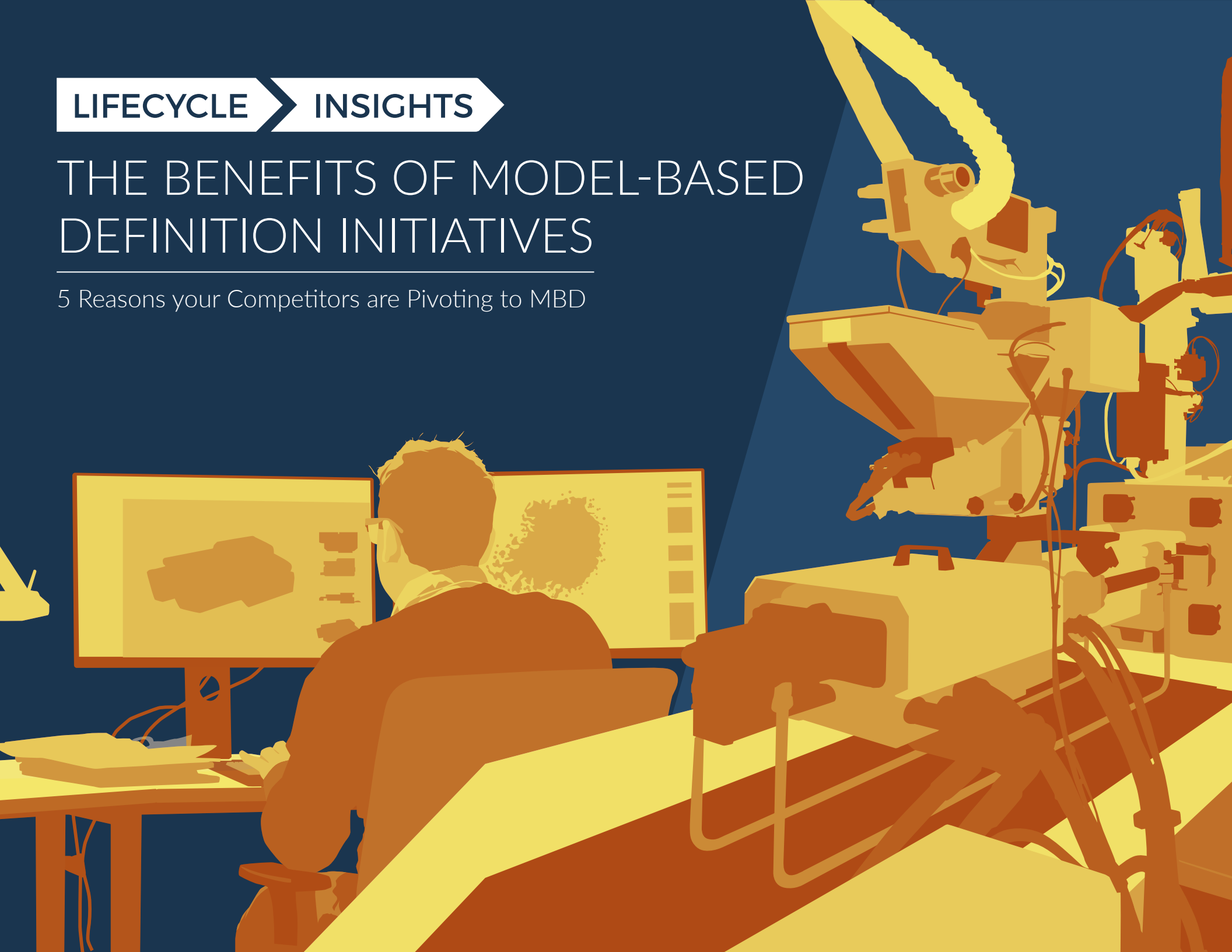
LIFECYCLE INSIGHTS

THE BENEFITS OF MODEL-BASED DEFINITION INITIATIVES

5 Reasons your Competitors are Pivoting to MBD



INTRODUCTION

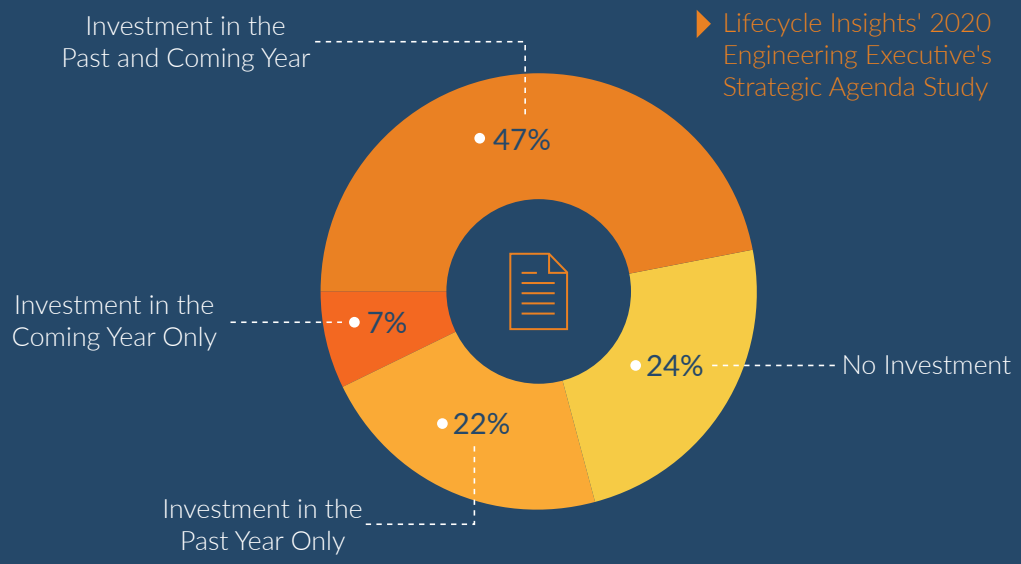
Manufacturers rely on design documentation to successfully drive the entire development process. Design documentation acts as the definition that guides all activities, including manufacturing, procurement, quality, and service, so it is no surprise that companies continue to invest in improving their documentation practices. The 2020 Lifecycle Insights Engineering Executive Strategic Agenda found 69% of survey respondents invested in such improvement initiatives last year. Fully 54% plan to continue that spend into the next year.

One innovation that is gaining momentum in the field is the use of a model-based definition (MBD). The MBD, a 3D model that contains product and manufacturing information (PMI), provides manufacturers a single, rich, and accessible source of truth for all mechanical hardware in a product. Such a resource can guide engineering and the activities of other functional departments throughout product development.

Making the move to an MBD requires transformation both inside and outside the engineering department. This eBook is a primer for the changes needed to pave the way for an MBD initiative, detailing the creation and consumption of an MBD as well as highlighting the benefits manufacturers can realize from it.

