SIEMENS

Ingenuity for life

Synchronous Technology

Going beyond traditional modeling approaches to solve design challenges

Siemens PLM Software

Remember that last project? While building your model, you got a last-minute change request. As you started making it, the model blew up. By the time you were done, you had rebuilt the model and lost half your weekend. Frustrating, right? And it wasn't just the last project, was it? Re-using designs, working with imported data, making changes – why are things we do so often still so challenging?

Isn't engineering hard enough?

You spend more time at work, take fewer vacations, and every project is understaffed. You're getting pulled into customer meetings, supplier fire drills, conference calls and shop floor talks. And you're not alone.

Isn't it time that things got easier? Isn't your product development software supposed to help?

In a recent study:

40% of users said it is a top priority to be able to re-use existing designs

But finding and reusing existing design data was their 3rd biggest challenge

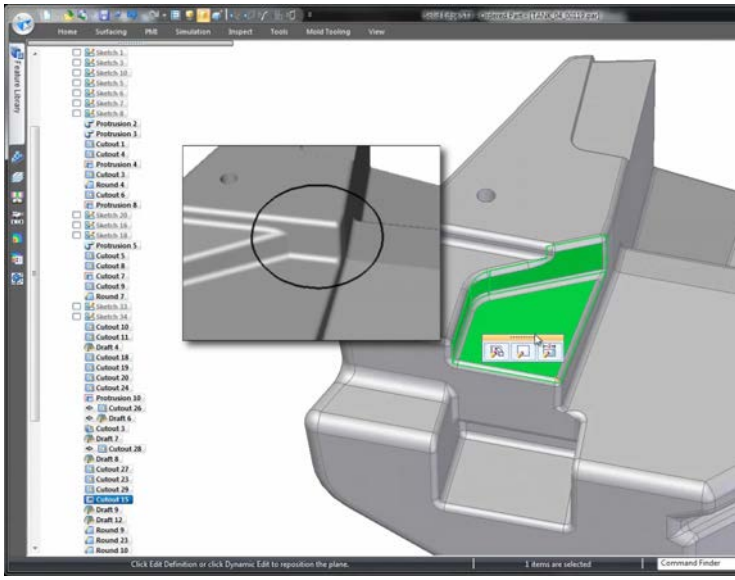
99% of CAD users said they need to work with imported CAD data

1 in 10 always work with imported CAD data

95% of CAD users say they sometimes receive last-minute change requests

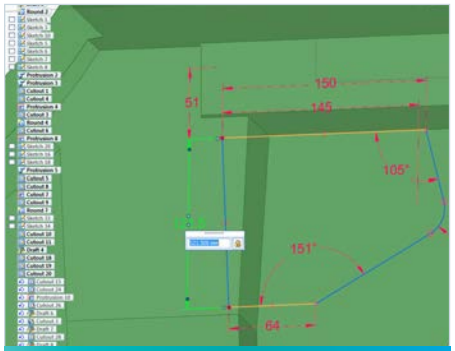
One quarter always experience last-minute change requests

Source: Siemens PLM Software, CAD challenges and industry trends survey, September 2016.



Choosing between two approaches: History-based and direct modeling

Product development software providers typically take one of two main approaches to creating and modifying geometry: direct modeling and history-based (also known as ordered or feature-based) modeling. Each approach has benefits, but each approach also has challenges.



History-based

History-based modeling is a structured modeling process, where a history tree of features with parent-child relationships is created to define the model. This requires preplanning for design intent, including dimensions, parameters and relationships.

Direct modeling

Direct modeling in contrast, offers few constraints. You can create and change geometry by selecting it and then pushing, pulling, dragging, or rotating it. Changes aren't remembered by the software – there is no saved list of features – and they don't create interrelationships.

62% of surveyed CAD users agreed that history-based modeling can be powerful but inflexible, and as a result concept design is slowed by time-consuming preplanning, imported models often have to be recreated, and making late-stage design changes is difficult.

History-based modeling: powerful but inflexible

In history based modeling, the structure and order of features control how models react to changes or edits. This creates predictable results from edits on underlying feature sketches using precise dimension changes. Because of this feature control, automating changes and linking features together is easy. But designers must take time to carefully plan out how they build the model, as even simple edits can take a lot of time – or require remodeling. And if a part contains a large number of features, re-computing can tax system performance, taking from minutes to hours to re-calculate the final result.

Few options to change imported geometry

With no underlying features or parameters to make changes, modifying imported geometry is up to you. That means you rebuild design intent – often removing geometry and manually adding features back in. Either way, you use the parameters in those features to drive change.

