



Part of
Sandvik Group

Leverage CAD & PLM to Make Efficiency Gains Across Engineering

Mike Pritchard
mritchard@3dcs.com



Solutions for Product Development, DFM, and Continuous Improvement

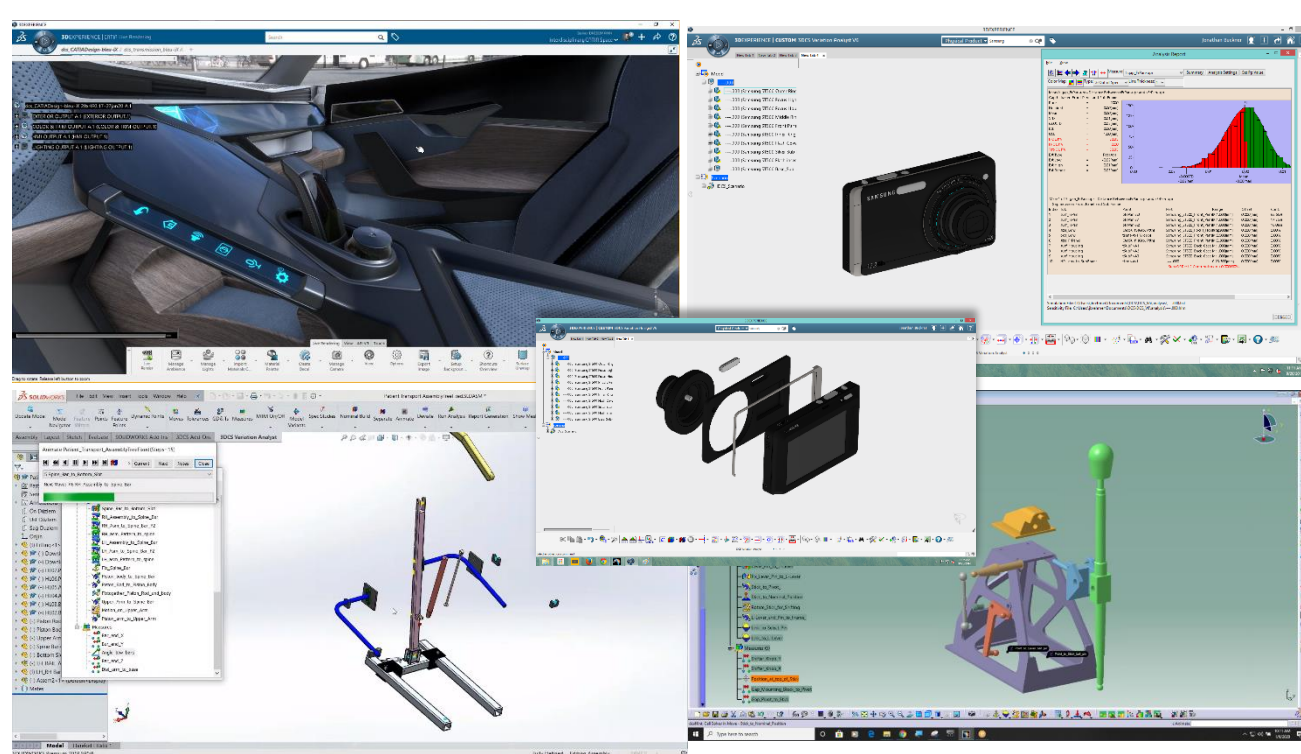


CAD Integrated Tolerance Analysis Software



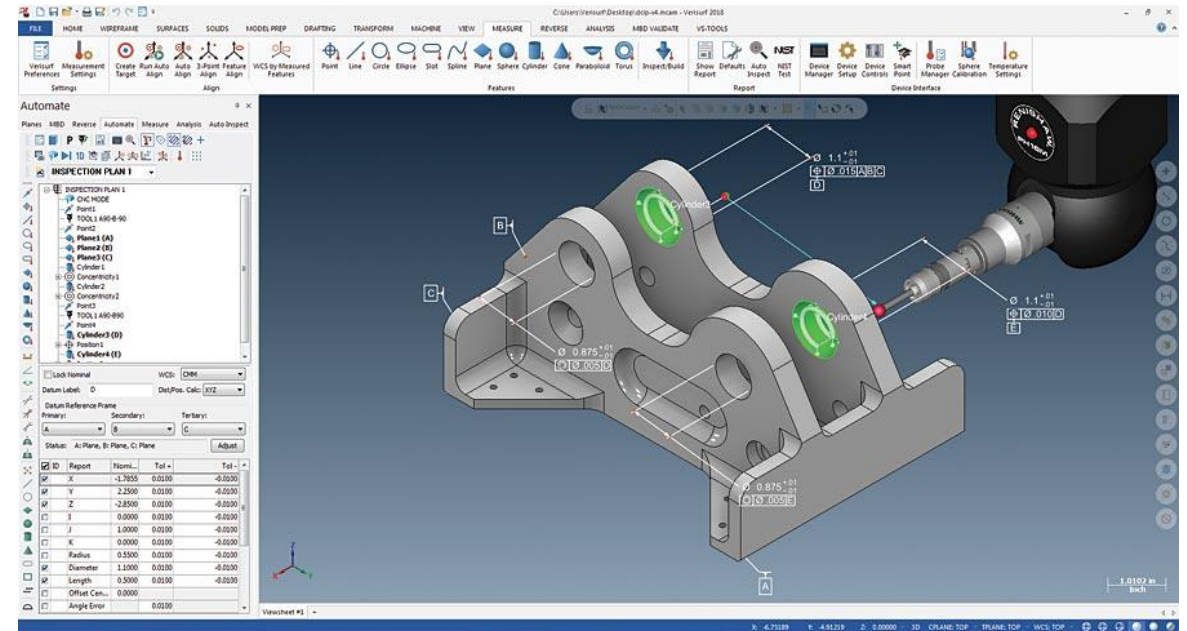
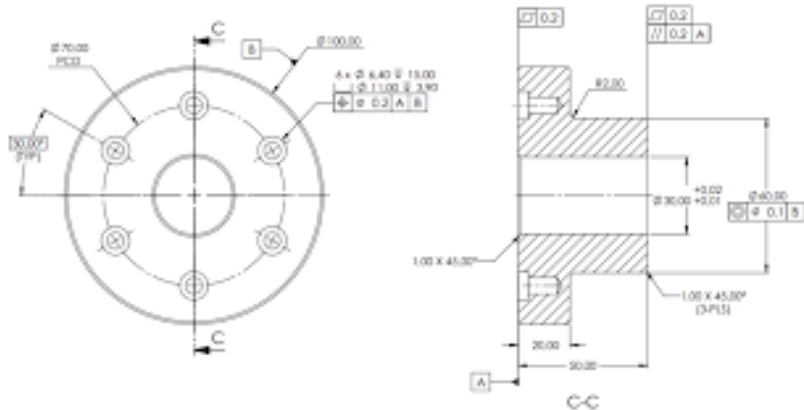
Quality Management System & SPC Platform

Device Agnostic – Any Inspection Device | CAD Connected | Cloud or On-Premise

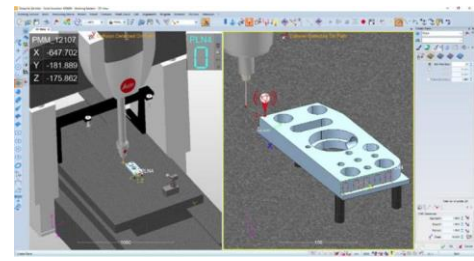
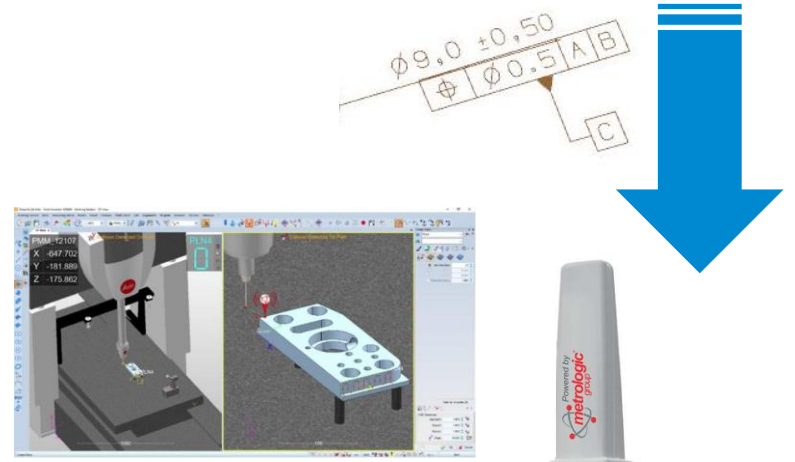
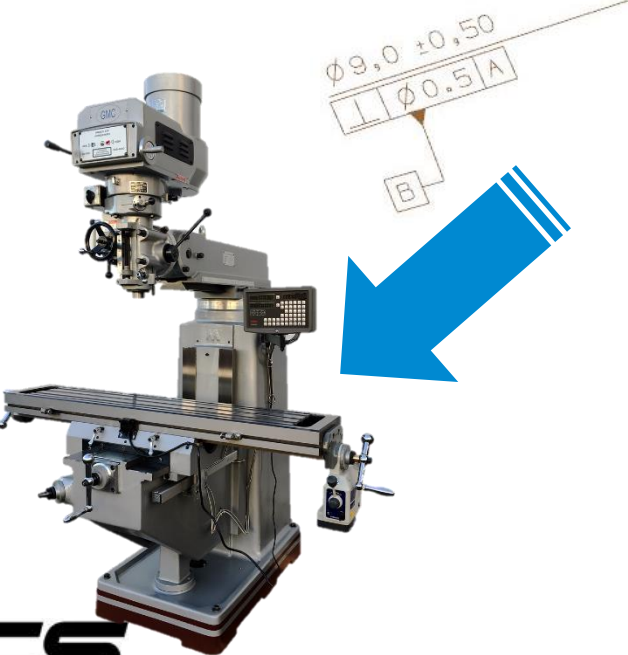
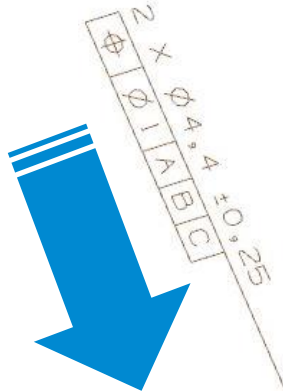
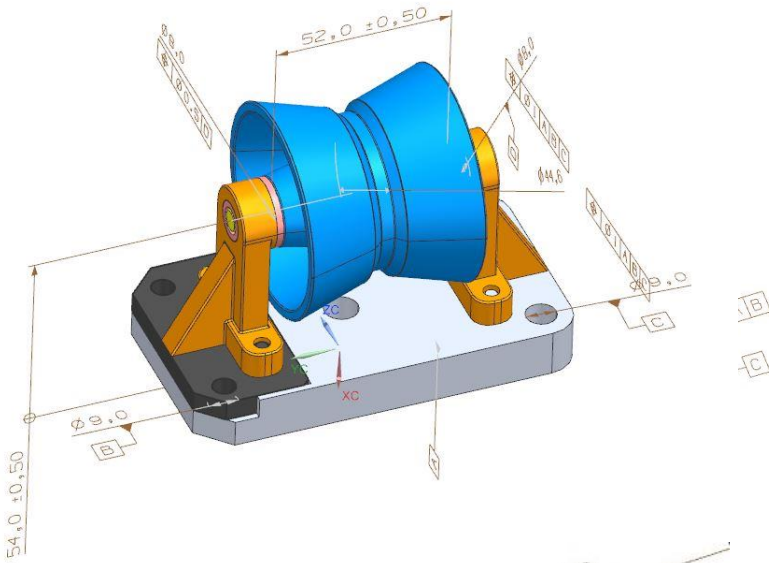




What Are We Talking About...



Utilize GD&T Downstream – Measurement, Cutting, Inspection



What Are We Talking About..

ANALYTICS

AUTOMATION

CLOUD COMPUTING

SMART FACTORY

INDUSTRY 4.0

BIG DATA

SYSTEM INTEGRATION

+47%

AUTONOMOUS ROBOTS

INDUSTRIAL REVOLUTION

CYBER SECURITY

SMART TECHNOLOGY

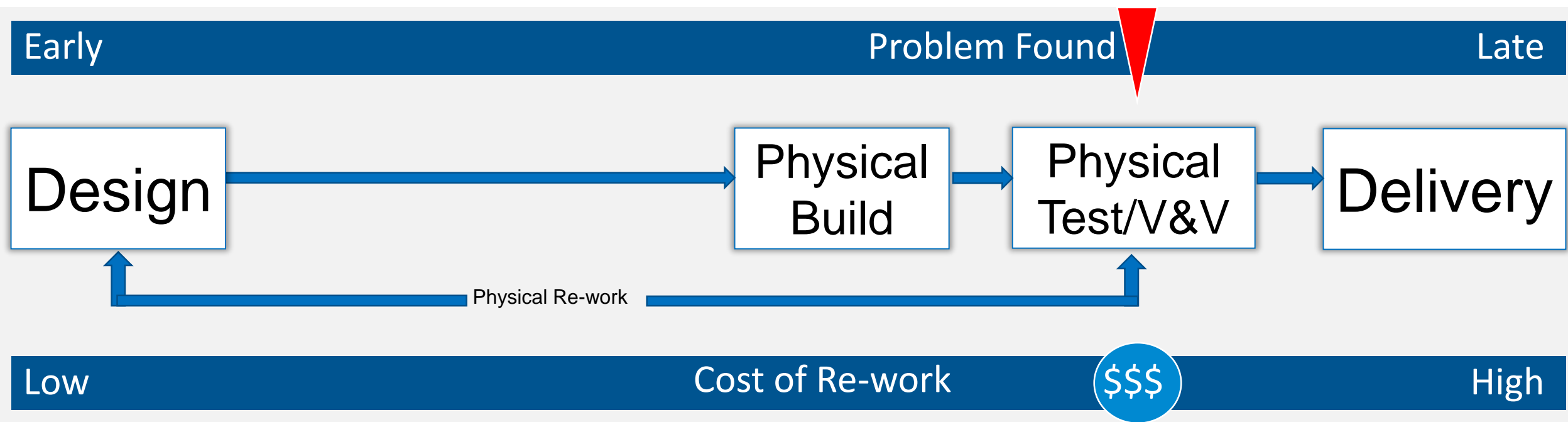
IOT

NEW BUSINESS MODEL





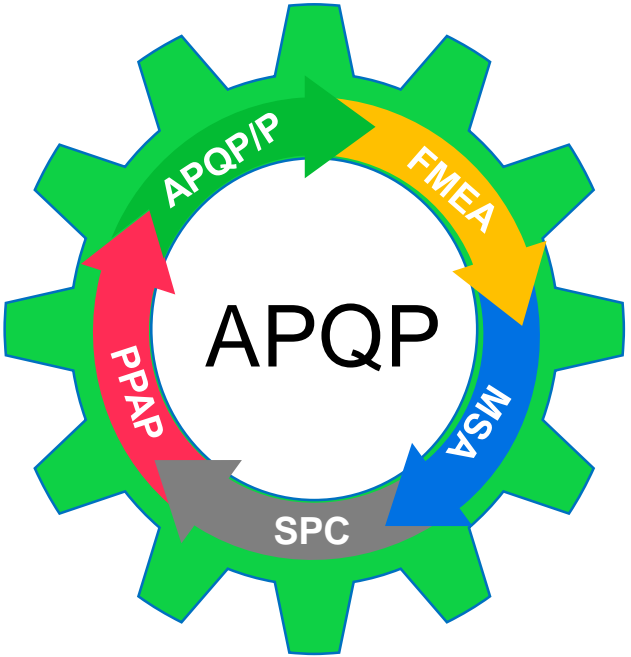
Old School: functional but slow and not taking full advantage of CAD and PLM





Program development involves three primary processes:

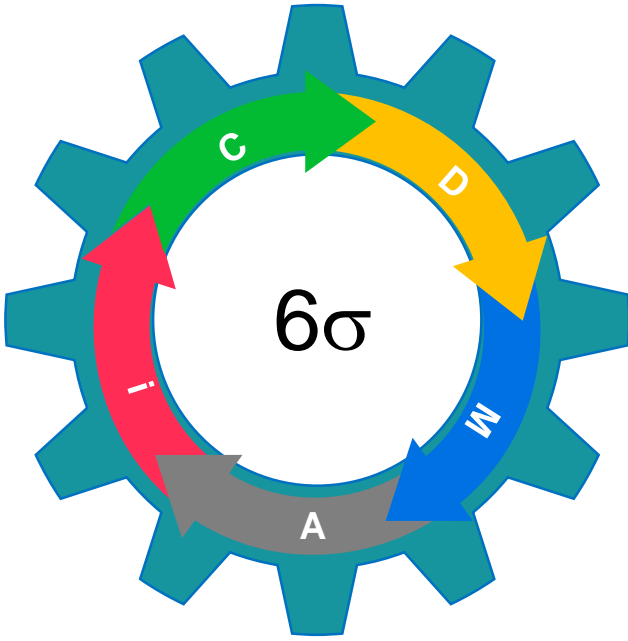
PRODUCT ENGINEERING



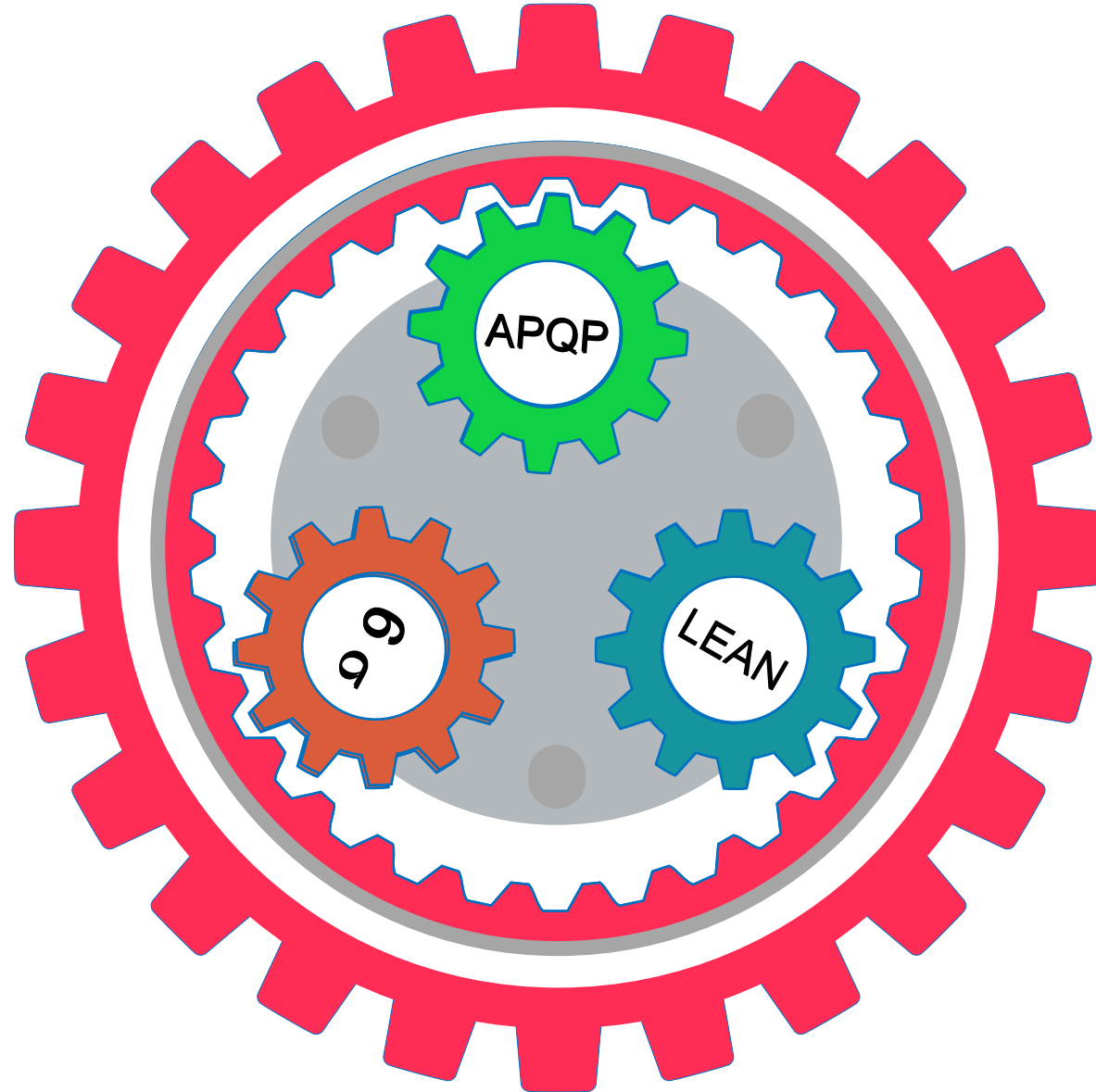
MANUFACTURING



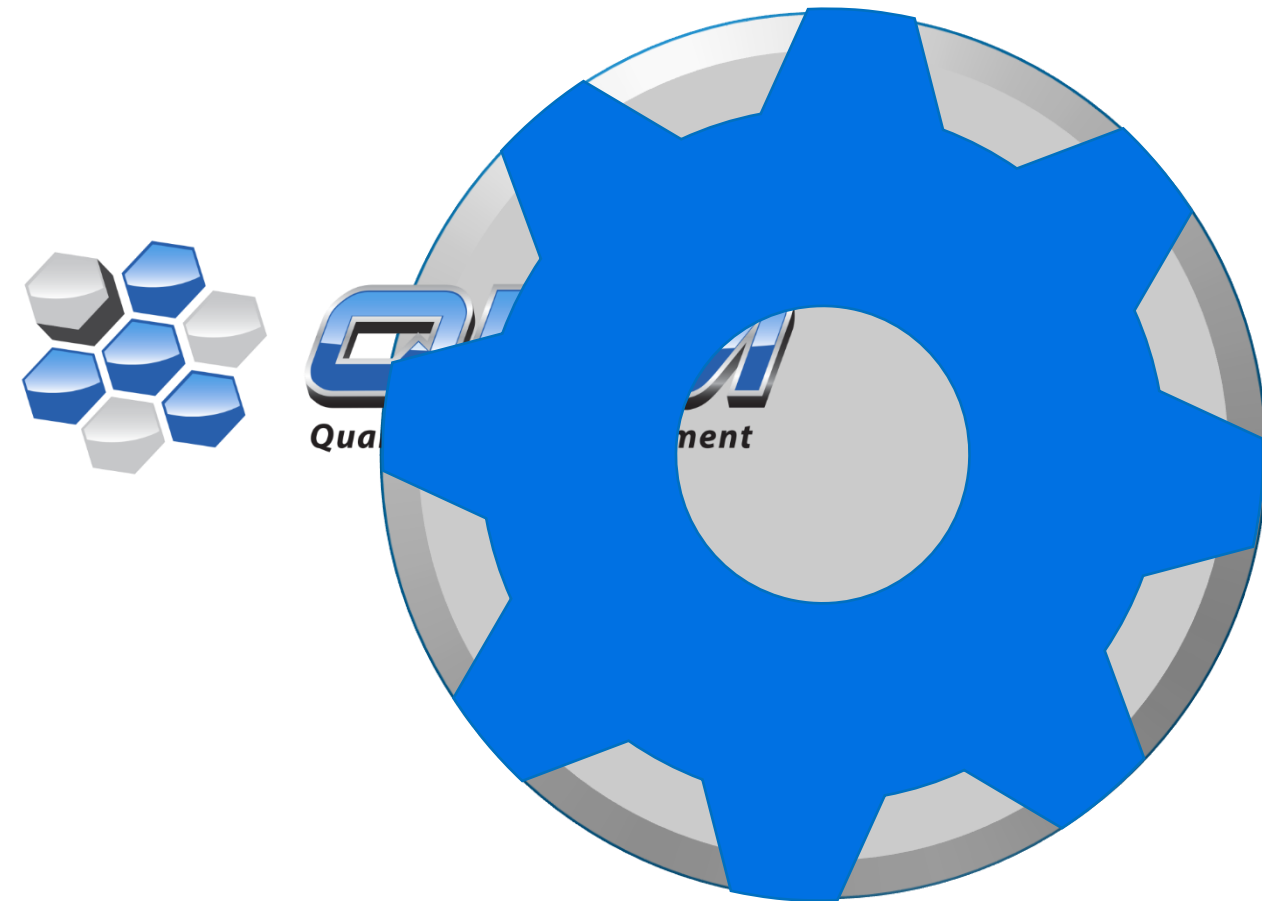
QUALITY CONTINUOUS IMPROVEMENT



Product Process Assurance



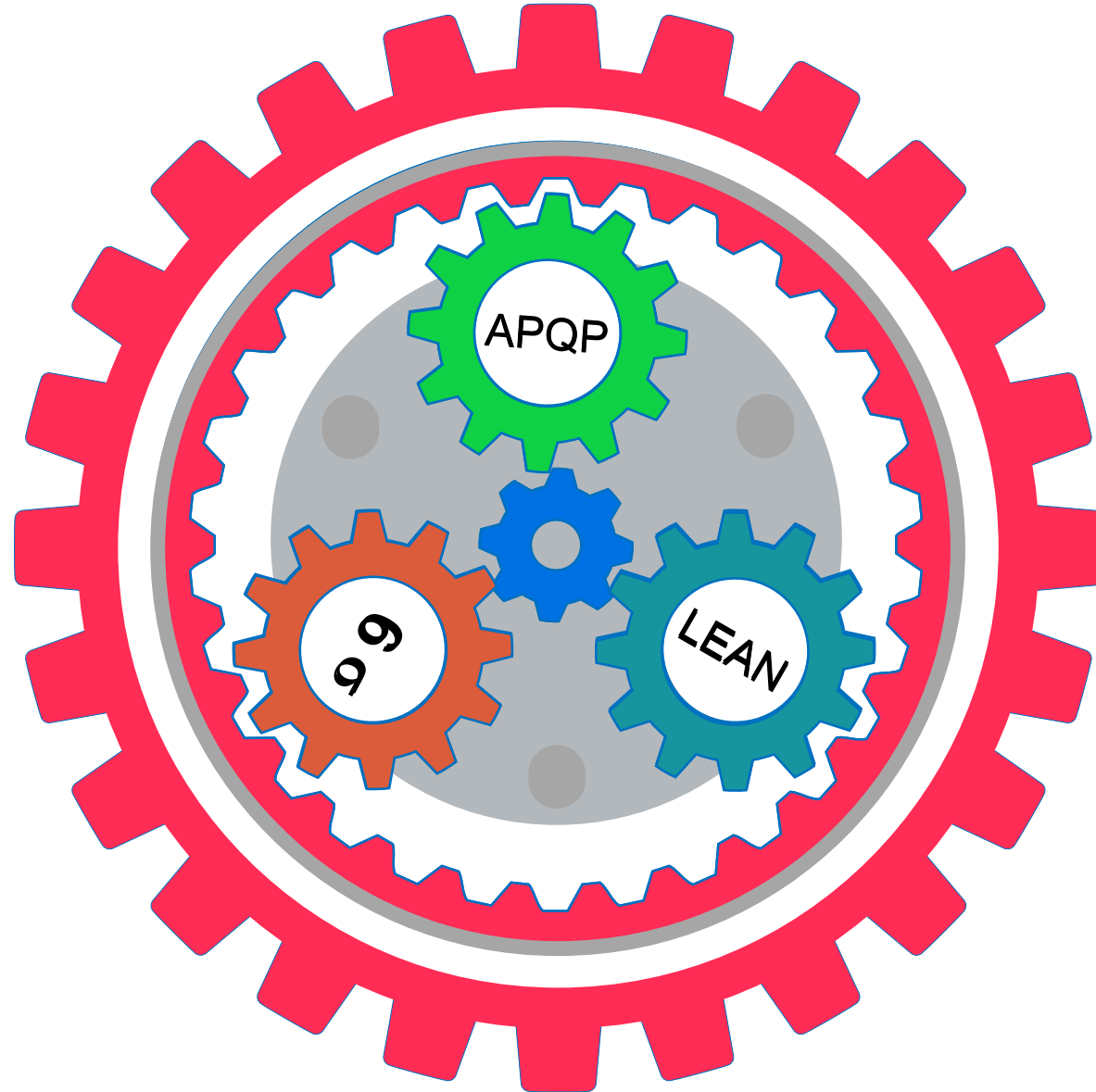
DIMENSIONAL ENGINEER'S TOOLBOX



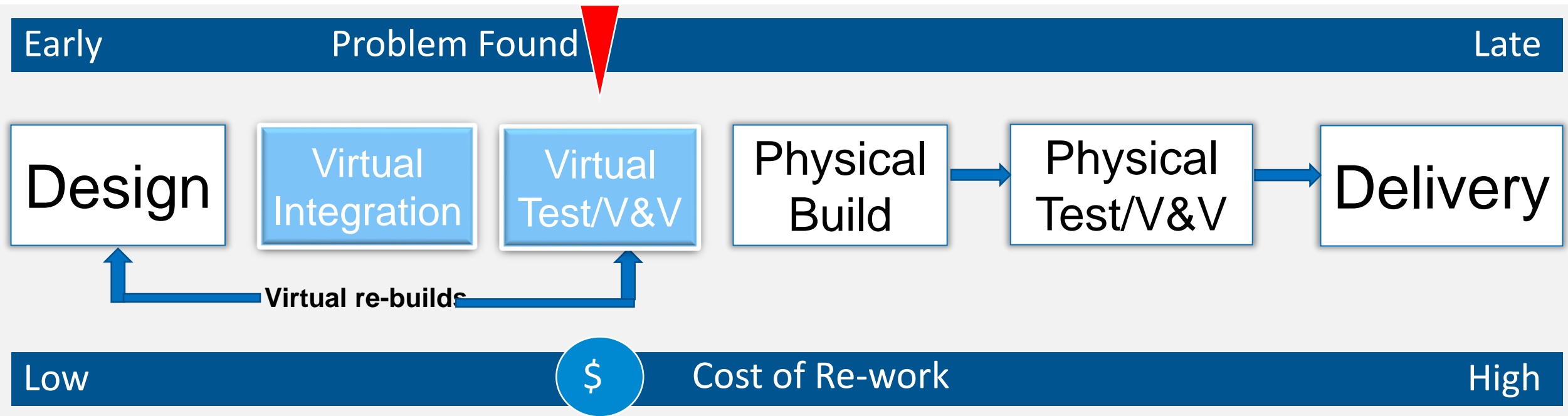
Dimensional Engineering Toolbox



Product Process Assurance



New School: leverage CAD w/ embedded AI; leverage PLM & QMS for global teams





Operational Efficiency Gains @ Sikorsky

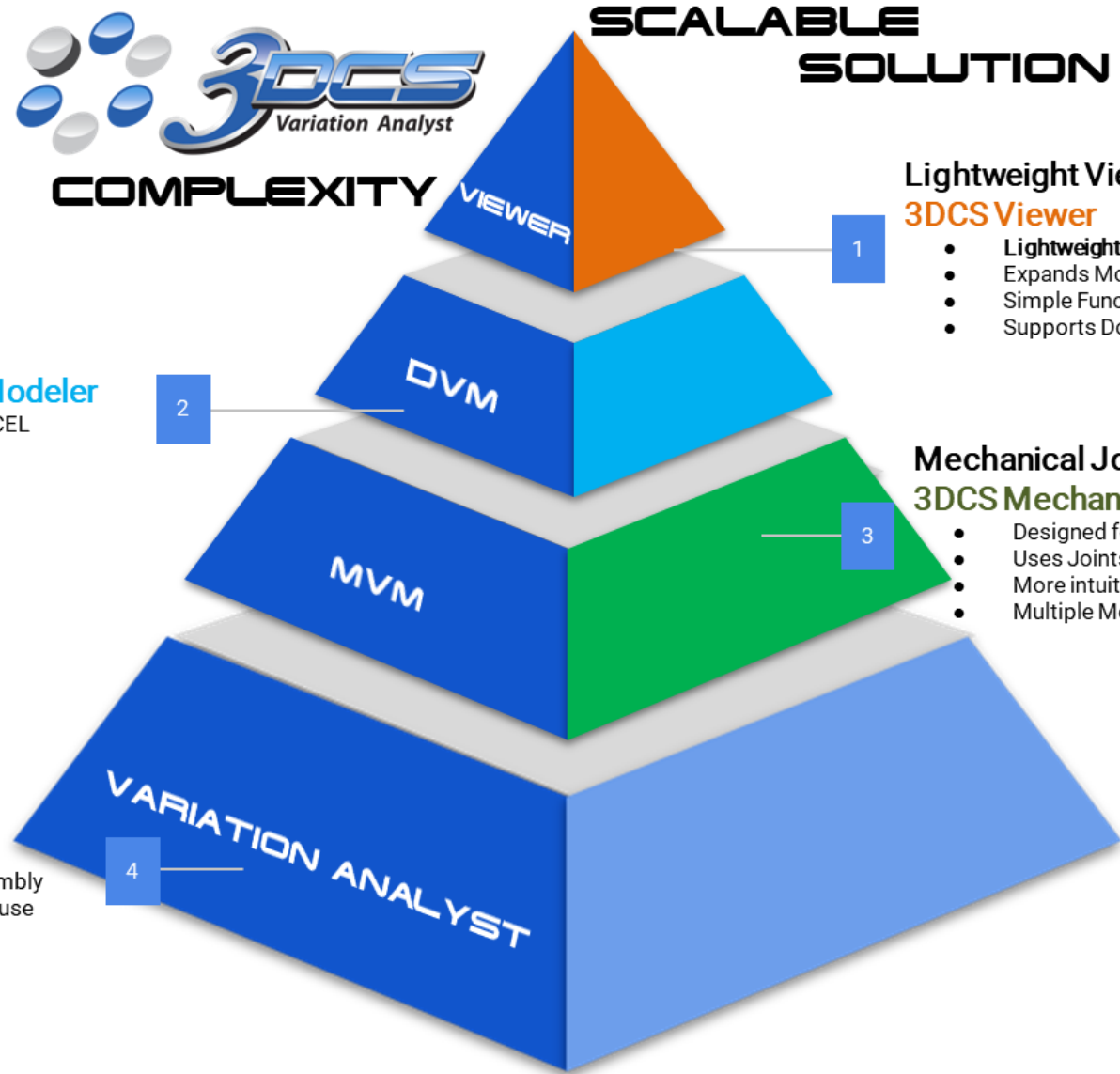


Simulate the “Build” before you Build...

A Digital Dimensional Platform...



SCALABLE SOLUTION



Lightweight Viewing Tool 3DCS Viewer

- Lightweight Viewing Tool
- Expands Model Access
- Simple Functions
- Supports Downstream MBD

Entry Level Tool

3DCS Design Variation Modeler

- Replaces 1D Stacks in EXCEL
- Easy to Use
- Single Assembly Move

Mechanical Joint-Based Entry Level Tool 3DCS Mechanical Variation Modeler

- Designed for Kinematic and Mechanical Assemblies
- Uses Joints and Constraints to build
- More intuitive
- Multiple Move Types.

Full Product Suite

3DCS Variation Analyst

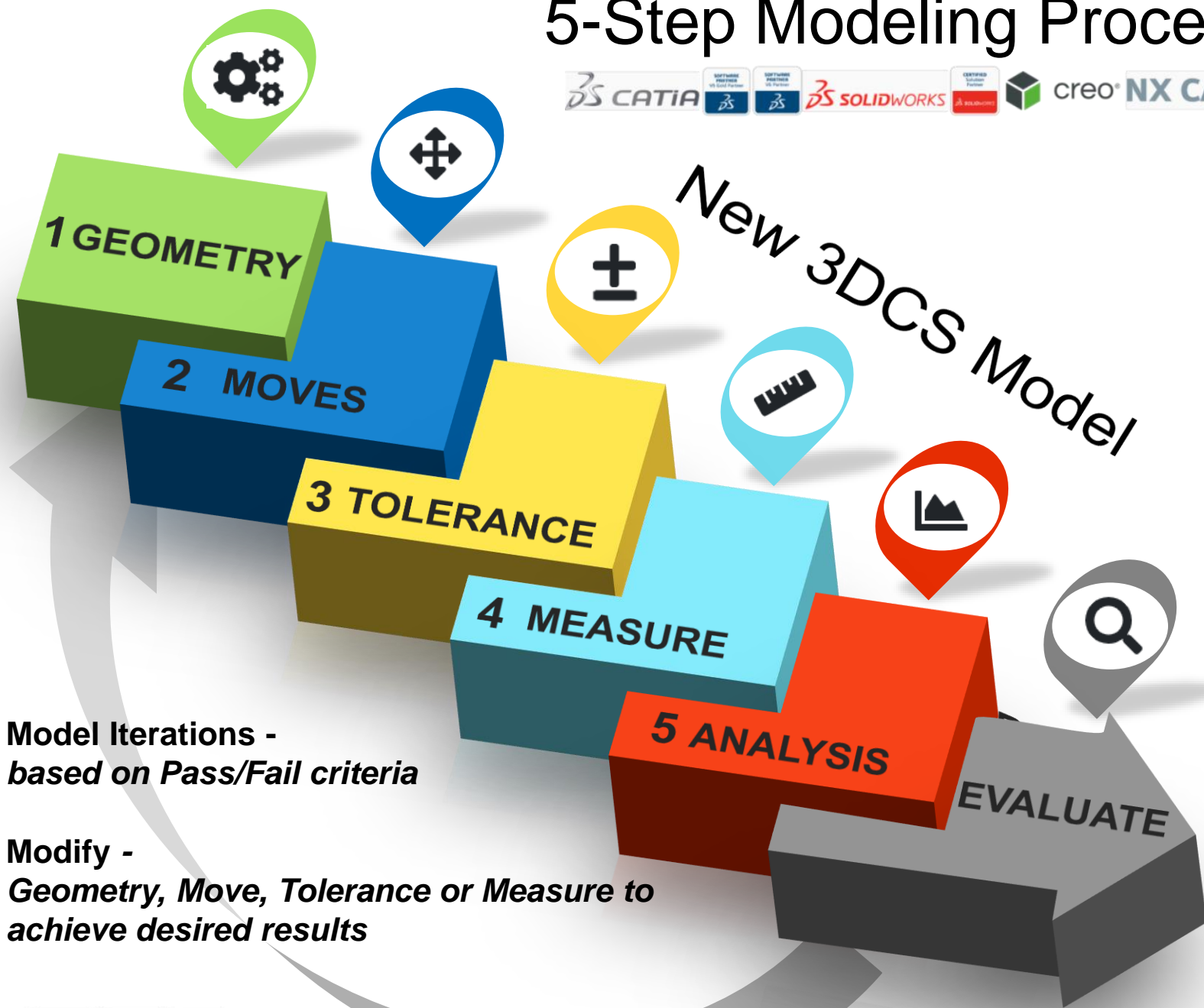
- Advanced Analysis and Assembly
- Requires training and regular use



WHAT'S THE BIG DEAL...