LIFECYCLE INSIGHTS

Manufacturers Investing in Design Documentation Improvements

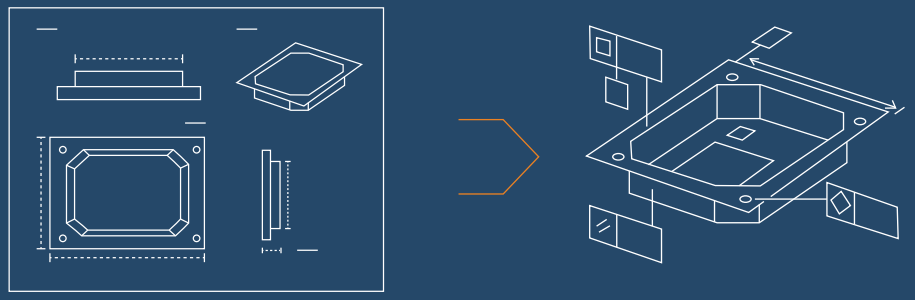


SHIFTING THE CREATION OF DESIGN DOCUMENTATION

Today, most engineers rely on a series of 2D drawings as the foundation for product design and development. Such drawings are quite time-intensive: Engineers report spending between 20 and 60% of their work time to create these vital deliverables.

In a typical drawing-based approach, engineers start by developing a 3D product design model. They place views of that model onto a drawing and add PMI. This acts as a specification for how the mechanical component, assembly, or product should be manufactured and assembled. Unfortunately, developing such a drawing duplicates some of the effort invested in creating a 3D model. Today's engineers can gain productivity by eliminating some of this unnecessary work.

Using an MBD approach, however, can save engineers both time and frustration. There is no need for an additional, separate deliverable of PMI-annotated drawings. Instead, engineers can add PMI directly to the 3D model and associate that data with the appropriate geometric references. This single model can then govern every step of the production process, from design to quality assurance.



