

# *3D-Model Based Enterprise a SASIG initiative*

*Ram Pentakota*

*Director, Global Engineering Application Services  
Johnson Controls Automotive Seating*



| Insight. Expertise. Results.

SASIG is a global consortium of automotive standards organizations.

AIAG

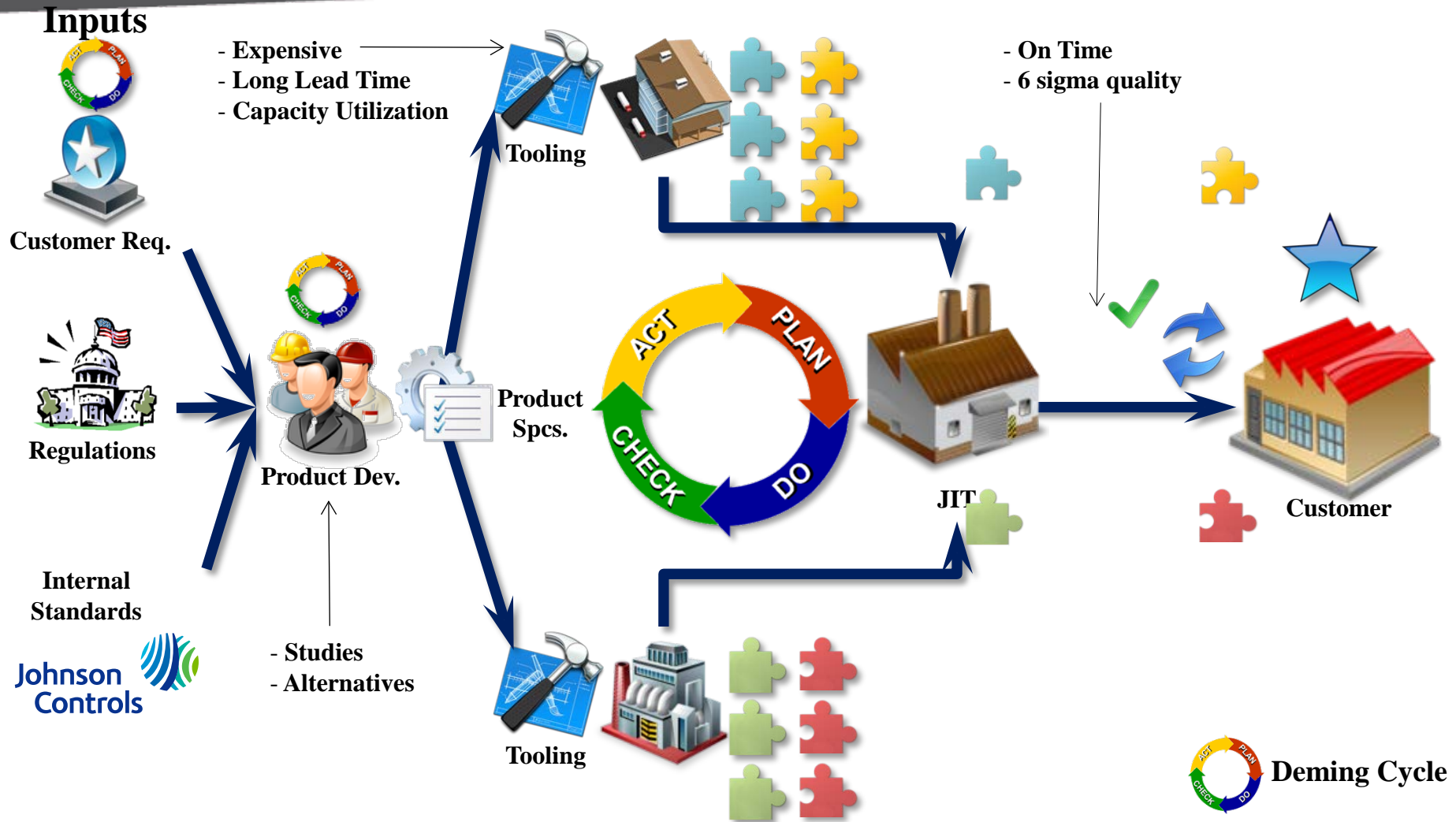
ODETTE  
SWEDEN

io mo



Insight. Expertise. Results.

# Product Development – Workflow

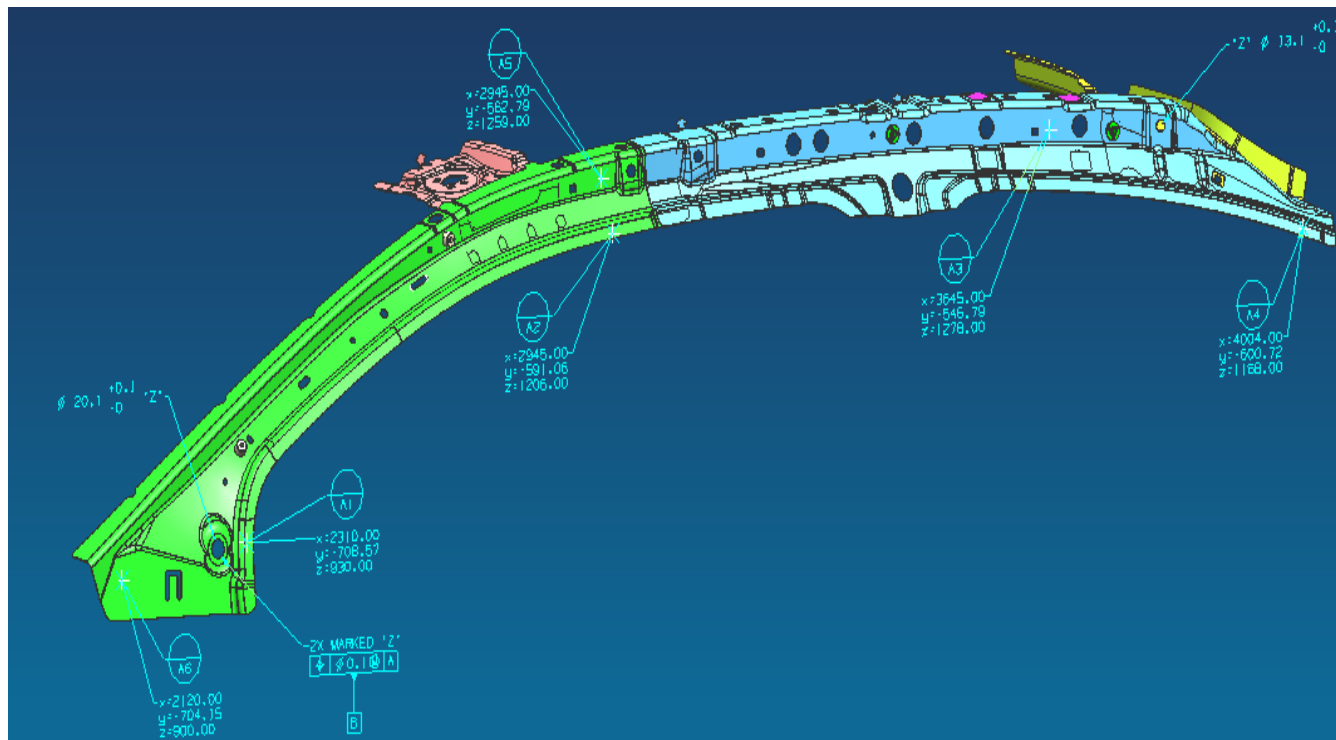


Effective Collaboration is Key to Optimal Operations

[illegible]

