

Advancing the Product Development Process







**From Individual Heroics to
Enterprise-Wide Collaboration**

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MSC Software Corporation
10/18/2004

Agenda

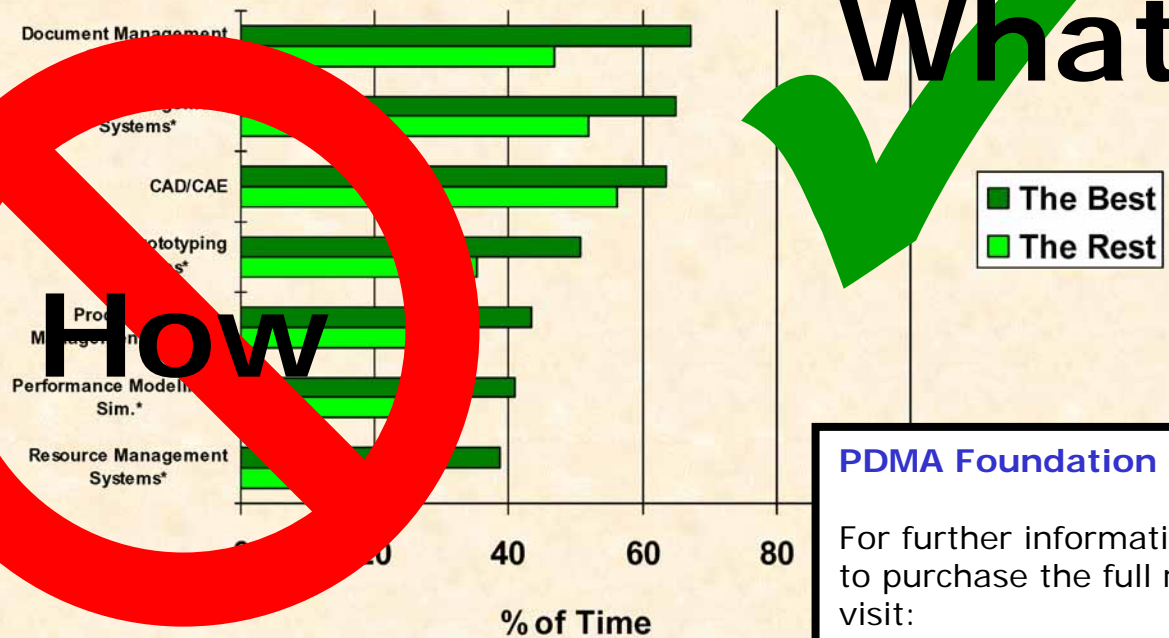
- PDMA Foundation CPAS Study
- Select CMMI Process Areas
- Virtual Product Development Maturity Model
- Latest Appraisal Data – Auto, Aero
- Aero Flight Controls Amplification
- Conference Resources

Overview

Data	What	How
PDMA CPAS Study		
CMMI Processes		
VPD Maturity Model		

PDMA Foundation

Technology Tools – Most Utilized (in order of usage by “The Best”)



What

How

PDMA Foundation
For further information, or to purchase the full report, visit:
<http://www.pdma.org>

