



The CAD Interoperability Survival Guide

Jim Brown | President | Tech-Clarity

Tech-Clarity

Multi-CAD Means Mayhem

Does this sound all too familiar?

- We spend hours working on suppliers' designs before we can do any real value-added work
- We waste time re-importing design changes from partners and still have to redo all of our modifications like adding ribs or creating tool paths
- The engineering firm that does our advanced FEA faces the same inefficiencies with our files
- Our industrial designers need features that aren't supported by our design engineers' CAD
- We have to rework every design before we send it to the shop floor
- We have years of effort and knowledge in old CAD files so we have to pay for licenses, but we still end up remodeling for the next revision
- We want to move CAD to the cloud, but we're don't want to leave our IP behind on the desktop
- We can't afford to retrain all of the engineers from the company we just acquired and migrate them to our "primary" CAD tool

Multi-CAD leads to significant non-value-added work. Given the unavoidable reality of multi-CAD, there should be a better way to manage the mayhem without wasting so much time. Let's take a look.



"9 out of 10 times when we import files, references are lost and we have to do a lot of extra work. We face a lot of inefficiency when we update designs."

Timon Alferink, Operational Manager, KMP Drivetrain Solutions

Lost Design Intent



Impacts of Poor CAD Interoperability

CAD Data Interoperability Conundrum

CAD Interoperability Issues in a Nutshell

Proprietary CAD data formats typically don't work well with CAD tools other than the one that created them. Why is this? It's not the tools, it's the way the geometry data is stored. CAD software vendors invest in building highly capable tools to help their customers develop innovative designs. They can't afford to compromise capabilities for a standard that works just as well across every CAD tool.

CAD vendors try to help customers by investing in import and export of standard, interoperable formats. But those formats sacrifice communicating detail, features, and design intent. *"When we create outputs for our manufacturing equipment we may be able to transfer geometry but we lose a lot of information,"* explains Steelcase Senior Consulting Applications Engineer for Global Product Visualization Technologies, Stephen Goetzinger. *"The volume of rework in our area is massive,"* he adds.

CAD imports and exports frequently don't import information completely. *"We ended up redrawing a fair number of designs. We would bring in a file and lines didn't always connect, we had to go around the perimeter*

and fix the breaks, and some of the radiuses weren't really radiuses," shares Mike Elsholz of Steelcase.

The Conundrum

We want the best tools available, but we want them all to work together. The hard reality is that we can't have both. But engineers have to get the job done despite the challenges.

What are the options?



"Poor CAD Interoperability leads to inefficiency. When design updates for an engineering change take too much time it's usually because the model lost its references and we have to redo them. It's the same as importing a brand new part, you have to redo the joints and make sure they don't clash."

Timon Alferink, KMP Drivetrain Solutions

Understanding Your Options

Evaluating Your Survival Options

You may have ended up in a multi-CAD situation due to legacy CAD files, customer mandates, supply chain realities, internal requirements, or all of the above. Regardless of the reason, this is the way it's going to be.

Now, what are you going to do in order to survive?



"My original goal was one software package everywhere in the shop. It may have been a little unrealistic."

Mike Elsholz, Model Shop Manager, Steelcase, Inc.

Option 1: The Status Quo

One option is to muscle through the problem by continuing to translate information to and from different CAD formats. You can absorb the time and expense of costly, error-prone, and time-consuming translation. If things are very static, this might be OK. But otherwise, every time you get an updated file you not only have to translate it, you have to manually reapply all of your changes. It's frustrating and inefficient.

Option 2: Standardize on a Common CAD System

Another option is to have everyone use the same tool and insist that your partners do the same. Unfortunately, this approach typically fails because innovators are hampered by limited capabilities. Standardization usually doesn't solve your problem anyway because even if you consolidate internally most companies can't control suppliers' tool choices, let alone force customers to comply. For the most part, this approach is simply not feasible.

There has to be a Better Option!

Option 3: Common, Interoperable CAD Data

This is clearly the ideal scenario, CAD files that work across all of your CAD solutions. Unfortunately, the path to open CAD data isn't a realistic option in the near term. CAD vendors are investing in interoperability and the top ones can open other native CAD files, which is extremely valuable. The leaders are even working on the potential to "round trip" CAD file changes back to their native format.

Option 4: Incorporating Non-native CAD with Associativity

The state of the market today is for your CAD solution to recognize and include designs of different formats. It should be able to read native files from other tools and bring the incorporated part or assembly into its environment. This still leaves the need to reapply any changes you've made, however.

The best in class scenario is for the tool to track changes *in the context of design relationships*. Then, parametric changes can be reapplied when a revised file is included without the need for rework.