# Model-Based Enterprise at Automotive Company **AIAG**

Embedded GD&T (EGDT) is the capability to create precise model-based definitions of dimensional tolerance requirements, associate those tolerances to features of a part/assembly model, and display that information within a 3D CAD model

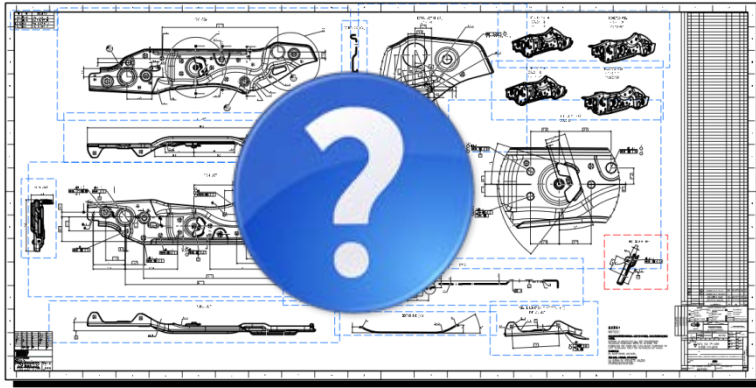


Insight. Expertise. Results.

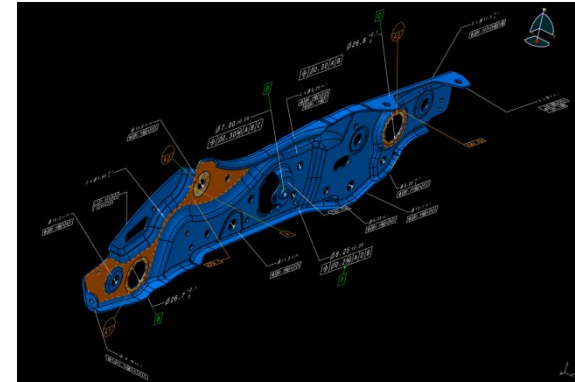
# Why 3D GD&T ? IMPROVE COMMUNICATIONS



## Drawings



## 3D GD&T



**Where is my  
Datum A ?**

(Difficult to Communicate GD&T Content)



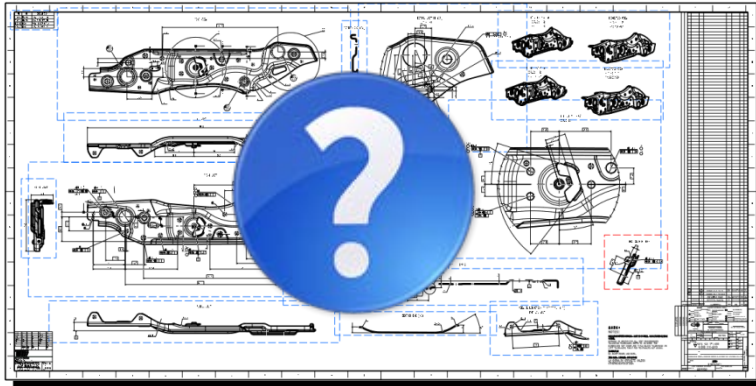
**The highlighted area  
is Datum A**

(Easy to Communicate GD&T Content)

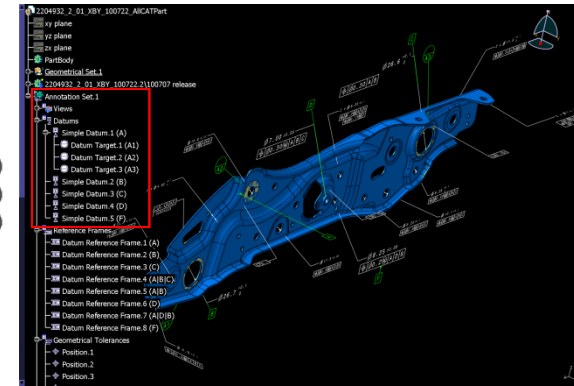
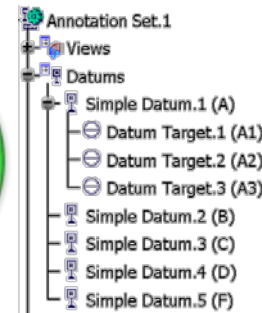
# Why 3D GD&T ? MANAGE GD&T



## Drawings



## 3D GD&T



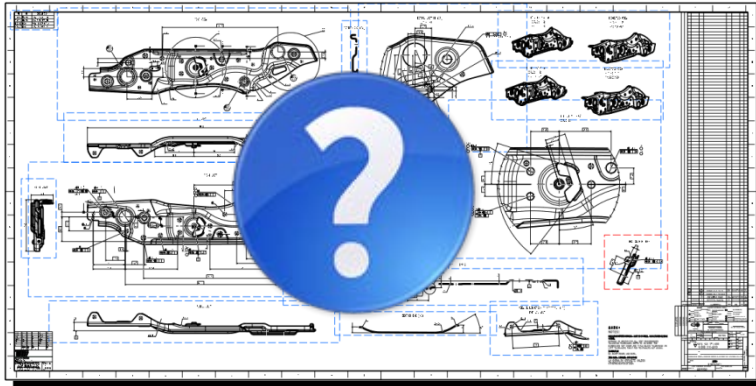
**How many  
Datums do I have ?**  
(Difficult to manage GD&T Content)

