

**INNOVATION**  
**WITHOUT LIMITATION**

- Innovation
- Systems Engineering
- The Business of Engineering
- PLM Underground

# Innovation without Limitation



“We are a product company”

“Clearly, the ability to produce fresh, new products and get them to market is key to our margins as well as our market share...”

# Innovation without Limitation

- Not just about building a faster mousetrap
- What about Packaging, Labeling, Compliance?
  - Limiting Liability?
  - Serviceability, Manufacturability, and Profit!



Innovation is not just about the Product !

**The Business of Engineering needs Systems Level Thinking**

# System Level Thinking

## Where's the Product?

- *The Device in your hand, or*
- *The Apps, the Services, or*
- *The Network with sufficient bandwidth*

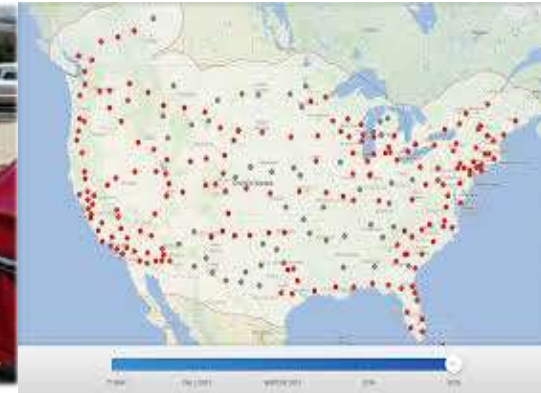
Phone is just a component, it's not the only Innovation



# System Level Thinking

Which is the innovation?

- a) Battery technology
- b) Buying experience (no dealers)
- c) Network of charging stations
- d) Marketing
- e) Over-the-air software updates
- f) All of the above



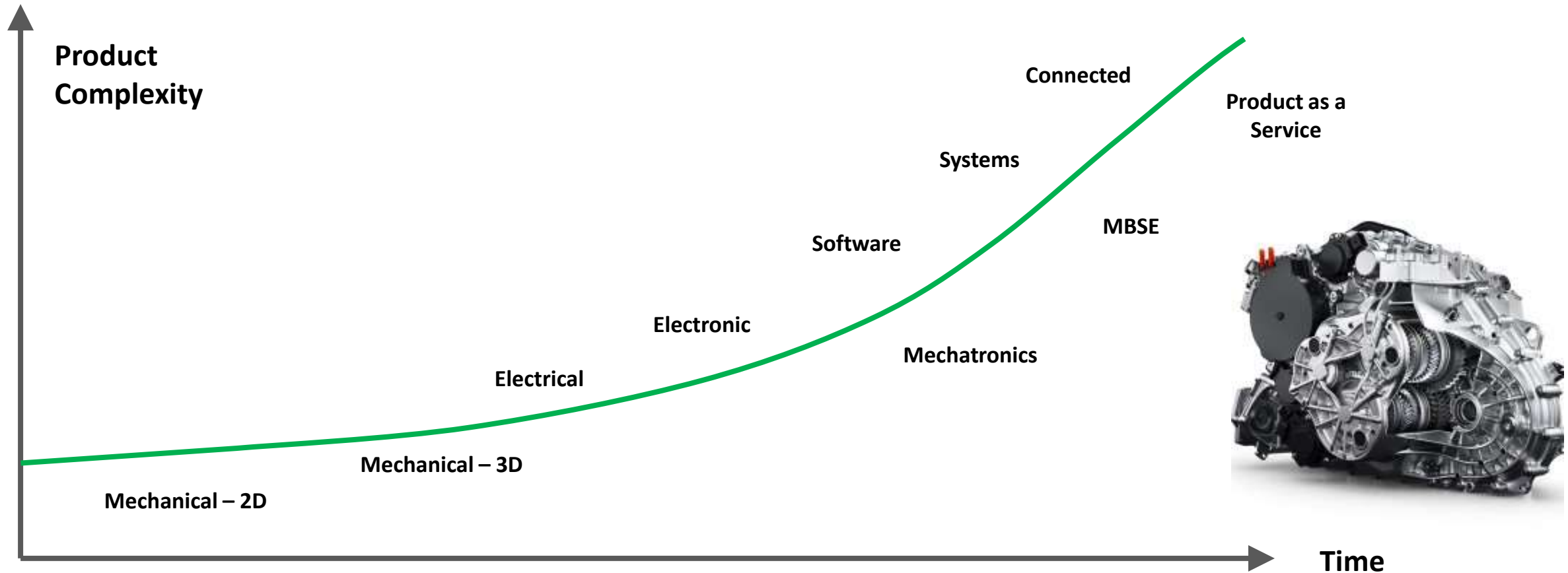
Or is the Innovation ...

