

Action Engineering Completes MxD-Funded Project Delivering a Data Standards Playbook for MBD Manufacturing

Industry-informed guidance helps manufacturers select and apply the data standards that make 3D model data usable across engineering, manufacturing, & quality.

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Action Engineering, LLC, a woman-owned small business specializing in [Model-Based Definition](#) (MBD), has completed a project funded by MxD examining how data standards can be applied to MBD manufacturing workflows used by U.S. manufacturers supporting the Department of Defense and the broader manufacturing base. The project was executed with team members Rubypoint, Capvidia, and Lockheed Martin.



Manufacturers integrating engineering, manufacturing, and quality systems face a landscape of overlapping and inconsistently applied data standards. That overlap creates rework, fragile connections between tools, and barriers to true interoperability across the supply chain. The project set out to map that landscape and define a practical implementation pathway.

Project Scope

The team examined five real-world MBD manufacturing workflows to identify use cases, define requirements, map the current state of applicable data standards, and disseminate the outcomes:

Ballooning. Characterizing MBD design models so features and characteristics can be tracked from design and engineering through downstream manufacturing and quality activity.

CMM. Coordinating digital metrology consumption of MBD so inspection programs can be generated with a high degree of automation.

Virtual Assembly. Feeding as-built product data back into tolerance analysis and cost estimation software to improve design based on real production results.

Adaptive CNC. Feeding as-built product data back to machine tools so programs can be updated automatically based on actual dimensional information.

Connected MES. Gathering shop floor and inspection data through MES while maintaining traceability to the master model and characteristics in PLM.

The work was grounded in interviews with OEMs, suppliers, and software providers, including Lockheed Martin, GD-OTS, Moog, Donaldson Company, Capvidia, Kotem, Siemens, Wolfram Manufacturing, and Met-L-Flo. Participants ranged from technical fellows and directors of engineering to quality and design engineers, data scientists, and MBE managers.

Results

The project produced a [Data Standards Playbook](#) that gives manufacturing organizations recommended data standards for MBD manufacturing, a gap analysis of existing standards, and actionable guidance for improving data interoperability. Supporting deliverables include a technical report on the current landscape of data standards, a standards and guidelines crosswalk written for non-technical audiences that maps where standards overlap and where they are distinct, and a workflow demonstration video showing real-world application of the standards, including QIF and STEP.

Interview findings pointed consistently to two themes. The workflows most affected by model-based adoption are design authoring and manufacturing work instructions and CAM, with quality and first article inspection following closely. The most common obstacles were not technical: two-dimensional habits carried into three-dimensional work, workforce turnover and training gaps, uneven GD&T knowledge, and effort that lands on engineering before benefits are visible downstream. Confidence in software tooling was the leading technical concern, with QIF, STEP AP242, and native CAD cited most often as the standards in active use.

Each organization interviewed approaches MBD implementation differently and applies data standards differently, often within an established software stack. That variation reinforced the value of a reference that shows what is possible across tool combinations rather than prescribing a single path.

Availability and Next Steps

The Data Standards Playbook and the workflow demonstration video are available on the Action Engineering website, as well as the MxD Member xChange.

The Playbook and demonstration illustrate the art of the possible for manufacturers of all sizes and for OEMs encouraging their suppliers to adopt standards-based MBD workflows. Anticipated follow-on work would partner with a representative set of manufacturers to build implementation roadmaps covering how to get started, expected benefits, technology stacks matched to available resources, and workforce adoption.

About Action Engineering

Action Engineering, LLC is a woman-owned small business guides customers to meet their digital engineering and manufacturing goals through process improvements for 3D data, interoperability tools, and technologies, MBD modeling guidelines consistent with industry standards, and, most importantly uplifting the people who implement. Since 2008, Action Engineering has partnered with more than 180 organizations across defense, aerospace, automotive, and government.

About MxD

MxD is a public-private partnership and manufacturing innovation institute focused on advancing the digital transformation of U.S. manufacturing.

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