

Capvidia: Transforming manufacturing with model-based workflows

by Jimmy Nguyen
Capvidia

Constant evolution: the shift to digital

Anything that can be digitalized, is being digitalized. In the 1970s, major aerospace and automotive companies began using a cutting-edge digital technology called CAD (computer-aided design) to design complex parts.

The mainstream dismissed it as a fad: CAD systems could never replicate the feel and detail of hand drawing on paper and mylar sheets. The cost of introducing computers, software, and retraining engineers from pen and paper to keyboard and mouse would be too high and almost impossible. CAD would never happen. In the 1980s, personal computers became mainstream. In the 1990s, CAD became standard.

Now in the 2020s, major aerospace and automotive companies are using model-based workflows, sometimes called MBD

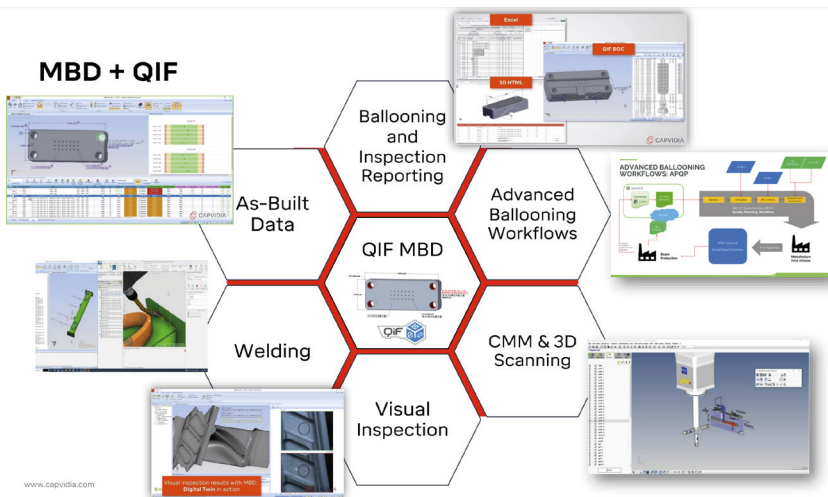
(model-based definition) or MBE (model-based enterprise), to design complex products.

Again, the mainstream is proclaiming it a fad: model-based workflows cannot compete with the ease and simplicity of 2D PDF drawings.

The cost of implementing MBD/MBE workflows, changing processes, and retraining engineers from a 2D to 3D workflow would be too high and almost impossible. Model-based workflows will never happen...

What are model-based workflows?

Traditional manufacturing is still a highly manual process. Design engineers design complex parts and assemblies in CAD.



However, to build and evaluate the part, design engineers capture all quantitative information (dimensions, tolerances, geometric dimensions, etc.), qualitative information (materials, surface treatments, surface roughness, etc.), and documentation requirements in a 2D drawing. Design engineers then pass the CAD file and the 2D drawing to quality engineers to check the feasibility of the design.

This is known in the industry as “throwing it over the wall” as the designer rarely understands the amount of work that quality and manufacturing engineers must go through to ensure a quality part or assembly.

Quality engineers take all the information conveyed in the 2D PDF drawing and manually re-enter data into quality workflows such as FAI (first article inspection), SPC (statistical process control), PPAP (production part approval process), CMM (coordinate measure machine), and more.

This process can take weeks or even months for complex parts and assemblies.

However, this process has many points of failure:

- Manual transcription increases the risk of error.
- Manual transcription increases the time required to perform a labour-intensive yet menial task.
- Manual transcription increases costs associated with rework and recalls.

All these setbacks associated with a 2D drawing-based workflow stem from a lack of interoperability. The design engineer has already put the manufacturing information into the 2D PDF drawing. Why do quality engineers have to re-digitalize the same information into their system? Shouldn't the information be automatically passed up and down the chain? The answer is model-based workflows.