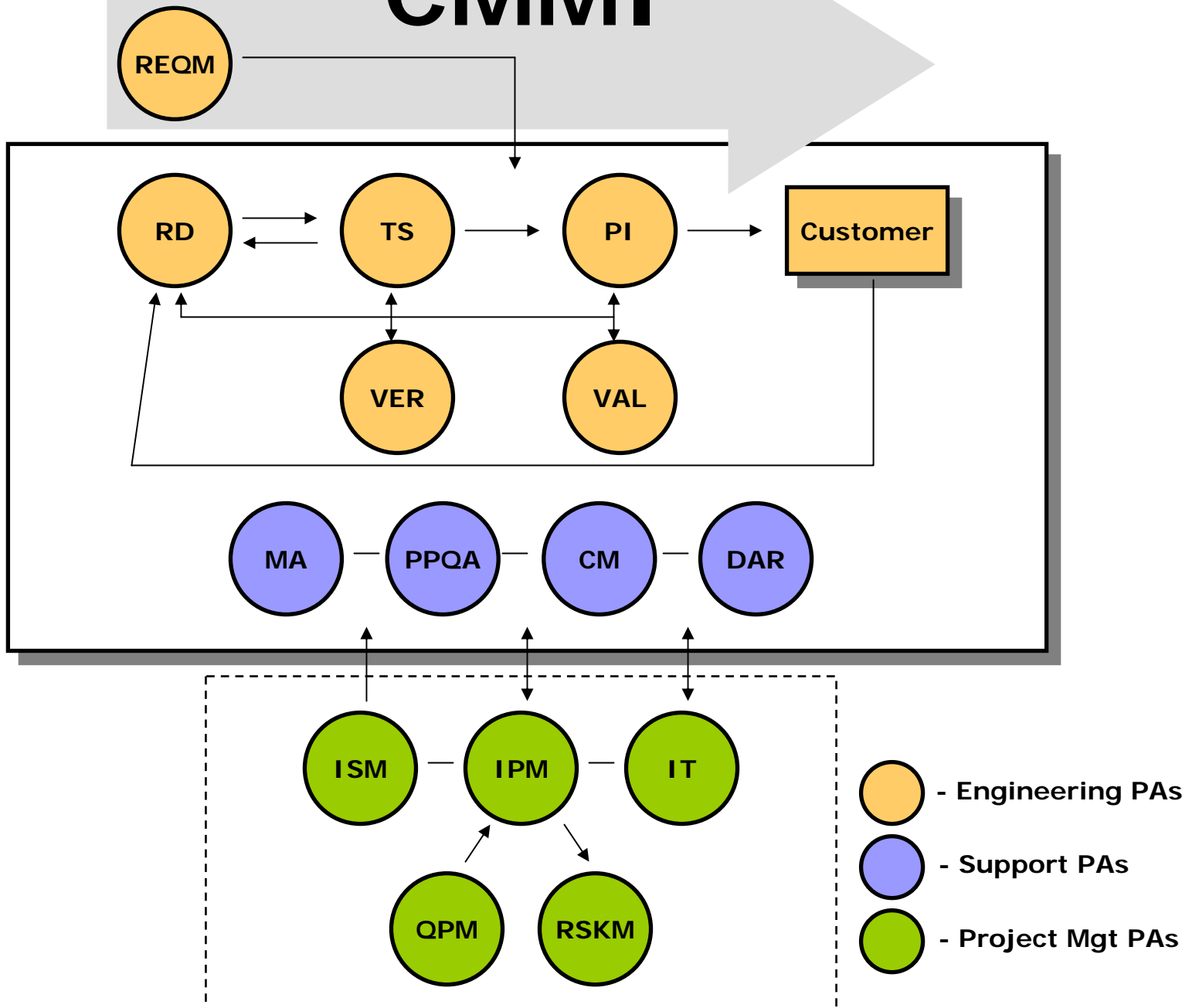
*p <.05, best vs. rest

Section IV - P.11 Q.1

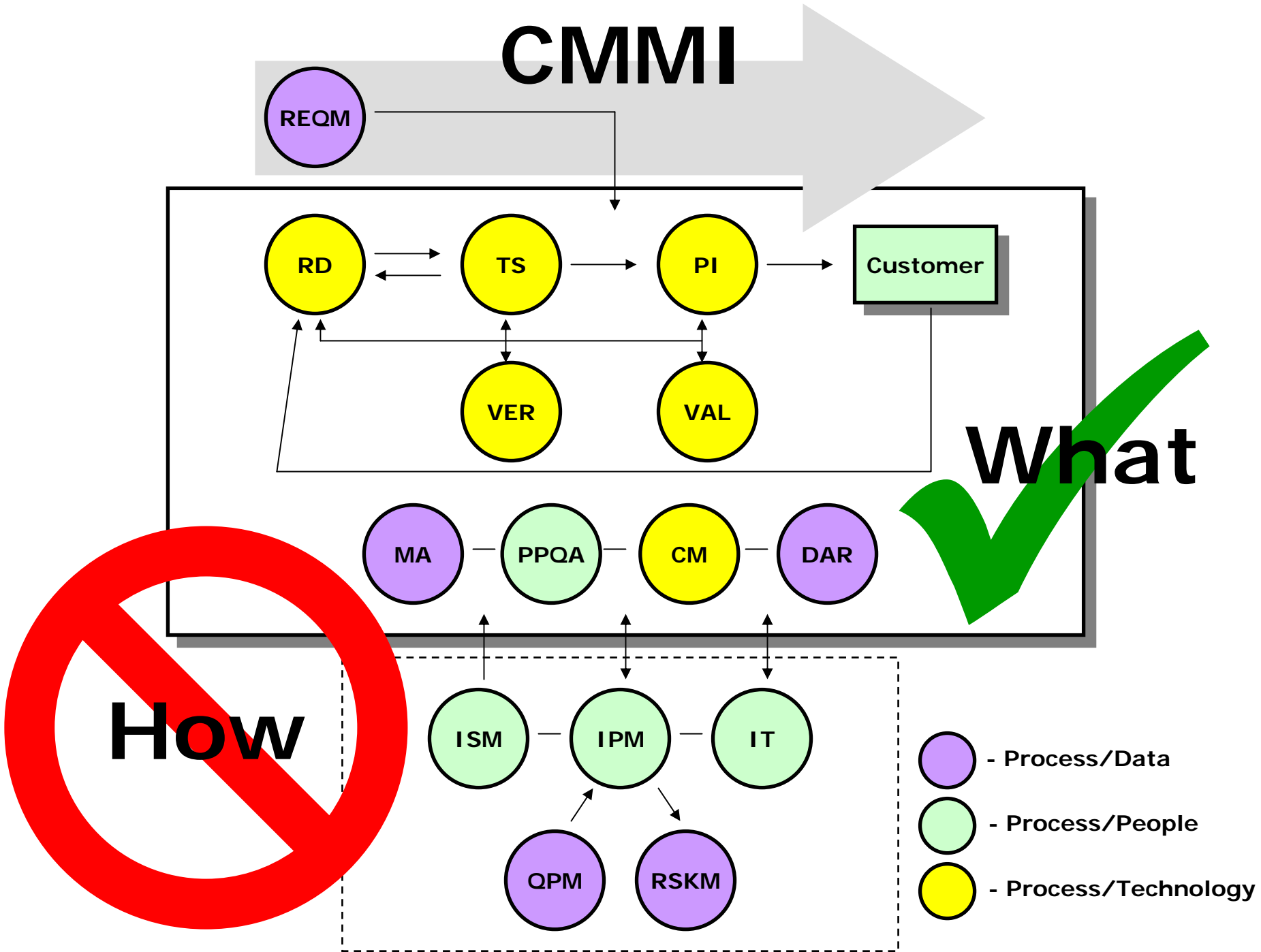
Initial Findings

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CMMI



CMMI



Driving Factors

- As Virtual Product Development is becoming mainstream ...
 - companies are looking to rate their processes against industry leaders
 - companies are looking to apply tools for quality control and continuous improvement
 - companies are looking for the “how” as well as the “what”