Continuous Engineering at a Systems Level. The product has become a platform. What is the impact on your Design Processes, QA, Verification, Liability?

# Systems Engineering: Why Now?

Product complexity is increasing

*...and creating product liability and profitability challenges*



# Where is the System?





# Everything is a System



AAA AUTO PARTS CHICAGO, IL	405 F10-A10-K
612238	XYZ SUPPLIER, PARIS
	00010 00050 001
<b>9357-189887-000</b>	
	
49999	WIRING HARNESS
	189887-000
54436633	
	D960208
936958	
	
<b>RoHS Compliant</b>	
<small>Actual sample label printed on 1/18/02</small>	

**Top to Bottom Compression**

Pallet Stack:

Box Number:

Compression per Box:

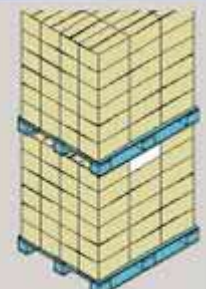
Multiply by Safety Factor:

Min T-B Compression:

This window calculates the minimum box compression for each box in the pallet. Most probably, you will need to choose the maximum value. However, you can deselect the checkbox below to choose the compression for the selected box only. In

Use max compression for all boxes

Cancel OK



Systems Engineering is PLM

PLM is Systems Level Thinking



# Innovation without Limitation



“To transform the company, you really need IT, which touches all parts of the business. And you need IT that is designed around *{your specific processes}*. There are no other *{companies like yours}* in the world...,” “One of the things that holds companies back is their technology legacy, and we are trying to push through that.”



