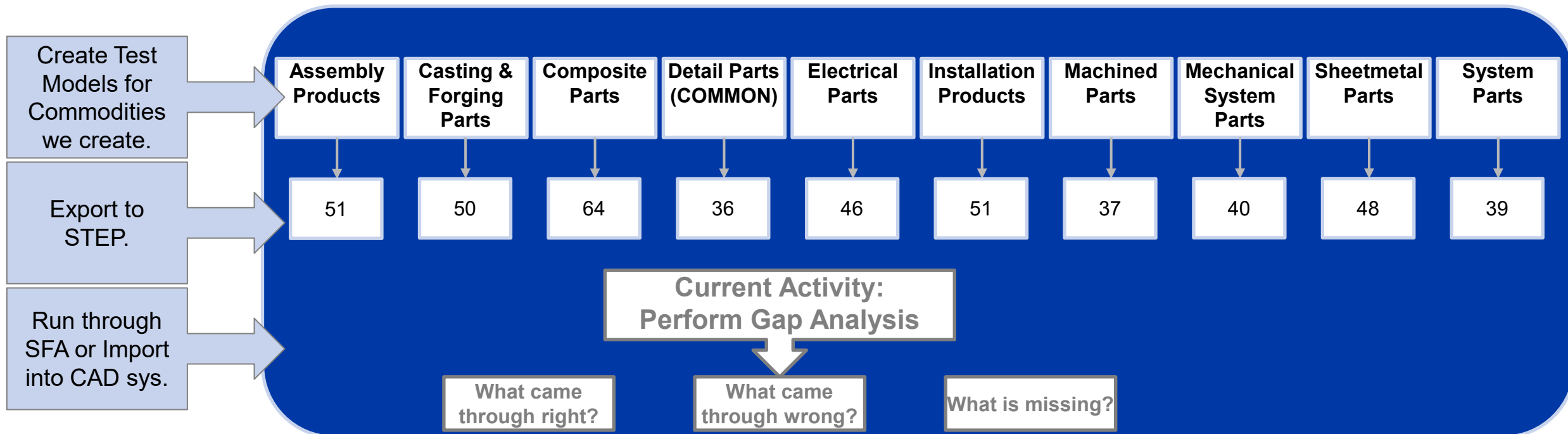
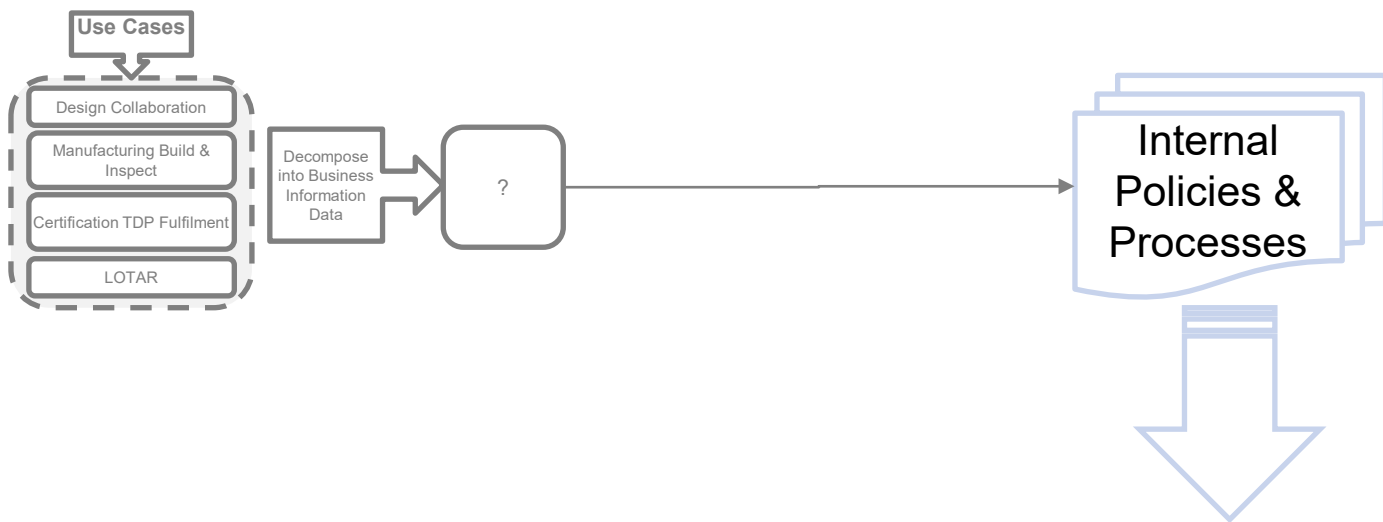
Question 1: What needs implemented? (the results)