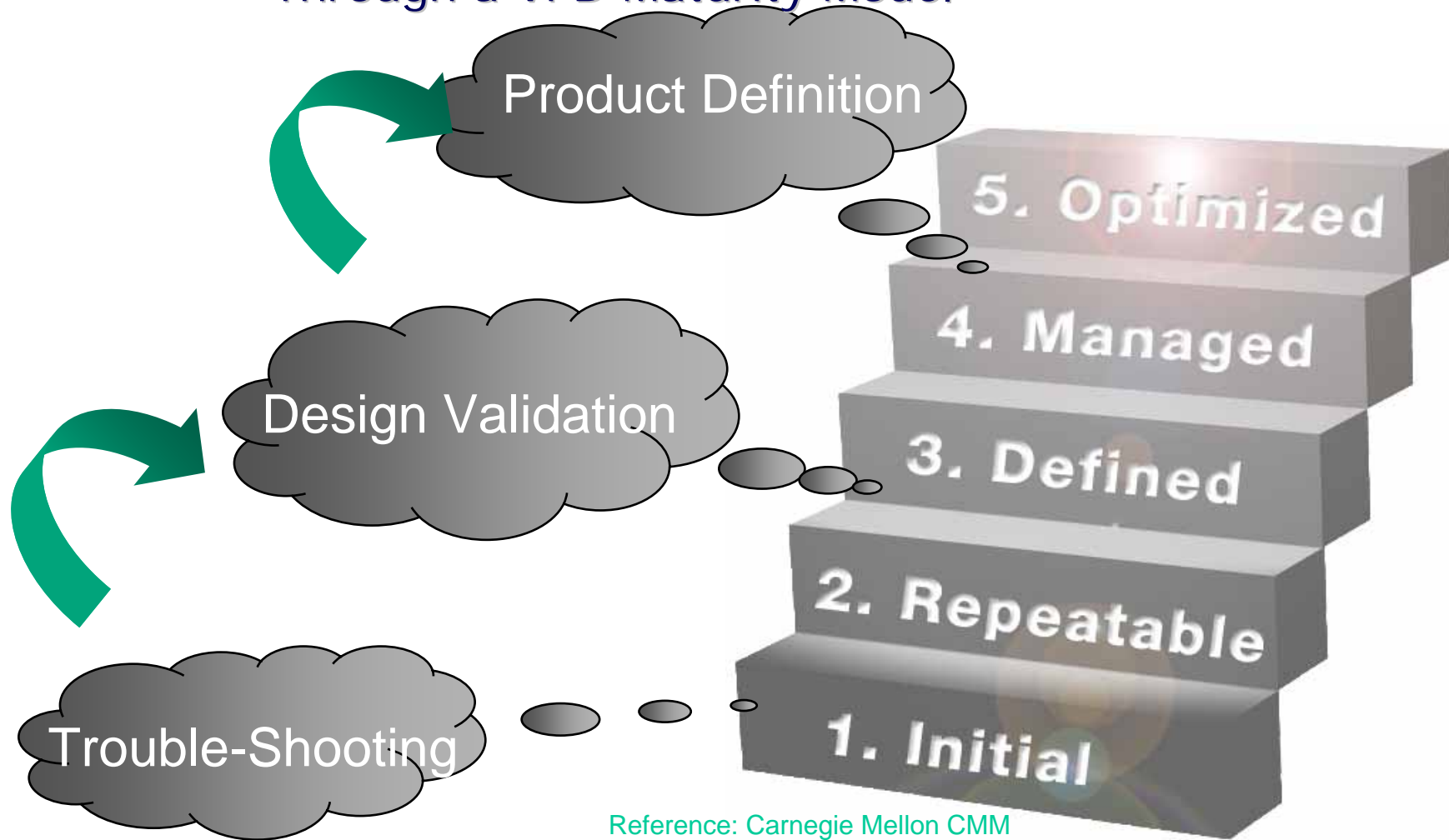
What



How

VPD Positioning and Deployment

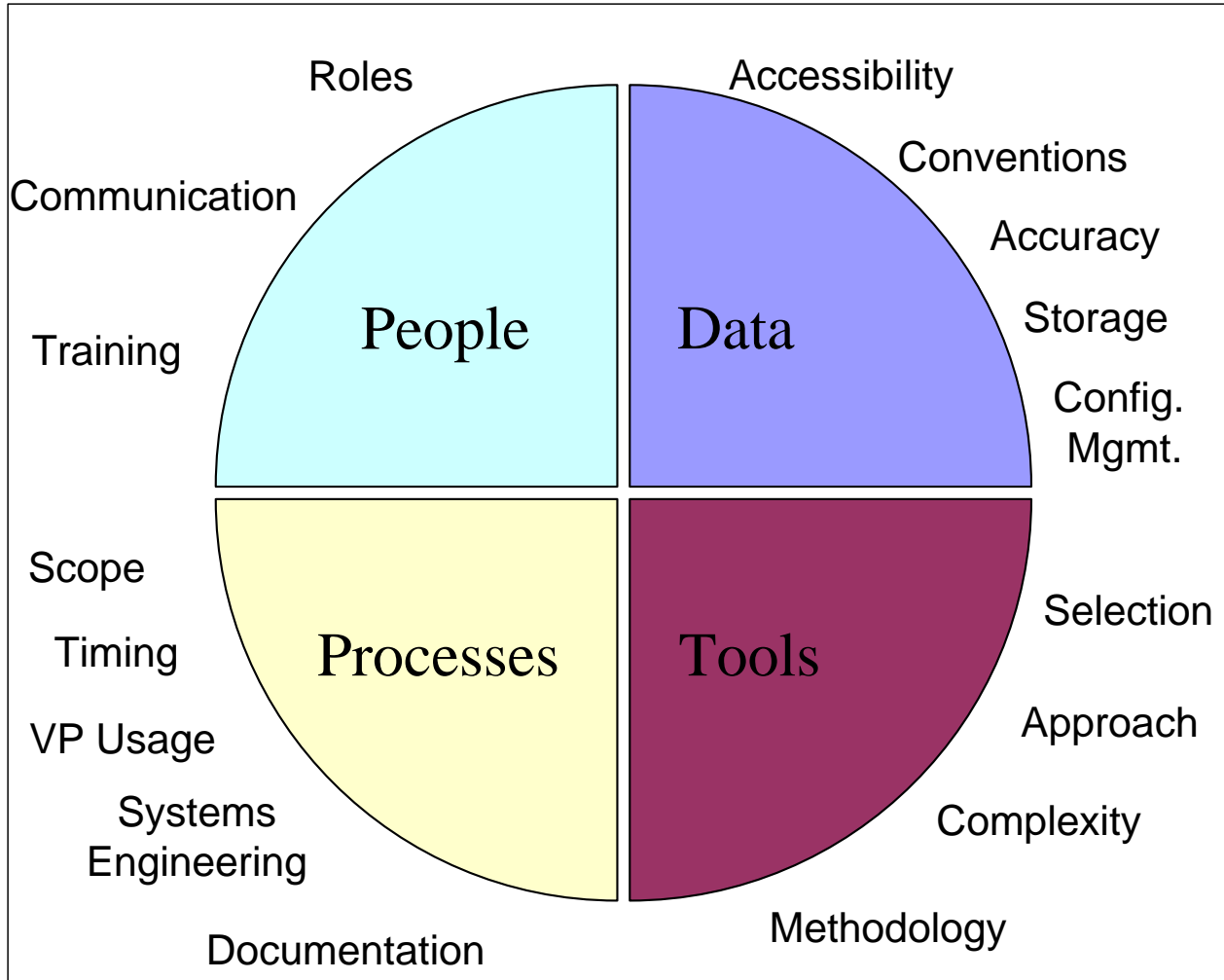
Through a VPD Maturity Model



Reference: Carnegie Mellon CMM

<http://www.sei.cmu.edu/cmm/cmm.sum.html>

VPDMM Breakdown



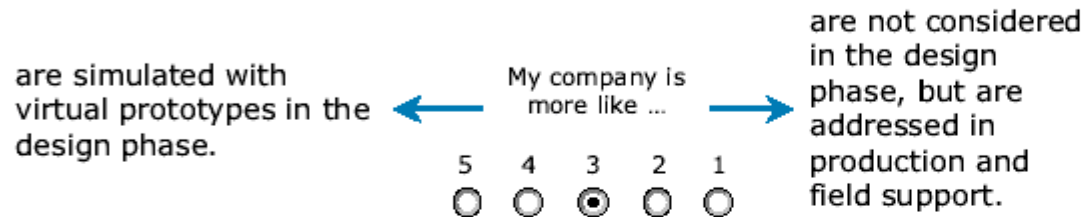
Topic: Robust design

Perspective: To what extent are product usage uncertainties and manufacturing process variations simulated with virtual prototypes?

Select if not applicable.

1. Maturity state

Product usage uncertainties and manufacturing process variations ...