- **Conduction of 3DCS analysis during digital phases of product development reduces the need for design changes through the entire product lifecycle.**
- **3DCS Analysis supports problem-solving in metrology, and decisions regarding, “the build.”**
- **Go to the Launch with multiple Build scenarios and Mitigation plan. Proactive engineering, not Reactive.**

5-Step Modeling Process

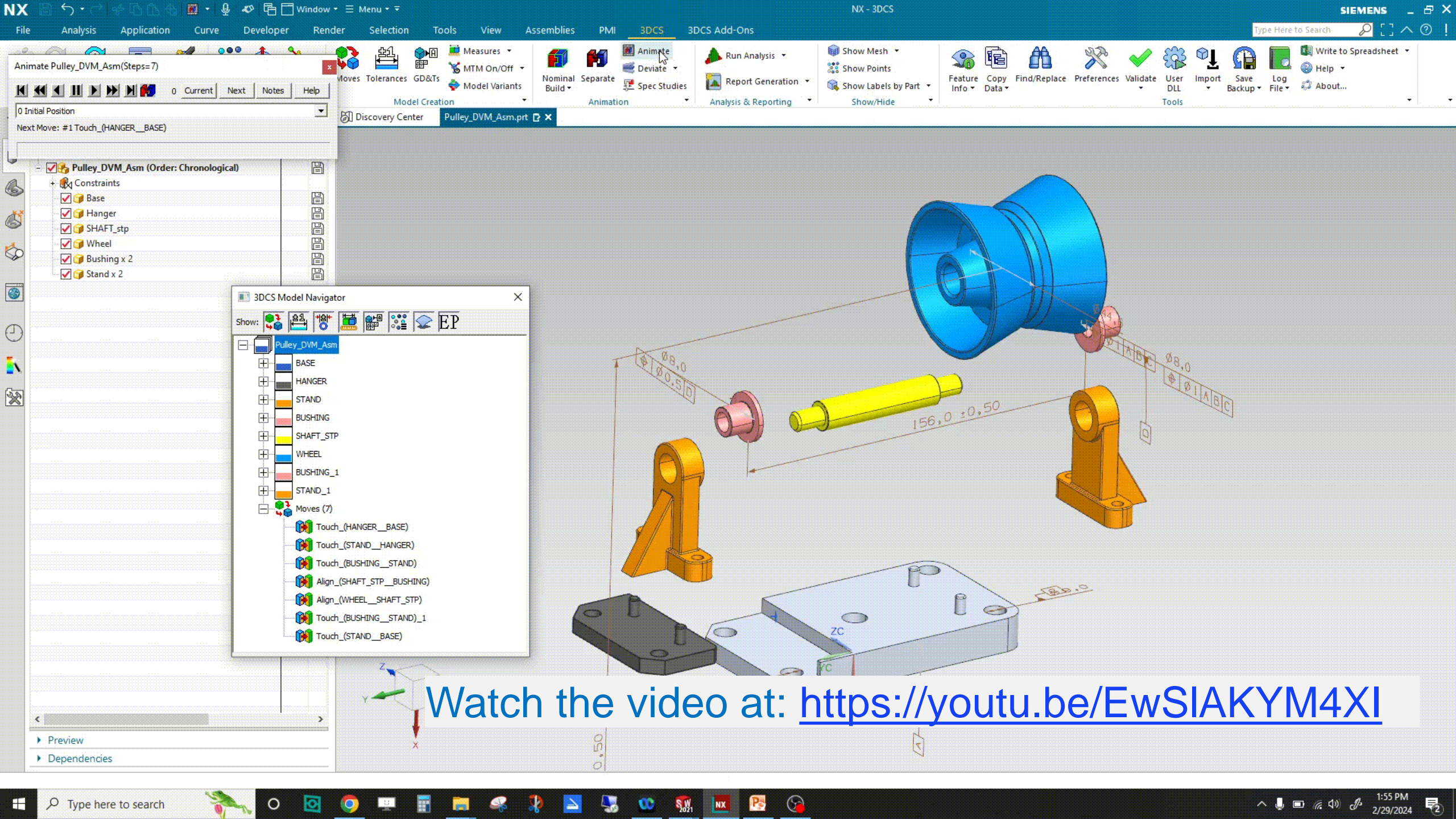


-  **Geometry**
Load CAD Geometry
-  **Moves***
Set-up Process Sequence & Locating Strategy
-  **Tolerance***
Apply Part and/or Fixture Tolerances
-  **Measure***
Define & Create Measurements and Specification Limits
-  **Analysis**
Run Monte Carlo Simulation & Sensitivity Analysis
-  **Evaluate**
Evaluate Simulation Results for All Measurements

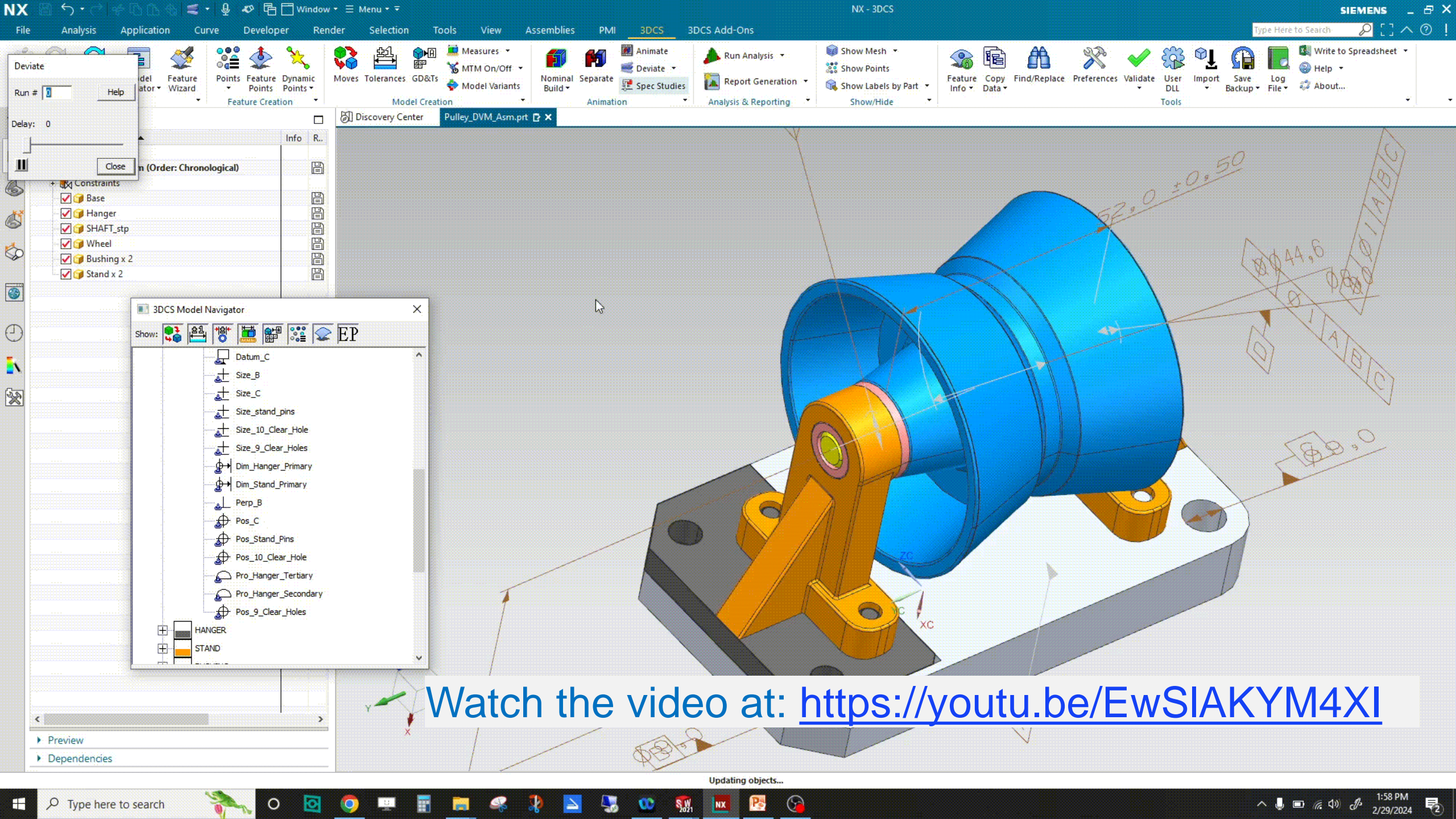
**Model Iterations -
based on Pass/Fail criteria**

**Modify -
Geometry, Move, Tolerance or Measure to
achieve desired results**

*Steps 2,3, and 4 can be directly imported from CAD if available



Watch the video at: <https://youtu.be/EwSIAKYM4XI>



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3DCS Variation Analyst

CAD Integrated Tolerance Analysis Software

Learn more at 3dcs.com

Contact DCS at:
sales@3dcs.com



Part of
Sandvik Group

DCS Solution Europe
Ulrich Decker

cenit



360° QUALITY PROCESS

DEVIATION IS THE ENEMY OF QUALITY

Mai 2023

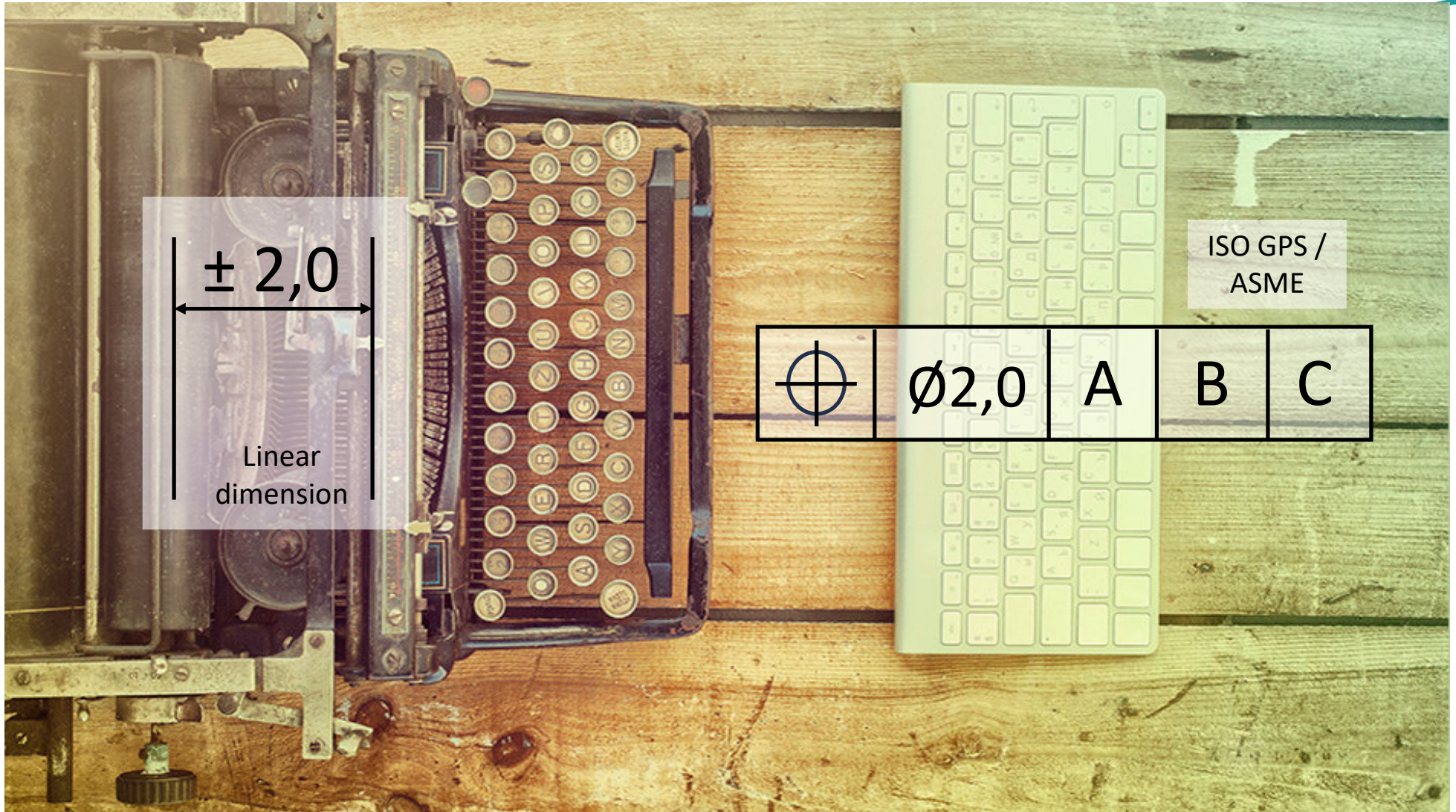
JUST ASK YOU.....



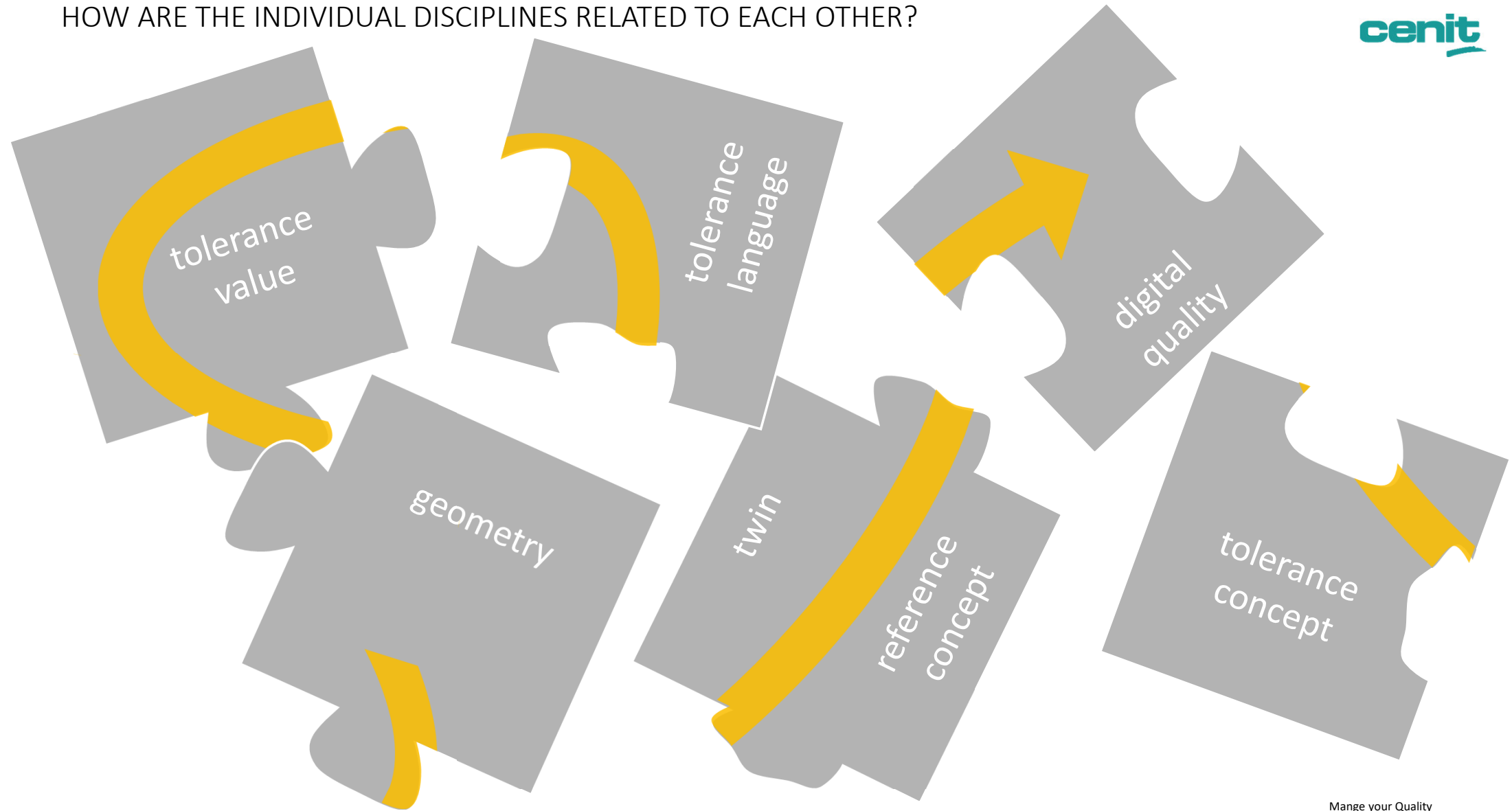
where do you think the desired quality is created in your company?

approx. 90% of the quality depth and the associated costs arise at the beginning of your product development process!!!!

HOW TO ENSURE FROM THE BEGINNING THAT THE FINAL QUALITY CRITERIA ARE MET



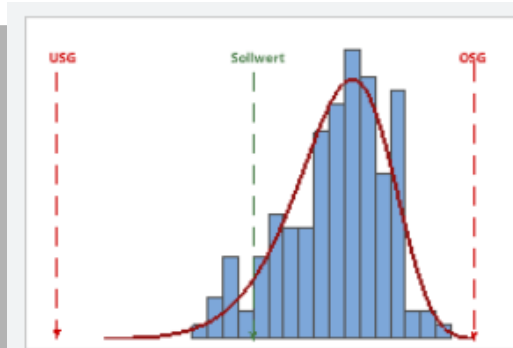
HOW ARE THE INDIVIDUAL DISCIPLINES RELATED TO EACH OTHER?



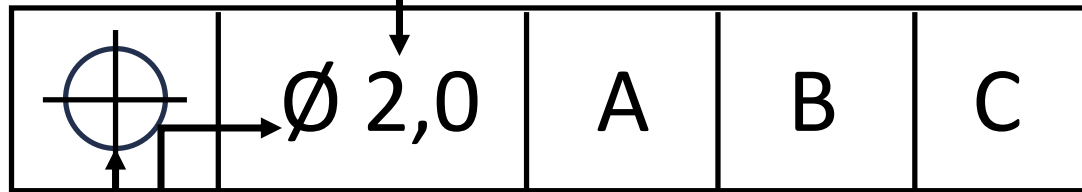
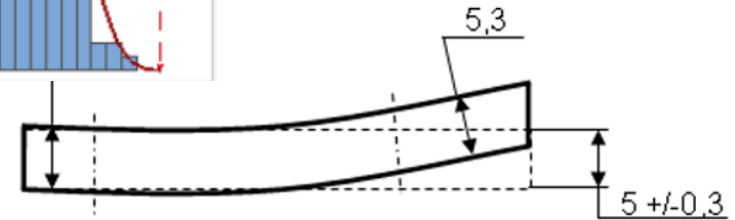
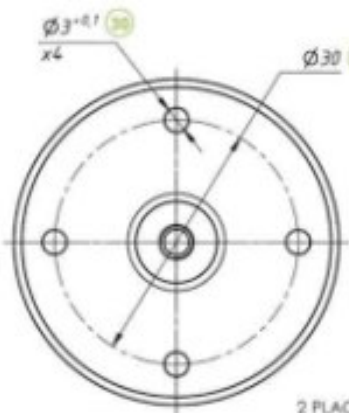
WHY YOU WILL BENEFIT