Flexibility decreases as your design progresses

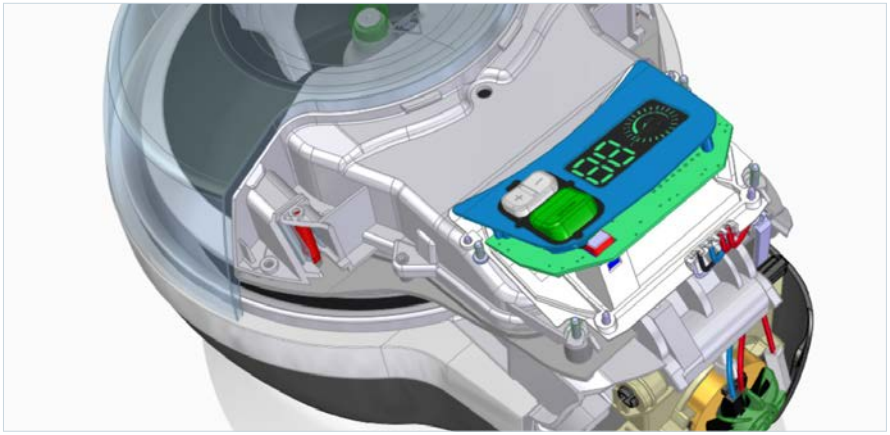
Features and parameters offer powerful ways to automate change and capture design intent. However, they are highly constrained. Modifications are limited to the definition of the feature. Dimensioning schemes are contained within features, limiting their scope.

Complex models are exceedingly fragile

If a change needs to be made to a feature created early in the design, the edit must take place on the model at the state it was in when that feature was created. Once the edit is made, all features created after that point have to be recomputed based on the new inputs. Far too often, modifying one feature can trigger a chain reaction of failures throughout the model. Often, it's easier to start from scratch.

Direct modeling: intuitive but weak

Direct modeling doesn't maintain a history of features or record how a model is built. There are no sketches driving features that make up the part. Editing is done by simply selecting what you want to change and changing it – fast and easy. With no rebuild of features after changes, there are no performance issues on edits. However, without features or history on how a part is made, designers aren't able to create precise edits or automate using parametric inputs such as dimensions.



Little design intelligence and manual complex changes

While you can add dimensions and even create relationships, control of intent and purpose is the weak spot for direct modeling. That, in turn, makes it difficult to automate intelligent design change. Because the direct modeling approaches in most CAD applications don't recognize the inherent relationships between different pieces of geometry within the model, users are left to manually cobble together the right combination of geometry that should move together.

Lack of model organization and intent

Due to the feature-less structure created with a direct approach, models lack organization and engineering intent. This makes it difficult to find engineering features in the model, or identify related groups when a design needs to be changed – for example, if you want to change the depth of counterbore holes in a model, but leave countersink holes as is.

Weak dimension-driven editing

While you can define dimensioning schemes with direct modeling approaches, they lack the intelligent control that you see in feature-based modeling. As a result, when you attempt a specific change, you don't always get what you expected.

The best of both worlds to solve design challenges: synchronous technology

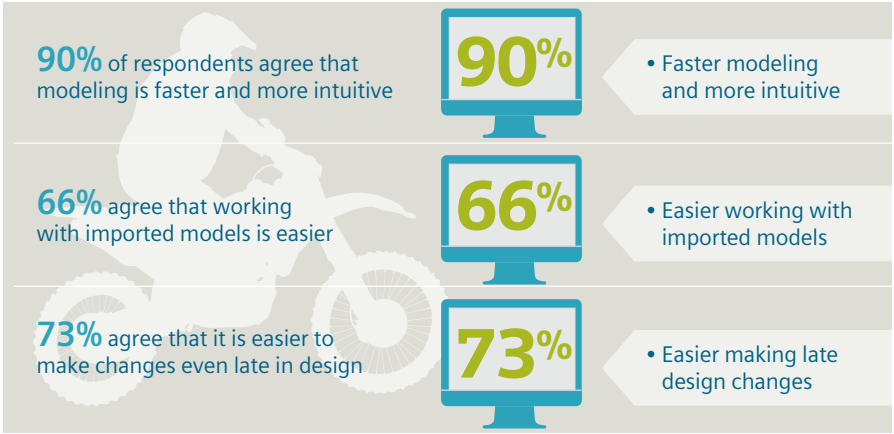
What if there was a way to combine the best aspects of each modeling approach, so that you could design with the speed and simplicity of direct modeling, and the control and intelligence of history-based design?

