

Maximizing NX 3D via Smart 2D



A CAD-Manager.com White Paper

by Robert Green



2D Endures

The more I work with CAD users, the more confused I've become about how 3D affects the way designers work and how they can derive maximum efficiency in their design environments. Yet as I ponder using 3D more effectively, I continue to see widespread use of 2D software in all manner of engineering environments.

In years past, the barriers to 3D software adoption were high software, operating system, and hardware costs as compared with 2D PC environments. But in recent years, these factors have been mitigated greatly as 3D software has become much more affordable and high-performance computers running standard Windows operating systems have become consumer-level products.

So the questions remain: Why aren't more companies deriving the full benefit from their 3D system investments? Why are 2D systems so entrenched? How can we maximize the effectiveness of CAD environments given that 2D is still with us? And how, specifically, can you best answer these questions.

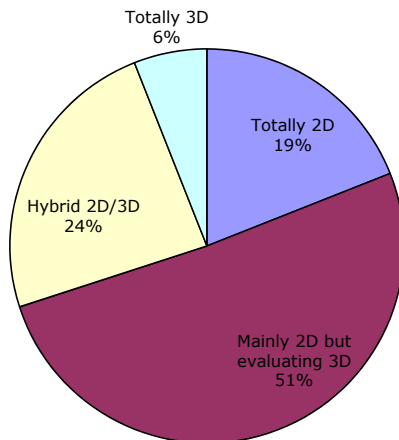
I will answer these questions in this white paper.

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Some Survey Data

Years ago, I started a CAD manager survey in which I polled CAD users and managers from various industries running all types of software about their 2D and 3D use. As the years go by, I've been surprised to see how entrenched 2D use still is. Consider the results from my 2009 survey data:

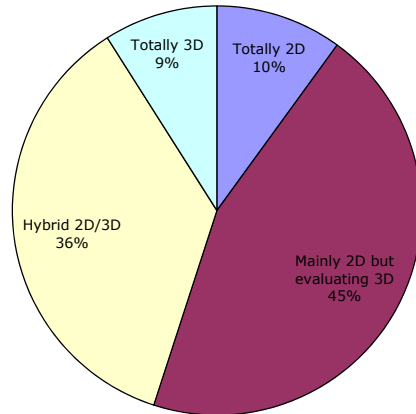
2D and 3D CAD Software Use in 2009





I had a very hard time believing these numbers, so I prepared a follow-up survey with a more detailed, industry-specific analysis. When I tallied the results for manufacturing and mechanical design industries, the numbers didn't change much as you can see here:

2D and 3D CAD Software Use in 2009 within the Manufacturing and Mechanical Design Industries



One could interpret these results as meaning that 90% (45% + 36% + 9%) of the CAD marketplace has at least some 3D software use, but I think that perception is far too generous given that *evaluating* 3D certainly doesn't mean actually *using* 3D. On the other hand, one can certainly interpret the results as meaning that 91% (10% + 45% + 36%) still have 2D as a functional part of their workflow.

I can safely draw the following conclusions from the data gathered in my manufacturing-specific survey:

- Only a very small fraction of companies — 9% — truly rely on 3D.
- Of the 36% of companies that have hybrid 2D/3D CAD usage, it seems reasonable to assume that the pattern of usage will remain.
- A full 55% of companies use 2D as their primary CAD tool with no clear 3D usage strategy.
- Removing 2D software from the workplace would cause problems for far more companies than would removing 3D software.

The survey data not only verified the prevalence of 2D usage that I'd noticed in client offices, it actually showed that reliance on 2D in manufacturing environments is much more pronounced than I'd thought. It is clear that 2D is still with us and isn't going away anytime soon.



If 3D Is So Great, Why Aren't We All Using It?

So if your company is like most, you already have a 3D CAD environment but have struggled to make the complete shift to 3D. There must be a reason why, right? Based on my experience, several key elements impede 3D adoption, and I'll list the most prominent of those below to provide context for further discussion.

Skepticism. For many 2D software users, making the shift to 3D is a daunting process of abandoning the familiar for an unknown. Whether the software is easy to learn or not isn't as important as the user's *perception* that it will be hard to learn.

Confidence equals familiarity. Engineers and designers must get the design right, and they have confidence in the 2D tools they've come to understand after long periods of time. Many users are afraid that changing their own design process from 2D to 3D will lead to design errors for which they'll be responsible.

Learning curve costs. After surpassing the skepticism and confidence phases, a new reality may start to emerge: Changing a 2D user into a 3D user will take time, training, and money. An organization's ability to absorb these costs often determines how many users are groomed for full 3D use and how many others must continue in 2D mode. I believe the learning-curve cost issue is the primary reason why so many companies function in a hybrid 2D/3D mode.

Legacy data. 2D has been around longer than 3D, so companies must manage a lot of 2D files. The sheer inertia of all that pre-existing 2D legacy data slows any company's ability to transition to a fully 3D design environment.