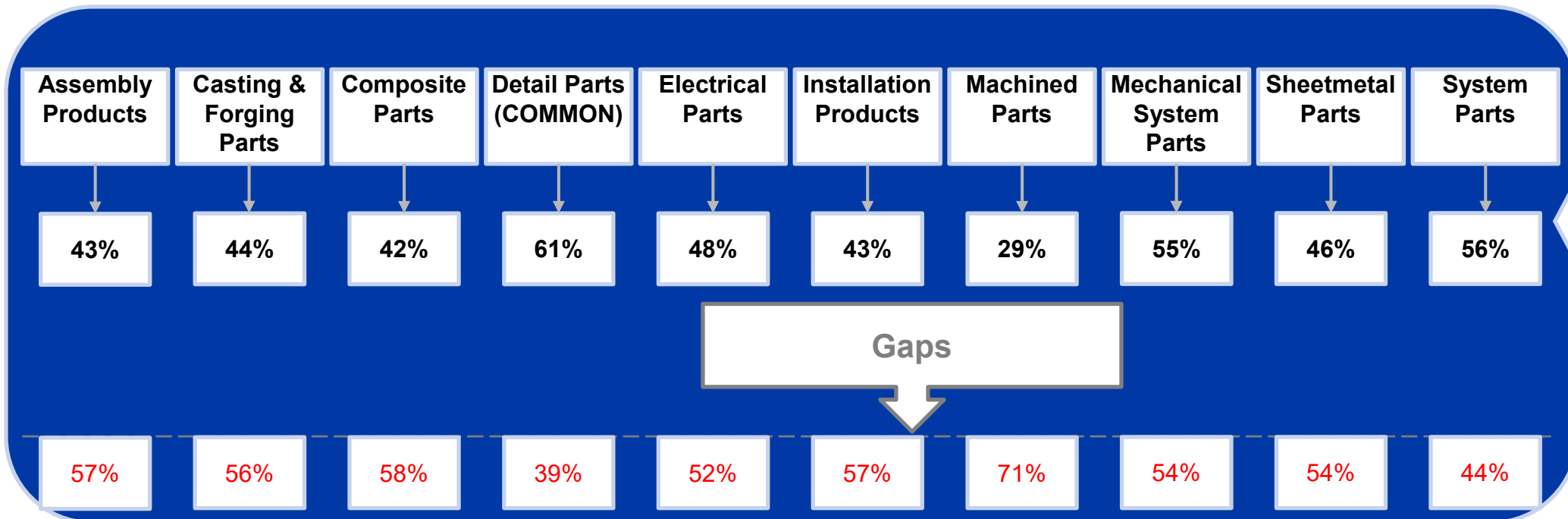
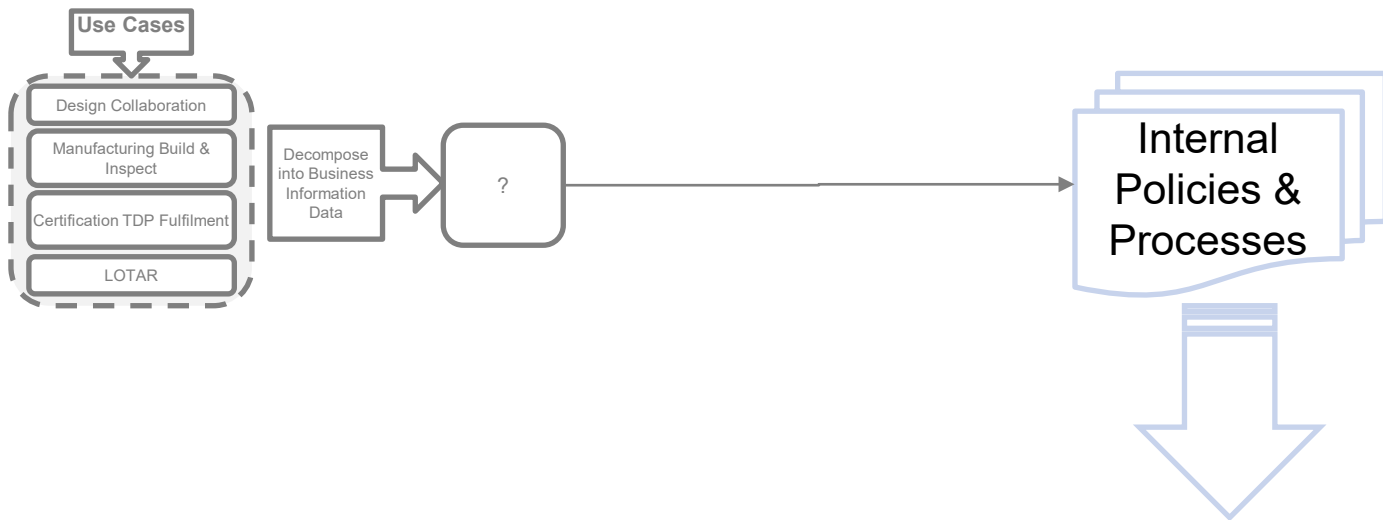
Question 1: What needs implemented? (an example)