**I have Datums  
A,B,C,D,F**  
(Easy to manage GD&T Content)

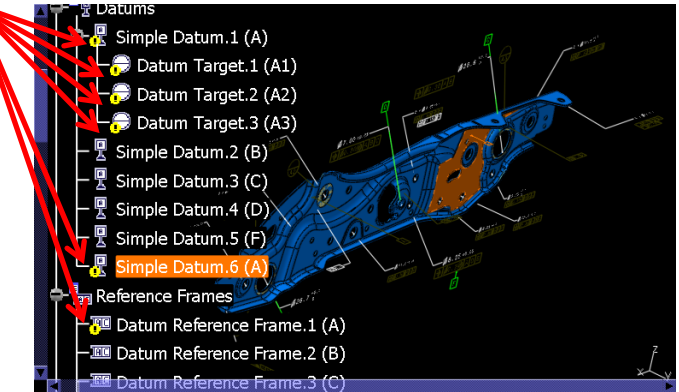
# Why 3D GD&T ? IMPROVE GD&T QUALITY



## Drawings

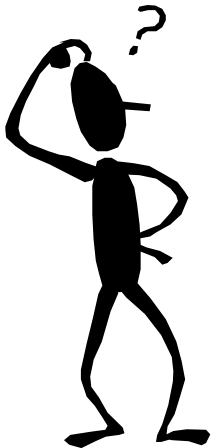


**Datum A  
Errors**



## 3D GD&T

**Do I have any  
GD&T Mistakes?**  
(No Quality GD&T Check)



**I have a Problem  
With Datum A**  
(Automatic GD&T Quality Checks)

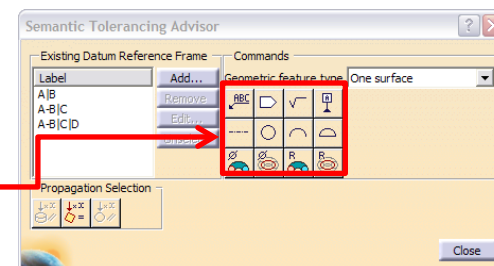
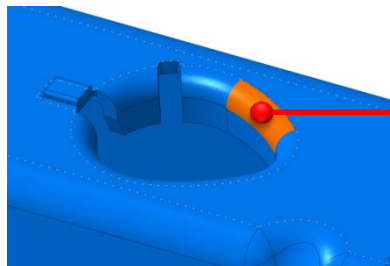
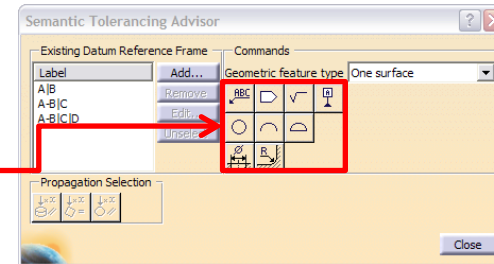
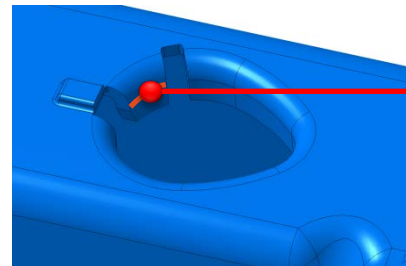
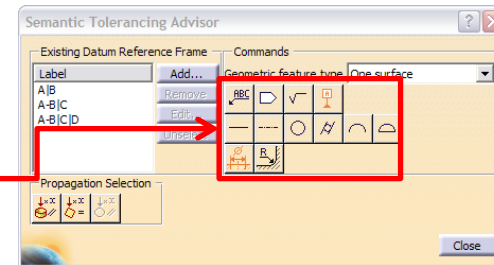
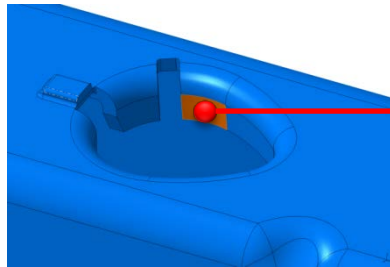
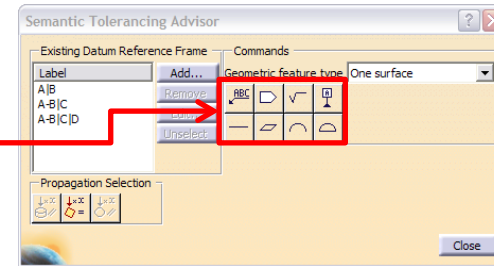
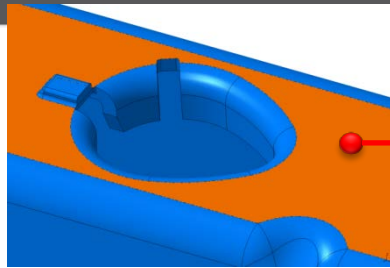


Insight. Expertise. Results.

# Why 3D GD&T ?



## QUALITY – Intelligent Content w/Quality Checks



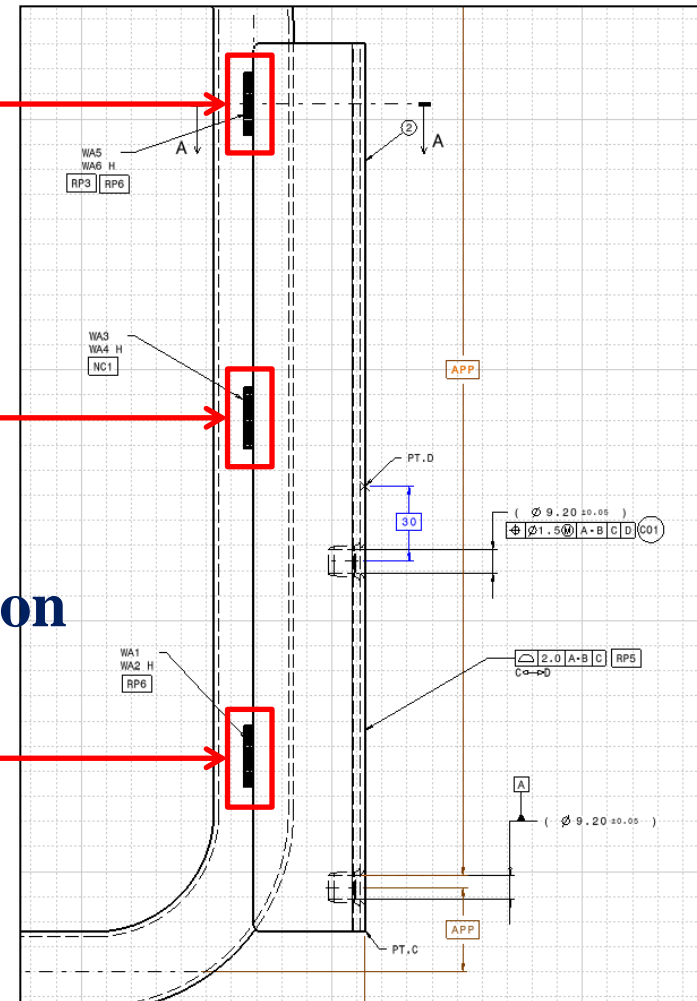
Intelligent system ➡ 1 GD&T quality 2- engineer's GD&T skills