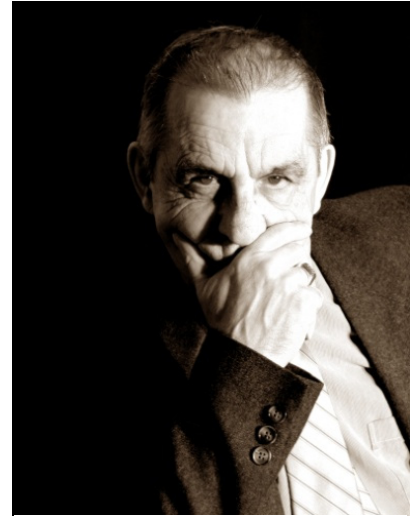
Non-native 2D data. Another real issue for 3D CAD environments is the preponderance of DWG-formatted data coming from outside vendors and partners that must be integrated into the operating environment. The ability to import and manipulate these non-native files is of critical importance for any company working with vendor- or partner-supplied data.

For many companies these factors mean that 2D and 3D systems must coexist in a mixed or hybrid environment. The question then becomes how to best manage the hybrid 2D/3D environment to achieve maximum efficiency.

Why Fight It?

If users like 2D and if 2D methods are effective for certain tasks in the design environment, perhaps the real question I should be asking is how to make 2D work best in this type of design environment. I like to call this the Why Fight It approach, and it is this mindset that smart 2D usage embraces.

Being productive in a hybrid 2D/3D environment isn't merely a matter of saying "we're going to use 2D" and hoping for the best. For a company to thrive in a hybrid 3D environment, you'll need to delineate exactly which functions will be performed using 3D and which will be done using 2D. Furthermore, by standardizing your procedures to balance 2D and 3D usage, you'll achieve better workflows, reduce errors, and increase user satisfaction as users focus on using tools most familiar to them to complete their daily tasks.



Many 2D users are skeptics when it comes to 3D.

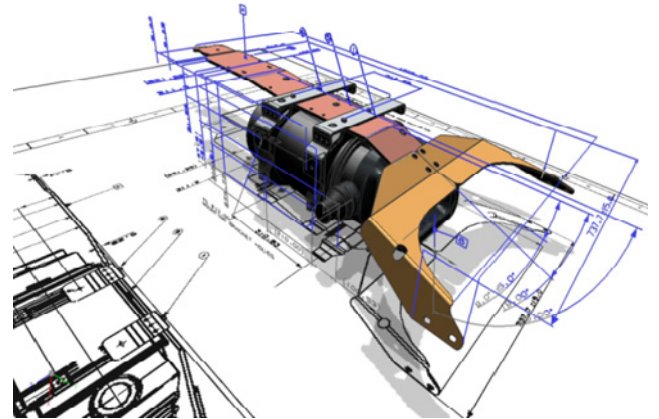


Use 2D for Its Strengths

To make the best use of 2D in general, you'll need to perform an analysis of your 2D needs and decide which functions can save you time. For a company using NX, understanding how new solutions like NX DraftingPlus can fit into the 2D/3D mix also will dictate how to approach 2D use.

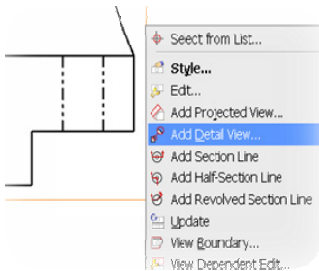
To begin a 2D analysis, consider the following challenges, along with applicable NX Drafting or DraftingPlus functions:

Creating fabrication drawings. No matter how well you model your designs in 3D, somebody somewhere must fabricate and assemble your parts. In almost all cases, fabrication and assembly are done via 2D drawings; therefore, the 2D tools you use determine how productive you can be in producing fabrication documents. In this area, the most important functionality will be integration with 3D modeling components to enable creation of section views and projections that form the basis for multiple-view prints and assembly drawings.



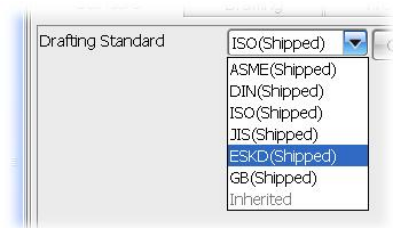
Fabrication drawings, though derived from 3D models are still a 2D product and process.

Advanced annotation. In addition to 2D projection and section views, good fabrication drawings also contain all manner of advanced annotation elements such as dimensional tolerances, feature control symbols, and feature details to name a few. The 2D drawing tools provided by NX Drafting allow users to automate time-intensive tasks such as detail preparation, symbol insertion, and even creation of a symbology library that lets users easily reuse annotative content as they develop it.



Automatic detail generation increases accuracy and reduces labor costs.

Drafting standards support. In today's global markets, there's an ever-increasing likelihood that your design could be produced in a country other than your own. In this situation, NX DraftingPlus' drafting standard support allows you to select from a palette of local and international standards to meet project requirements.



Support for international standards eases the process of globalizing part fabrication.