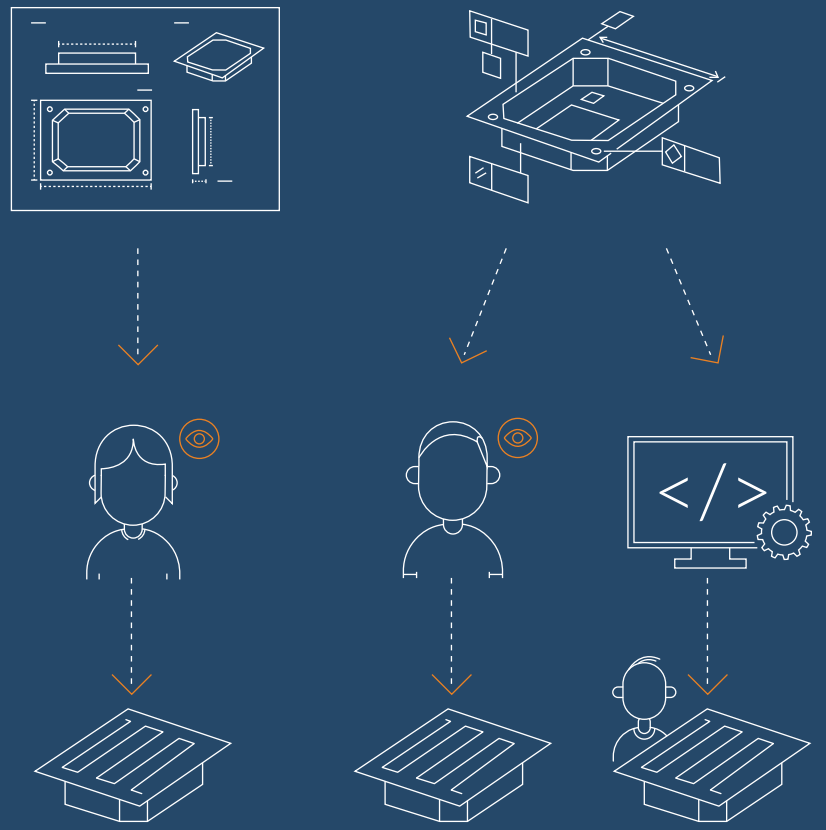
An MBD initiative's first step is creating an MBD instead of a drawing.

CHANGING THE CONSUMPTION OF DESIGN DOCUMENTATION

Design documentation is a fundamental building block of development. Other functional departments use the documentation for sourcing during the request-for-proposal process, manufacturing planning, toolpath creation, inspection planning, and many more critical path activities.

In these other functional departments, drawing-based approaches require employees to have distinct knowledge and skill sets. Employees must be able to construct a 3D shape in their heads from the many views on a drawing. Furthermore, they must also be able to comprehend how the model's PMI is related to the relevant geometry of the design.

But when a manufacturer uses an MBD, product development teams across the enterprise have greater flexibility and options. Employees do not have to mentally construct a 3D shape from drawing views. Instead, they can view, spin, and interrogate the MBD model directly, gaining unique insights into the associated PMI. They can also employ smart software applications to help them read and apply the PMI, automating arduous activities like creating the numerical control (NC) sequence or coordinating measuring machine (CMM) toolpaths.



An MBD initiative's second step is shifting to model-based processes.