## QUALITY – Checking Inter-level zone dependencies

## Weld Zones in Part Drawing

## Weld Callouts in Assembly Drawing



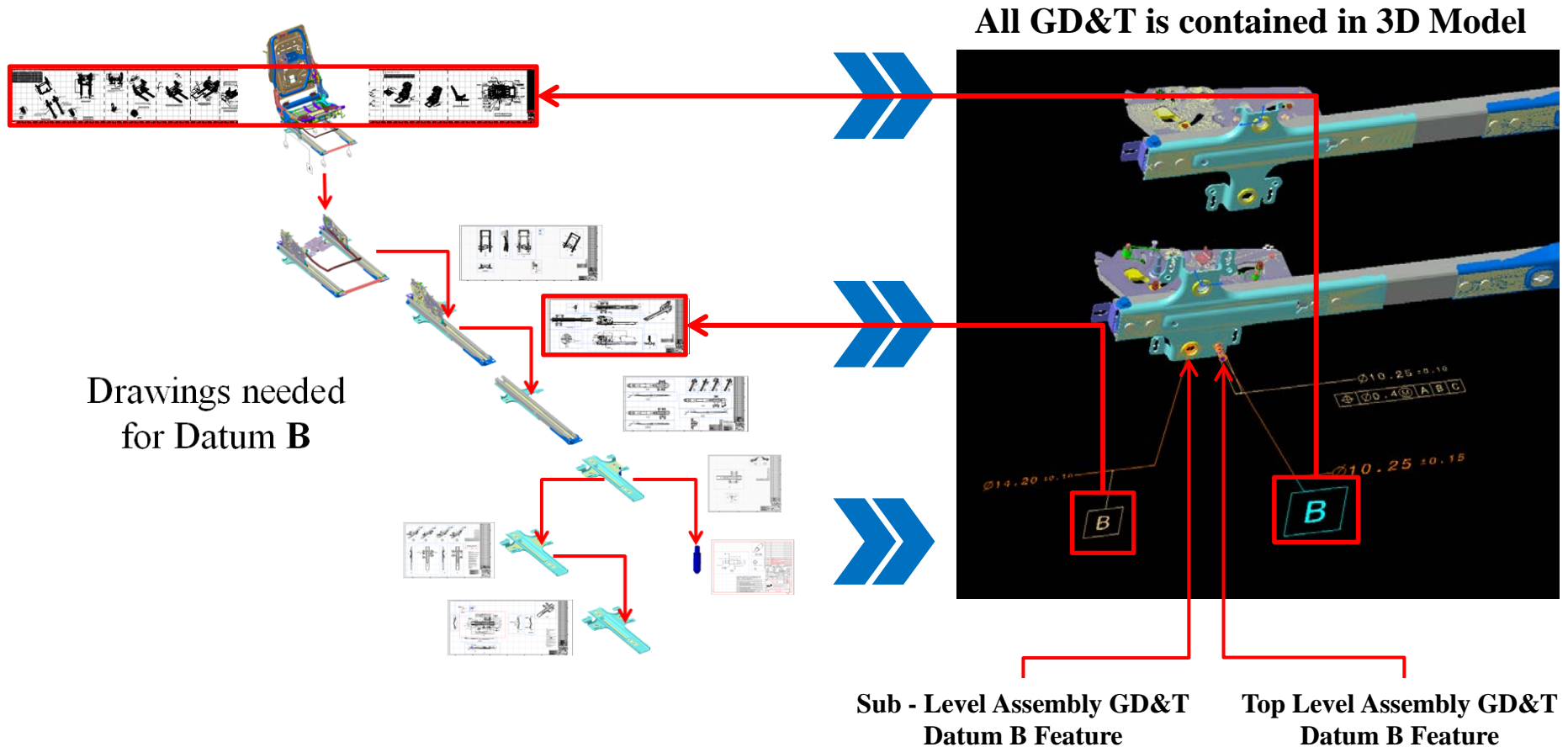
## Product Details Managed on Separate Drawings

## Component details not visible at the assembly level

# Child/Parent datum alignment



Child/Parent GD&T alignment can Easily be checked Systematically using 3D GD&T



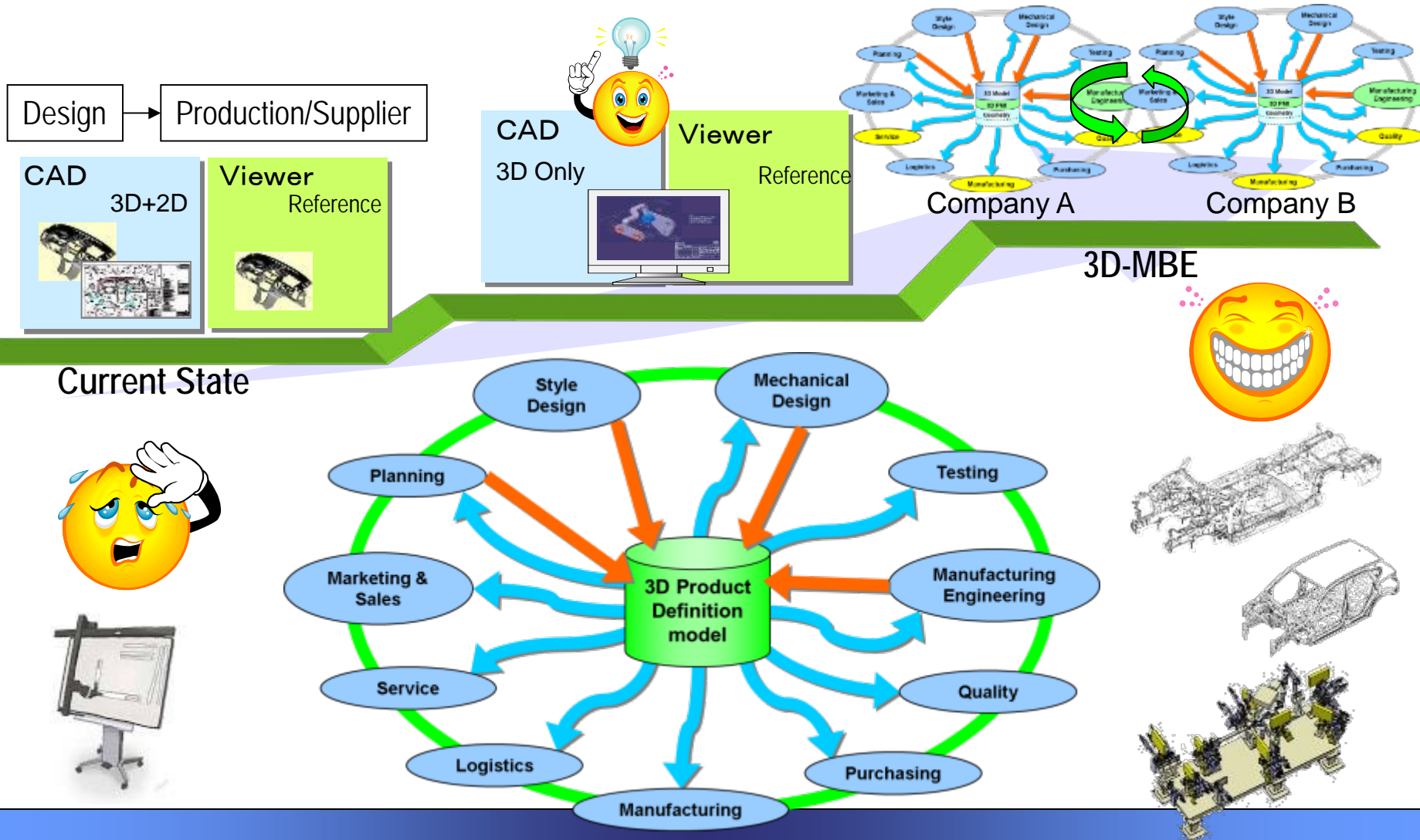
- 

## Manufacturing

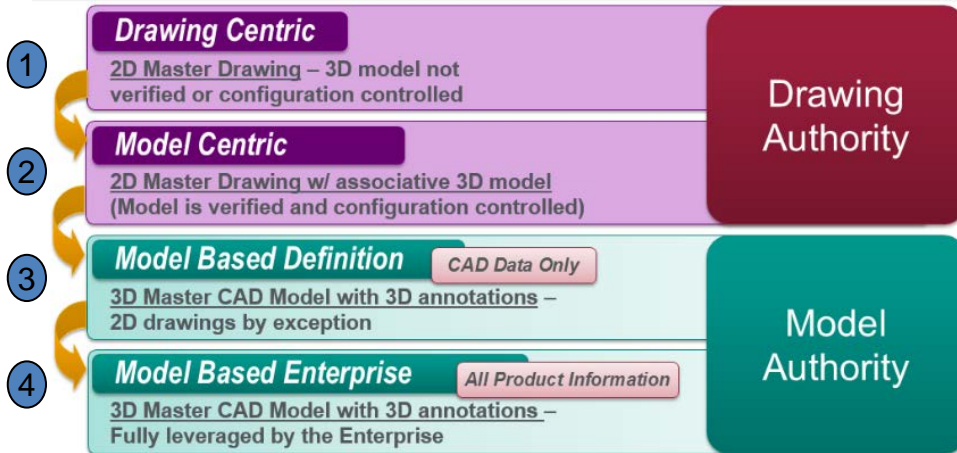
Insight. Expertise. Results.