## What's holding you back?

# Innovation without Limitation

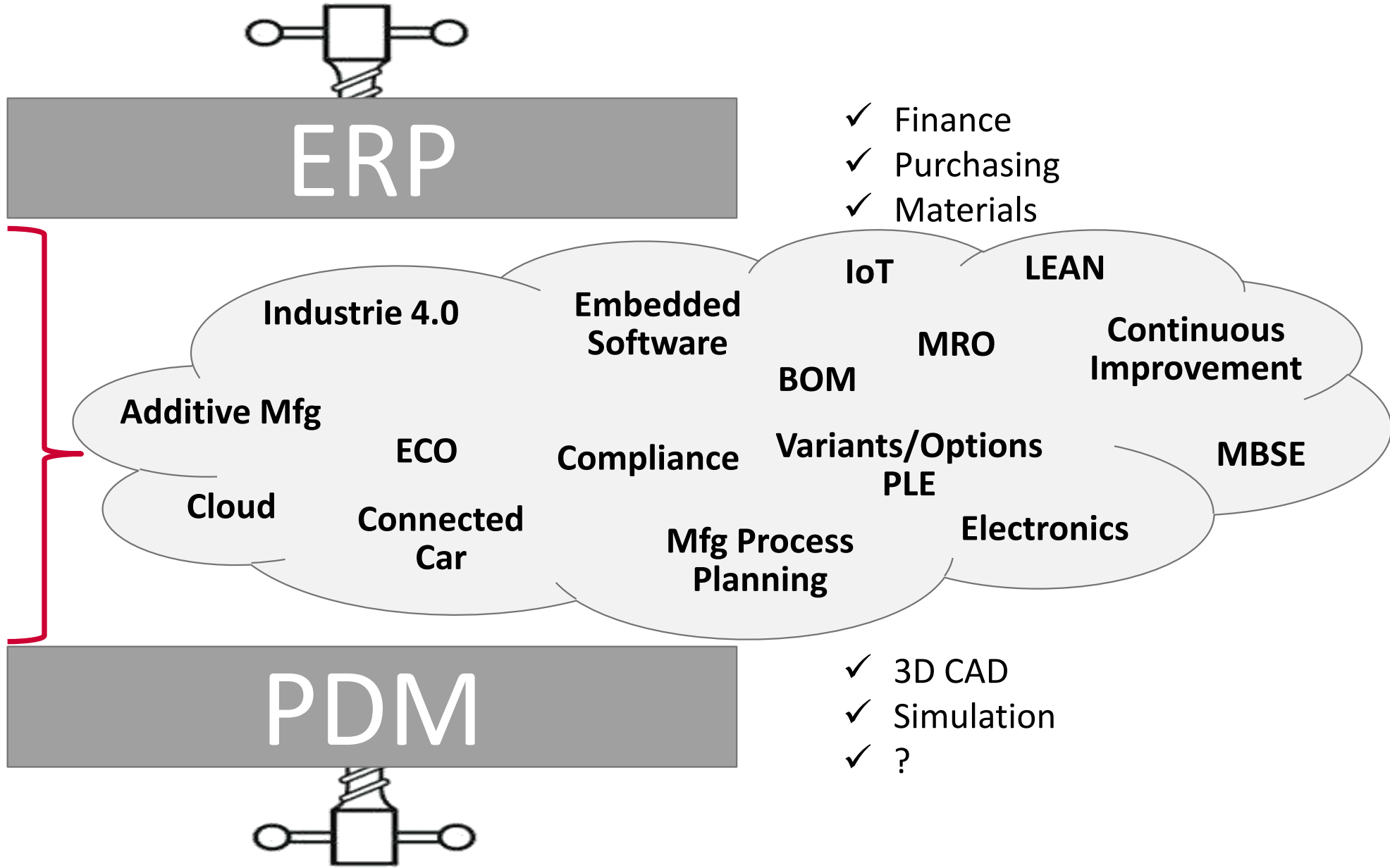


“To transform the company, you really need IT, which touches all parts of the business. And you need IT that is designed around *{your specific processes}*. There are no other *{companies like yours}* in the world...,” “One of the things that holds companies back is their technology legacy, and we are trying to push through that.”

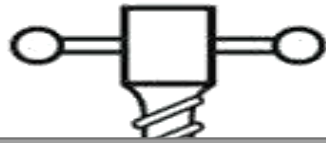


**What's holding you back?**

# Business of Engineering



# Reality Check



ERP

- ✓ Finance
- ✓ Purchasing
- ✓ Materials

**Business of Engineering**



Dropbox



PDM

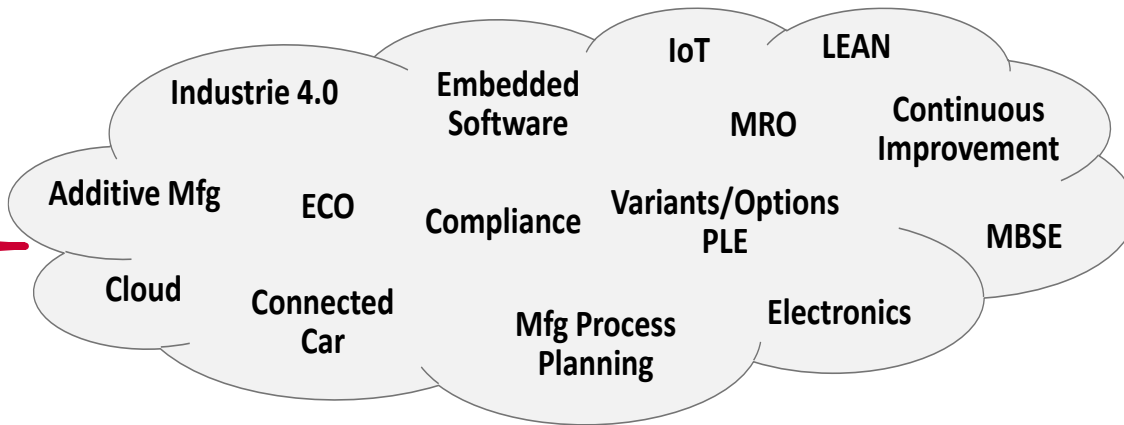
- ✓ 3D CAD
- ✓ Simulation
- ✓ ?



# Business of Engineering

ERP

- ✓ Control finance, materials purchase, inventory control
- ✓ Balance Sheet integrity to GAAP standards
- ✓ **Flexibility and change do not lead to data integrity**
- ✓ Specialist user community



PDM

- ✓ Control 3D CAD file Configurations
- ✓ Maintain Design integrity over decades
- ✓ **Flexibility and change risk breaking the 3D CAD Model**
- ✓ Specialist user community

# Business of Engineering

ERP

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- ✓ **Global users, casual users, non-employee users**
- ✓ **Everything changes, all the time**
- ✓ **Process centric, highly collaborative**
- ✓ **Key driver for competitive advantage**