With model-based definition, design engineers bring all the information needed to manufacture a product directly into CAD. One file, one source truth.

The CAD file is automatically used downstream by quality and manufacturing, providing a digital thread throughout the product life cycle, resulting in: automation, traceability, faster workflows, faster iteration,

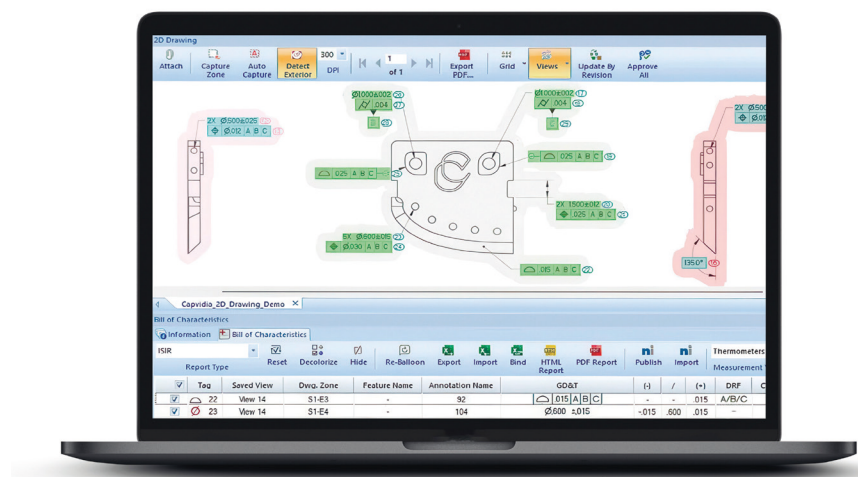
faster time to market, lower costs, and better products. And that is just the beginning. In this new age of AI and big data, manufacturing leaders will draw insights from model-based workflows to beat the competition on speed, price, and quality. Better revenue. New revenues. All from data-driven insights.

QIF: The first step to model-based workflows



While it is easy in theory to incorporate manufacturing data into a CAD model, in practice it is hampered by interoperability issues, namely native CAD data that is locked into Creo, NX, SolidWorks, AutoCAD and other proprietary CAD software that needs to exchange reliable data with other software.

Neutral formats such as STEP and IGEs have been acceptable for geometry, but model-based workflows require a robust format that can handle product manufacturing information (GD&T, inspection plans, measurement results, etc.) and universally unique identifiers (UUIDs) for granular traceability, such as linking measurements to specific components. Enter QIF (Quality Information Framework).



QIF is an ISO CAD-neutral format designed specifically for model-based workflows and the digital thread in manufacturing, enabling traceability, collaboration, and automation from a single source of truth.

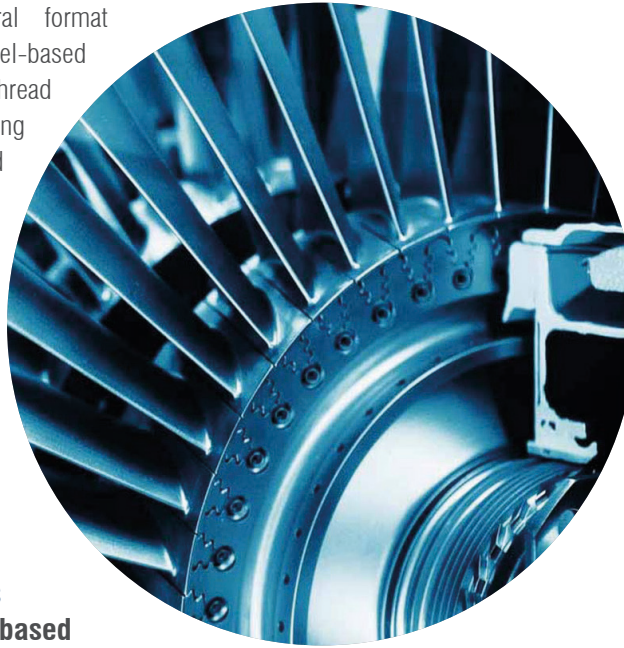
Capvidia software works with native CAD and QIF to provide seamless interoperability from design to inspection to manufacturing and beyond.