# 3D-MBE Vision

To Promote the implementation of the 3D-MBD Model to enable seamless sharing of Product information within the extended enterprise and the Automotive industry



# 3D-MBE Maturity Index



Category	Criteria	Level 1	Level 2	Level 3	Level 4
Product Data Creation	Geometry	2D or 3D	3D	3D	3D
	Dimensions	2D	3D	3D	3D
	Datums	2D	3D	3D	3D
	GD&T Call-Outs	2D	3D	3D	3D
	Supplementary Information	2D	3D	3D	3D
	Validation	None	Semi Automatic	Automatic	Automatic
Consumption (Downstream Usage)	CAD	IGES or STEP	Native CAD, IGES/STEP	Native CAD	Native CAD
	PMI	2D	2D or 3D	3D	3D

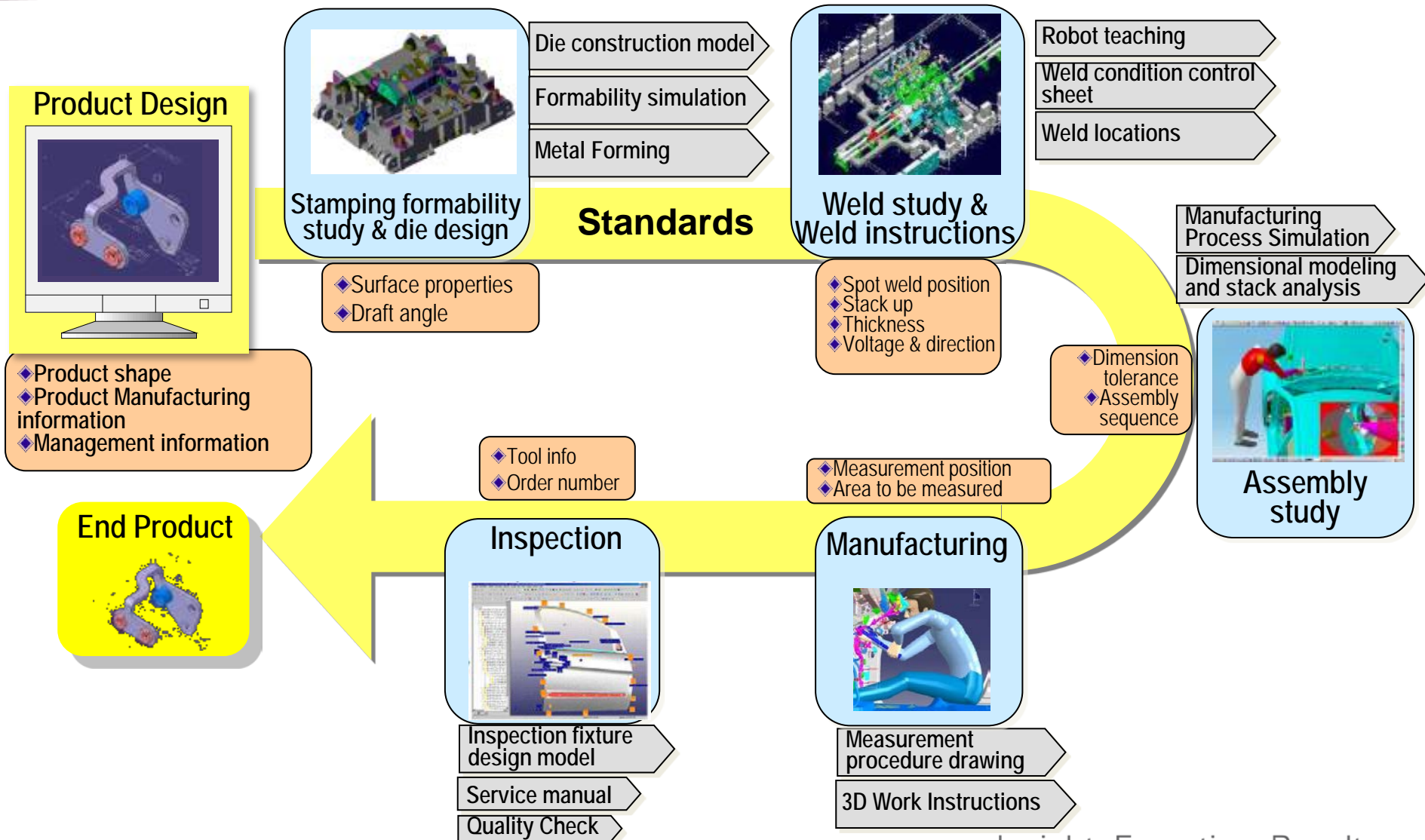
# 3D-MBE Benefits



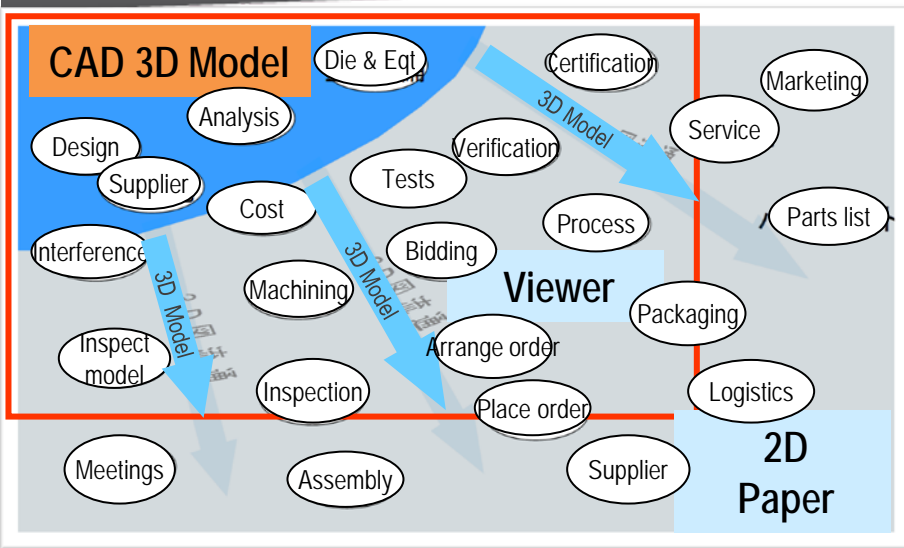
Category	Key Enablers	Typical Range
Designer Efficiency	•GS&T advisor supported GD&T information added to 3D model	10 - 30%
Engineering Efficiency	•Reduced involvement in repeat drawing creation iterations for GD&T information checking and validation	5 – 10%
Engineering effectiveness improvement	•Productivity gains to effectiveness	10 – 20%
Reduced need for manufactured part checking	•Access to correct GD&T information for manufacturing process planning	15 - 25%
Reduced Rework and Scrap	•Access to correct product information	10 – 20%
Reduced Cost of Quality	•Access to correct GD&T information for manufacturing process planning	2 – 10 %
Improved win rate (and margins) through higher quote confidence	•Sufficient time for cost estimation and sourcing based on timely and accurate PMI data availability	TBD
Quality of Life Improvement	•Eliminate non-value work	Intangible but Significant
Risk mitigation against significant product fulfillment error	•Single source of product information •Access to correct product information to all stakeholders	Significant

