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The Three Commitments Every Successful MODEL-BASED ENTERPRISE Makes

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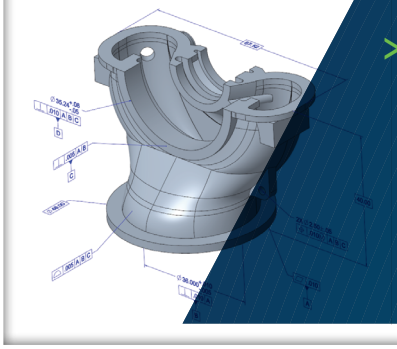
WHAT IS A MODEL-BASED ENTERPRISE?



> MODEL-BASED ENTERPRISE (MBE):

A collaborative environment with the 3D product definition as the definitive information resource for activities (and users) spanning a product's complete lifecycle. An MBE model not only contains the geometry or CAD data but also additional information needed for production and support, such as product and process specifications, and inspection data.

Imagine your company adopts a model-based enterprise approach. The 3D CAD model is now the source authority for every person in the company and drives all engineering activities. No more chasing what you need around the company or discovering too late that someone relied on out-of-date information.

Instead, the CEO is using a viewer to look at the model; the manufacturing engineer is running tool paths off that same model; and the design engineer is using that same model for simulations. Moreover, since your CAD and PLM (product lifecycle management) systems are associative, the design intent from the CAD models also appears in your PLM system, making it easy to create reliable, rich, visual Bills of Materials. Talk about digital transformation!

At PTC we understand that manufacturers are not known to linger long in the land of imagination. How, exactly, do you get started? We're not going to tell you it's easy, but we can tell you that the customers we see who are having success view this as a journey and they make three commitments.

THREE COMMITMENTS

1. They Commit to Cleaning Data.
2. They Commit to Model-based Definition (MBD).
3. They Commit to Starting Small and Close to Home.

1 > THEY COMMIT TO CLEANING DATA

This commitment is the most complex, the most time-consuming, and the most important. We admit it could keep you busy for years and has (at least) **three major sub-components**. Don't skip it. As you gradually 'get your digital house in order' you will slowly rid your business of old data, siloed information, and homegrown processes that 'everyone knows' work well.

We define clean data as a complete 3D CAD model that is documented correctly, not a space claim or the shape of the object with other information living elsewhere in the company - or at a supplier. Another way to think of it is that clean data is human-readable, digitally readable, and can be used throughout the enterprise.

> I LOOK AT THE MODEL ITSELF AS A PRECISE DATABASE FOR ALL PMI RATHER THAN AS A SUPPORTING ITEM TO CREATE A 2D DRAWING QUICKLY.
>
> - CAD ADMINISTRATOR

The good news is that you can begin with three activities you probably intended to do anyway.

1A BUILD DESIGN ENGINEERS' MODELING SKILLS

You have two goals here: reduce avoidable errors and ensure that your team makes the best use of the CAD software they already have. These both seem obvious, but we've seen manufacturers tolerate engineering change order rates of 25% – or higher – caused by modeling errors and CAD drawing errors. Other firms languish in workable, sub-optimal situations because the design skills haven't kept up with the software (nor has the business made it a priority).

If the thought of approaching this challenge makes you wince, start by making sure every design engineer knows what capabilities the team owns. We've yet to meet a customer whose teams didn't emerge from this meeting pleasantly surprised – and eager to learn how to use the cool new functionality.

1B AVOID THE PRIMROSE PATH

'Primrose Path' errors are treacherous because they arise from a desire for efficiency and originate in what appear to be reasonable choices. You can find these hiding under the rock named 'homegrown workarounds' or as part of processes that nobody has examined in a while. Try to stamp out at least one of them. Here's some of what we've come across.

- **One customer** found their teams were reusing all sorts of existing designs, which is typical, but were doing so without asking questions. It makes sense to work off earlier designs but not ones for failed prototypes!

- **Another customer** made it a practice not to include the routing of wires and cables on drawings. Instead, they asked their wiring team to learn a new software tool that would show them the routing paths. Learning time - three days. Undaunted by this training assignment, the wiring team simply devised their own routing paths and tossed out the wiring specially prepared for them.