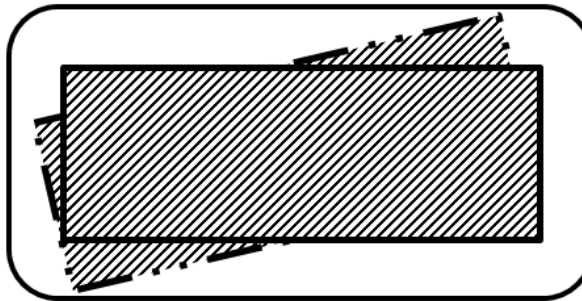
digital
quality



tolerance
language

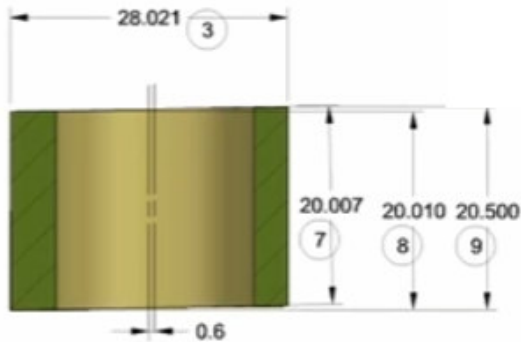


twin

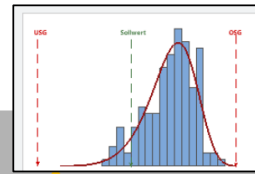
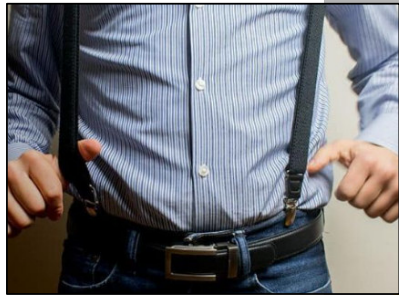


geometry

tol
co



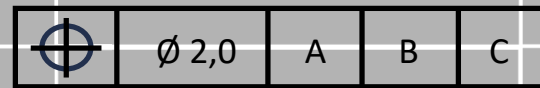
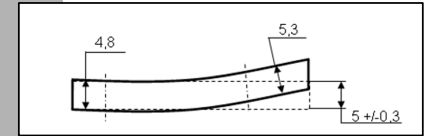
MAKE THE PROCESS FLOW



tolerance language

tolerance value

digital quality

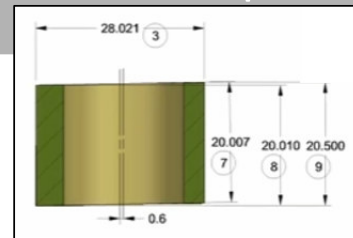
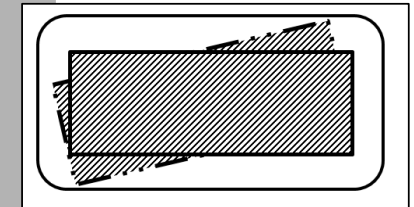
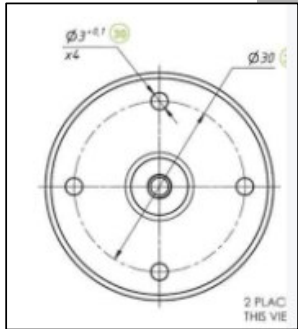


twin

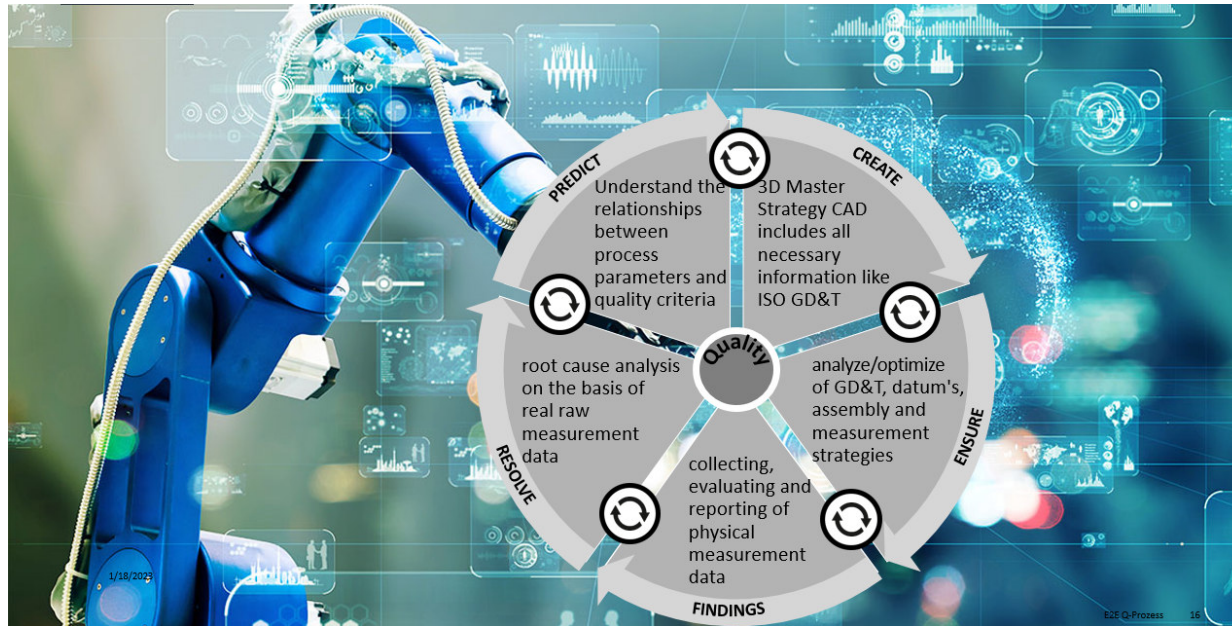
tolerance concept

reference concept

geometry



HOW WE DO IT IN GENERAL



"IDENTIFY STATUS QUO"

Building customer understanding with requirements gathering

Review and recording of existing strategies, initiatives, methods, processes, audits/assessments, tools and interfaces

"DEVELOP TARGET IMAGE"

Definition of the target state

Delta analysis between actual state and target state

Integration of existing / ongoing initiatives into the target picture

Prioritization of the fields of activity

"DEFINE TARGET LANDSCAPE"

development Solution concept

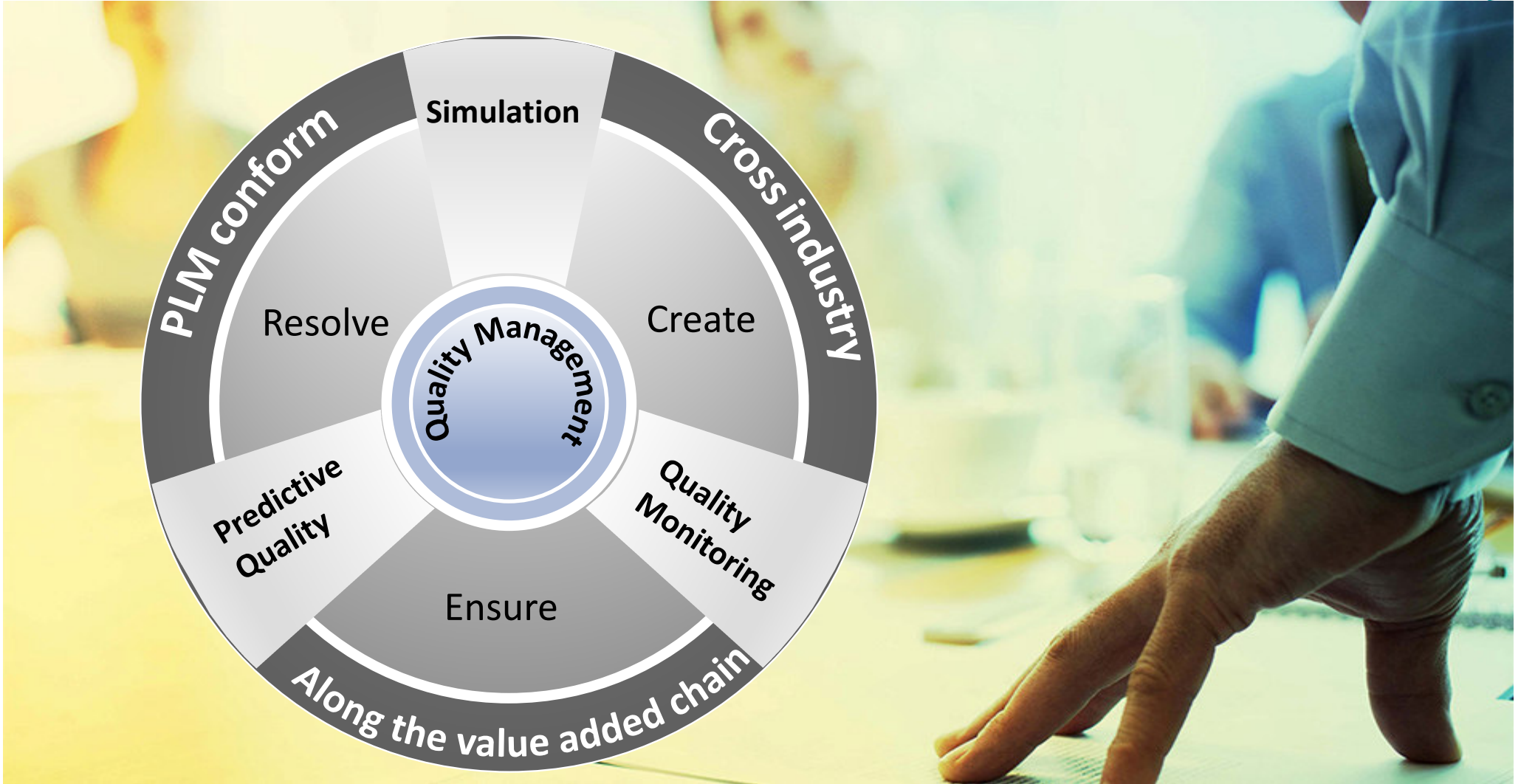
Detailing the fields of action

Solutions & added value

"PLANNING IMPLEMENTATION"

Rollout plan with corresponding training and software concept

THE TOTAL QUALITY SYSTEM TAKES YOU TO THE NEXT LEVEL OF QUALITY UNDERSTANDING
BUT HOW....



Mange your Quality

TAKE AWAY'S



“We identify what are the risks, so for instance if we have an issue with one part, we can see where the impact is and determine the risk of failing to meet requirements.”

ITER

“The Function of DVA within JLR is to optimize the Design Intent with recognition and implementation of Actual Variation and Capability.”

JLR

“By being able to do very comprehensive modeling, the other advantages we’ve seen is we’ve discovered sensitivities in areas we wouldn’t have expected...well outside our region of interest that had influence. It’s also served as a quality check for our drafting process as well as allowing us to incorporate feedback from the manufacturing floor.”

Philips Medical

WHY YOU WILL BENEFIT....

Just some statements from customer in average:

- high but payable quality
- small waste and scrap rate
- high 1st time quality
- significantly lower production risk
- quality is perceived and recognized as a business factor

CHANGE IS HAPPENED NOW.....



.... by starting streamline your processes
.... by recognizing the really important points make you focus on them
.... by manage quality and not only react on quality issues

**WHEN WILL YOU
FOLLOW**



Mange your Quality

MANY THANKS!

Ulrich Decker

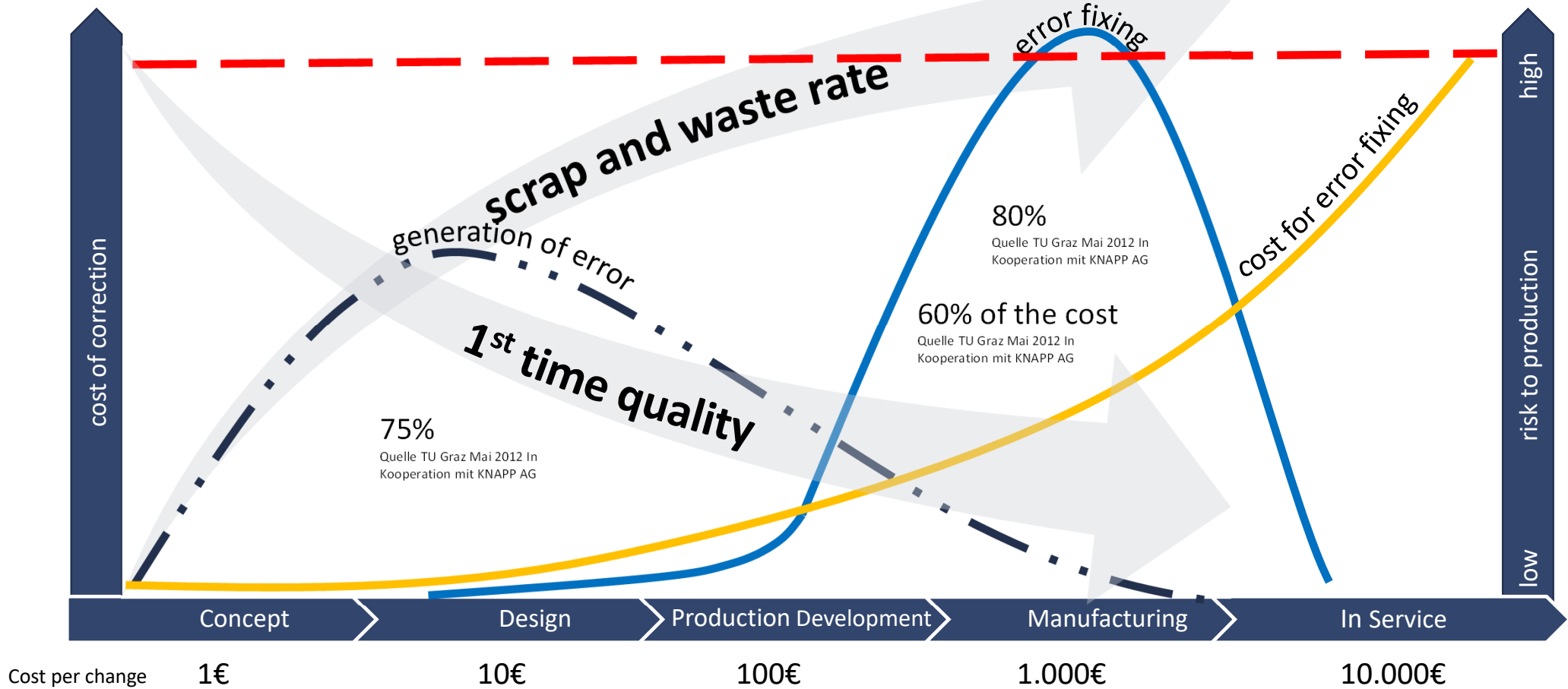
DCS Solution Sale Europe

CENIT AG
Industriestrasse 52-54
70565 Stuttgart
www.cenit.com



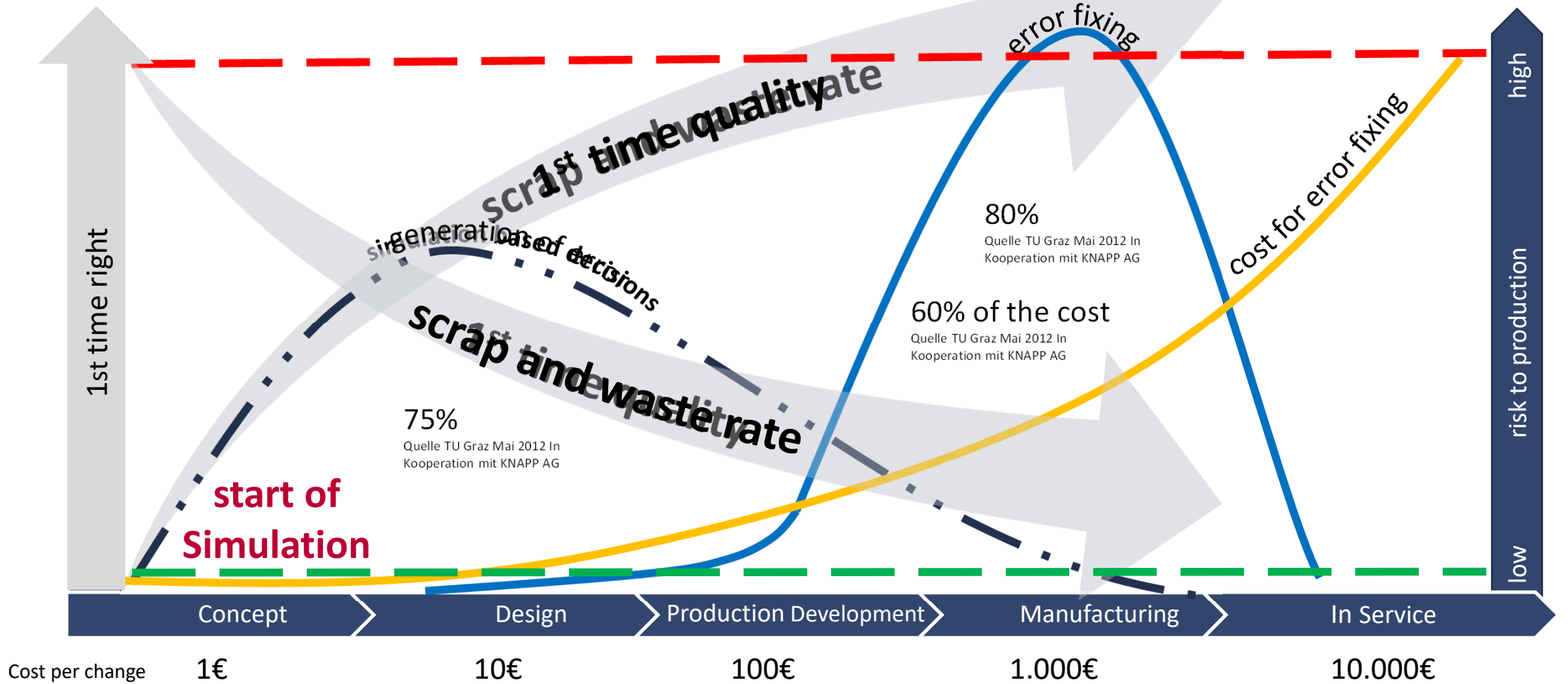
WHY SIMULATION

OLD AND WELL-WORN BUT STILL IMPORTANT AND RIGHT

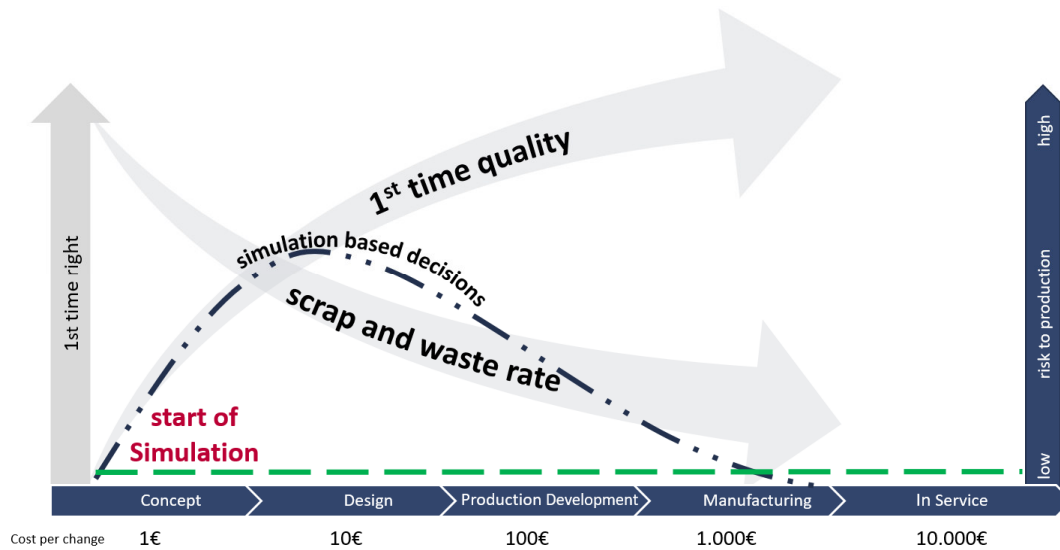


WHAT WE BELIEVE

MOVE TO THIS WITH SO MANY COMPANIES ALREADY



TAKE AWAY



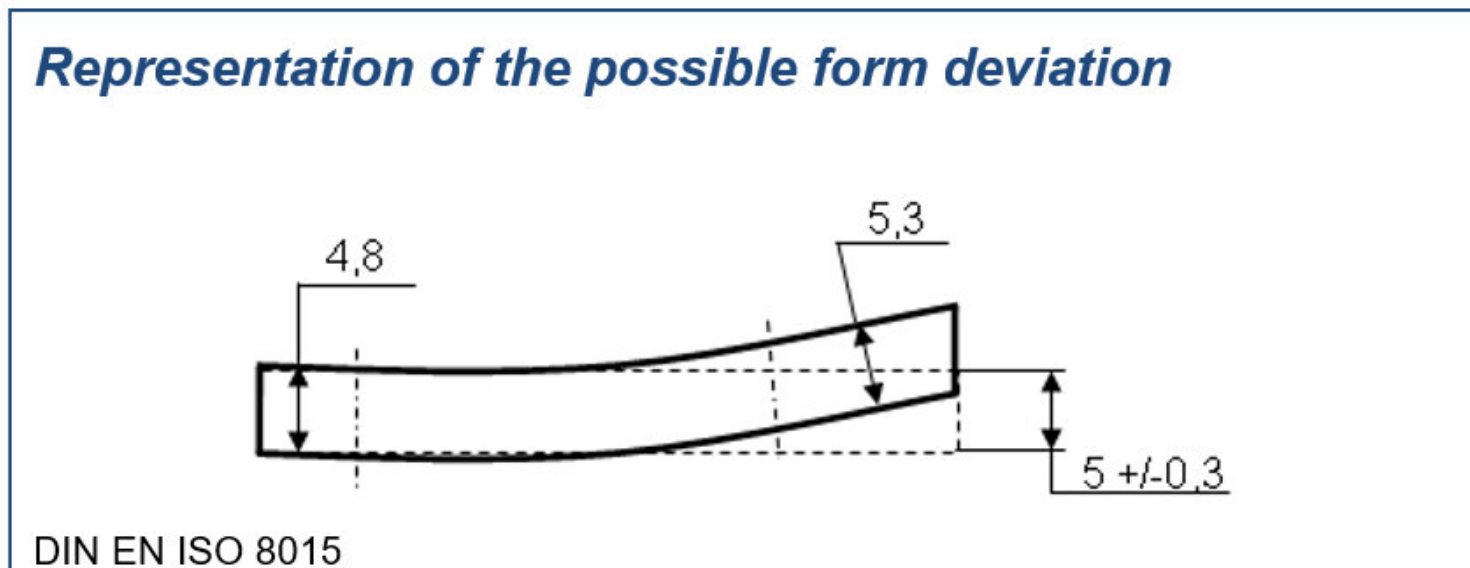
WHY SIMULATION MAKES YOU BETTER

Digital Prototype offers you.....