2. Procedures

Is there a documented procedure? yes no

Is the procedure followed? yes no

Is the procedure formally audited? yes no

3. Fit within company

How important is robust design within your company? Very important 5 4 3 2 1 Not important

How well is robust design performed within your company? Very well 5 4 3 2 1 Poorly

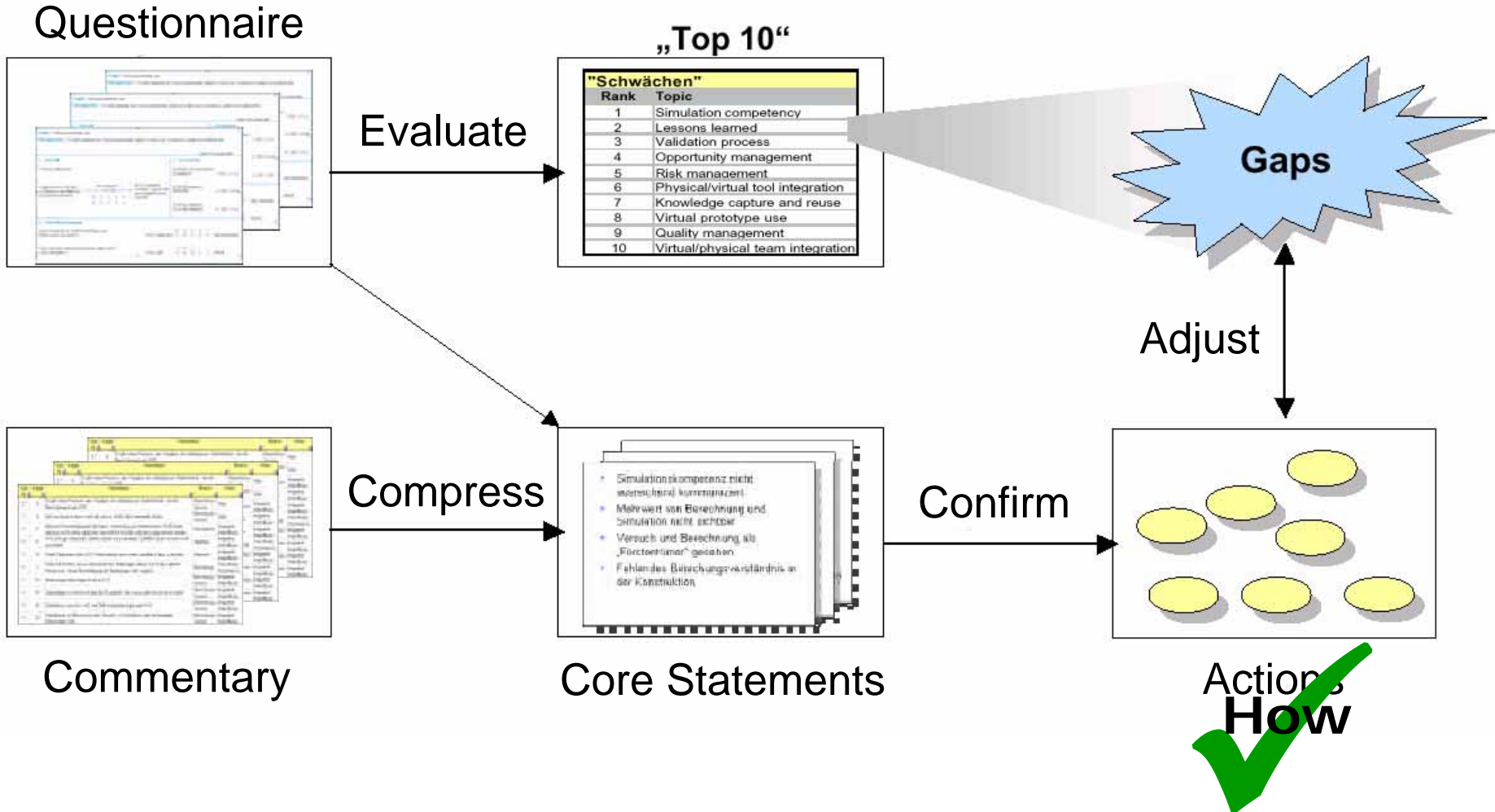
Comments, improvement suggestions, primary points of contact:

More of a research competency used by specialists only. Find a way to deploy to the masses on every new product development program. Contact John Hill at 555-283-1285.

What



Data Analysis Process to Derive Actions



Where are the biases?

Most Important Gaps (ALL)

Measure	Category		
	CAE	CAD	PDM
Hit Rate	29%	22%	27%
Avg Gap	2.14	1.93	2.03
Profile	37%	28%	35%
VPD Maturity Model			
Level	2.4	2.7	2.9

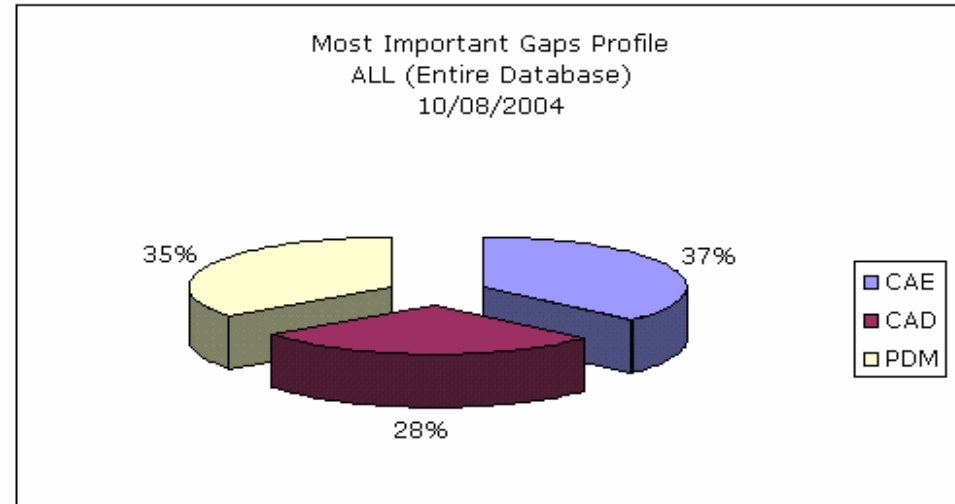


Where are the gaps?

Industry	ALL (Entire Database)
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Surveys	526
Companies	134

Rank	Topic	Hits
1	Lessons learned	243
2	Knowledge capture & reuse	231
3	Data integrity	224
4	Robust design	212
5	Data flow	204
6	Physical/Virtual tool int.	194
7	PDM/Enterprise systems int.	194
8	Quality management	191
9	Validation process	180
10	Risk management	173



Rank	CAE	CAD	PDM
1	Lessons learned	Design/Engineering tool int.	PDM/Enterprise systems int.
2	Knowledge capture & reuse	Knowledge capture & reuse	Workflow
3	Data integrity	Supply chain exchange	Collaboration