Capvidia provides solutions that power model-based workflows

MBDVidia: Deploy model-based workflows across the enterprise

MBDVidia is a model-based workflow productivity software that publishes native CAD models to QIF for downstream use.

Create a machine-readable bill of characteristics for automated FAI, PPAP, APQP, and other inspection reports. Publish inspection reports to Excel, PDF, HTML, and Net-Inspect.



MBDVidia also has an optional 2D workflow called Balloon 2D that converts 2D annotations into a machine-readable bill of characteristics.

Model-based workflows include quality inspection, welds, visual inspection, APQP, assembly, enterprise automation, and more.

CompareVidia: Manage CAD revisions and validate derivative models

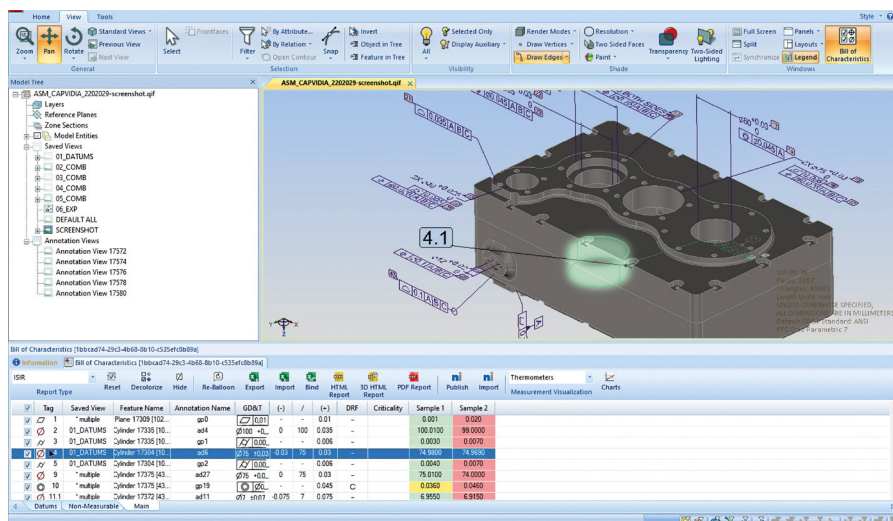
CompareVidia is a model-based workflow productivity software that validates customer production definition requirements such as Boeing DPD and other aerospace requirements.

Compare changes in derivatives (NX to QIF), revisions (Rev. 1 to Rev. 2), or versions (Creo 9 to Creo 10). Ensure consistency between native model and derivatives.

MBDConnect / FormatWorks: Native CAD plug-ins to export QIF and MBD data

MBDConnect/ FormatWorks is a model-based workflow productivity plug-in that exports native CAD files from Creo, NX or SolidWorks to a neutral MBD-ready CAD file such as QIF or STEP242.

Reuse CAD downstream for automated inspection reports and other model-based workflows including welding, visual inspection, APQP, assembly, and more.



Embracing the future

With AI and big data, manufacturing leaders will leverage insights from model-based workflows to outperform competitors in speed, cost, and quality, driving better revenues and new opportunities. Capvidia continues to lead this transformation, providing the tools to realize the full potential of model-based manufacturing.

For more information:

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About Capvidia - Leading innovation

Founded in 1994, Capvidia has been at the forefront of emerging technologies in manufacturing. The company was the first to market with CAD translation in 2000 and first to market with CAD validation for Boeing validation in 2009.

In 2013, Capvidia saw the confluence of high-speed internet, fast computing, big data, and cyber-physical technologies to create conditions for a true quality-based digital thread throughout the product lifecycle. The company bet on model-based workflows as the future of manufacturing.