- **A third customer** wanted to give everyone on the team access to the latest information, so they put the latest 2D drawings up as pdfs on an intranet. This system worked until it didn't or until a team member forgot to upload or update the drawing. The system to find and deliver late-stage changes? The so-called 'sneaker net'.

1C GET COMPLETE, TRACEABLE DATA

We define complete, traceable data to mean that your product can go from CAD model to production with precisely the same data. A classic example of disconnection goes something like this: the customer relies on a supplier's manufacturing team to complete a crucial CAD modeling task, such as applying the proper draft to the 3D CAD models for injection-molded parts. The supplier does the task.

What the process should look like is this: feedback goes back to the design owner, that person makes the change to the production design, and the supplier's mold team then builds a proper mold off of a part that's properly drafted in the model.

2 > THEY COMMIT TO MODEL-BASED DEFINITION (MBD)

MBD is an approach to product engineering that makes the CAD model the 24/7 source authority – not the 2D drawing, which carries with it the danger of being out of synch with the model. Your team will also avoid what one design engineer called Days of Dread: the work weeks where she would sit in her office waiting for the inevitable calls from the manufacturing floor.

3 > THEY COMMIT TO STARTING SMALL AND CLOSE TO HOME

When we meet with customers who have had a project fail, one common reason is trying to do too much too soon in an environment where caution rules. One customer put it this way,

> AT THE FIRST SIGN OF PROBLEMS, STAKEHOLDERS WHO AREN'T TOTALLY COMMITTED PEEL OFF FASTER THAN BARK FROM A DEAD TREE.
>
> - CAD ADMINISTRATOR

A model-based enterprise takes time to build. Start by choosing a small, well-defined project that has the enthusiastic support of those in the data's chain of custody. Your stakeholders will view glitches and surprises as an inevitable part of doing interesting, important work. Below are three types of projects with which you might begin.

Three suggestions to start small.

Prototype Reduction

MBD is about more than documenting the model, it's about how you develop the model and verify it against its requirements. Start with a design that requires four or five prototypes and see if you can get it down to two. Build your CAD model, look at the kinematics there, and see if you can eliminate a series of iterative prototype steps.

Reduced-Instruction Drawing

Choose one part. For this project, start moving to the model some of the information that would normally be on the 2D drawing. This delivers the largest impact when you begin with information, such as GD&T, more easily seen in three dimensions than in two. It's even better if the software can guide your product engineers through the process of constraining the model correctly. The goal here is to get the information to live on the model, not in a set of 2D drawings that may (or may not) be up to date.

CNC Machining

Nobody likes throwing away expensive tooling or seeing piles of scrap. Looking for CNC machining software that sets the machining and tool path design directly on the digital model – instead of requiring that this process first take place on the factory floor. Extra credit: Change the GD&T that lives on your model and watch the tool paths accommodate the changes you made to GD&T changes. Bonus: the information can be reused.

A Last Thought...

You cannot buy your way to successful adoption of an MBE approach. No amount of new software or a single transformative capability will allow you to skip steps on this journey of digital transformation.

Don't allow the length of the journey to discourage you! That bite-sized project you choose and complete will give you evidence to prove broader value to the business and will build your momentum.

You'll have contributed to reducing error and design time, cutting cost, and speeding time to market.

We'd also argue that starting the MBE journey may bring you a small step closer to becoming a more innovative company. Nobody can guarantee innovation, but we can tell you this: freeing up highly skilled engineers, giving management a clearer view of what's happening, and making data available across your enterprise makes innovation more likely. That's worth striving for.

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THE CREO ADVANTAGE

Creo is the 3D CAD solution that helps you accelerate product innovation so you can build better products faster. Easy-to-learn Creo seamlessly takes you from the earliest phases of product design to manufacturing and beyond. You can combine powerful, proven functionality with new technologies such as generative design, augmented reality, real-time simulation, additive manufacturing and the IoT, to iterate faster, reduce costs and improve product quality. The world of product development moves quickly, and only Creo delivers the transformative tools you need to build competitive advantage and gain market share.