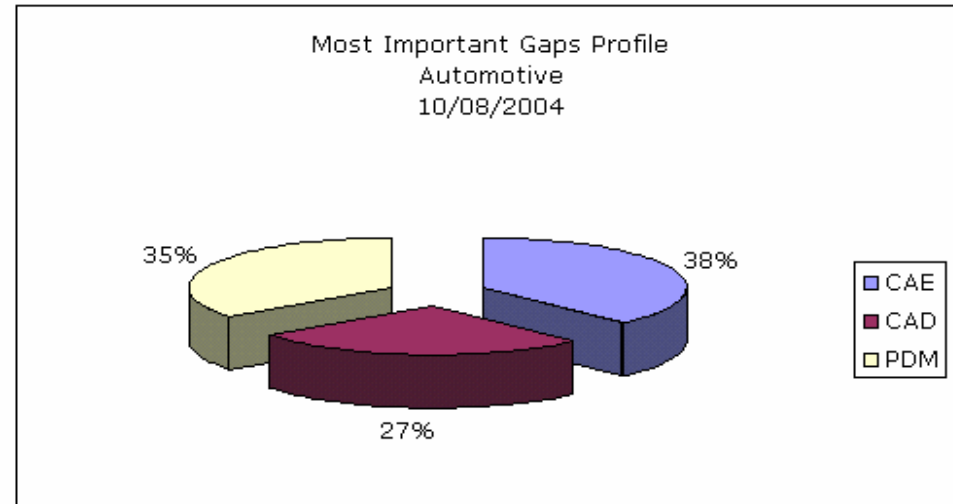


Where are the gaps?

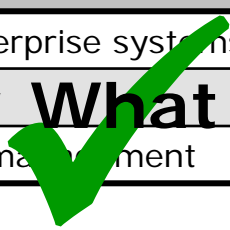
Industry	Automotive
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Surveys	292
Companies	60

Rank	Topic	Hits
1	Lessons learned	156
2	Robust design	139
3	Knowledge capture & reuse	135
4	Data integrity	122
5	Physical/Virtual tool int.	117
6	Quality management	110
7	PDM/Enterprise systems int.	109
8	Data flow	107
9	Validation process	107
10	Risk management	104



Rank	CAE	CAD	PDM
1	Lessons learned	Supply chain exchange	PDM/Enterprise systems int.
2	Robust design	Knowledge capture & reuse	Workflow
3	Knowledge capture & reuse	Design/Engineering team int.	Change management

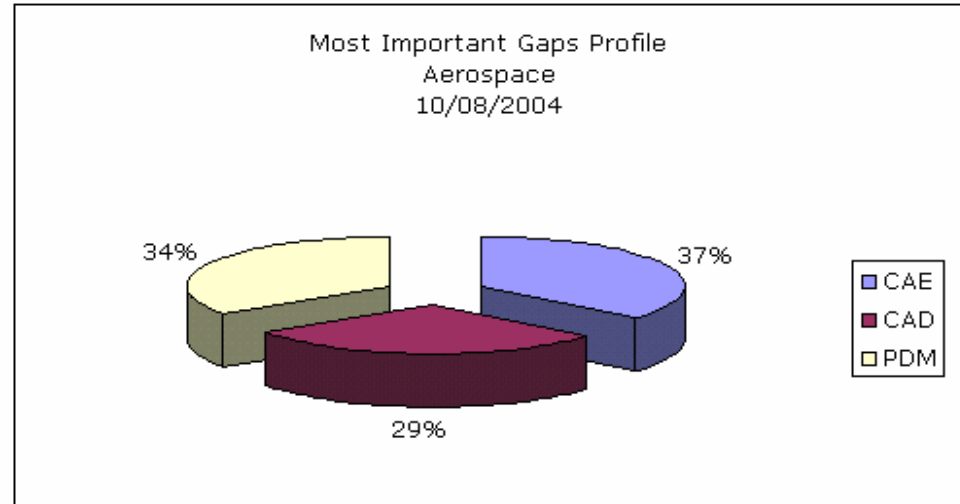


Where are the gaps?

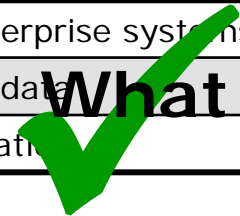
Industry	Aerospace
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Surveys	92
Companies	49

Rank	Topic	Hits
1	Data integrity	49
2	Data flow	43
3	Lessons learned	38
4	Knowledge capture & reuse	37
5	PDM/Enterprise systems int.	37
6	Design/Engineering tool int.	35
7	Internal data	33
8	Supply chain exchange	32
9	Collaboration	32
10	Quality management	31



Rank	CAE	CAD	PDM
1	Data integrity	Design/Engineering tool int.	PDM/Enterprise systems int.
2	Data flow	Supply chain exchange	Internal data
3	Lessons learned	Knowledge capture & reuse	Collaboration

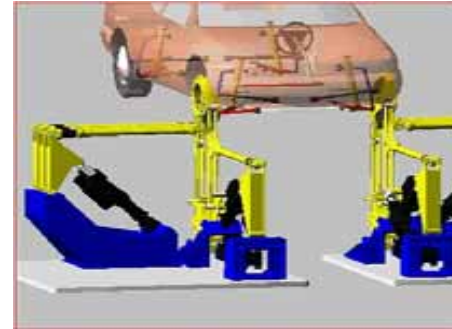


Summary

UNIQUE



- Desire to use virtual prototyping as part of an overall risk management strategy
- Need to further simulate product usage uncertainties and manufacturing process variations
- More tool integration to support better physical and virtual tests
- Improved model validation - build long term confidence



Auto

5	Risk management
9	Robust design
16	Physical/Virtual tool integration
25	Validation process

COMMON | Auto | Aero

4	Quality management
10	Data flow
11	Data integrity
12	Lessons learned
13	Knowledge capture & reuse
54	PDM/Enterprise systems integration

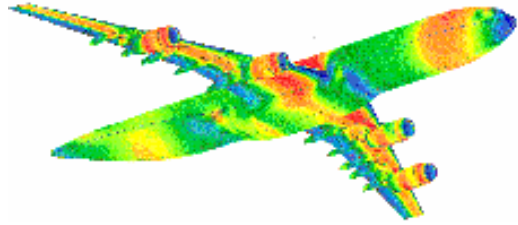
- VPD should be quality focused
- Capture and reuse of virtual prototype data is still problematic
- Better virtual prototype data must be produced to make product design & release decisions
- Infrastructure improvements are required

Summary

UNIQUE



- Develop plug-and-play component and subsystem models to optimize system performance
- More tool integration to support better collaboration between designers and analysts
- Continue transition from paper based processes to full use of electronic media
- Enhance communications and bi-directional product data sharing with customers and suppliers



