



Metrology Interoperability Perspectives in the Automotive Industry

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Predictions

- Only two of the three North American auto companies will survive
 - 25 mfg plants eliminated by 2008
 - 8 large tier one suppliers are in bankruptcy
 - 200,000 auto workers will lose employment by 2008
- Toyota becomes the world auto leader by 2008



What sets these companies apart?

- Cost
- Quality
- Adaptability
- Flexibility
- Legacy costs

Consumer Reports Product Reliability		Problems per 100 Vehicles
 TOYOTA		10
		
European Makes		21
		21
		23

Future Success

- The ability to achieve full utilization of our manufacturing facilities
 - Fast flexible change of product
 - Faster integration & production launch
 - Reduced staffing requirements
 - Ability to leverage technology - doing more with less

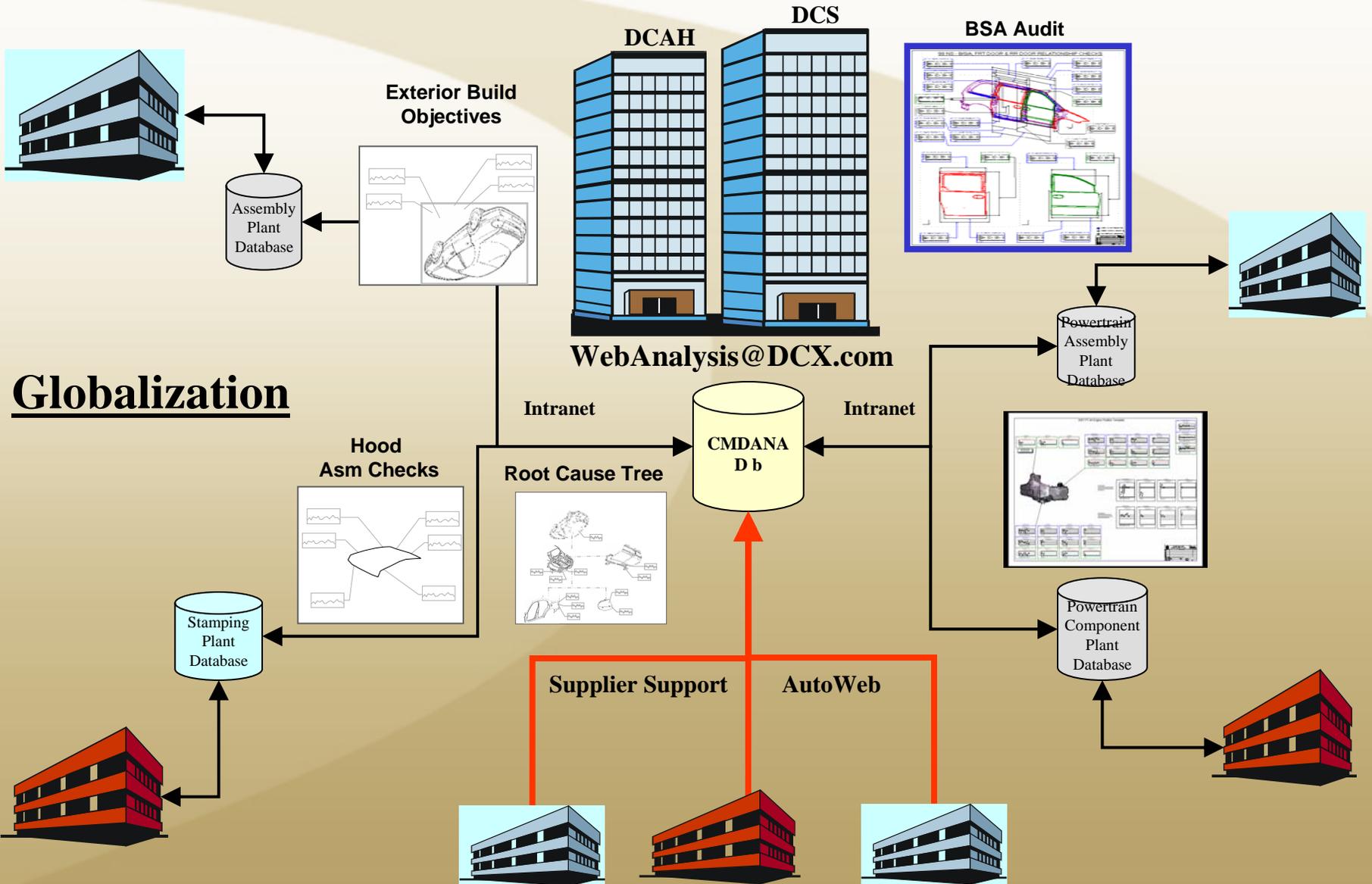


Future Success

- The ability to reduce capitol investment
 - Design & development costs drive component sharing on a global basis
 - Top hat programs using existing platforms
 - Lower capitol equipment investments