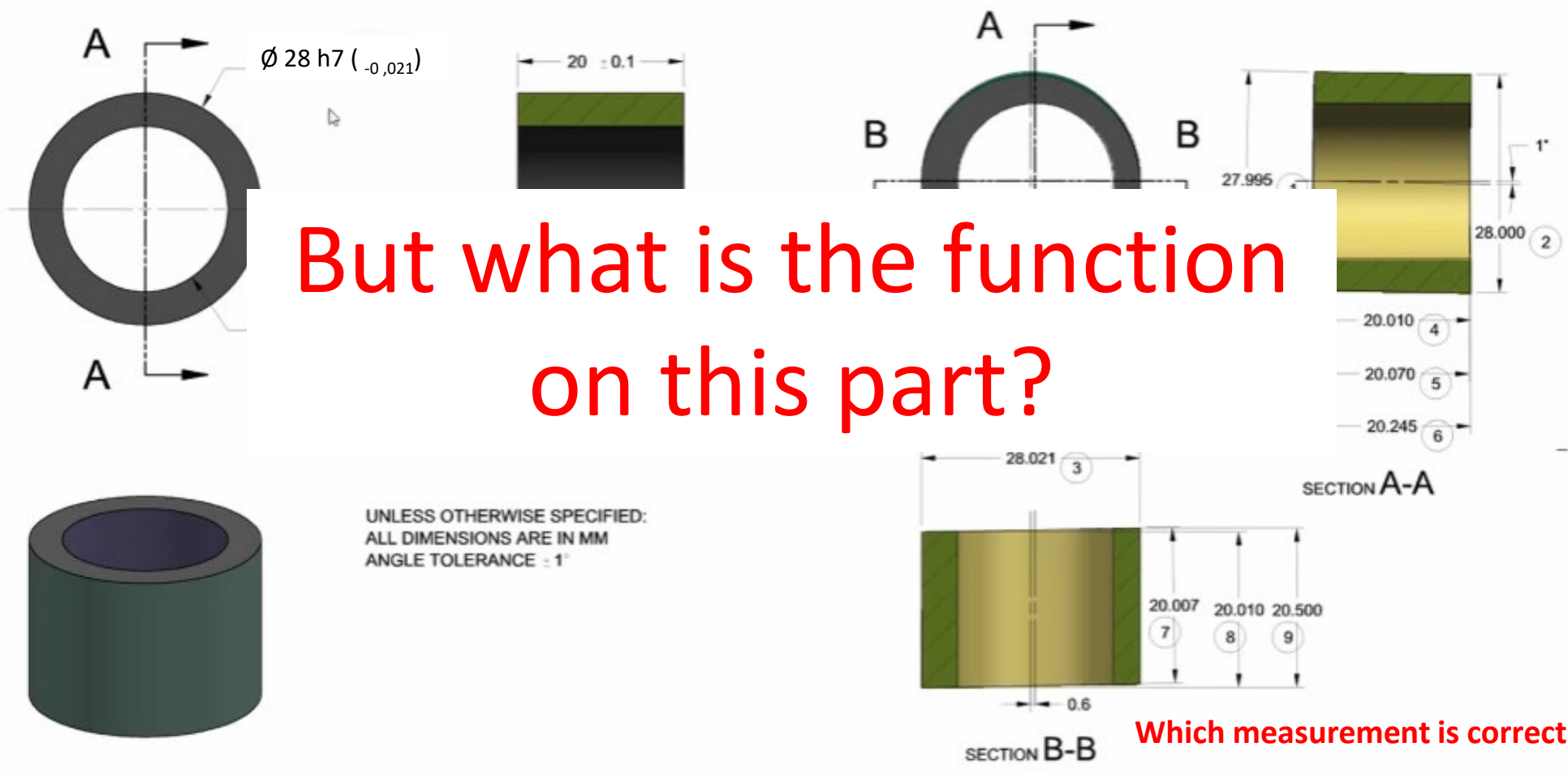
- addressee and validate your quality criteria from the first line and not wait to first parts
- focus on exact as you need and not as you could
- minimized the risk of production to a lower level
- minimized scrap and waste by increasing 1st time right

IF YOU STILL WORK WITH \pm TOLERANCES YOU USUALLY HAVE THE FOLLOWING DIFFICULTIES.....

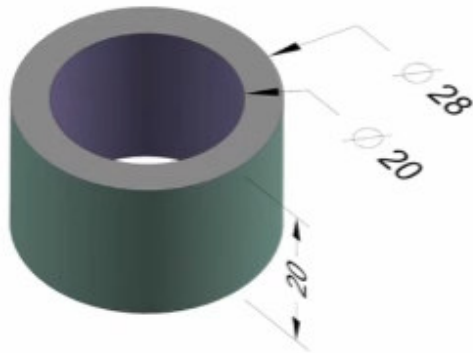
- Different part adjustment - > no repeatability
- Dimensional tolerances without Form tolerance - > no form control
- Linear dimensioning without consideration of the circular tolerance zone
- Dimensional tolerances without position tolerance - > no control of the axle tilt
- Maximum Material Condition not indicated - > no flexible tolerance zone (e.g. MMC)



DOES ISO GPS MAKE THE COMPONENTS EXPENSIVE AND COMPLICATED? THE ANSWER IS SIMPLY NO !!!!

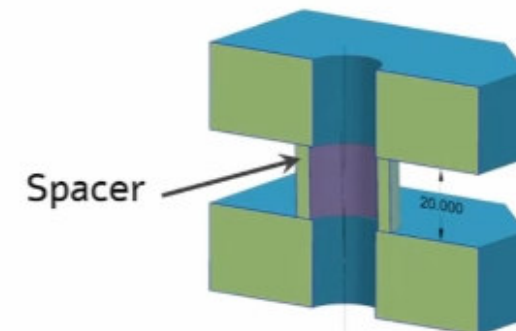
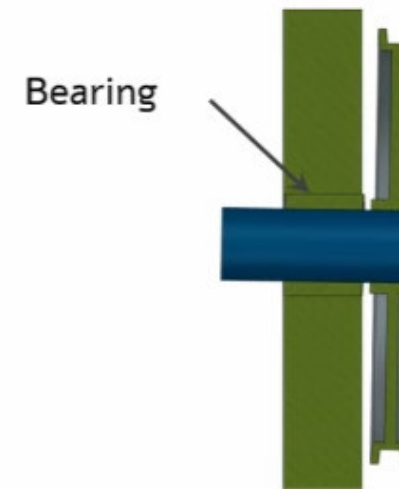


WITH \pm DIMENSIONING STYLE THERE IS NO CHANCE TO DESCRIBE THE FUNCTION OF A COMPONENT OR PART

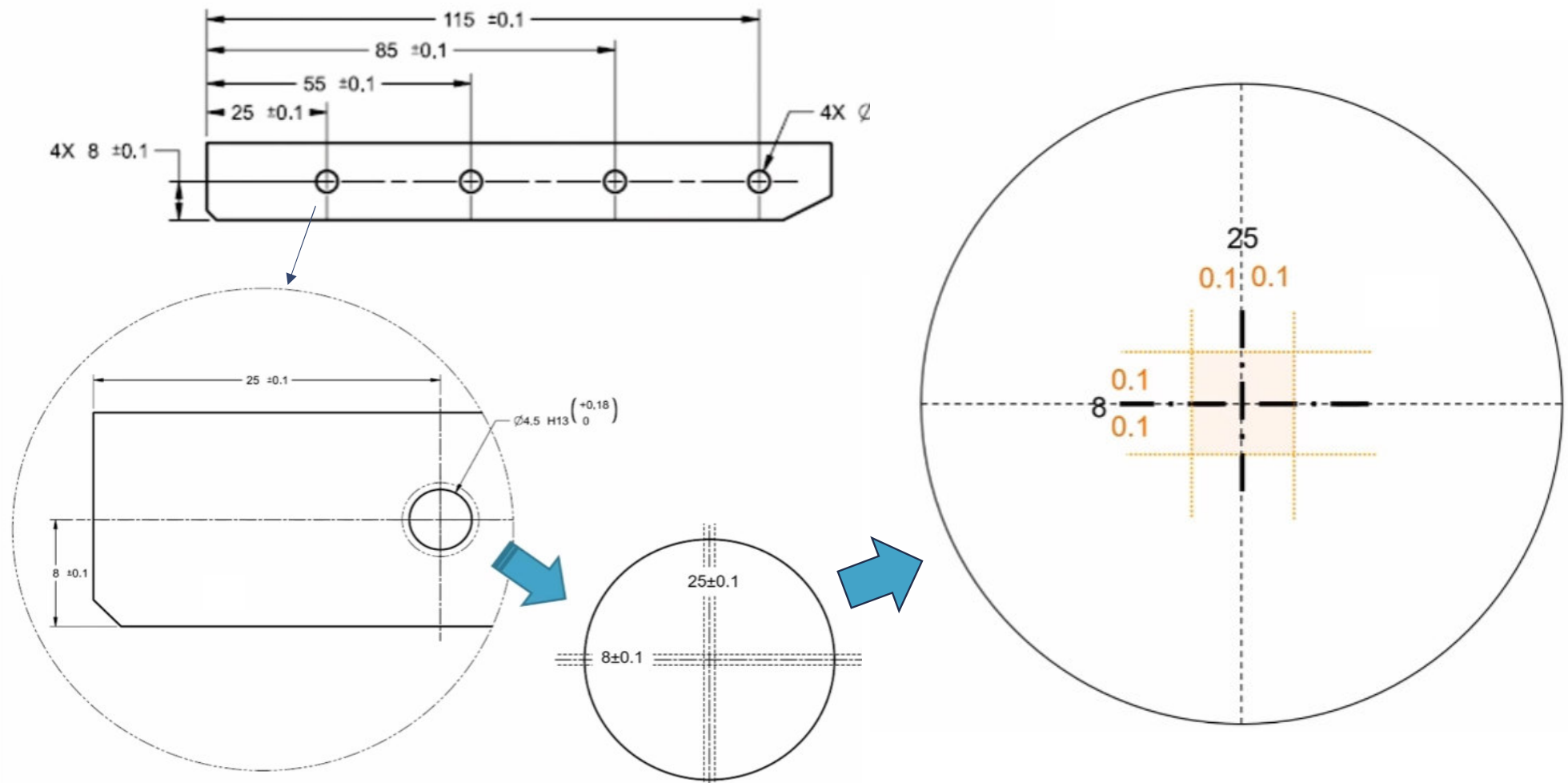


GPS – Geometric Product Specifications

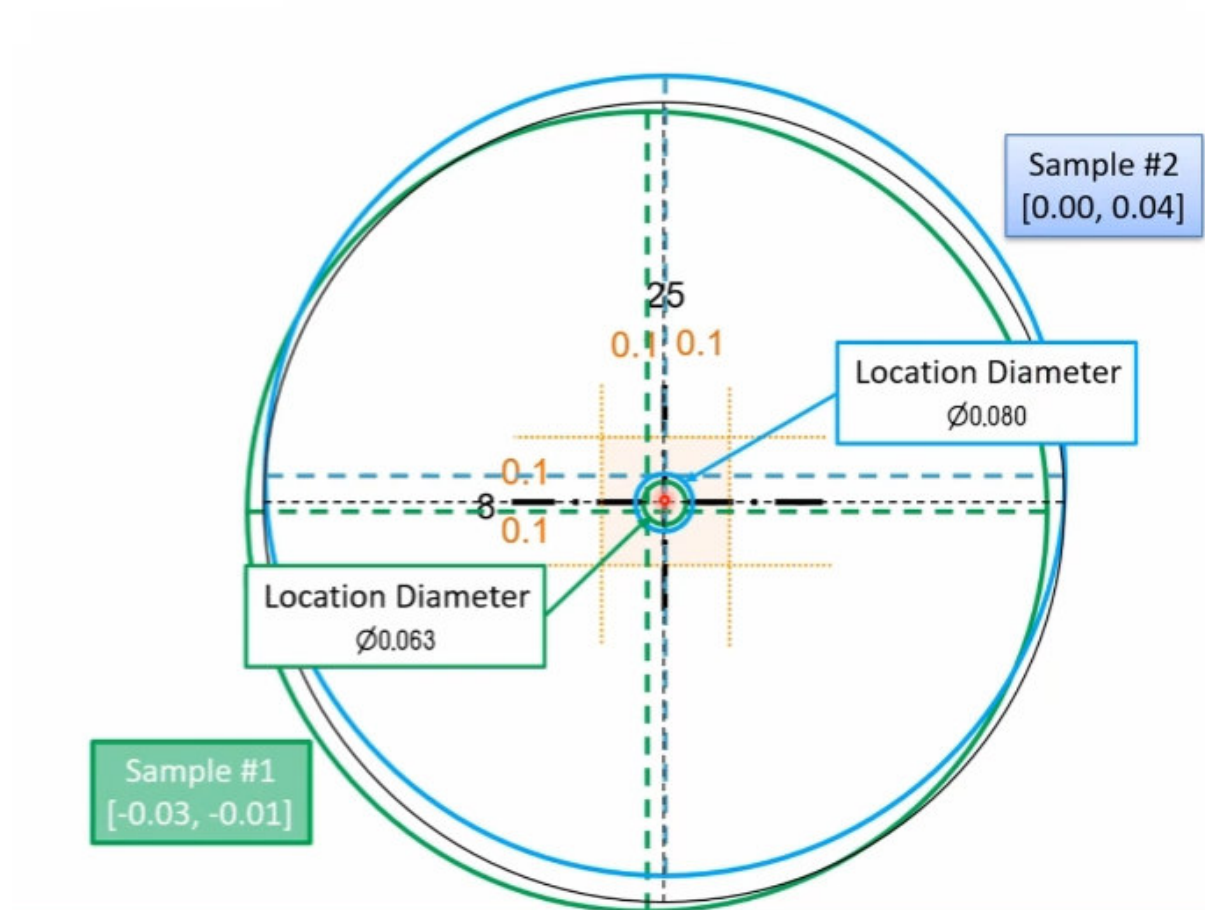
- Conceptual Change
- Feature properties & Relations
- Functional Geometric Specifications
- Common Language (Design, Make, Inspect)



LET'S TALK ABOUT COSTS! ON A DAILY EXAMPLE FROM PRACTICE



LET'S TALK ABOUT COSTS! ON A DAILY EXAMPLE FROM PRACTICE
1940 STANLEY PARKER FIND SOME ANSWERS



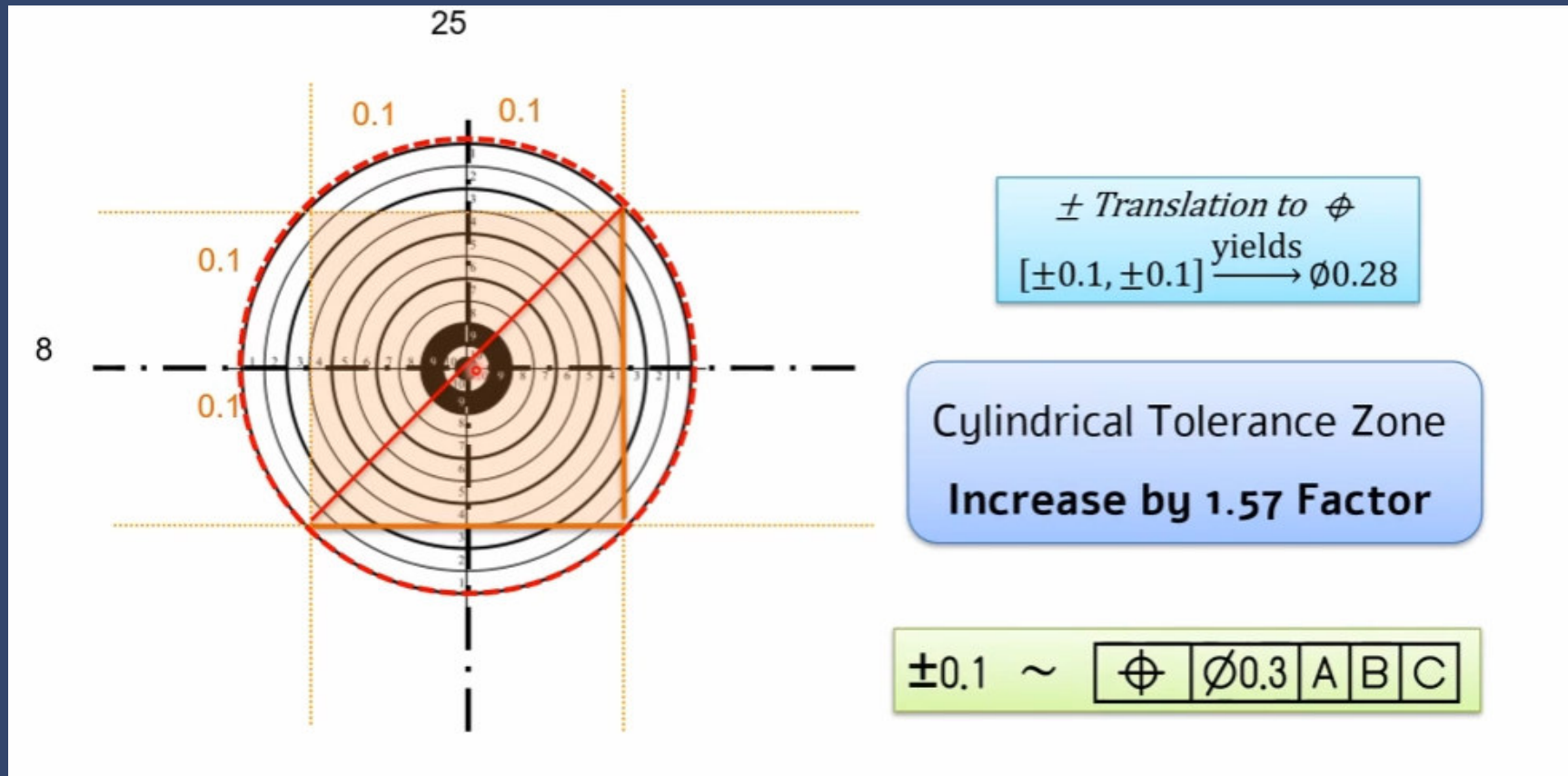
Which of the two parts is better?
Is the process drifting out?

So the process is drifting out!