Question 1: What is implemented? (the approach)



Question 1: What is implemented? (the results)



Positive coverage findings.

Are able to see where our remaining work is.

Allows us to prioritize efforts & resources.

Tables

- 00A_Lookup Key
- 00B_V5 Mapping Matrix
- 00C_3DX Mapping Matrix**
- 01A_LIST_Business Capability
- 01B_LIST_Part Type
- 01C_LIST_Requirement
- 01D_LIST_Sub Requirement
- 02A_LIST_DS Object
- 03A_List_Standards
- 03B_LIST_Application Protocol
- 03C_LIST_STEP Object
- 04A_LIST_RP
- 04B_LIST_RP Object
- 05A_LIST_IT Build
- 11_LOG_Change Requests

Queries

- 3DX Part Type Query
- 3DX to STEP Query
- V5 Part Type Query
- V5 to STEP Query

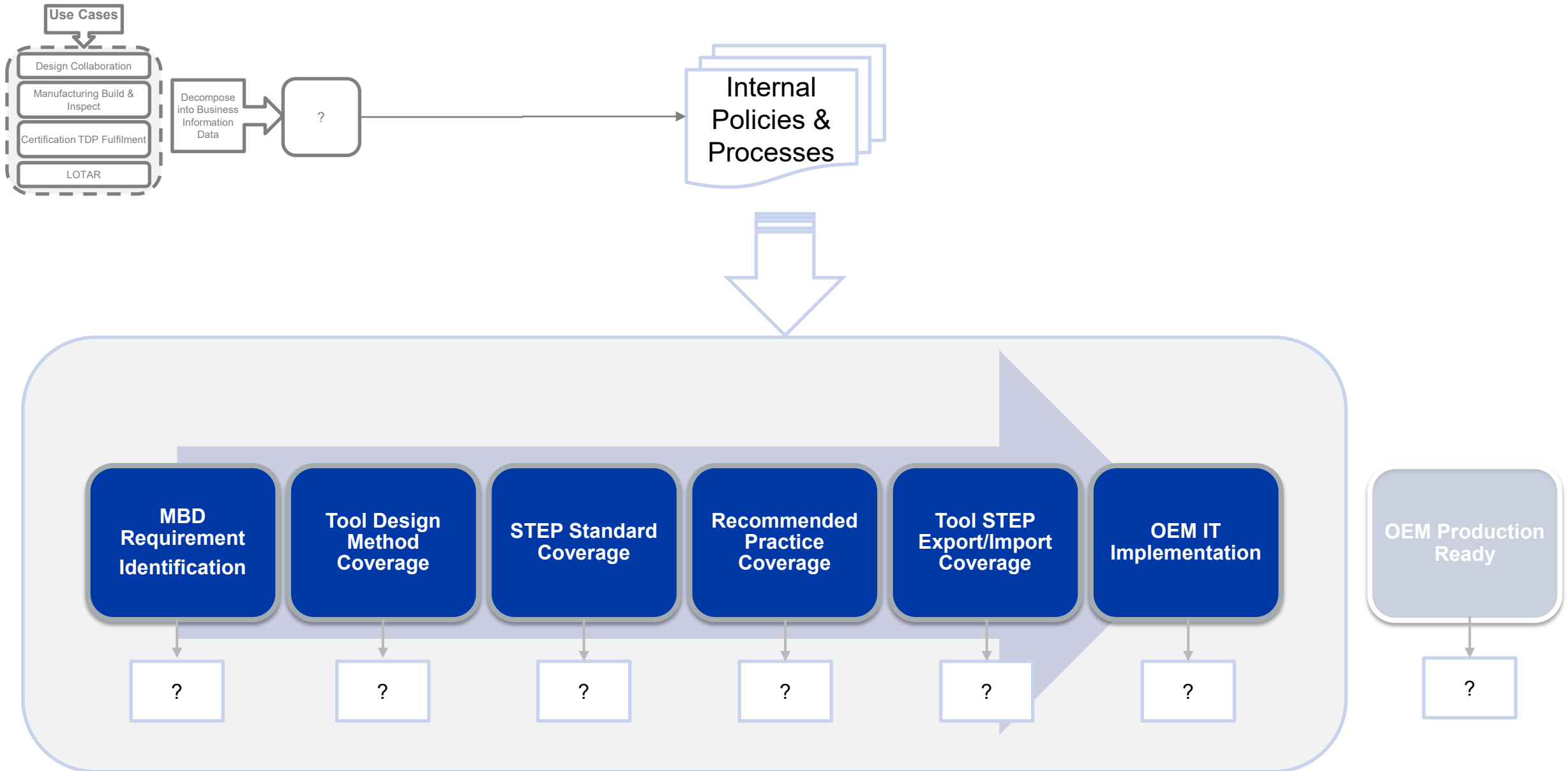
Design Object	STEP Object	Recommended Practice	Associated CRs	Associated Part Types
Material	Material_identification_with_conc	Composite Materials	Idea 3	1, 2, 3, 4, 5, 6, 7, 8, 9
Parameter	Property_definition_relationship, F	User Defined Attributes	02_Not Applicable	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Axis System	Axis_placement, Axis_placement, F	Geometric and Assembly Validatio	02_Not Applicable	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Reference Designator	Assembly_definition, Assembly_sh	Electrical Wire Harness Tutorial Pa	02_Not Applicable	9
Part Body	Bead_end_type, Bead_feature	01_Gap	03_CR Needed	4
Material Standards Table, Sheetm	Form_feature_in_panel	01_Gap	03_CR Needed	4
Wireframe	Form_feature_in_panel	01_Gap	03_CR Needed	4
Wireframe	Form_feature_in_panel	01_Gap	03_CR Needed	4
Part Body	Form_feature_in_panel	01_Gap	03_CR Needed	4
Parameter	PropertyDefinitionRelationship	User Defined Attributes	03_CR Needed	3
Notes, Producibility Parameters	02_TBD	Composite Materials	03_CR Needed	5
Composite Parameters	Composite_material_identificatio	Composite Materials	02_Not Applicable	5
Reference Designator	Connector_based_interconnect_d	01_Gap	02_Not Applicable	9
Connectors	Connection_definition_to_conne	01_Gap	03_CR Needed	6, 7, 8