Aero

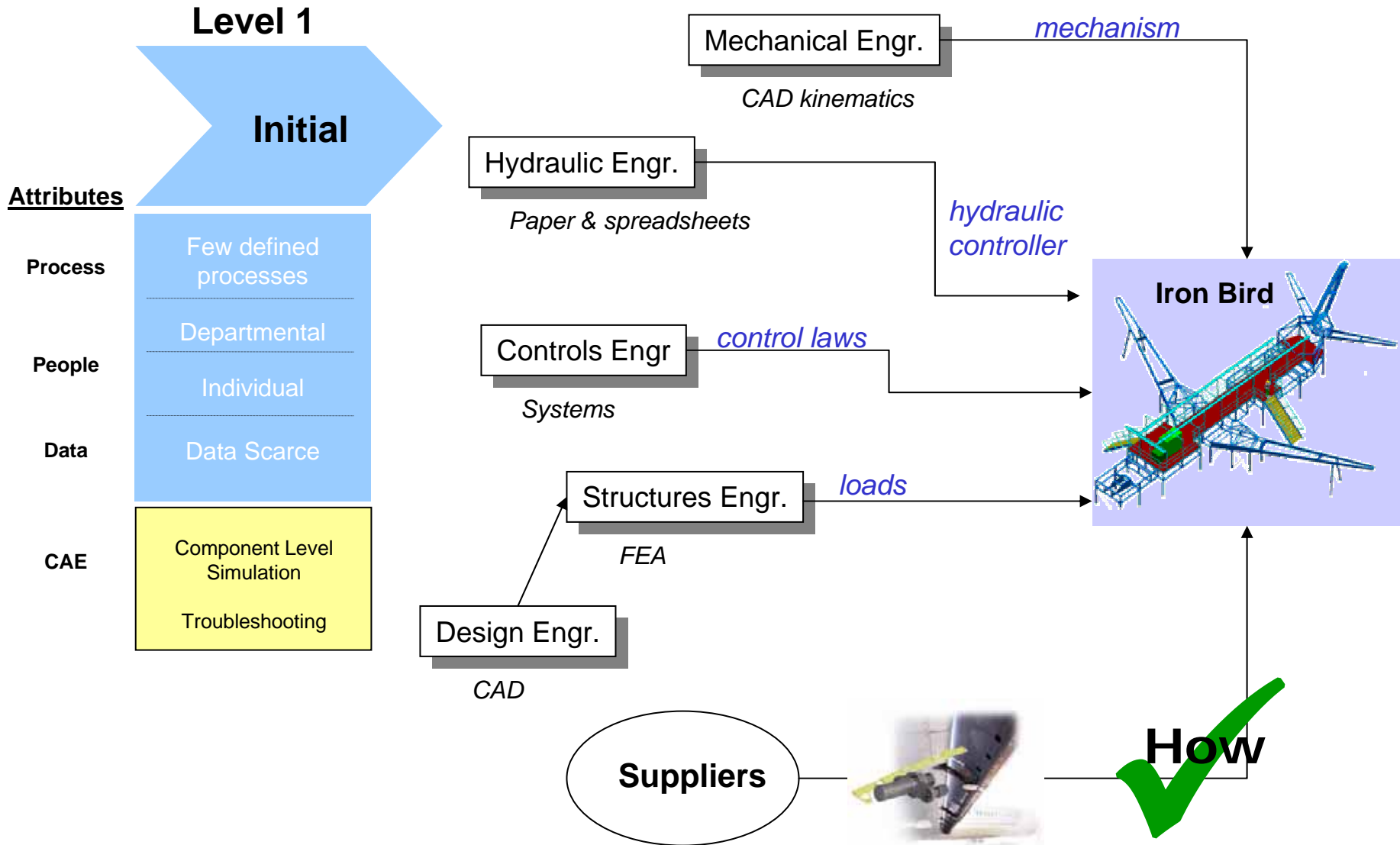
2	Supply chain exchange
31	Design/Engineering tool int.
45	Internal data
50	Collaboration

COMMON | Aero | Auto

4	Quality management
10	Data flow
11	Data integrity
12	Lessons learned
13	Knowledge capture & reuse
54	PDM/Enterprise systems integration

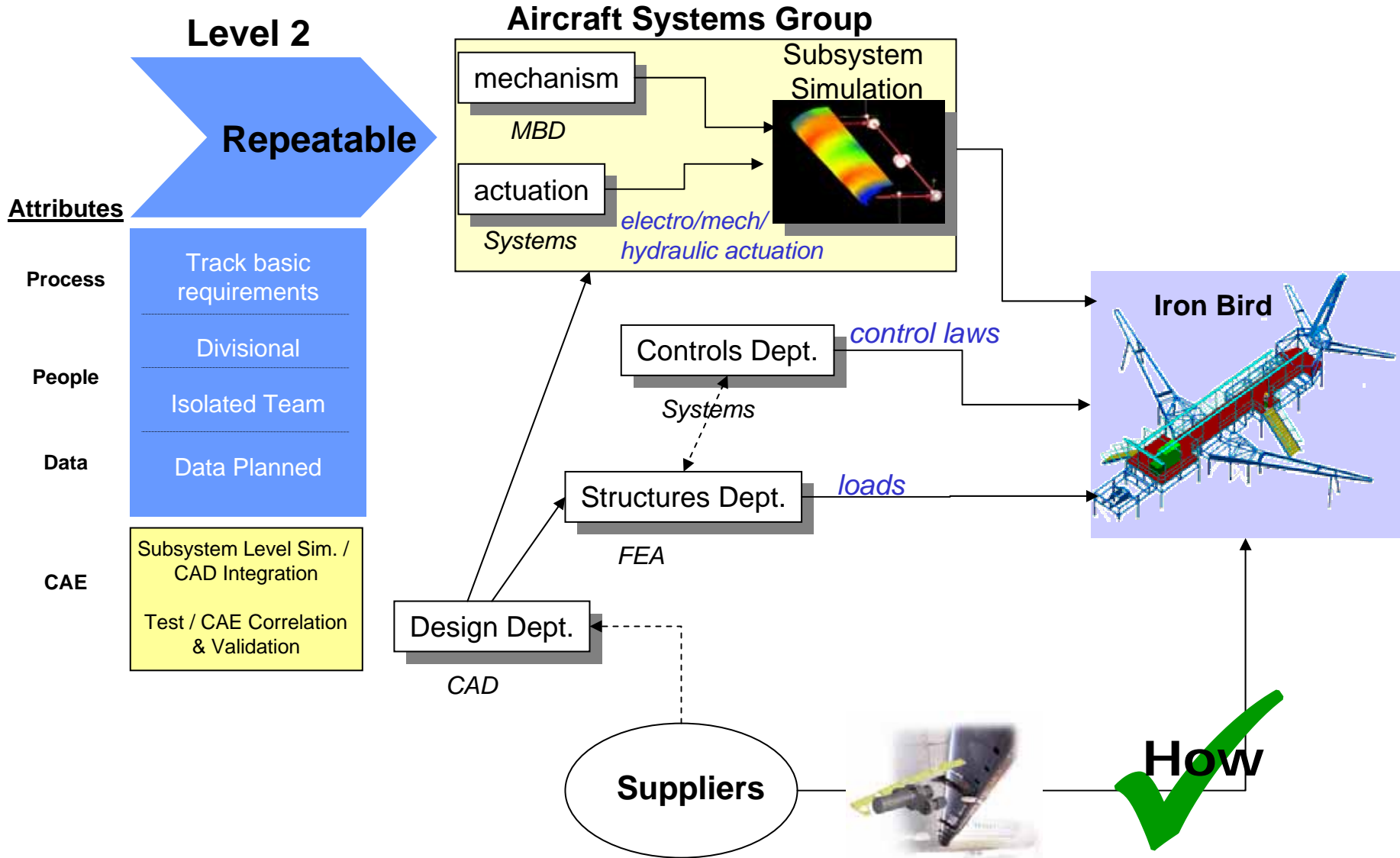
- VPD should be quality focused
- Capture and reuse of virtual prototype data is still problematic
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Flight Controls – Level 1