There is a way: synchronous technology

Synchronous technology enables you to rapidly create new concept designs, easily respond to change requests, and make simultaneous updates to multiple parts within an assembly. With this design flexibility, you can eliminate cumbersome preplanning and avoid feature failures, rebuild issues, and time-consuming rework. The power of synchronous technology also allows you to treat multi-CAD data just like native files, supporting seamless collaboration with suppliers and partners.

Synchronous technology: fast and flexible

Synchronous technology combines the strengths of both history-based and direct modeling approaches, plus a set of unique capabilities. Users finally have a solution that is both powerful and easy to use. Surveyed users already taking advantage of synchronous technology also reported that it helped them solve some of their top challenges:



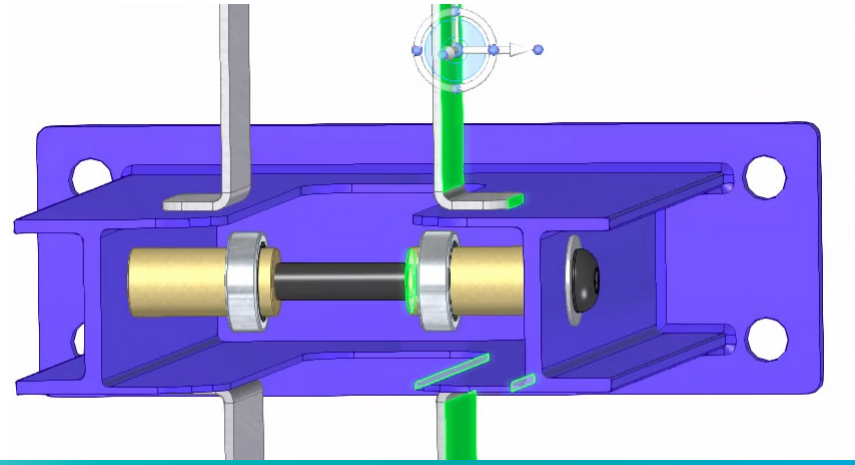
The value of synchronous technology: faster

Fast and flexible design creation
With integrated 2D and 3D sketching, synchronous technology allows you to begin your concept designs immediately, without tedious preplanning. Work directly with your design geometry, and make changes instantly, maintaining control with organized feature trees where needed.

Precise direct modeling
Synchronous technology gives you the best of both worlds: fast direct modeling and precise parametric control – relating faces together, dimensioning with design intent control, and drag–and-snap editing – all in 3D, with no sketch work. Fast and easy, but most importantly, accurate.

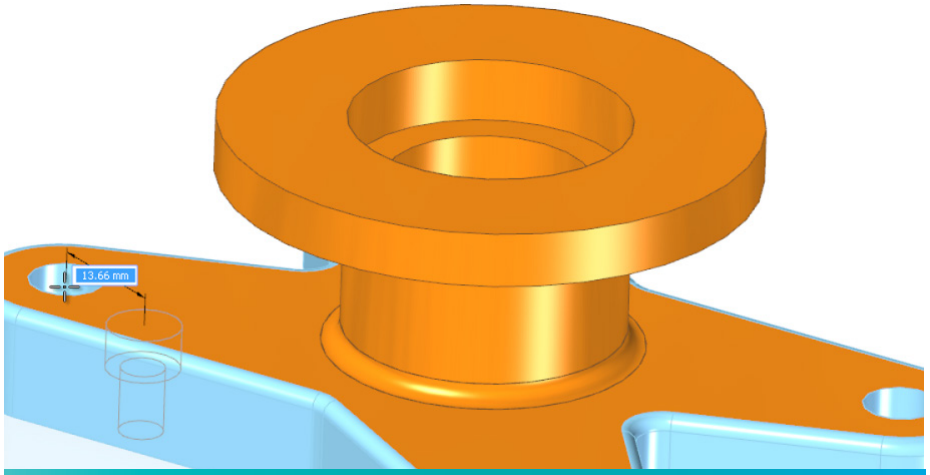
Quick response to late-stage design changes
With synchronous technology, making changes is easy, even to history-based models. Simply update reference dimensions, or push and pull on the geometry – without worrying about feature failures, rebuild issues or time-consuming rework.

Simultaneous editing of multiple parts in an assembly
Easily edit multiple parts in an assembly, without time-consuming history-based edits or the need to create links between parts. Simply select and drag to make changes.



"Our process engineer advised me to taper the sides. This would have taken two hours in the ordered environment. With synchronous technology, it took one minute."

Daryl Collins
Designer
Planet Dryers



"Through synchronous technology, the system has improved significantly. I am really excited about how easy it is to operate. Synchronous technology means a quantum leap in the user-friendliness of 3D CAD systems."