Target: Reduction in physical parts and testing by 50%

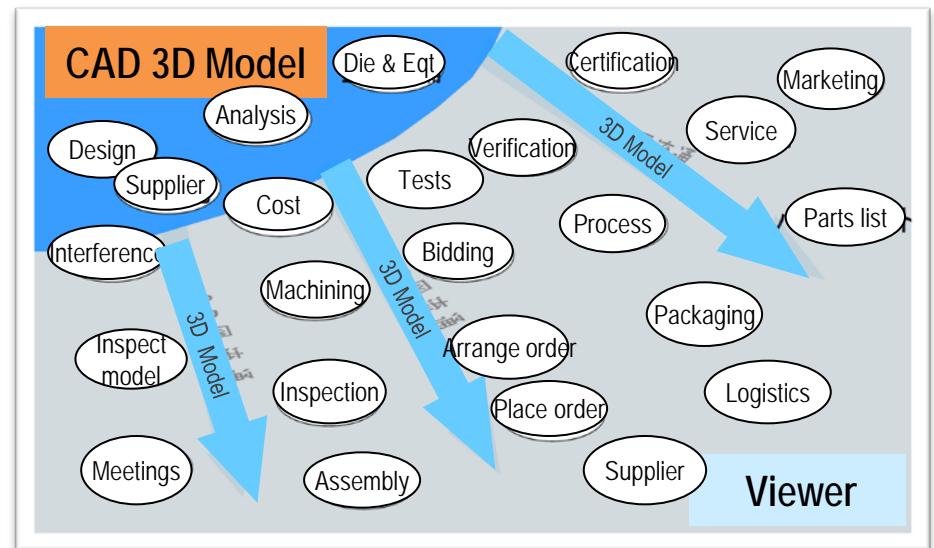
expertise. Results.



# What is role of Drawing?



Current State



Future State

Too big of a jump



All major OEMs have been trying for the past 10 years to implement full 3D.

# 3D-MBE Interim Approach



3D penetration rate

Address issues in the  
transitioning stage

Start transition to  
3D models

Continue 2D operations in the  
transitioning stage

2D drawing automatically  
created with 3-view drawings  
and layout of views



To address the 2D drawing processes

Submission to government

Suppliers

drawing process

Drawing mark-ups made at work site

Circulated by physically providing on site in  
paper

- Being able to see the whole drawing at once
- Paper drawings spread out line side

- Size reduction
- No PC necessary (PCs not needed)
- Maintenance of approved information

2D drawing operation



Disposed

3D Only

3D +  
Automatic 2D

What to do about  
operations that was  
always done in 2D?



3D+2D (2D+3D)

We are here

2D Only

Insight. Expertise. Results.

Future

# 3D MBD Utilization



Design



Eng.



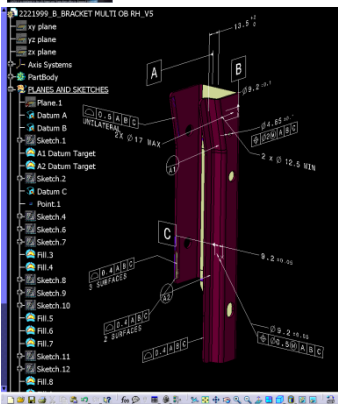
Suppliers



Tool Shop



Native CAD



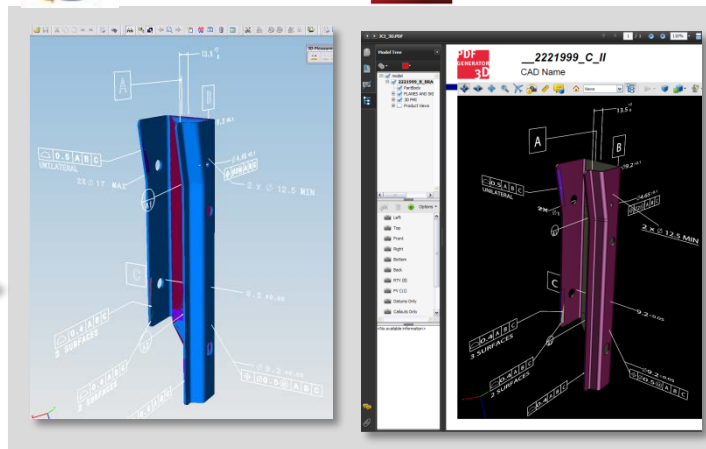
Visualization CAD



JT



3D PDF



Purchasing



Costing



Etc,

Prototype  
Part



Eng.



AMEs



AQEs

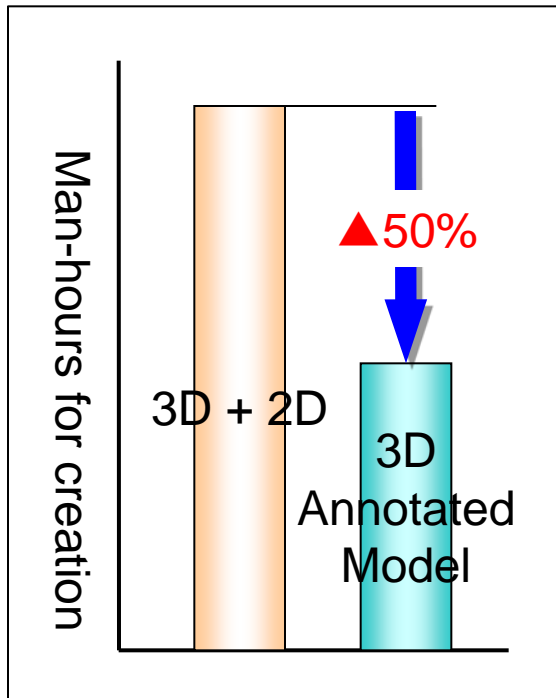


Suppliers

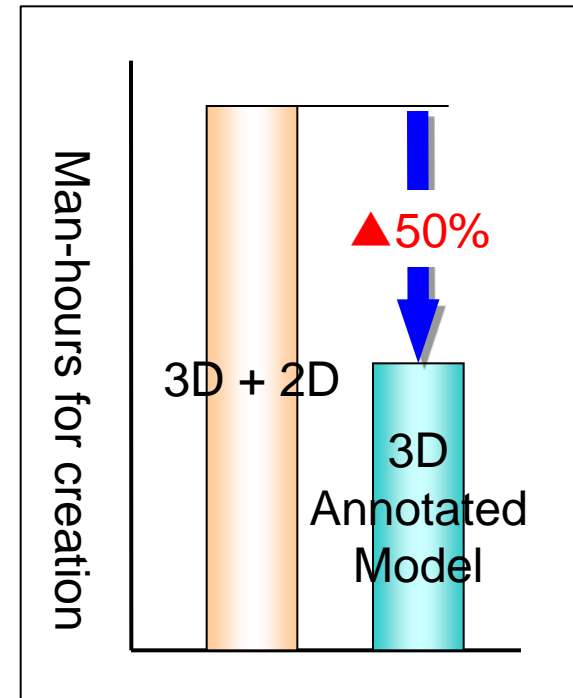
Insight. Expertise. Results.

