Why QIF Matters
A Roadmap for Digital Manufacturing
Digital Transformation of Industry

These are all about using DATA to solve business problems
(Data, not software)

It’s all about Digital Transformation

Model Based Definition (MBD)
Model Based Enterprise (MBE)
Industry 4.0
Digital Enterprise
Advanced Manufacturing Enterprise
Digital Twin
Digital Thread
Digital Tapestry

Not all data is created equal. Consider:

dat txt tif csv xls
pdf xml prt stp jt

Images courtesy of Action Engineering
Looking to the Future: What is the Value of MBD?

Model Based Definition provides a source of value in the downstream direction from design, and in the upstream direction from operations and deployment.

This approach is embodied through QIF
What is the QIF?

- Feature-Based Ontology of Manufacturing Quality Metadata
- XML Technology: Simple Implementation and Built-In Code Validation
- Information Semantically Linked to Model for Full Data Traceability to MBD
- Approved ANSI Interoperability Standard
  Harvesting by ISO/TC 184/SC 4
Process, and Process Automation

**Process over Personnel**
Avoiding the a “human-in-the-loop” is always preferred in modern manufacturing

- Heavy human intervention means that the creativity and adaptability of the human mind is required to resolve a given step in the manufacturing process.
- Relying on human creativity, rather than rigorous corporate process, means a less repeatable outcome and higher risk.

**Automation**
When a business process can be adequately defined, automation becomes possible

- Increases speed of task completion
- Lowers costs due to decreased labor requirements
- Frees up valuable personnel for other tasks more suited for the human mind
- Automated processes are extremely repeatable and low in risk compared to relying on human involvement
QIF MBD is the base for providing traceability to authority CAD data. It is not required for basic QIF use cases. Considered to be the strongest semantic CAD+PMI standard available.

Wide range of optional levels of detail for measurement plans:
- What to Measure: Bill of Characteristics
- How to Measure: Inspection Plan
- Assign measurement resources
- Specify sampling point locations

Specify basic or highly detailed information about available measurement equipment (e.g., CMMs, probes, calipers, gages). As always, this data is contextual and semantic.
Workflow Example

Process Stage 1:
Identify Measurement Tasks (Bill of Characteristics).

Process Stage 2:
Assign measurement resources to measurement tasks.

Process Stage 3:
Generate a DMIS inspection program.

Process Stage 4:
Evaluate point clouds against GD&T.

Process Stage 5:
Perform statistical analysis.

All QIF data generated throughout the entire process is linked to the authority model. This fulfills traceability requirements and provides fertile opportunities for data mining.
Value of Manufacturing Data

• Currently, manufacturing data is not fully exploited because of lack of structure

• **A study by McKinsey & Company states:**

  *We estimate that the AI techniques we cite in this briefing together have the potential to create between $3.5 trillion and $5.8 trillion in value annually across nine business functions in 19 industries*

• The second largest growth area for AI and Big Data is Supply-chain management and manufacturing

• Providing structure and data traceability is required to unlock this potential
"This hole size is out of tolerance; the mating pin will not fit into this hole during assembly"

"This hole size is out of tolerance; the mating pin will not fit into this hole during assembly"

Data

Information

Knowledge

Wisdom

Application of Knowledge towards a specific goal

Applied Information

Data with context

“Remove more material”
Without context, data cannot be transformed into knowledge. QIF provides this context.

DIKW Pyramid & QIF

- **Data**
- **Information**
- **Knowledge**
- **Wisdom**

Raw Measurement Data
The fundamental constructs behind QIF:
Features & Characteristics

- CAD geometry is wrapped by **Features**
  - Different concept from CAD features!
  - Sometimes referred to as:
    - Tolerance Features
    - Metrology Features
    - Measurement Features
- Features are referenced by **Characteristics**
  - Usually, these are GD&T
Roadmap for Success

Active Schema Development

Data Integrity

Standardization Efforts

Facilitate software development

Free Open Source Tools

QIF Community
**Thanks!**

**DMSC Board of Directors**

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*Digital Metrology Standards Consortium*

**Download the Standard at:** [www.QIFStandards.org](http://www.QIFStandards.org)