Rainer Schmid, Co-owner
Assistant General Manager
Waldis

The value of synchronous technology: easier

Easy editing of imported data
With synchronous technology, importing a file from another 3D CAD system is as simple as opening it. Editing imported data is done by simply clicking and dragging features. Or add and edit dimensions on-the-fly, and intelligent updates will happen automatically, as if a history tree existed.

Improved design re-use from other models
Easily re-use design detail from other models – with just a copy and paste. Synchronous technology treats files in other CAD formats just like they were native Solid Edge files.

Design intent recognition
Synchronous technology recognizes and maintains design intent on the fly, giving sensible and predictable changes and allowing for faster revisions.

Simulation preparation
Preparing a model for finite element analysis (FEA) is easy with Solid Edge synchronous technology, even if you don't have extensive 3D CAD skills. Solid Edge provides easy-to-use tools for FEA simulation preparation, and it does not matter if your geometry was created in Solid Edge or another 3D CAD tool.

Solid Edge: harnessing the power of synchronous technology

Solid Edge is a portfolio of affordable, easy-to-use software tools that address all aspects of the product development process – 3D design, simulation, manufacturing, data management and more.

Synchronous technology in Solid Edge combines the best aspects of direct and history-based modeling simultaneously in a single design environment. That enables discovery-driven design, precise control, and the ability capture the intent and purpose of the design. The ability to dimension anywhere and infer and understand existing geometric relationships drives intelligent change for failure-prone feature-based models as well as imported geometry.

But all of those are technical capabilities. What synchronous technology in Solid Edge really does is let you concentrate on design instead of the CAD application. It means you spend a larger portion of your work time designing products. And isn't that what your career is supposed to be all about? And with more of the non-value added activities out of the way, you get more of your personal time back.

"Using Solid Edge with synchronous technology, I can actually do many more iterations now that I wasn't able to do before. And because of that, the cost of the product comes down. The weight of the product comes down. The performance goes up. The warranty is a lot longer. Quality loves it. We love it. The profit margin loves it."

John Winter
Mechanical Engineering Manager
Bird Technologies

Buyer Beware: The differences matter

Many vendors claim to offer "flexible" modeling or a "combination of direct and feature-based modeling" – but not all versions of this approach are created equally. When evaluating vendors, make sure you understand how they are providing this capability, and the implications of that approach.

The "translate" approach

One approach is to keep two separate environments, one for feature-based modeling and one for direct modeling, and translate any geometry creation or modification between them. The approach seems logical at face value, but there are underlying problems. Geometry in feature-based approaches falls into preset definitions for creation and modifications. Geometry in direct modeling does not have any preset definition and can allow dramatic modifications – modifications that can even violate the definitions of the features used to originally create that geometry. How do you translate that change? To date, these vendors don't have any great answers.

The "featurize" approach

As in the translate approach, the "featurize" approach also keeps the feature-based and direct modeling environments separate, but records creation or modification actions as a feature. The main problem with this approach is that numerous direct modeling changes can result in a large number of additional features. Those features can result in greater interdependencies with prior features. A lack of careful management of feature interdependencies can result in models that are failure-prone. Strangely enough, with this approach, users may actually be creating even more complicated models with direct modeling in a "featurize" approach than if they had used feature-based modeling alone.

The "synchronous" approach

In contrast with the two other approaches, Solid Edge uses a "synchronous" approach, leveraging the strengths of both history-based and direct modeling in a single environment. No translations back and forth where you could lose your changes. No secret features hidden behind the scenes to unnecessarily complicate the model. Synchronous technology allows designers to freely make changes to design intent using the 3D model faces themselves, allowing for intuitive changes to designs. This design intent can be changed using 3D dimensions and face relationships and constraints. The true power of synchronous, however, is that a majority of the design intent of a 3D model is inherently recognized and maintained through the software without any physical actions from the designer. Things like coplanar faces, concentric cylinders and symmetry are automatically detected during an edit and can be automatically maintained with no user interaction.

Try synchronous technology for yourself

Solid Edge: more than just CAD
With synchronous technology, Solid Edge combines the speed and simplicity of direct modeling with the flexibility and control of parametric design. But the strengths of Solid Edge extend beyond synchronous technology and design, and address all aspects of product development:

- **Design:** Industry-leading product design software
- **Simulation:** A scalable set of simulation solutions
- **Manufacturing:** Integrated CAM and 3D printing tools
- **Technical publications:** Attractive illustrations and interactive technical documents
- **Data management:** Perfect control, no matter how big your data

Take the next step.

Try Solid Edge with synchronous technology for free:

www.siemens.com/plm/try-solid-edge

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