PDM

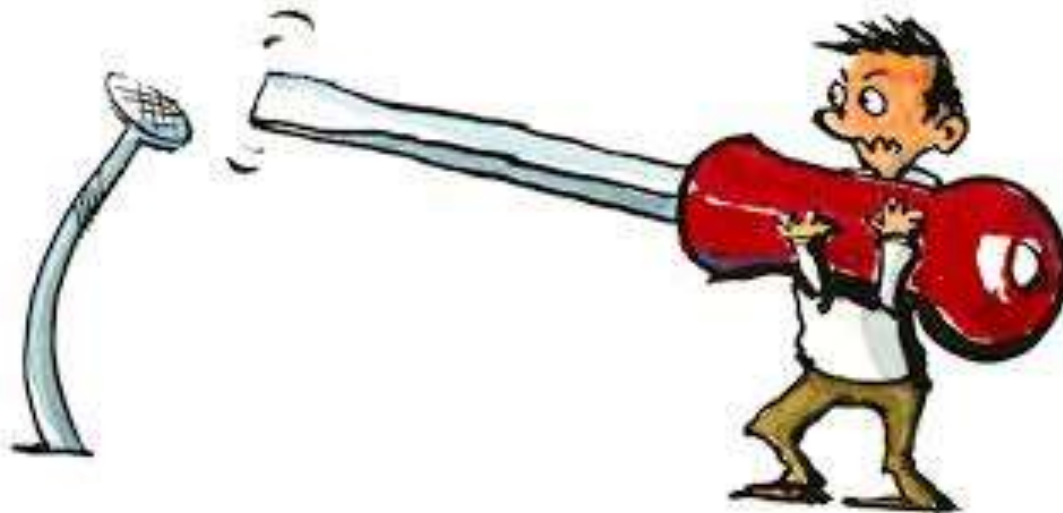
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# Business of Engineering

ERP

? Why did SAP not solve this problem



Data Model and  
Software Architecture  
do matter ...

PDM

? Why did Siemens not solve this problem



# Investment is not balanced with new reality

- **Electronics**
- **Electrical**
- **Software**
- **Manuals**
- **Packaging**
- **Services**
- **IoT**
- **Manufacturing**
- **Phase-Gate**
- **Cost**
- **BOM**
- **Quality**
- **Supply Chain**
- **Compliance**
- **Variants-Options**



- **Mechanical**

**Science of  
Engineering**



**Business of  
Engineering**



# Is this the End of Mechanical?

Of Course Not...

- The Science of Engineering is still critical
- Aras continues to invest in 3D CAD and Simulation management

We Propose only that a Balance is Needed



And that One System can not solve the Whole Problem

# Business of Engineering



ERP

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aras  
**INNOVATOR**<sup>®</sup>  
PLM Platform

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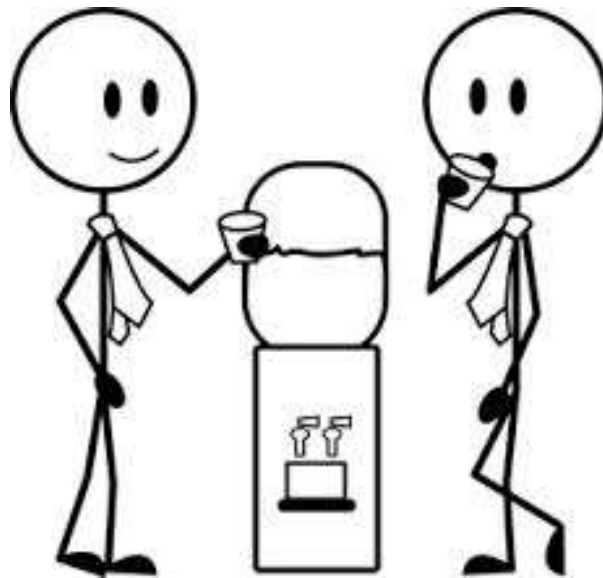
PTC  
Autodesk

PDM

Aras  
Siemens  
Dassault

- ✓ Control 3D CAD file Configurations
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What do you  
think about the  
Business of Engineering?