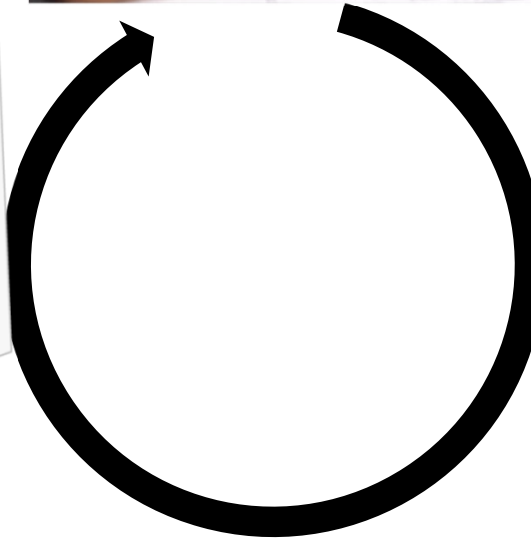
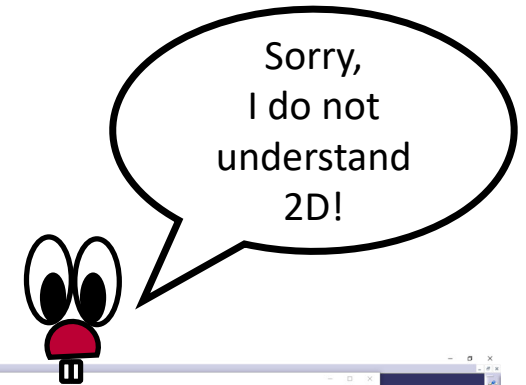
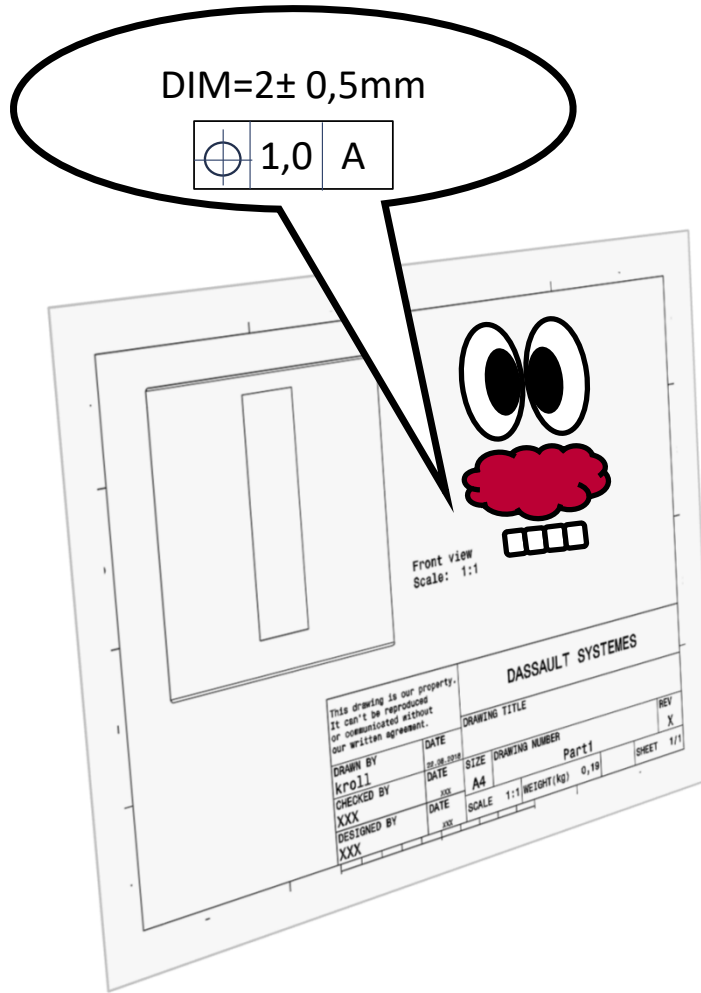
The Solution

- Location Diameter
- Good – closer to bullseye
- Single quality variable

WITHOUT ISO GPS, COMPONENTS ARE TOO TIGHTLY TOLERANCE OR ARE REJECTED EVEN THOUGH THEY ARE GOOD, RESULTING IN EXTREMELY HIGH COSTS.

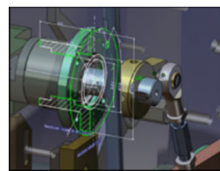
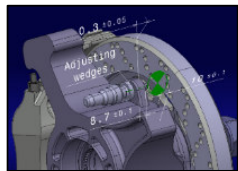
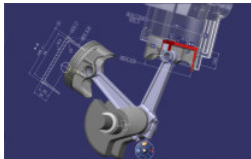


WHY DO YOU STILL RIDE A DEAD HORSE WITH SO MUCH EFFORT?

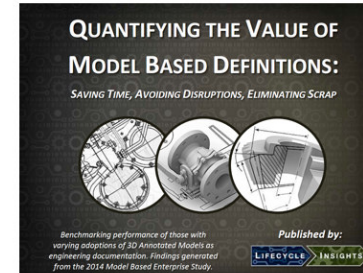
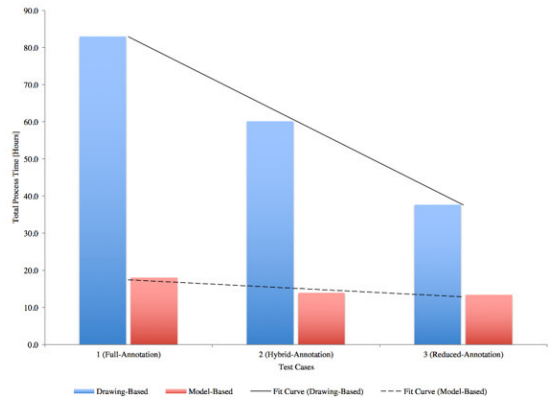
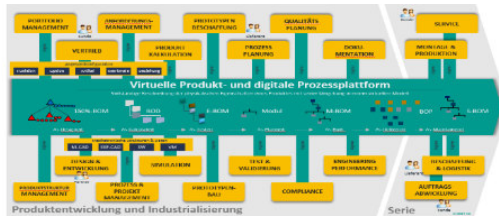


Manage your Quality

ISO GPS MOVE FROM DRAWING INTO MODEL BASED DEFINITION



3D Master 3D Design



RESULTS LIFECYCLE INSIGHTS STUDY

- 37% decrease in the number of "design emergencies" (change orders, delivery stop, recalls).
- 24% less effort for documentation (e.g. creation of views and snapshots for downstream users)
- 59% less production errors due to scrap and waste

RESULTS NIST STUDY

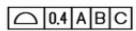
- Reduction of cycle time (design, manufacturing, testing) by 75% compared to drawing based processes
- The time difference lies especially in the number of working days until completion, not only in the total number of hours worked

| | |
|-------------------------------|-------------------------------------|
| MODEL-BASED DEFINITION | MODEL-BASED ENTERPRISE |
| MATURITY LEVEL 2 | MATURITY LEVEL 3 |
| 3D Model as Master | Fully Loaded 3D Model is the Master |

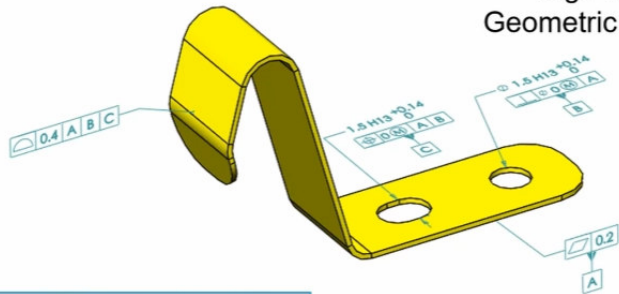
TAKE AWAY

NOTES:

1. MATERIAL: STAINLESS STEEL 301, 3/4 HARD, THICKNESS: 0.2 ±0.01mm
2. UNLESS OTHERWISE SPECIFIED



ISO GPS
Sign language for
Geometric Variation Limits



Unambiguous variation Limits
Risk Mitigation

WHY ISO GPS MAKES YOU BETTER

ISO GPS.....

- focus on your functional need
- avoid scraping good parts
- common language all around the world
- lead to cheaper parts (factor 1,57 bigger than ± tolerances)

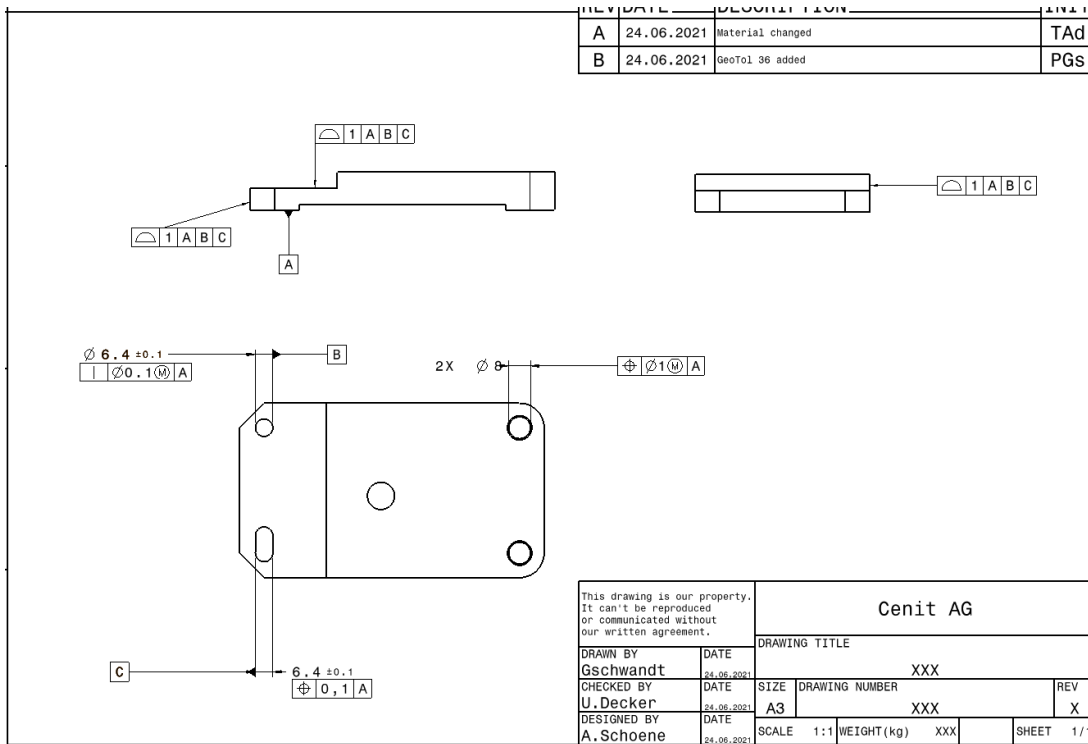
Model based definition.....

- one base of truth
- Reduction of cycle time
- Quick change management

WHERE IS THE DIFFICULTY

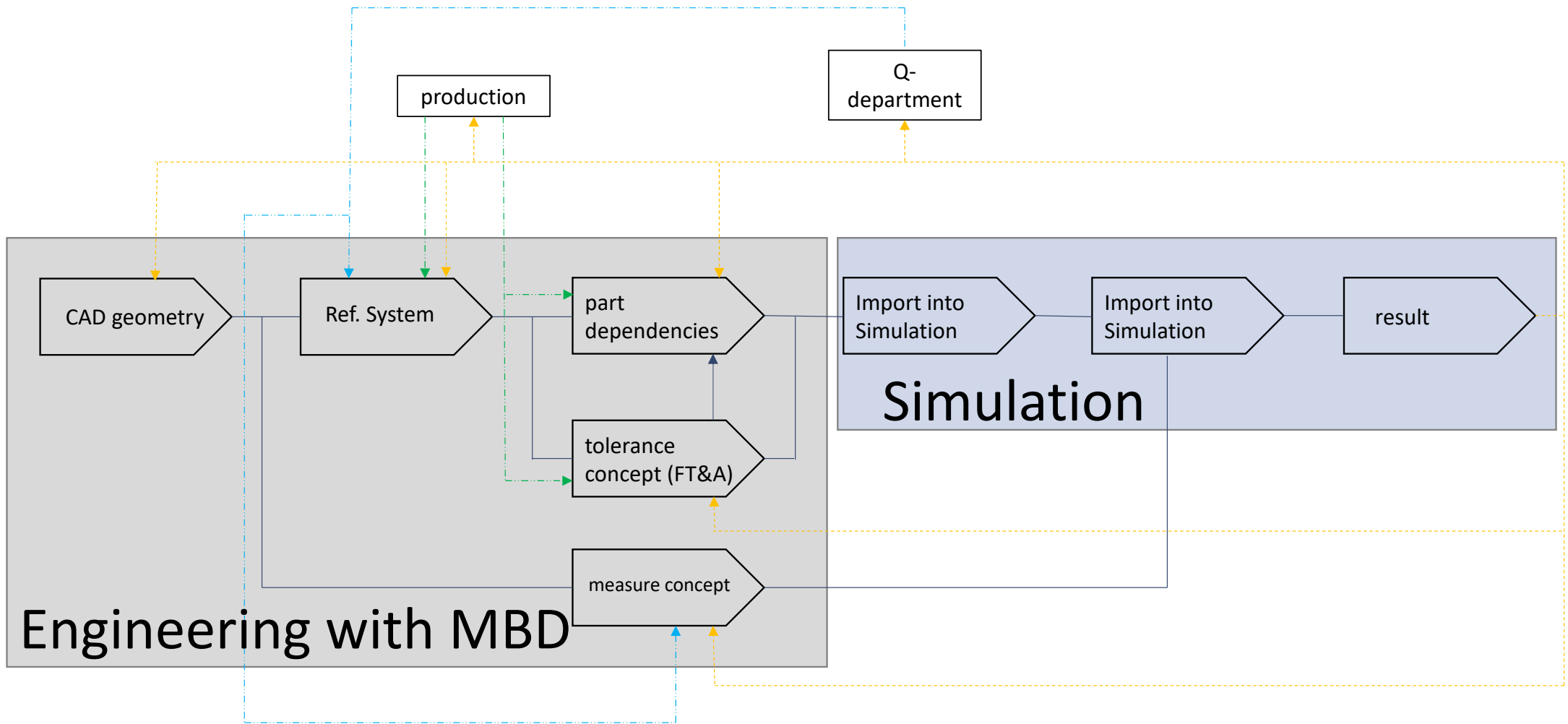


How do you ensure that the tolerance values entered correspond to your final quality criteria, without manufacturing a real component?



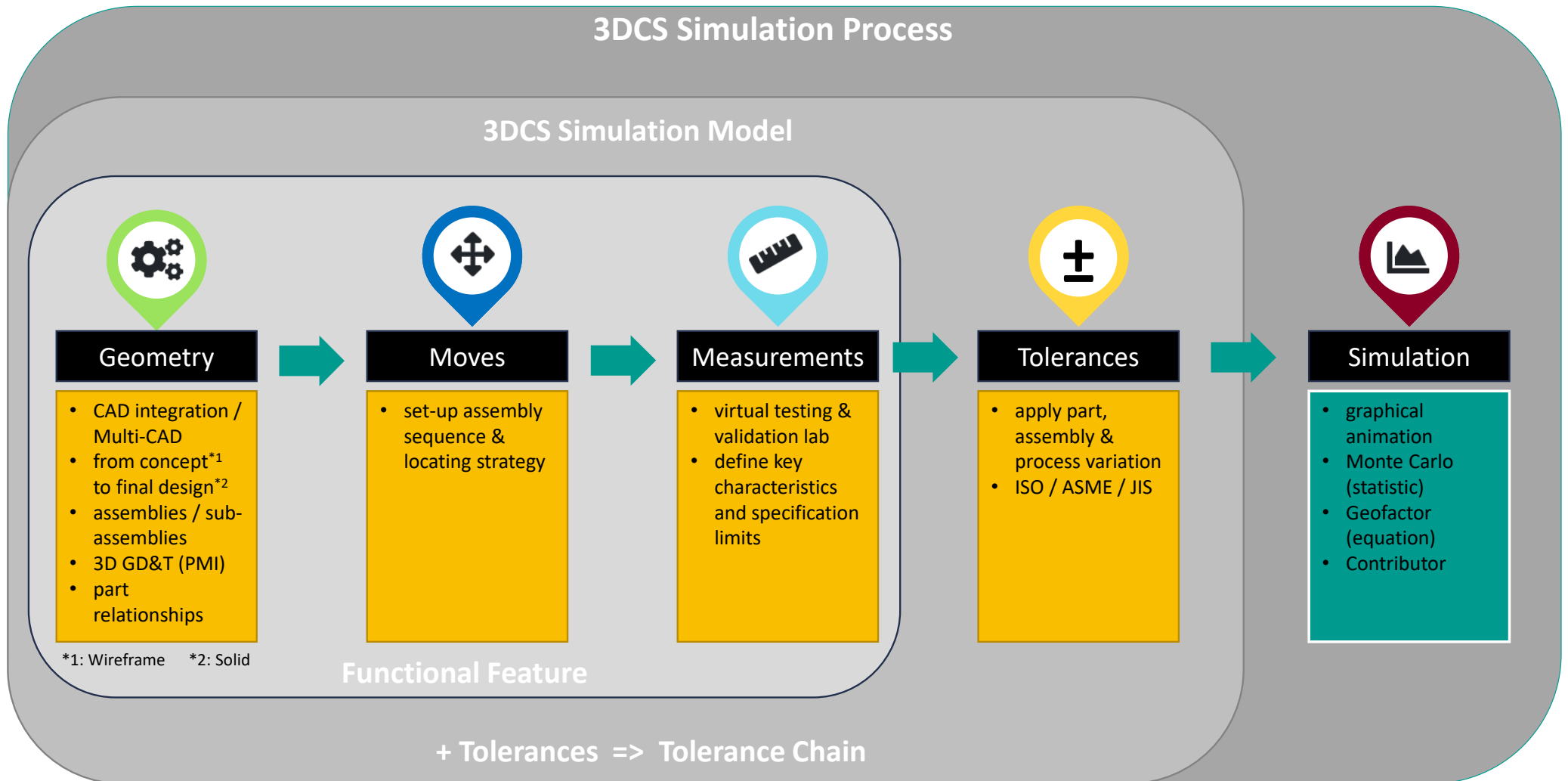
How to set up a digital manufacturing, for validating the tolerance values and concepts?

HOW TO FOLLOW A DIGITAL TREAD

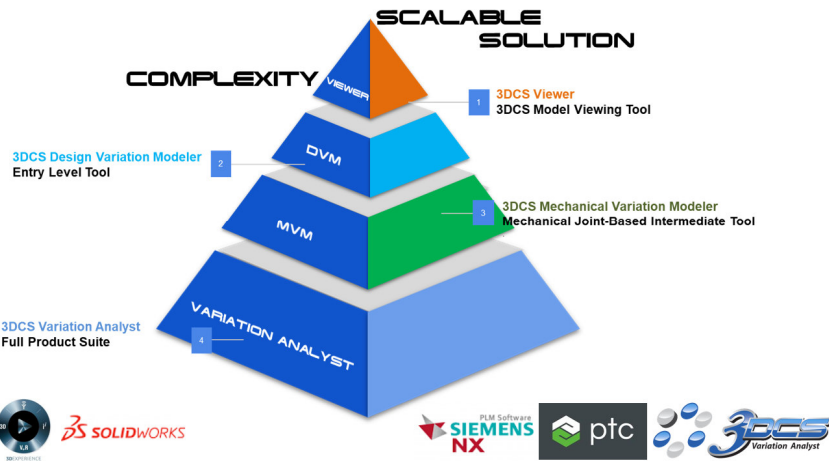


Engineering with MBD

Simulation



TAKE AWAY



WHY A SCALABLE SOLUTION?