Solid, Surface, Wireframe	Constructive_geometry, Construct	Supplemental Geometry	02_Not Applicable	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Core, Solid	Beveled_sheet_representation, Be	Composite Materials	02_Not Applicable	5
Core Sample	Percentage_laminate_table, Perce	Composite Materials	01_Gap	5
Part Body	Form_feature_in_panel	01_Gap	03_CR Needed	4
Part Body	B_spline_curve, Boundary_curve, C	Geometric and Assembly Validatio	02_Not Applicable	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Part Body, Wireframe	Basic_round_hole, Basic_round_h	01_Gap	03_CR Needed	4
FT&A	Property_definition_relationship	01_Gap	03_CR Needed	3
Parameter	Property_representation, Property	User Defined Attributes	02_Not Applicable	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
02_Not Applicable	3-branch_node, 3-external_node, i	02_Not Applicable	02_Not Applicable	
Part Body	Cutout, Cutout_edge_segment, Cu	02_Not Applicable	02_Not Applicable	
Solid, Surface, Wireframe	Next_assembly_usage, Next_asser	Geometric and Assembly Validatio	02_Not Applicable	
Reference Designator	Occurrence, Part, Part, Part_occu	Electrical Wire Harness Tutorial Pa	02_Not Applicable	
Solid, Surface, Wireframe	Product, Product_view_resource	External References	02_Not Applicable	
Reference Designator	3-splice	01_Gap	Idea 24	
Wireframe	Direction, Direction	01_Gap	03_CR Needed	
Parameter	02_TBD	01_Gap	01_Gap	
Orientation Parameter, Paramete	02_TBD	01_Gap	03_CR Needed	
Parameter	02_TBD	01_Gap	03_CR Needed	
Parameter, Part Body	02_TBD	01_Gap	03_CR Needed	
Parameter, Part Body	Basic_round_hole, Basic_round_h	01_Gap	03_CR Needed	
Parameter, Part Body	02_TBD	01_Gap	03_CR Needed	
Solid, Surface, Volume	02_TBD	01_Gap	03_CR Needed	
Orientation Parameter	Ply_orientation_angle, PlyOrientat	Composite Materials	02_Not Applicable	
TBD	02_TBD	03_TBD	04_TBD	
Surface	Form_feature_in_panel	01_Gap	03_CR Needed	
Part Body	Form_feature_in_panel	01_Gap	03_CR Needed	
TBD	01_Gap	01_Gap	03_CR Needed	4, 10, 11
Parameter	Property_definition_relationship, F	01_Gap	03_CR Needed	3