Future Success

- The ability to achieve high quality products
 - Quality systems need to work in harmony
 - Fast, responsive, intuitive
 - Connects the inspection process to the manufacturing process without gaps
 - Organized data in a format that's intuitive to quality engineers



Globalization Challenges

Achieve globalization through standard processes

- Design, mfg, inspection, reporting
 - Who's process is considered benchmark?
 - Who's systems will be considered?
 - How to achieve common dimensional control objectives?

Standards play a key role

- Use of ANSI or ISO tolerance?
- DIN, ANSI or ISO inspection standards?

How to preserve legacy systems but gain global connectivity?

- With minimal cost added

The Role of Standards

- Standards can reduce cost across the extended enterprise
 - Allows for easier integration
 - Reduces cost for users
 - Reduces cost for suppliers
- Enable standard processes to occur

Examples of cost opportunities....

CMM system compatibility issues migrating to Catia V5:

- 1450 CMM's worldwide
 - V5 direct translator costs = \$4,350,000
 - 80% require software upgrades
 - 40% require controller upgrades

Examples of cost opportunities....

New engine program purchases completed designs in Pro-E to reduce design costs:

- \$5,000,000 in integration costs
- 30% of geometry required repair
- Tolerance could not translate

Examples of cost opportunities....

- Connecting the extended process chain
 - High accuracy CMM purchased for the plant
 - Tool supplier had identical hardware but different software from the same supplier
 - Duplicate set of programs developed to run off tools at supplier
 - Cost penalty \$300,000

Examples of cost opportunities....

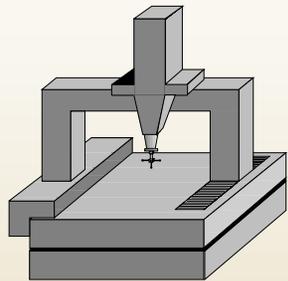
- Typical vehicle manufacturing plant today
 - 6 major quality systems
 - Each have redundant SPC software
 - Each have a unique database for data storage
 - Each require custom translators
 - Each are disconnected from the user of quality data

Cost of a Poor Quality Process

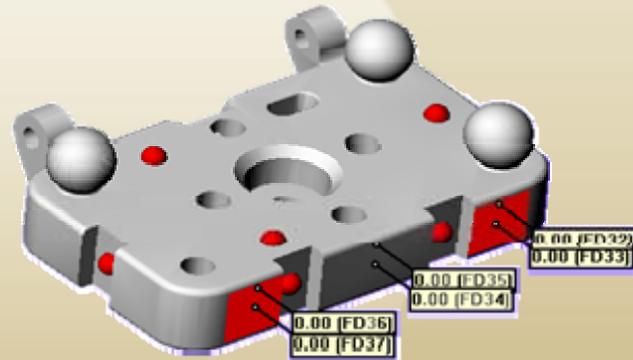
- Shut down the line
 - Vehicle assembly plant = \$25,000,000 / day
 - Power train plant = \$2,500,000
- Defects causing warranty issues
 - Recall cost
 - Repair cost
 - Dissatisfied customers / quality perception
- Legal implications of quality problems
 - \$1,000,000,000 class action suit



Re-active Quality Process

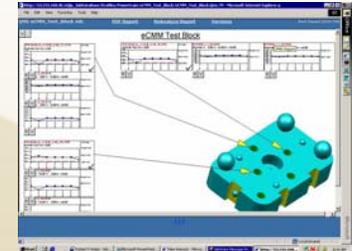


Local CMM



Corp CMM Database

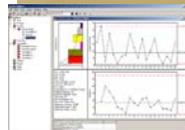
Corp Quality Database



User



Local OP 10



Local OP 20



Local Op 30



Valve Seat Analysis

- The SPC chart indicates the valve seat operation is running out of control.
 - Engineer receives the static SPC chart via a pdf file displayed on a web browser
 - The engineer can not dive directly down to investigate the inspection results. Calls inspector for the last 20 files.
 - The results files indicate excessive run out
 - The engineer needs to see the underlying hit points to determine what is the form error but only the last inspection retains this data.