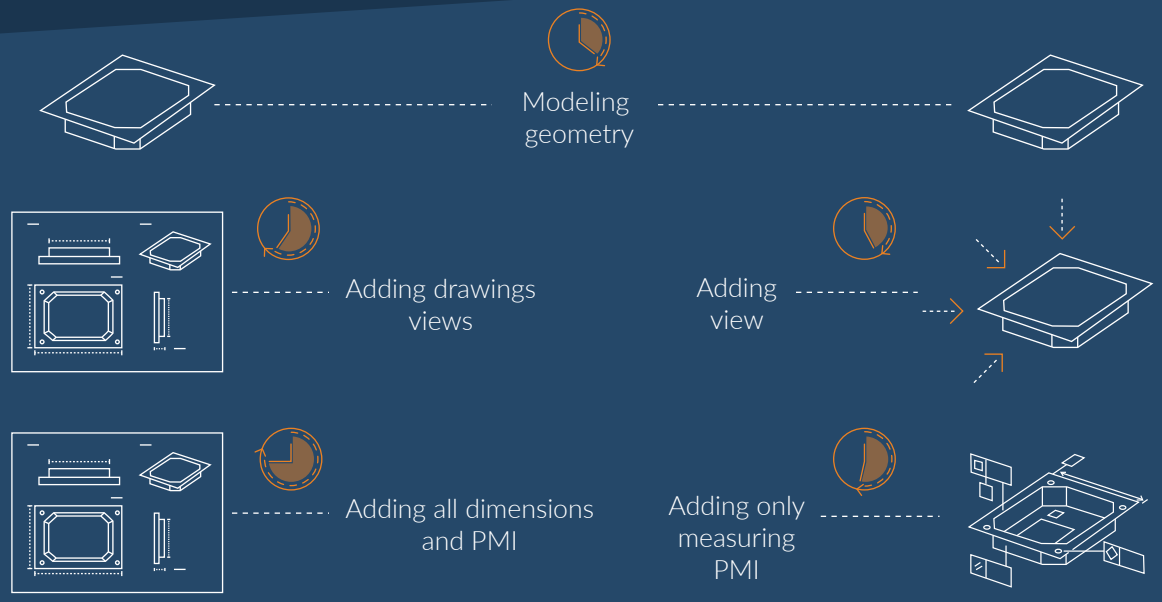
COMPARISON OF THE ACTIVITIES AND TIME TO CREATE A DRAWING AND AN MBD

Today, manufacturers are taking a hard look at how engineers are spending their valuable time. With an MBD initiative, engineers devote less time to design documentation and more time to the kind of analysis and problem solving that leads to superior products.

Traditionally, in a drawing-based approach, engineers must manually add dimensions to spatially locate every piece of geometry in a 3D model. This defines the shape and size of the mechanical hardware for all others in the development process. But this is a duplicative effort.

A 3D model already explicitly defines where every piece of geometry of a component lies in space. There is no need to specify such details again. But while many manufacturers have adopted 3D modeling, such habits are hard to break.

In an MBD approach, engineers can rely on the modeling work they've already completed to spatially define the design's geometry. Then they only have to add the dimensions and tolerances that manufacturing and quality departments need to measure conformance. This not only reduces the documentation burden on engineers, but simplifies the deliverable as well.



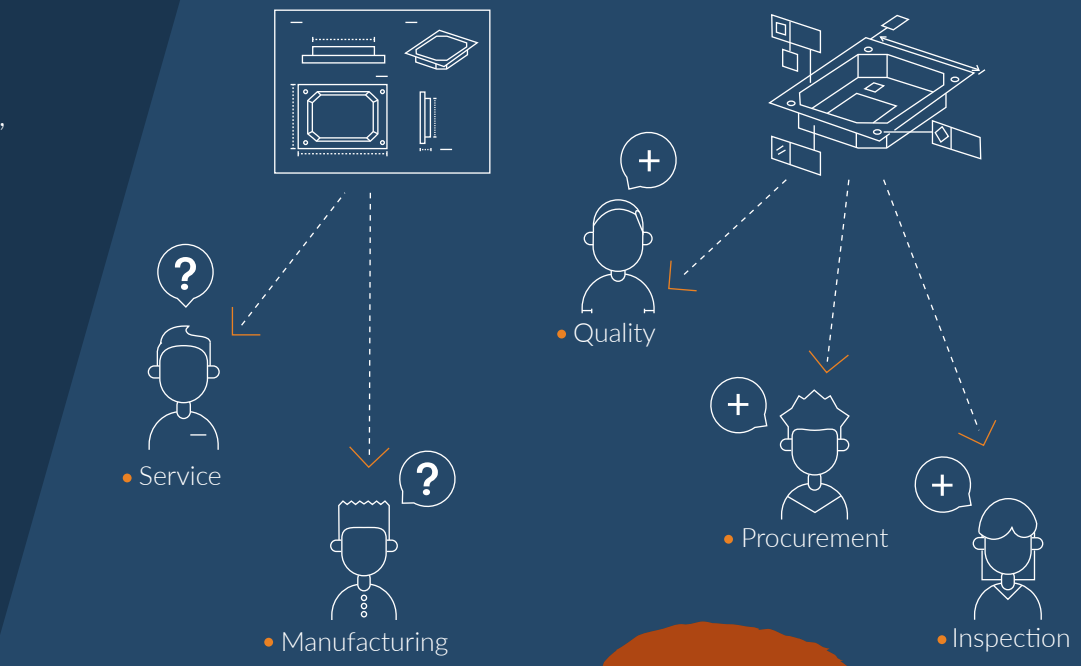
Creating an MBD requires less engineer's time.

REDUCING DOCUMENTATION-RELATED ERRORS

Problems with design documentation invariably result in issues later in the development process. When working from a drawing, employees are more likely to order incorrectly manufactured components or measure incoming parts against the wrong specifications. This increases the risk of excessive scrap and rework on the manufacturing floor. It can also result in late-stage change orders, which are painful and costly for all involved.

PMI misinterpretations are to blame for these kinds of errors in a drawing-based approach. The best-case scenario involves requests for clarification or addendums requiring more of the engineering department's time. In the worst-case scenario, stakeholders base critical decisions on incorrectly interpreted drawing views or information, leading to excessive development and production delays.