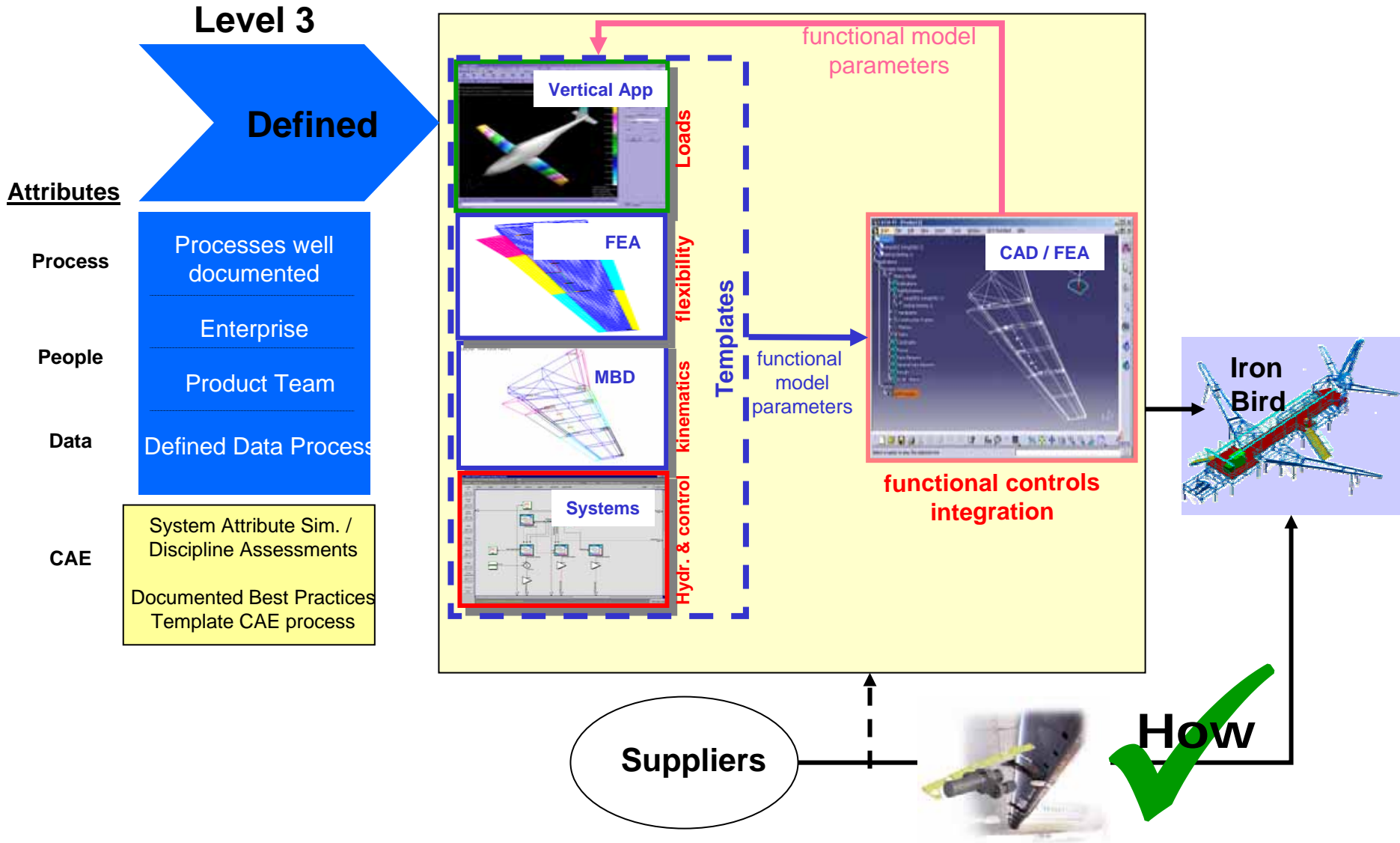
Flight Controls – Level 2

Current State



Flight Controls – Level 3

Supports Goals



Flight Controls – Level 4

Level 4

Managed

Attributes

Process

People

Data

CAE

Process measured and controlled

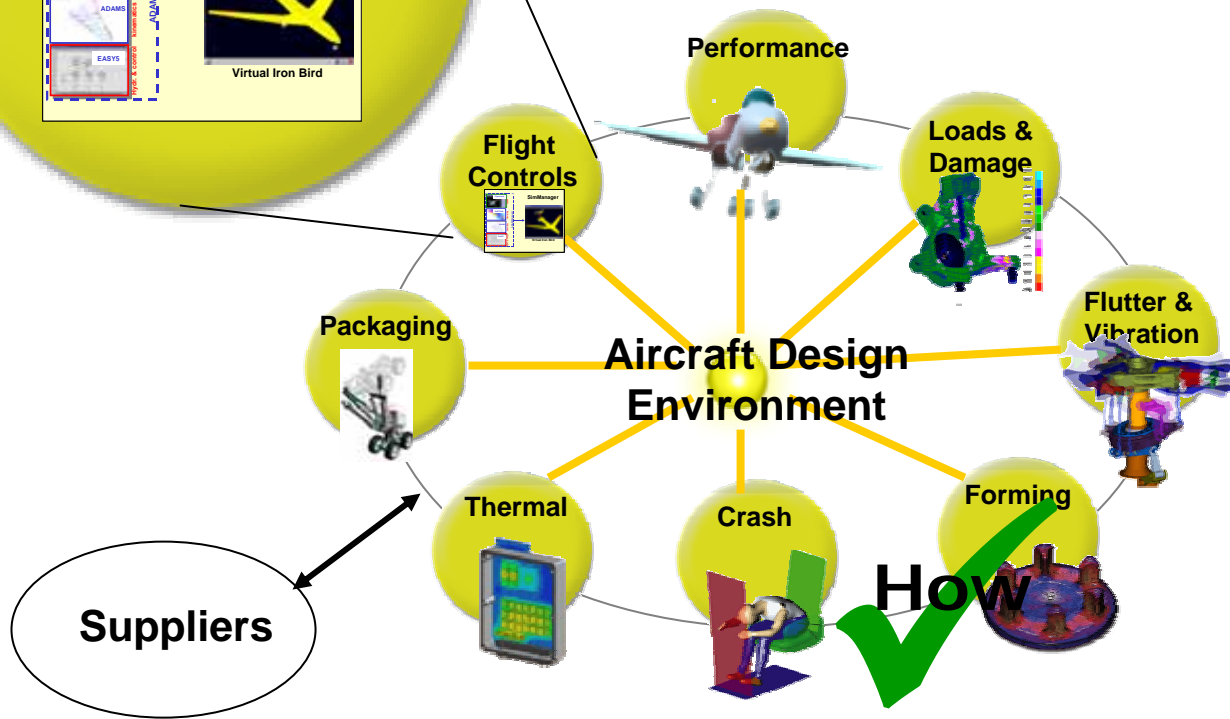
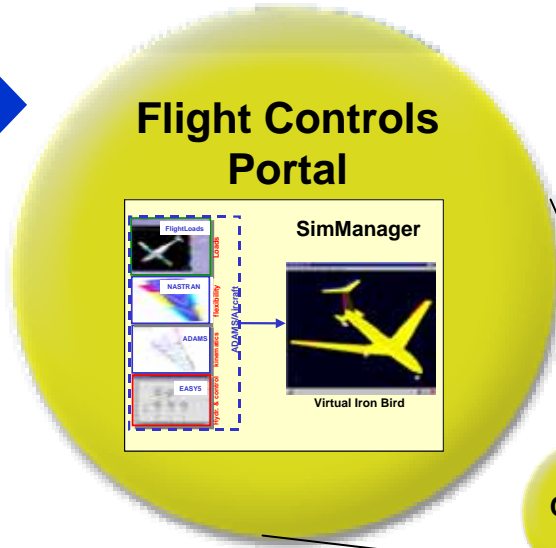
Supply Chain