# Man-hour reductions Using 3D Annotated Model

## Product Development



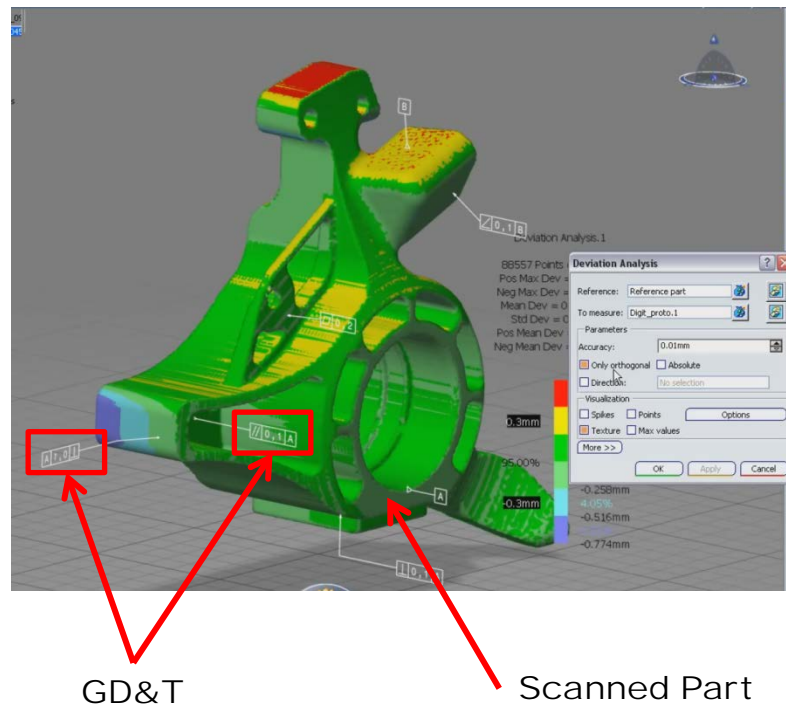
## Manufacturing Work Instructions

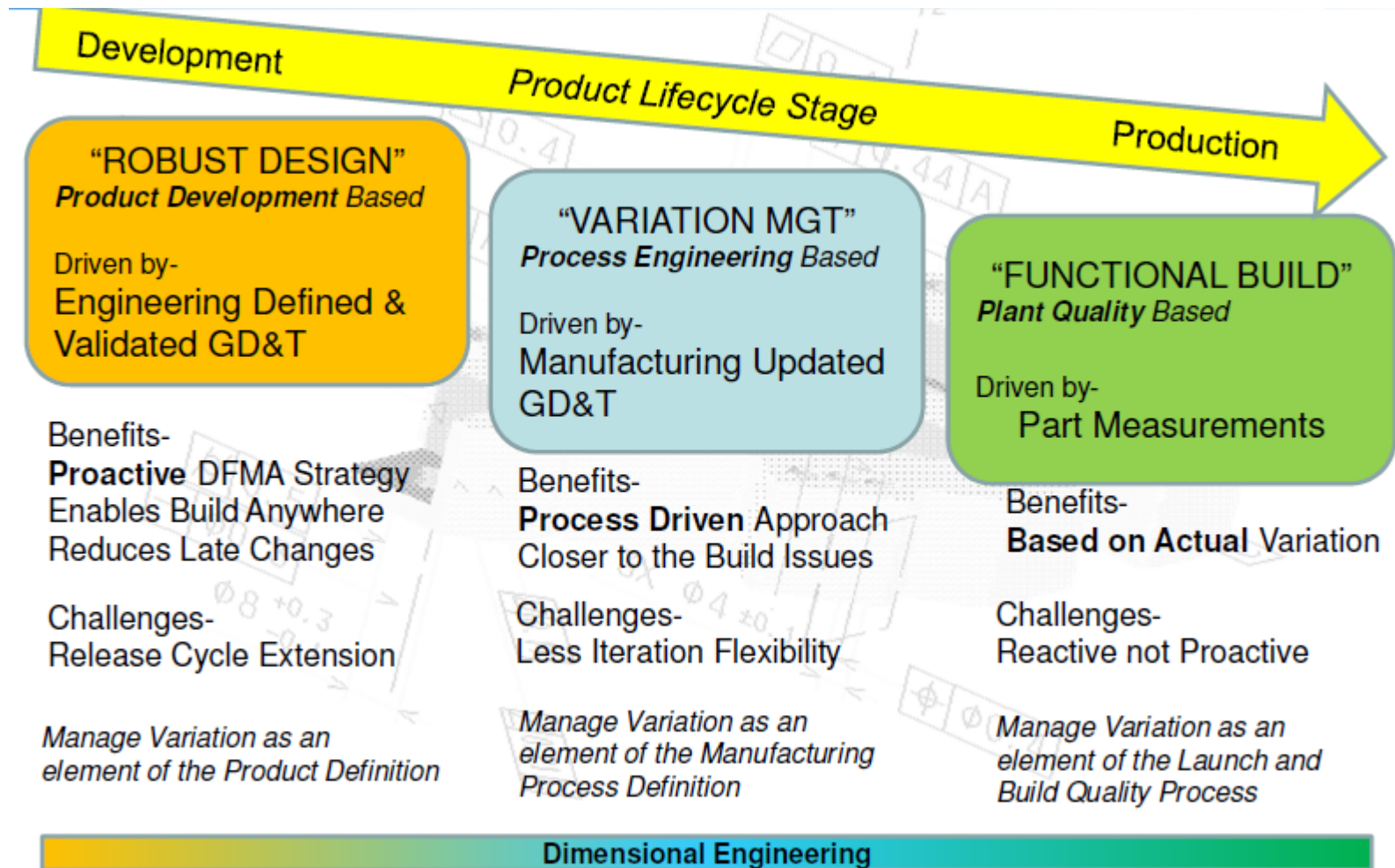


**An OEM study validated a 50 % man-hour reduction using 3D Annotated Models**

Virtual verification (Compare a scanned part to 3D GD&T model) Higher priority for profile and position based callout in GD&T compare