"You're not going to get everyone to use your software system. Our system has an amazing ability to read in geometry from anyone, it saves me a lot of time."

Stephen Goetzing, Senior Consulting Applications Engineer for Global Product Visualization Technologies, Steelcase, Inc.

Choosing a Direction

This really isn't a hard choice, but many feel the status quo options are all there is. Others wish for the ideal option. But there's a practical option available today and it offers a large efficiency improvement over the status quo. *"Reading files from one to another has gotten better because our system is more interoperable, now engineers and designs can just jump in and make a change when it occurs."* says Mike Elsholz, Steelcase. *"Our redraws have gone way down."*

Support Customers, Shops, Suppliers

Liberate Supply Chain CAD Choice

Let's explore the value of incorporating native CAD with associativity, starting with the benefits for the supply chain. Without interoperability, you have to limit the supply chain's ability to innovate or accept a negative impact on your productivity. *"We would have to remodel if we need to change the design,"* shares Timon Alferink of KMP Drivetrain Solutions, a drivetrain specialist with focus on motorsports. *"We do not have licenses for all different software packages."*

Expand Customer and Supply Chain Options

You shouldn't have to choose your suppliers based on their CAD tool or force them to use a tool they aren't as comfortable with. Interoperability allows you to work with supplier and engineering services firms of all kinds, regardless of their CAD choice. Interoperability also allows you to work more seamlessly with contract manufacturers or your own shop.

The same can be true for your customers. Companies like machine shops and toolmakers must respect their customers' CAD choices in order to be easy to work with. Interoperability may open manufacturers like this up to find more customers and grow their business.



Mike Elsholz, Steelcase, Inc.

"With interoperability, if an engineer gives us a file we can 3D print or machine it as is. You get the part that you drew because it takes the human error out of it."



Timon Alferink, KMP Drivetrain Solutions

"If we get a 3D design for a car and need to design something in between, at some point in the workflow they will change the design. It's an advantage to replace in relationship and keep the original joints intact."

Leverage Legacy Knowledge and IP



“When we didn’t have as much CAD integration it was a battle. We could rarely use the files in their natural state. We had to redraw them because they had too many inaccuracies. When you redraw, you can introduce human error and make a part too big or too small, and you might not catch it until testing and end up with a part that’s not functional and cause huge delays.”

Mike Elsholz, Steelcase, Inc.

Leverage Models Regardless of CAD Format

Incorporating native CAD with associativity helps companies better utilize their existing CAD models, even if they’re in a different format. Whether you acquired a company or however you ended up with files from another tool, the legacy files hold valuable intellectual property. The value erodes quickly if you have to keep people trained and have to keep up licenses for the old system. And as KMP Drivetrain Solutions’ Alferink explains, you typically have to remodel them anyway. *“We had a bunch of legacy CAD files when we moved to our new system.*

We could bring them into other designs, but we couldn’t change them so we had to remodel them when we needed them,” he shares.

On the other hand, native CAD with associativity lets you leave your existing models in place and design around them without the pain and expense of a massive conversion or having to redraw everything on the fly. *“If you’re already running a CAD package for 10-15 years you may not want to switch, but you could bring those files into a design platform without having to create STEP files, recreate relationships, or redo calculations. It makes it easy to use advanced capabilities,”* Mr. Alferink adds.

Use Advanced Capabilities with Non-Native Data

Reusing designs, potentially with some minor changes, also lets engineers pull in non-native CAD data to run advanced functions. For example, they could open a legacy CAD file and quickly run a stress analysis using embedded simulation tools. In a similar way, companies can get greater value by using legacy designs to develop CAM tool paths or 3D printing data. This bridges the gap between legacy CAD data and modern, connected production equipment.

Use the Right Tool for the Task

Pick the Right CAD Tool without Tradeoffs

Incorporating native CAD with associativity improves internal efficiency in much the same way it does for the supply chain. It allows different people to use the tools they're comfortable with and let them get their jobs done efficiently, but allows them to work together without excess rework.

Remove Handcuffs from Designer Productivity

For example, designers can use more freeform conceptual tools, engineers can use more parametric detailed design solutions, manufacturing engineering can use specialized CAM solutions, and more. *“Industrial Design and Engineering are our primary ‘customers.’ Our CAD tool allows us to incorporate their models and draw, import/export, and make CAM programs easily from them,”* shares Steelcase’s Elsholz .

You may have other reasons for supporting different tools to encourage individual designer productivity. Sometimes it's because of functionality or integration with specific manufacturing equipment. Of course it may also be for business reasons. These reasons can include cost, engineering skillsets, or the high learning curves required to adopt some CAD solutions.