Boeing Part Types

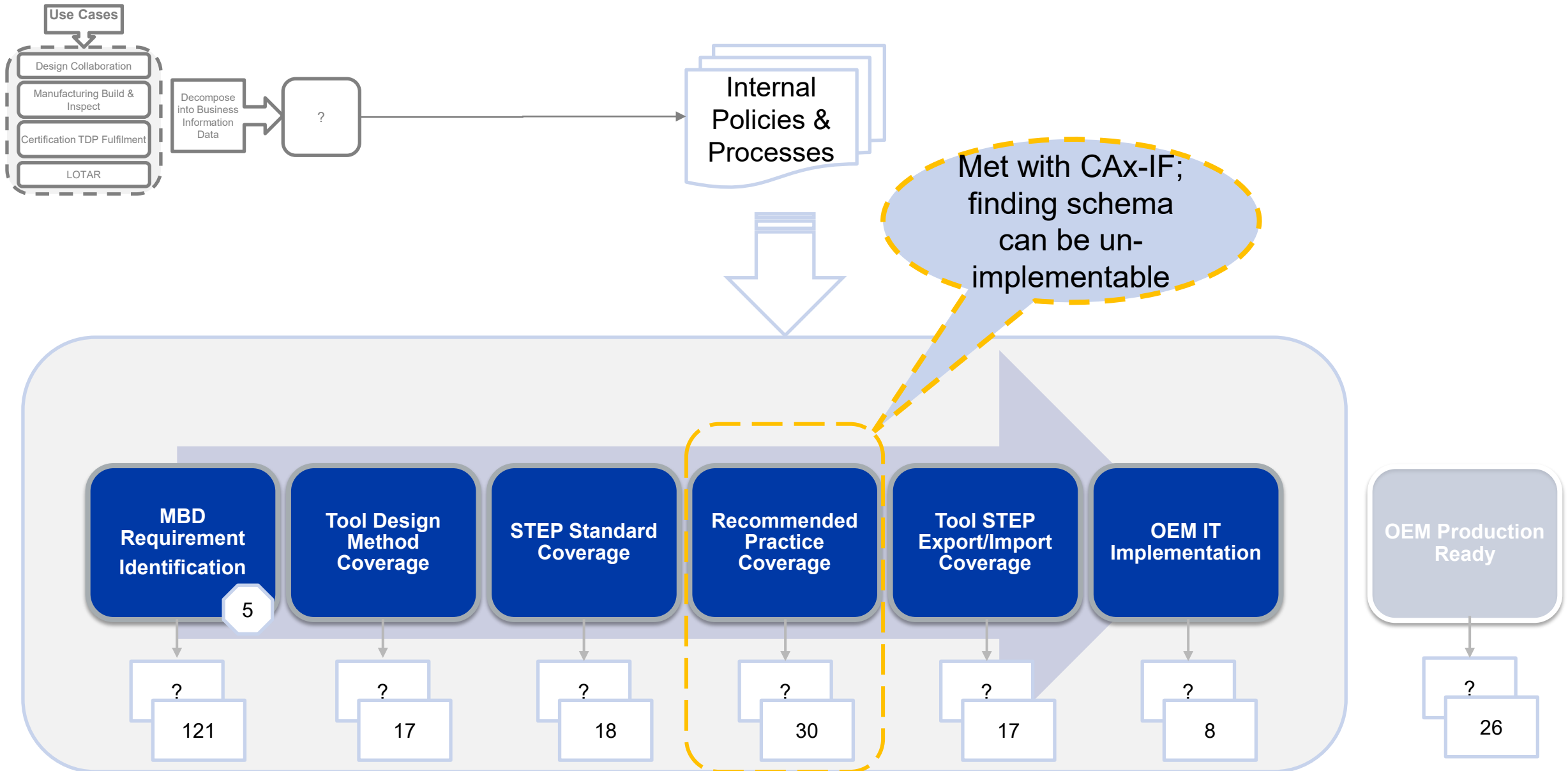
- 1 Detail Part
- 2 Machined Part
- 3 Casting & Forging Part
- 4 Sheetmetal Part
- 5 Composite Part
- 6 Mechanical Systems Part
- 7 Systems (Rigid) Part
- 8 Systems (Flexible) Part
- 9 Electrical Part
- 10 Assembly Part
- 11 Installation Part

Module/Resc	10303 ENITY	Language	Object Type	AP203	AP242
484	ApplicationDomain	XML	TYPE	<input type="checkbox"/>	<input checked="" type="checkbox"/>
484	ApplicationDomainSelect	XML	TYPE	<input type="checkbox"/>	<input checked="" type="checkbox"/>
44	Applied_activity_assignment	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
485	Applied_activity_method_assignment	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
38	Applied_independent_activity_proper	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
326	Applied_independent_material_proper	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
32	Applied_independent_property	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
32	Applied_independent_property_relati	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
162	Applied_independent_resource_prope	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
431	Applied_independent_test_result_pro	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
136	Applied_information_usage_right	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
431	Applied_process_operation_occurrenc	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
149	Applied_state_assignment	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
237	Applied_state_definition_assignment	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
431	Applied_test_activity	EXPRESS	ENTITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Approval	EXPRESS	ENTITY	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Question 2: Implementation Analysis (the workflow)



Question 2: Implementation Analysis (the tentative results)



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

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