Platform Team

Standardized Data Methods

Multi-disciplinary Assess /
Sim. Process Capture

Enforced Best Practice
Managed Data & Models



Suppliers

How

Flight Controls – Level 5

Level 5

Optimized

Attributes

Process

Continuous process improvement

People

Global Team

Platform, Supplier

Data

Innovation-driven Insight

CAE

Robust Design /
Stochastics / Collaboration

Project Level /
Knowledge Reuse

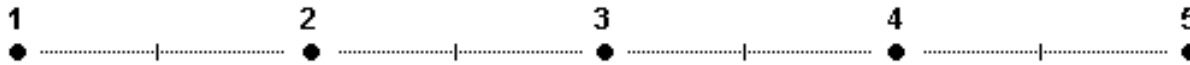
- Continuous Process Improvement
- Project knowledge capture
- System level Robust Design
- Virtual Certification



How



Where are the leaders?



Level 1

Level 2

Level 3

Level 4

Level 5

Initial

Repeatable

Defined

Managed

Optimized

Process

People

Data

Technology

CAD

CAE

TEST

MFG

PDM

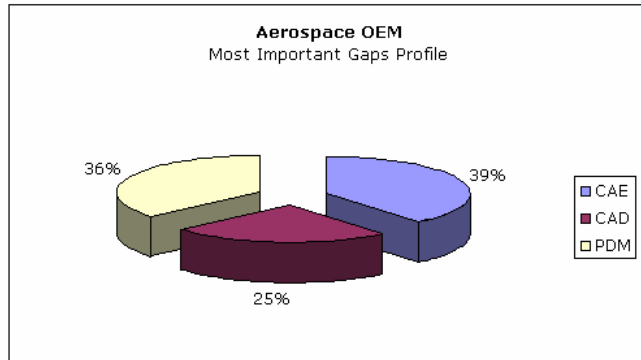
SYSTEMS

Rest

Best



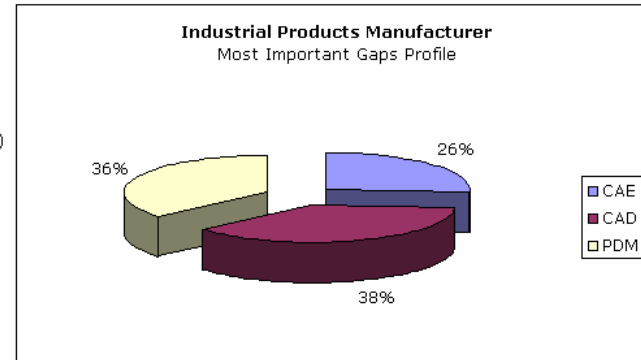
Where are your gaps?



Measure	CAE	CAD	PDM
Hit Rate	35%	15%	36%
Avg Gap	2.03	1.43	1.83

Themes

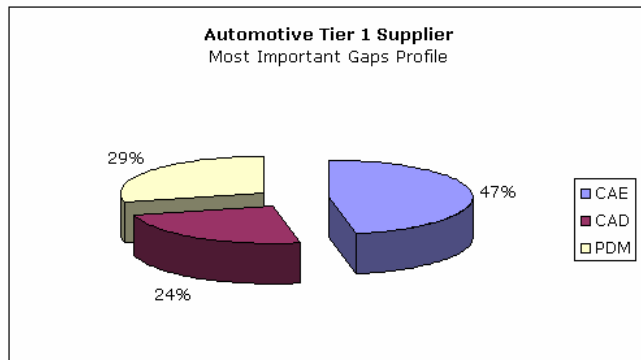
1. Methods & Skill Development
2. Data Management (VP, PDM)
3. Test & Correlation
4. Organizational Alignment



Measure	CAE	CAD	PDM
Hit Rate	17%	23%	36%
Avg Gap	2.43	1.73	2.58

Themes

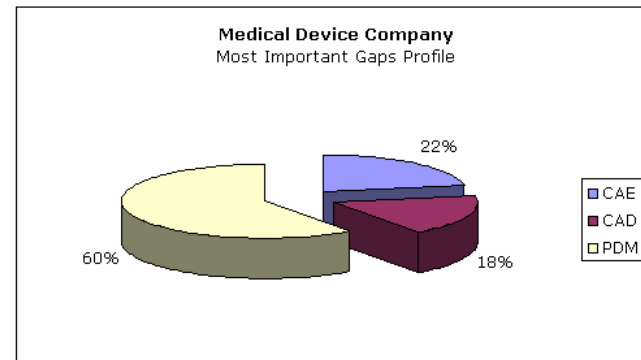
1. Data Management (Internal)
2. Product Definition (Assembly)
3. Virtual Prototyping
4. Tool Integration



Measure	CAE	CAD	PDM
Hit Rate	37%	19%	23%
Avg Gap	1.84	2.06	2.27

Themes

1. Validation Process
2. Accountability
3. Robust Design
4. Process Automation



Measure	CAE	CAD	PDM
Hit Rate	21%	18%	58%
Avg Gap	2.10	1.86	2.09

Themes

1. Data Management
2. Process Automation
3. Verification & Validation



Conference Resources

- “Predicting and Measuring the Value in Process Change”;
Tuesday, 10/19, Management Track
- Technical Resource Center
 - VPD Environments Lab
 - VPDMM 1-on-1 Discussions
 - <https://www.engineering-e.com/vpd>

Thank You!