No worries...  
just another  
buzzword

- Digital Thread
- Digital Twin



# Digital Thread

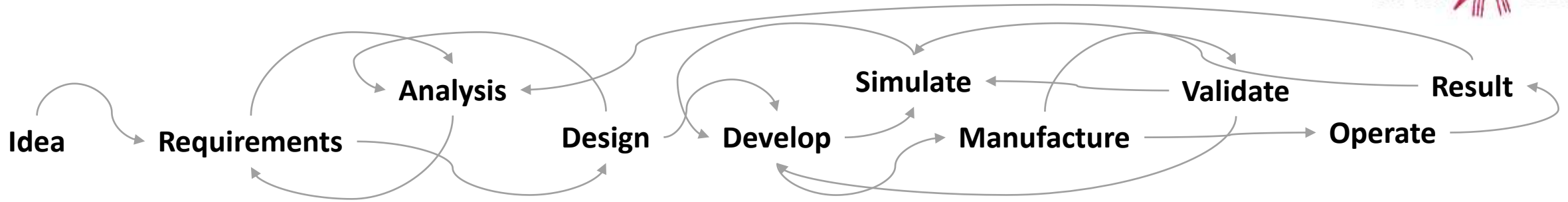


*Digital Thread is the creation and use of cross-domain, common digital surrogates of a materiel system to allow dynamic, contemporaneous assessment of the system's current and future capabilities to inform decisions in the Capability Planning and Analysis, Preliminary Design, Detailed Design, Manufacturing, Testing, and Sustainment acquisition phases.*

**D'oh!**



# Digital Thread



## Queryable dataset with all the versions of data, results and decisions across the lifecycle

- How do we make decisions, who made the decision, what were the known facts at the time of the decision, and what are the long term results of those decisions
- Every step gets controlled, accurate, and digital inputs, and then links these to its outputs
- No Paper, No Excel, no USB-sticks

- Just having a 3D CAD model does not build a Thread
- Thousands of Excel files are not a Thread



# Digital Twin



“Digital model of a real-world physical asset”

Used to:

- Simulate impact of proposed changes
- Verify that the physical asset was built/maintained correctly
- Manage the context for IoT real-world performance data

# Digital Twin

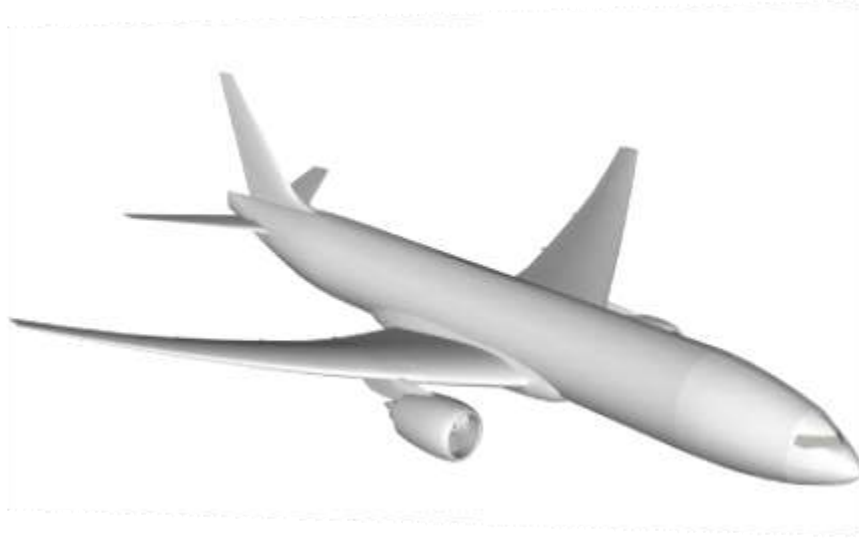
Quiz:



Is the 3D CAD Model (left) a Digital Twin of the Aircraft (right) ?

# Digital Twin

Quiz:



3D CAD does not contain critical data about electronics, software, versions, maintenance history, part replacements, re-test results, ...

If we are going to make decisions based on the Digital Twin, it needs to represent the actual Aircraft

Systems Engineering,  
Digital Thread,  
Business of Engineering,  
Digital Twin!



Just  
wish it was  
easier to use ...

# The PLM Underground



- Too much of PDM, PLM and the Business of Engineering is running outside of the enterprise IT platforms. Why?
  - IT not able/willing to keep up with changing business requirements
  - Too complicated to use

# Open PLM Community Challenge



## Usability

Re-think the user experience of PLM

How to both visualize complex data and processes and simply find the data you need to make decisions

An open community innovating around an open flexible architecture is the right approach



# Just Simply Works



I   
PLM

*Business of Engineering PLM must engage the end-users*

- Systems Level thinking is required for innovation
- Monolithic software is old thinking; PLM (Business of Engineering) is not the same as PDM
- We are not done making PLM usable, scalable, resilient → open PLM community challenge



# Next Steps



- Aras PDM deep integrations into M-CAD, E-CAD, MBSE, CASE
- Systems Engineering / Requirements Engineering / MBSE
- Technology platform – usability, flexibility, scalability, resilience
- Business of Engineering Applications

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