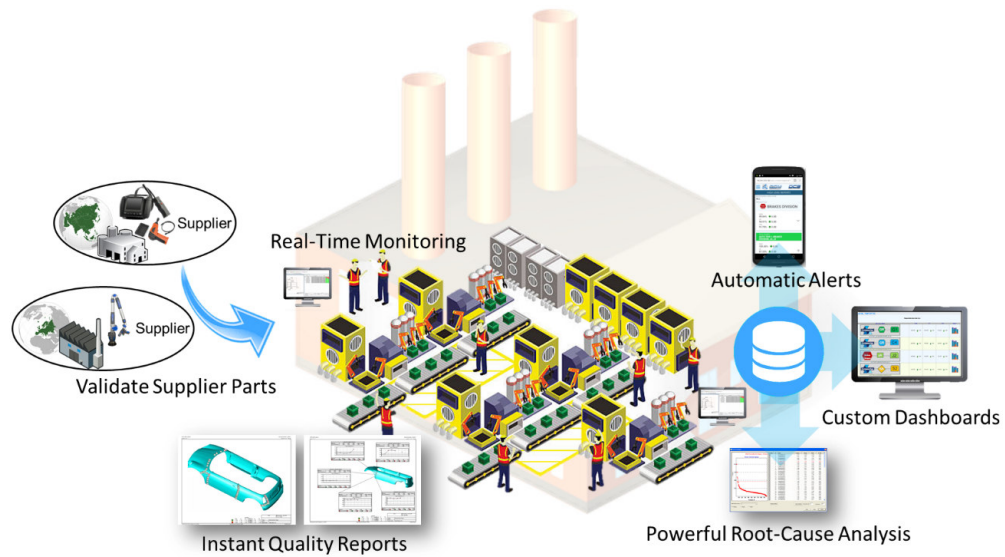
a scalable solution.....

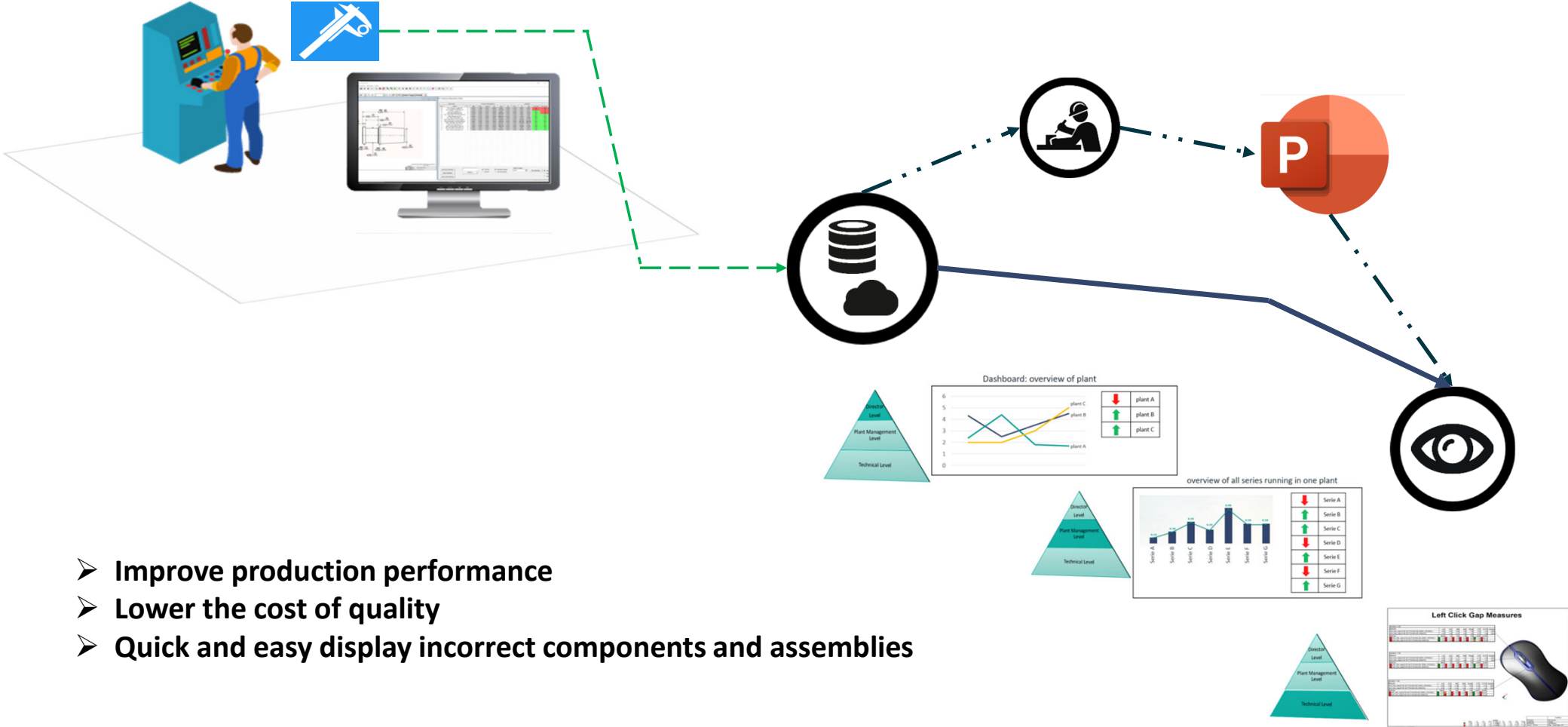
- addressee your need through all different departments a long your value added chain
- investment protection
- integrated software supports the digital approach

WHEN QUALITY DATA BECOMES VISIBLE MEANS
MAKE DECISIONS BASED ON PROVABLE FACTS AND DO IT WITHOUT EFFORT



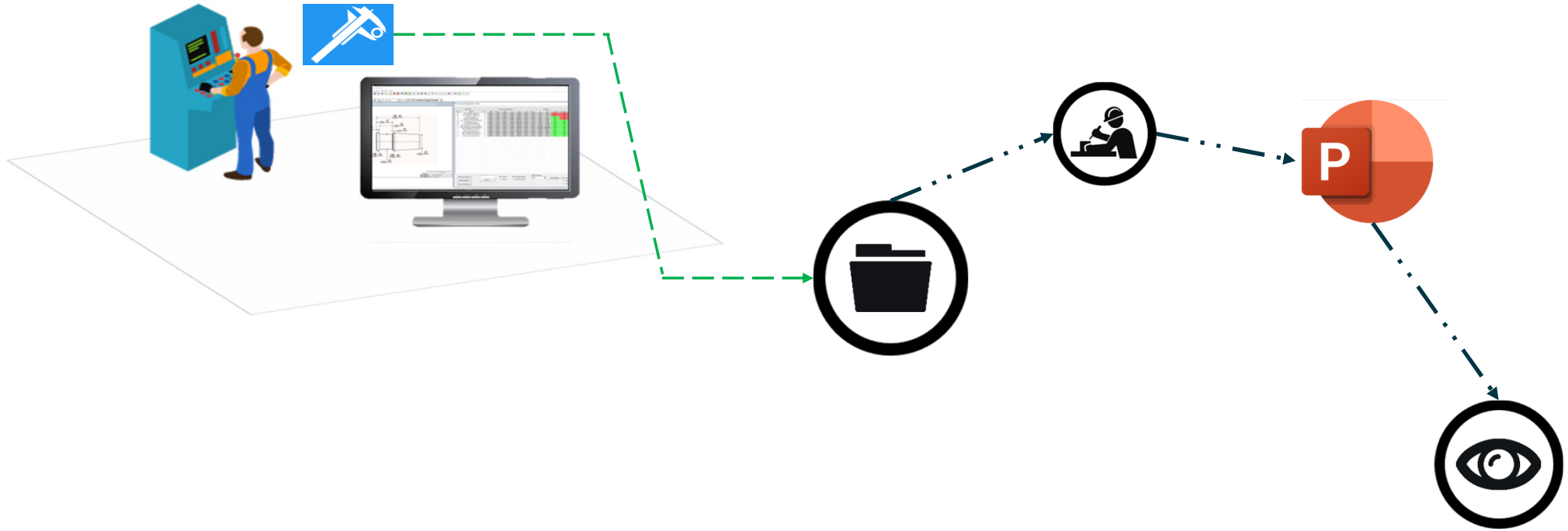
Manufacturing Root Cause Analysis Measurement Reporting



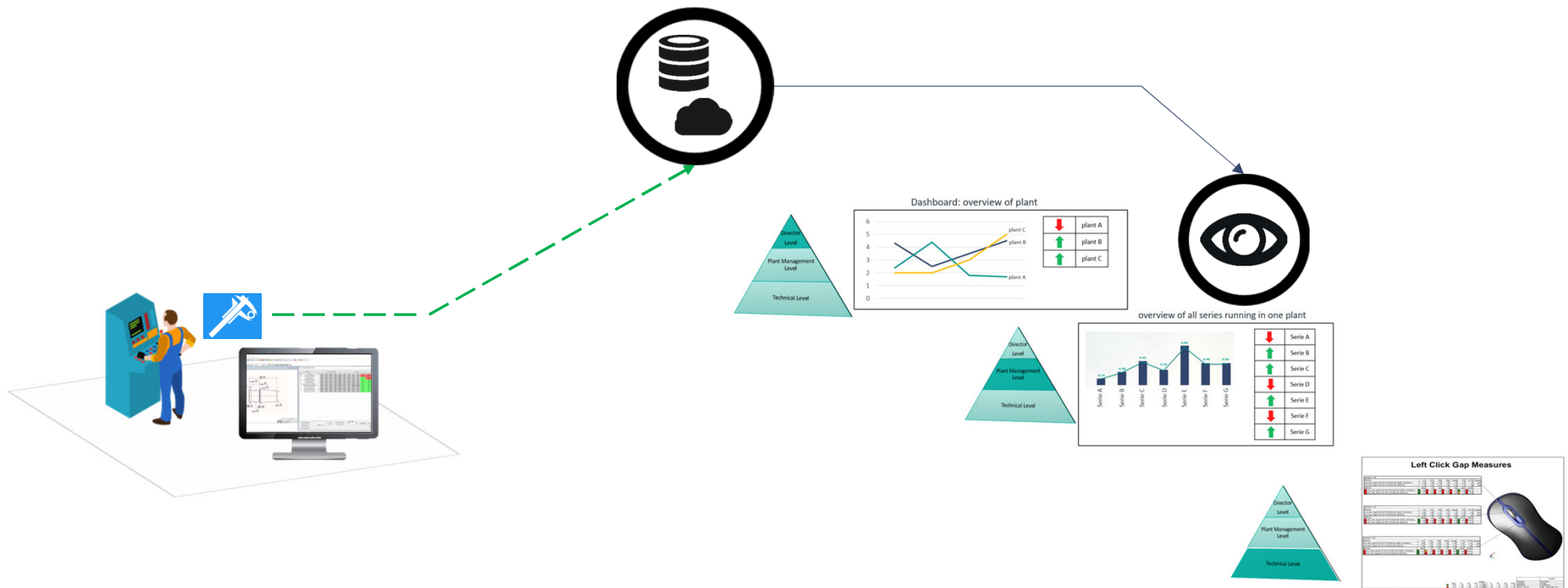


- Improve production performance
- Lower the cost of quality
- Quick and easy display incorrect components and assemblies

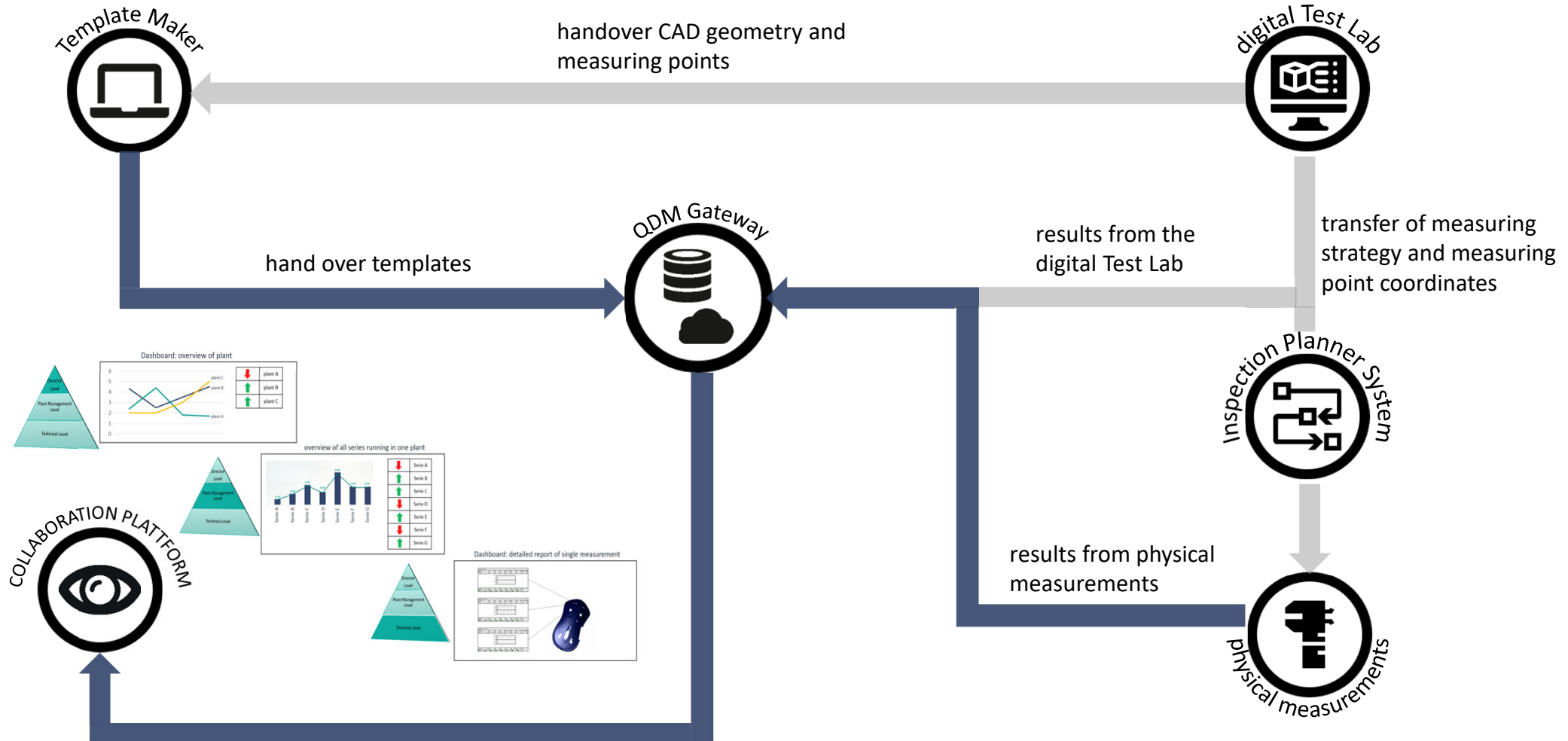
QUALITY MONITORING OLD FASHION



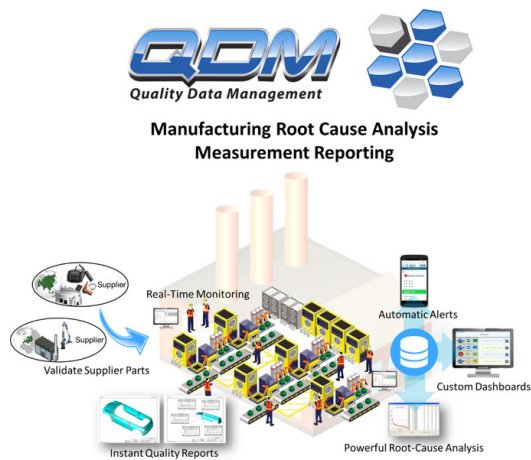
- Improve production performance
- Lower the cost of quality
- Quick and easy display incorrect components and assemblies



STREAMLINE YOUR INFORMATION PROCESS FOR MONITORING QUALITY



quality data when it is needed

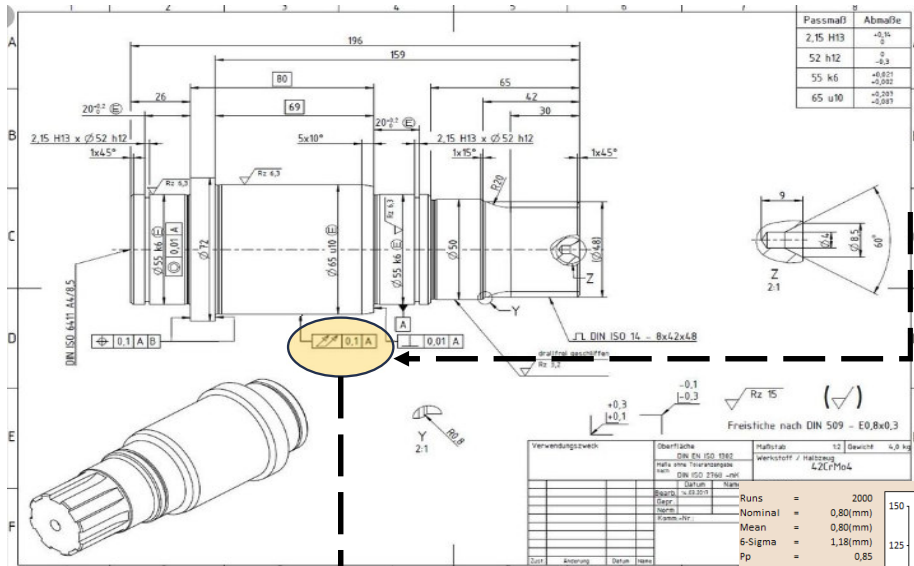


WHY REPORTING MAKE YOU BETTER?

because of.....