Support Advanced Needs and Special Formats

There are special formats for different purposes as well. The increase in the use of 3D including augmented and virtual reality means the number of uses will continue to grow. For example, Steelcase’s Stephen Goetzinger explains, *“We also have 3D scanned data and we use 3D gaming engines for marketing-based geometry.”*

Interoperability let's companies stop avoiding different tools by task and start taking advantage of it. For example, they can access advanced tools and cloud solutions without making an all-or-nothing switchover.



“Some big companies use different software in different areas to make sure they are comfortable using the software they're used to, but working together on the same project. CAD interoperability helps if you have teams inside the same company with different software.”

Timon Alferink, KMP Drivetrain Solutions

Exploit the Power of Design Platforms

The Power of the Platform is Interoperability

It's important to keep an eye toward the future of interoperability. The transition to design solution platforms versus point solutions helps in a different way. Leading software vendors are now providing the same level of interoperability across their own platform. This offers similar benefits by removing tradeoffs, but without the need to use conflicting file formats at all.

Platforms provide multiple tools around a central data model. *"Today's software packages have gotten really*



"It's like a free ticket. You can use your old files and do perfect analysis, rendering, and leverage CAM programs without changing your CAD package"

Timon Alferink, KMP Drivetrain Solutions

good about connecting and being more user friendly than point solutions. When Design sends us a change, the platform will update it and it will flag the revision and ask if you want to update your CAM file. It even makes recommendations, and sometimes it's a simple click or two," offers Mike Elsholz of Steelcase.

Innovation platforms offer digital continuity of designs, keeping design data in one place and format to support multiple needs. Platforms also provide seamless workflows across design steps on interoperable data spanning the lifecycle from conceptual design to manufacturing. This eliminates the need for rework and drastically reduces the number of tools your business requires. This is the direction to follow as the industry moves away from point solutions.

Combine Platforms with Associative Non-Native CAD

Additionally, if the platform allows incorporation of associated CAD from different formats, you can leverage advanced platform tools like CAM. This way you can manufacture items designed in older CAD systems without any need for translation, even if you need to make changes.

Next Steps

Pack Interoperability in your Multi-CAD Survival Kit

It's time to adopt non-native CAD with associativity capabilities to take away the multi-CAD productivity penalty. These capabilities are applicable to many different kinds of scenarios and companies. *“For a job shop that machines for others if the customer changes a STEP file and changes a face it would they would need to redo 50% for their CAM program because it lost all of the references, but it would be easy with associative CAD interoperability,”* explains KMP Drivetrain Solutions' Alferink.

The Business Value of Native CAD with Associativity

Native CAD with associativity allows companies to develop seamless design workflows regardless of format and adapt quickly to changing designs. It allows companies to embrace collaboration with others regardless of their tool of choice. It can also open up your own ability to embrace new CAD solutions (including cloud options) without worrying about leaving your IP behind.



“Industrial design still likes to use simpler tools that we would have to redraw. Since we got an interoperable tool a lot of that went away. It translates very smoothly and all of these files come into our CAD systems really nicely. Time is so important nowadays that not having to redraw things is a huge benefit, we probably do 50% less redrawing now.”

Mike Elsholz, Steelcase, Inc.

Interoperability and Productivity go Hand-in-Hand

The bottom line is that you should demand this kind of interoperability. It exists. Associative interoperability is the new best practice and state of the art to survive the reality of multi-CAD. *“In the end, CAD interoperability drives efficiency. Without it, somebody will make a change a part and it will take much longer because you have to redo a lot of work. Associative CAD interoperability will be more efficient for design changes,”* concludes KMP Drivetrain Solutions' Alferink.



www.tech-clarity.com



clarityonplm.com



[@jim_techclarity](https://twitter.com/jim_techclarity)



[TechClarity.inc](https://www.facebook.com/TechClarity.inc)

The CAD Interoperability Survival Guide

This eBook is sponsored by Autodesk
www.Autodesk.com



About the Author

Jim Brown is the President of Tech-Clarity, an independent research and consulting firm that specializes in analyzing the business value of software technology and services. Jim has over 20 years of experience in software for the manufacturing industries. He has a broad background including roles in industry, management consulting, the software industry, and research.

Jim's experience spans enterprise applications including PLM, ERP, quality management, service lifecycle management, manufacturing, supply chain management, and more. Jim is passionate about improving product innovation, product development, and engineering performance through digitalization and the intelligent use of software technology.

Jim is an experienced researcher, author, and public speaker and enjoys the opportunity to speak at conferences or anywhere he can engage with people with a passion to improve business performance through software technology.

Tech-Clarity

© Tech-Clarity 2018