But an MBD provides ease of interpretation for all stakeholders. Anyone can spin, view, and interrogate the 3D MBD model to thoroughly understand a design's PMI. This is a vast improvement over having to puzzle over the details of a part based on a 2D drawing.



The clarity of an MBD results in fewer misinterpretations and errors.

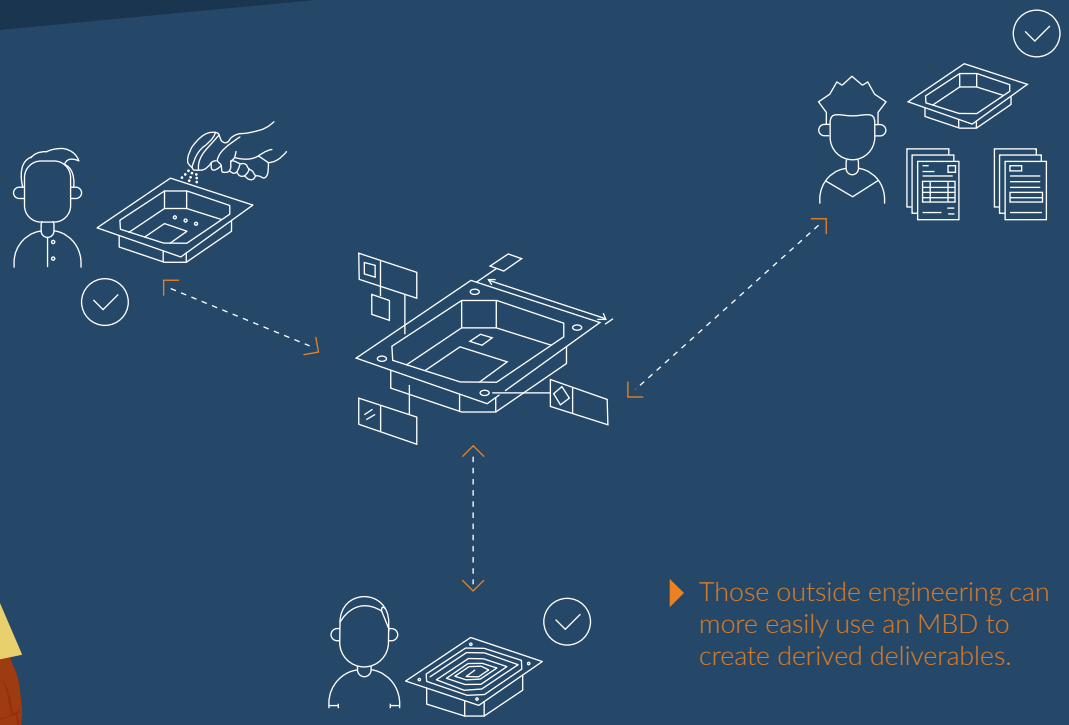
ACCELERATING THE CREATION OF DERIVED DELIVERABLES

Design documentation isn't just used as a specification to guide product development. It is also the basis of other important derived deliverables. Stakeholders use design documentation to build tool paths for manufacturing, inspection plans for quality assurance endeavors, technical data packages for procurement, and technical documentation for service instructions.

This can be a challenge when using traditional drawing-based approaches. Employees are restricted to the design views that exist on the drawings. They are forced to manually create the views they need to move forward.

This is time-consuming and increases the risk of errors due to misinterpretations of the drawing.

MBD approaches provide universal access to a fully annotated 3D model. Workers can quickly and easily create the derived deliverables required for critical downstream steps in the product development process, reducing costly delays and errors.



- Those outside engineering can more easily use an MBD to create derived deliverables.

SUMMARY AND RECOMMENDATIONS

As products become more complex, development executives are expected to do more in less time. This makes having reliable, unambiguous design documentation to guide the development process more important than ever.

Manufacturers that are pivoting to MBD initiatives to drive design, manufacturing, procurement, quality, and service are already seeing tangible benefits in terms of time, tasks, and resources. The use of these 3D models annotated with essential PMI offers:

- a reduction in engineers' documentation burden, freeing them up to engage in more valuable analysis and problem-solving activities;
- more flexibility for other employees across the enterprise to view, spin, and interrogate the model to gain proper understanding of its specifications;
- reduced documentation-related errors during design, as well as further down the line in the production process; and
- an acceleration in the creation of derived deliverables to better support manufacturing, quality assurance, procurement, and service needs.