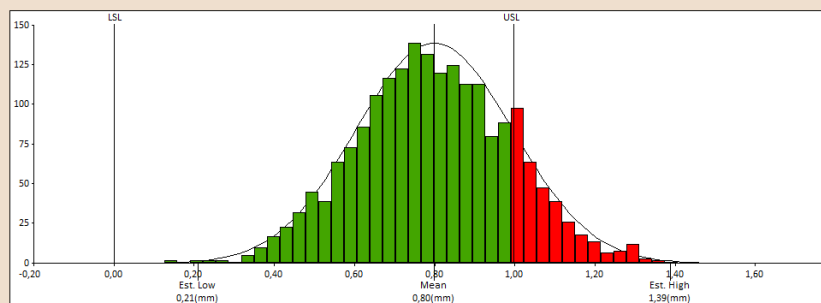
- ability to quickly use the information to make decisions at the right time
- used to connect plants and suppliers to central database (all having the same page of understanding)
- avoid negative impacts in production before happened

ONE EXAMPLE OF MANY



- Speed
- Temperature
- Grease
- etc.

| Verwendungswech | Oberfläche | Material |
|-----------------|--------------------------------|-------------------------|
| | DIN EN ISO 1967 | 12 Gewinde |
| | Metalle ohne Temperaturangaben | Werkstoff / Halbleitung |
| | DIN ISO 2768 - mSf | 4,2CF7Mo4 |



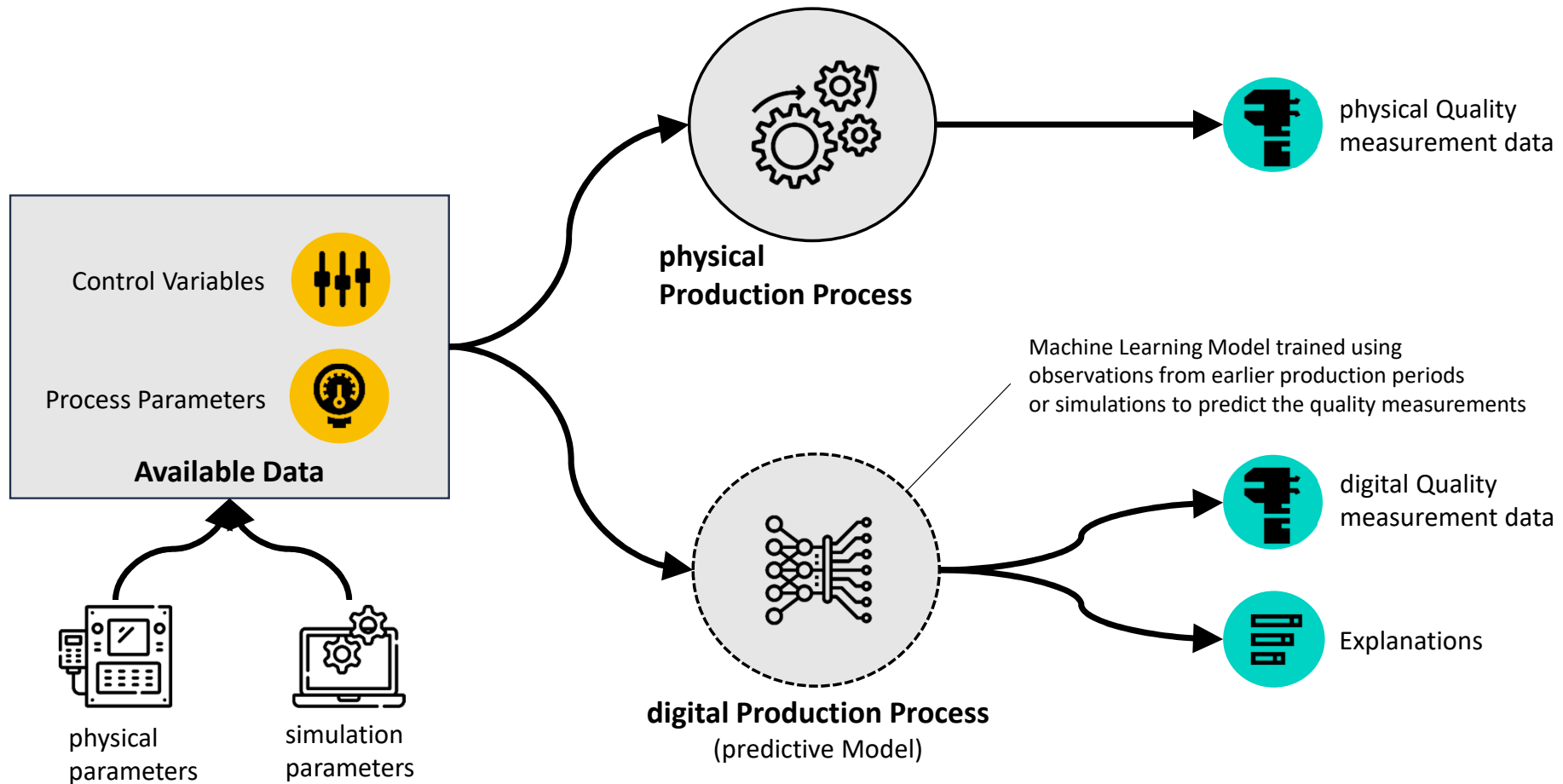
Meas1 of 11: Left_Click_Gap1 - Distance Between Left_Cover_Gap_MS1 and Left_Cover_Gap_MS1

| Index | Contributor | Part | Range | GeoFactor | 6-Sigma | Contribution % | Contribution Grad |
|-------|--|--------------|-----------|-----------|----------|----------------|-------------------|
| 1 | HP_Round[0'1]A | Mouse | 0,100(mm) | -2,64 | 0,79(mm) | 33,92% | |
| 2 | Position_surfacic_profile_Top_Cover_1 | | 0,200(mm) | 3,49 | 0,70(mm) | 26,32% | |
| 3 | Position-Left/Right_Covers_Top_Cover_1 | | 0,200(mm) | 3,11 | 0,62(mm) | 20,90% | |
| 4 | HP_Round[0'1]A | Mouse | 0,100(mm) | 1,64 | 0,49(mm) | 13,12% | |
| 5 | Position_surfacic_profile_Left_Cover_1 | | 0,200(mm) | 1,00 | 0,20(mm) | 2,16% | |
| 6 | Position_surfacic_profile_Top_Cover_1 | | 0,200(mm) | 1,00 | 0,20(mm) | 2,16% | |
| 7 | Position_1 | Left_Cover_1 | 0,100(mm) | 1,57 | 0,16(mm) | 1,33% | |
| 8 | Perpendicularity_1 | Top_Cover_1 | 0,100(mm) | 0,42 | 0,04(mm) | 0,09% | |
| 9 | Perpendicularity_1 | Left_Cover_1 | 0,100(mm) | 0,09 | 0,01(mm) | 0,00% | |
| 10 | Position_1 | Top_Cover_1 | 0,100(mm) | -0,07 | 0,01(mm) | 0,00% | |
| Total | | | | | 1,36(mm) | | |

Sum of Remaining 4 Contributors = 0,00%

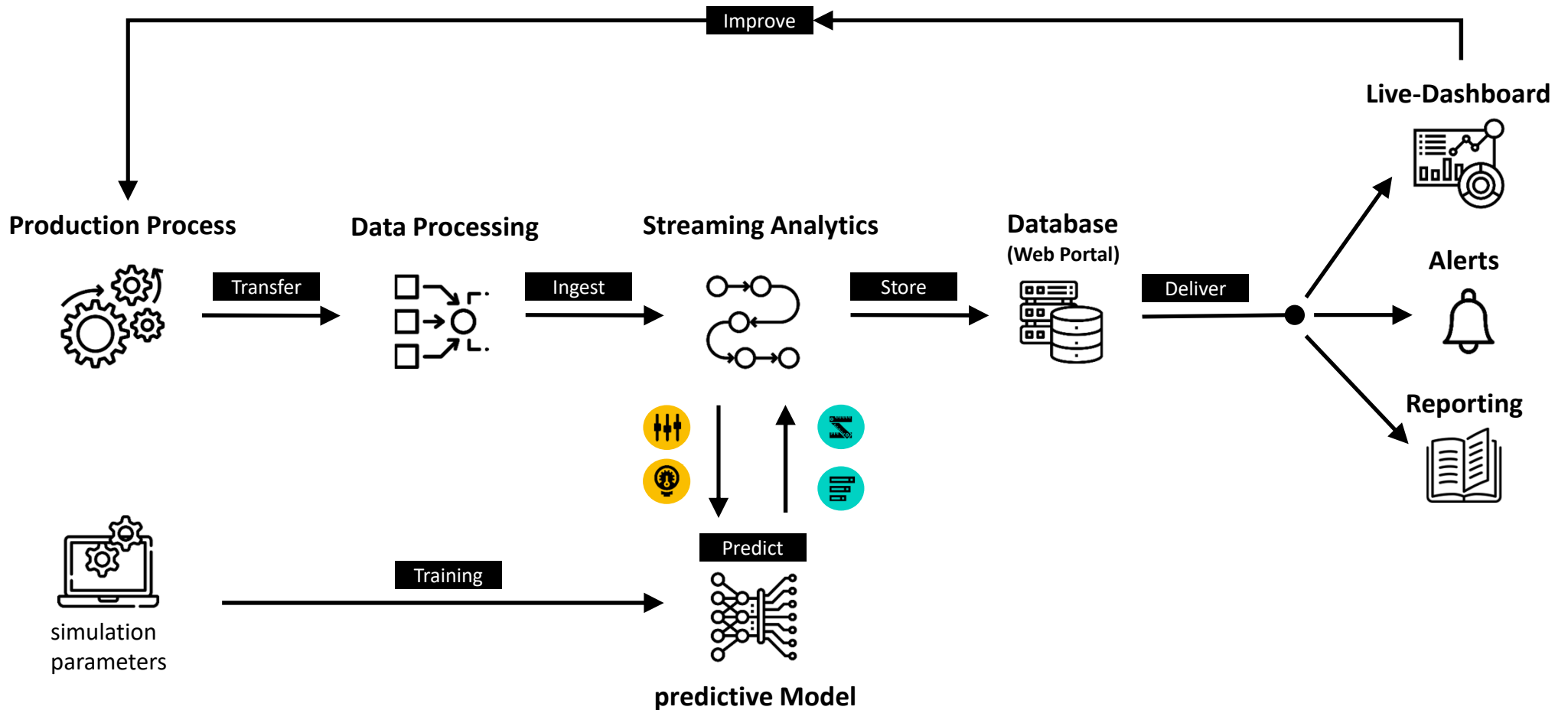
Mange your Quality

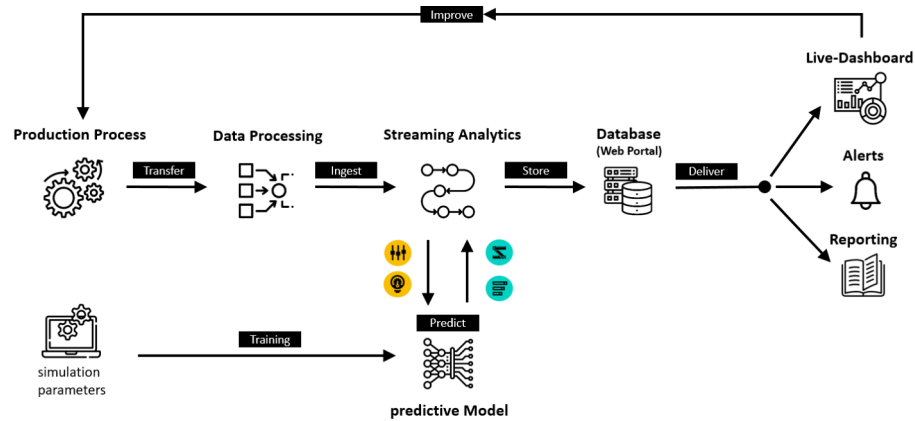
THE DIGITAL QUALITY TWIN



BRINGING THE DIGITAL QUALITY TWIN INTO OPERATION

VISION

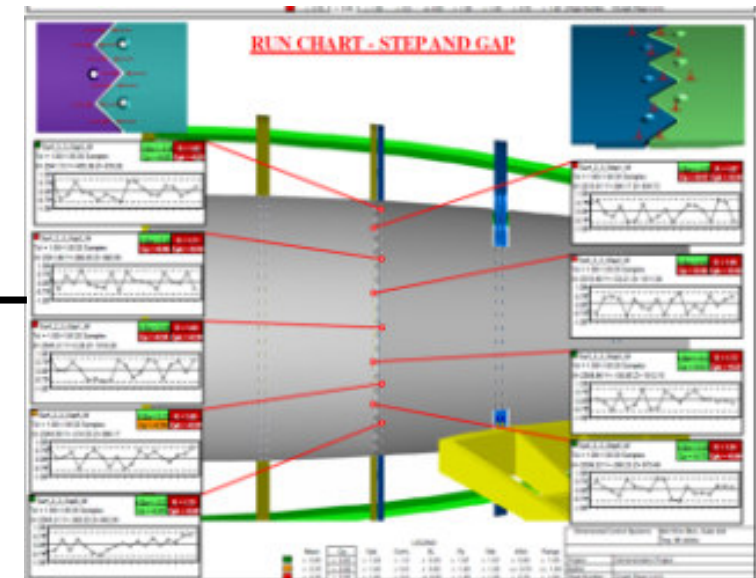
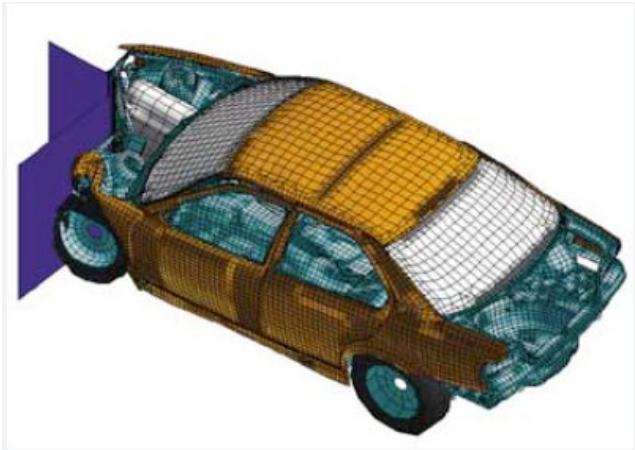




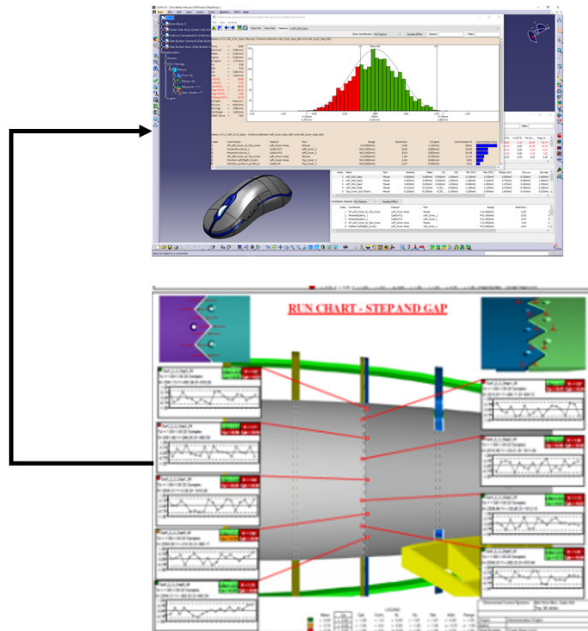
WHERE IS YOUR BENEFIT

- find in a early stage the correlation between quality parameter and production to set up goal oriented tolerance parameter right from the start
- reduce needed measurement effort
- reduce tuning phase of the tools
- enlarge the use of tools to a maximum

FEED BACK LESSONS LEARNED FROM PHYSICAL WORLD INTO THE SIMULATION



Manage your Quality

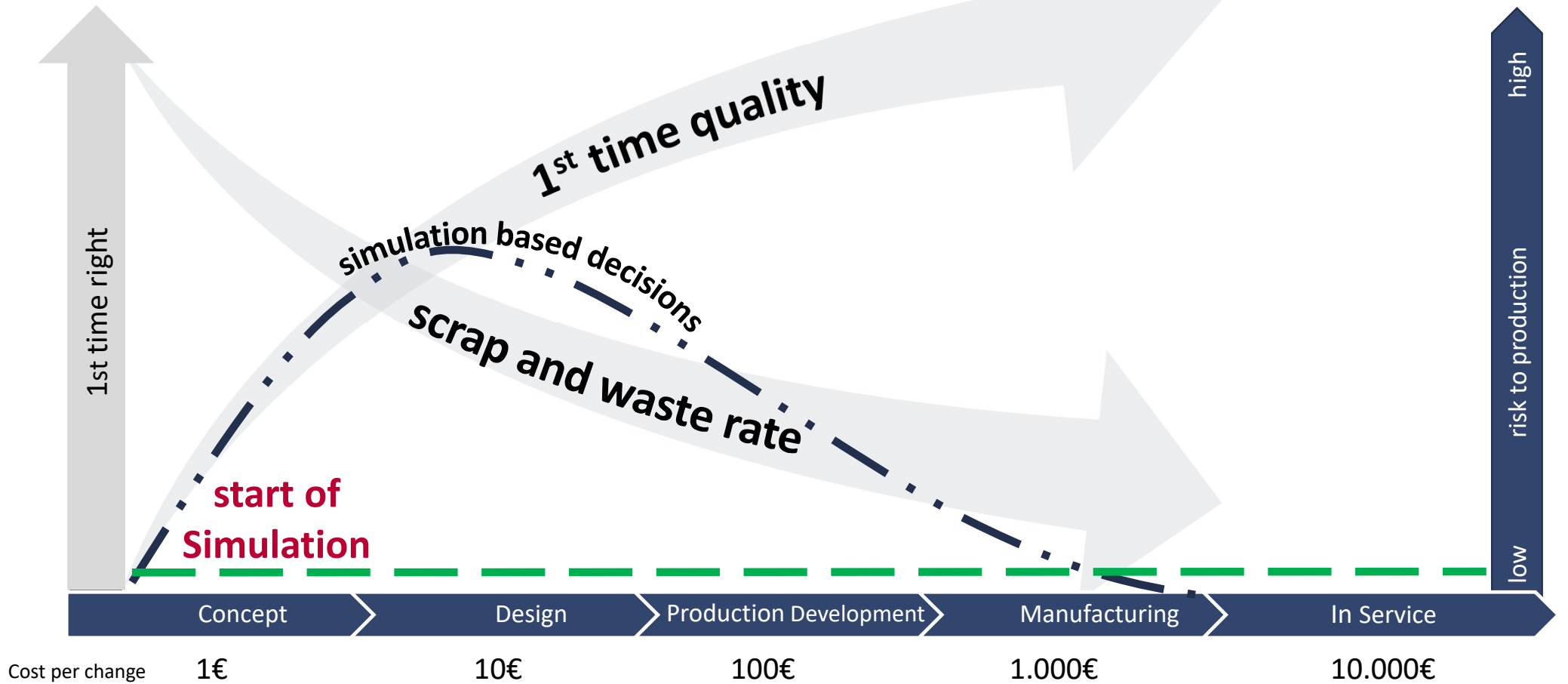


HOW THIS MAKES YOU BETTER....

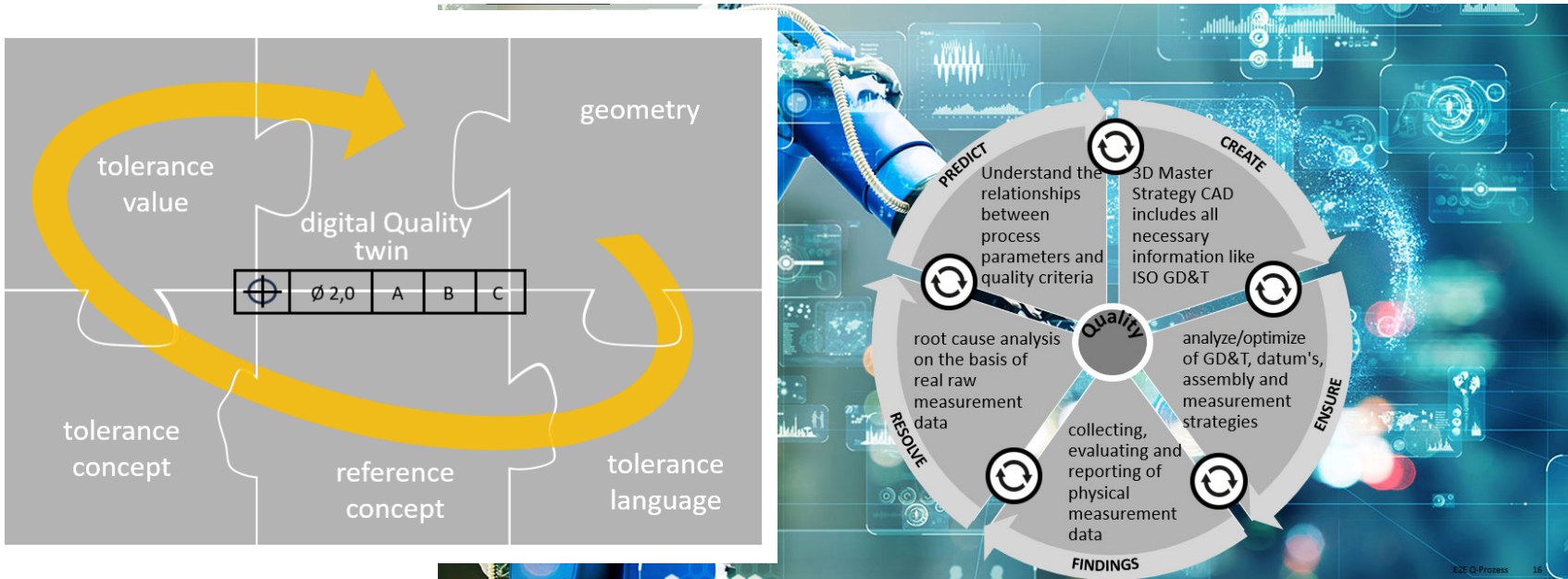
- validation of assumptions (lessons learned)
- increase of accuracy of further simulations
- decision made on facts (root cause analyses)
- find potential to optimize tolerances to lower the cost of manufacturing

WHY SIMULATION

WHAT WE LIKE TO HAVE



HOW WE DO IT IN GENERAL



"IDENTIFY STATUS QUO"

Building customer understanding with requirements gathering

Review and recording of existing strategies, initiatives, methods, processes, audits/assessments, tools and interfaces

"DEVELOP TARGET IMAGE"

Definition of the target state

Delta analysis between actual state and target state

Integration of existing / ongoing initiatives into the target picture

Prioritization of the fields of activity

"DEFINE TARGET LANDSCAPE"

development Solution concept

Detailing the fields of action

Solutions & added value

"PLANNING IMPLEMENTATION"

Rollout plan with corresponding training and software concept