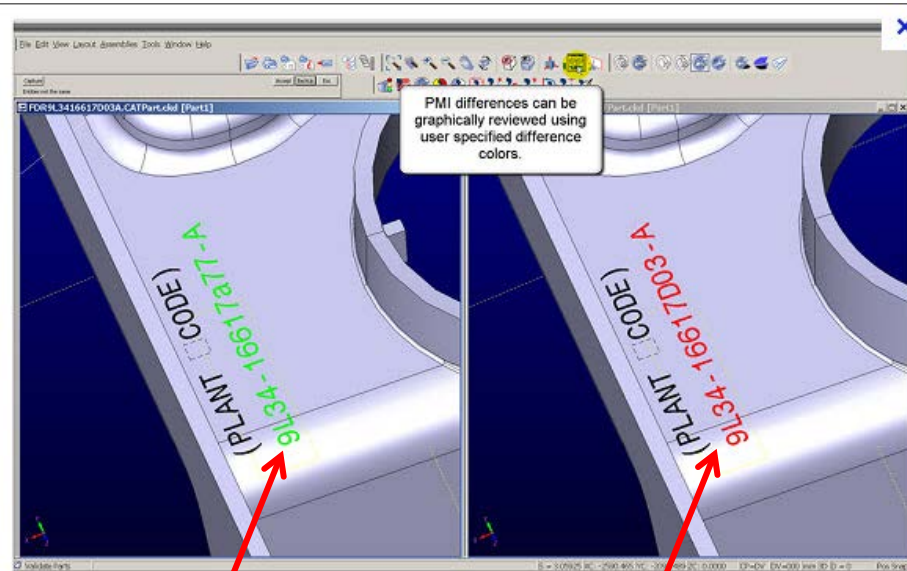
Virtual verification can significantly reduce PPAP cost and be a powerful tool in 6 sigma studies





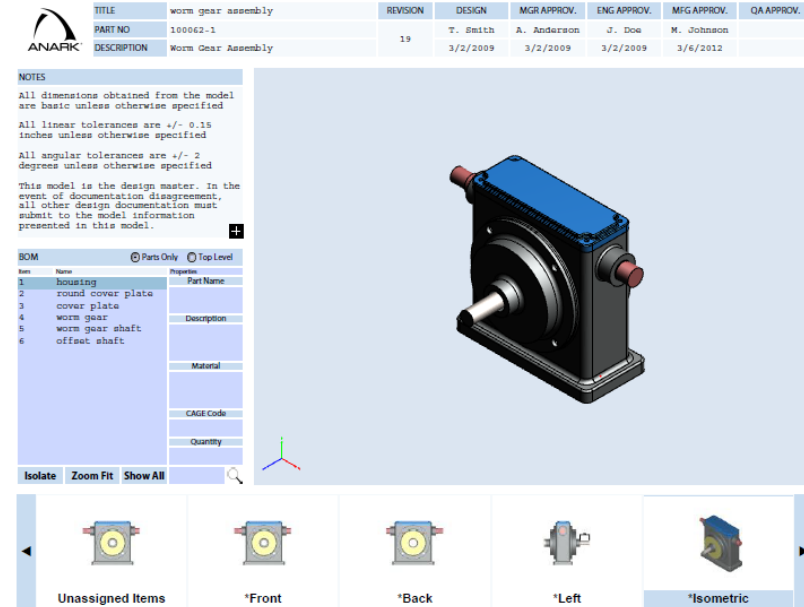
# Technical Data Package

## Release to Release GD&T Compare



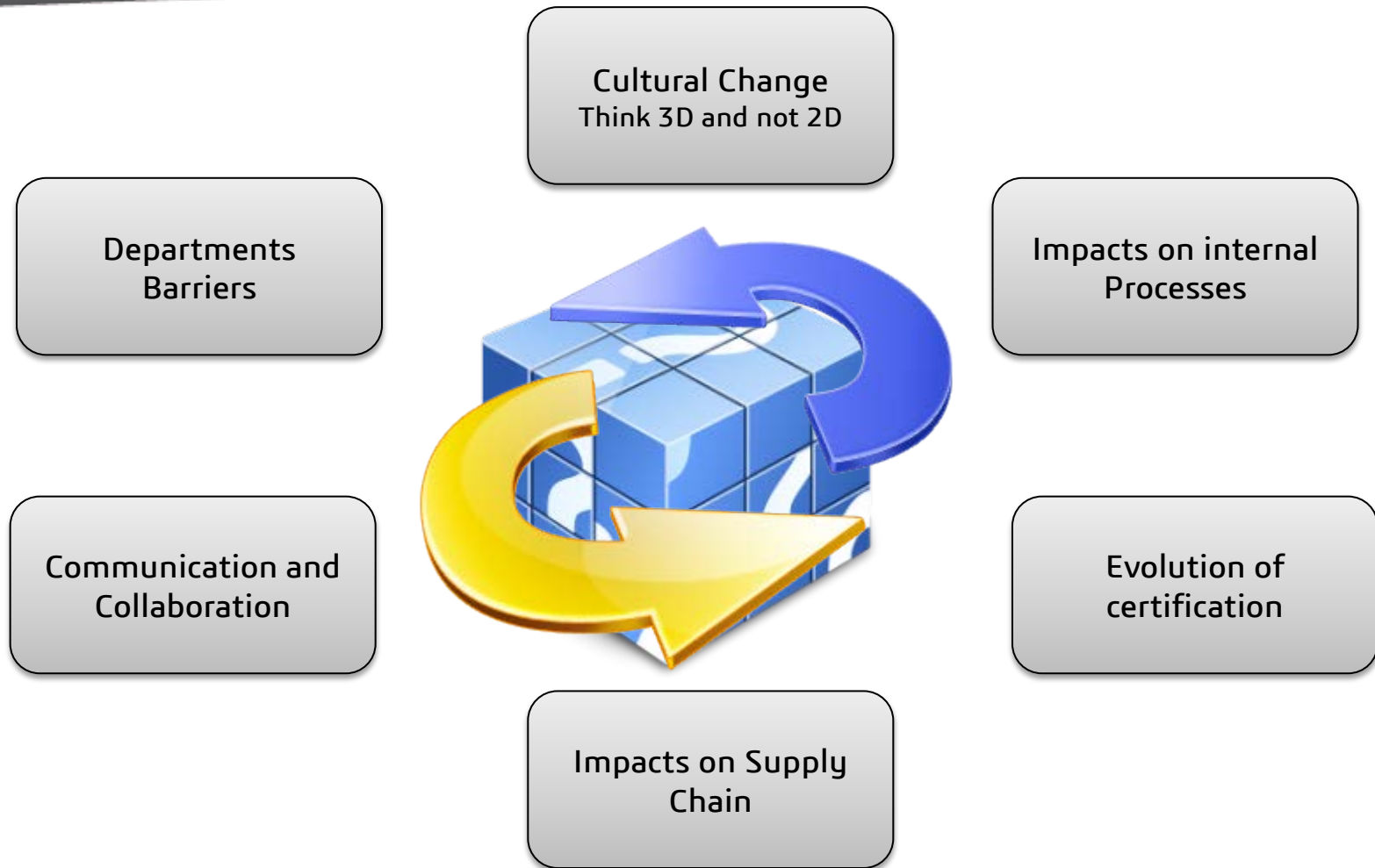
New Annotations

Old Annotations



Supplier BOM Package

# 3D Master: Important points to be considered





Thank You