Pro-active Quality Process

Summarize quality problems

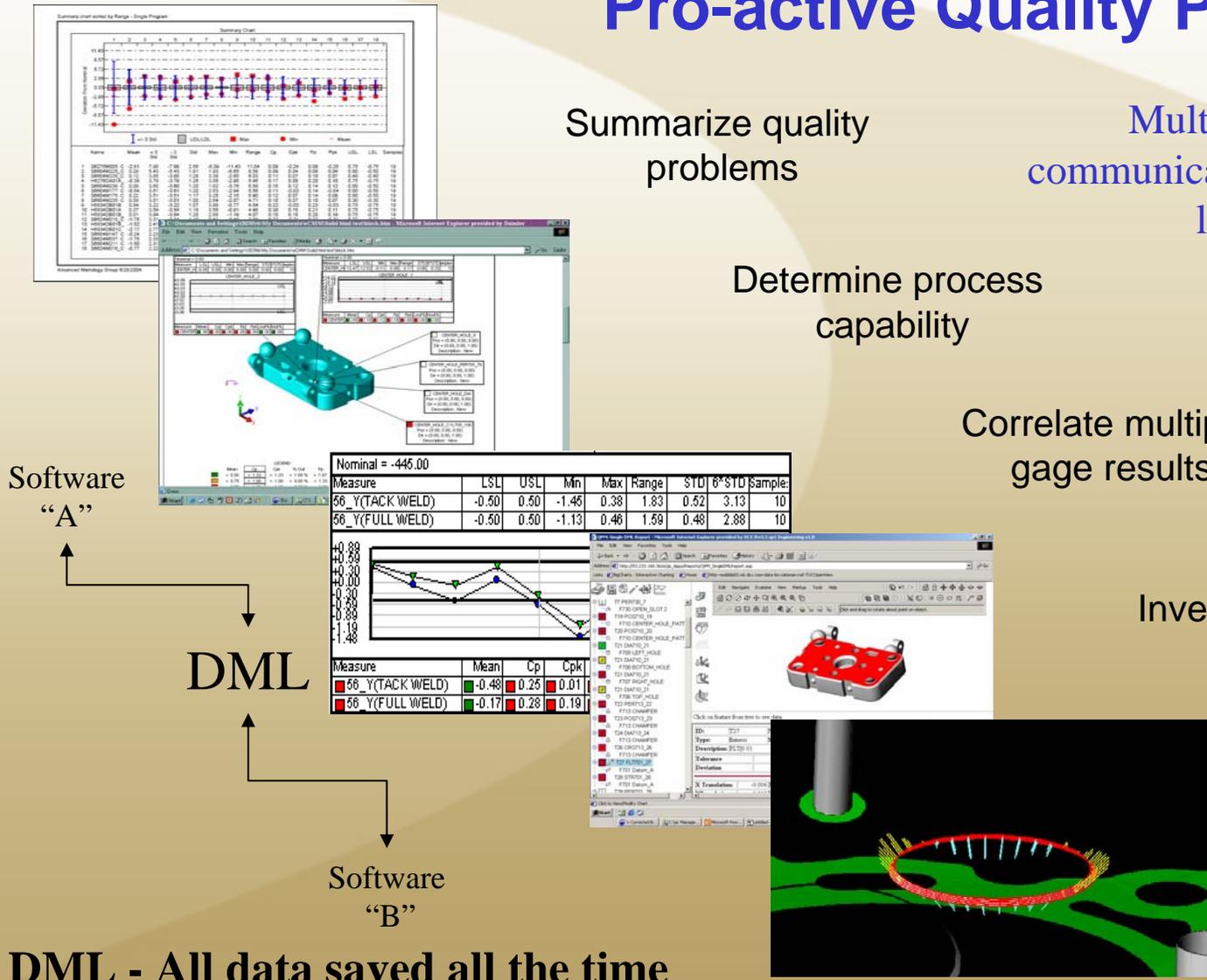
Multiple systems communicating in a common language

Determine process capability

Correlate multiple gage results

Investigate specific data files

Graphical display of feature data



DML - All data saved all the time

Dimensional Metrology System:

Component diagram with candidate open & non-proprietary interface standards

Design Planning Execution Analysis