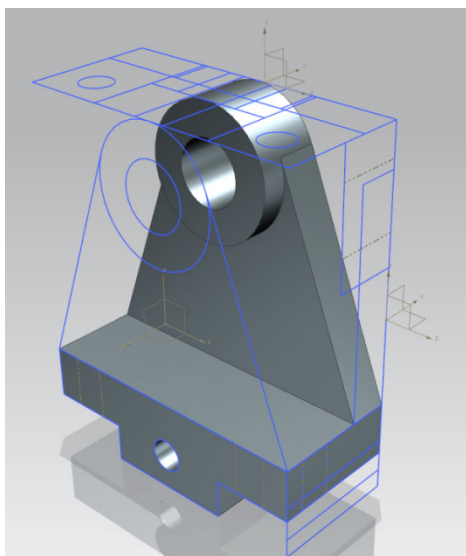


Layout and conceptualization sketching. Have you ever started your design process by sketching a 2D layout first and then thinking about how it will work in 3D later? Most engineers and designers use this type of workflow frequently and find that 2D tools allow them the freedom to perform quick sketching operations without the computational burden of creating complex 3D solids. The ability of a 2D system to create complex 2D geometry with maximum ease of use becomes a key factor.

Bridging into 3D from 2D

Besides the traditional 2D annotative functions I've discussed, other options let designers make 2D a bridge into more 3D use. By supplementing the familiarity and comfort of the 2D environment with NX DraftingPlus tools that allow 2D to be converted into 3D easily, user resistance can be mitigated and the 3D culture will grow. The key point is to build this bridge from 2D to 3D with the minimum possible amount of user disruption and training to keep costs down.

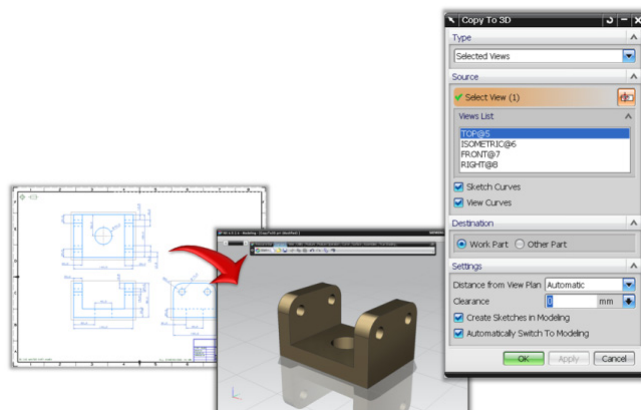
I'll discuss a few possible ways to bridge from 2D into 3D below.



CopyTo3D functionality (at right) makes 3D part construction easier.

Design of uniform thickness geometry. For companies that produce sheet metal, plates, flanges, etc., a part can be thought of as being essentially 2D — but with a uniform thickness. Sometimes called *2.5D*, these types of parts are common and can be created easily using 2D drawing tools. Even slightly more complex objects such as brackets or frames can be thought of as several 2D profiles with different thicknesses.

Multiple-view to 3D. If users can work in 2D multiple-view projection drawings comfortably, then they can begin to use NX DraftingPlus' CopyTo3D functionality to create 3D geometry semiautomatically. Although CopyTo3D isn't magic, it allows a 2D-centric user to create 3D geometry through a nonthreatening, menu-driven environment that focuses on those 2D interfaces the user already knows, thus providing a bridge into the world of 3D. If designers can use these types of tools to make 3D seem easier and lower their anxiety levels, you'll see the rewards in lower training expenses and a more 3D-literate workforce over time.





2D Data Management for Hybrid 2D/3D Environments

Of course any work model must be tracked and managed over time, and 2D files are no different. Most NX installations use Teamcenter as their data-management solution because of its tight integration with NX. But what about 2D files? Will they be managed the same way?

One of NX Drafting/DraftingPlus' key benefits is that the 2D files are managed via Teamcenter in the same way as 3D models, thus providing a consistent data-management experience for all team members. In addition to the consistent user experience, the administration of the Teamcenter environment is easier because all files use native NX formats rather than having to integrate add-ins to accommodate other CAD system file formats.

2D Challenges

Many firms will face a few other 2D challenges, which I will describe below.

Manipulating 2D legacy data from in-house projects. If you ever need to begin a project by loading in old 2D geometry to serve as a starting point, then you're at the mercy of your 2D CAD tools. NX DraftingPlus' ability to import I-deas drawing (ASC/DWG) and symbol (SYM) files directly into NX provides an immediate productivity boost, especially in NX environments that have migrated from I-deas. The fact that the imported files can then be managed in Teamcenter as any other controlled engineering file is an added benefit enabled by NX DraftingPlus.

Manipulating 2D data from other 2D systems. If you ever need to begin projects by receiving 2D geometry from another CAD system, then chances are that you'll receive it in DXF or AutoCAD DWG file format. NX DraftingPlus' ability to read these files directly and store them in Teamcenter means that you'll have the data captured and managed at the origination of the project, so you can move the data into 2D or 3D NX formats as you see fit.

Training and Staffing Decisions

One thing that I've noticed without fail since I've been tracking the hybrid CAD office is that nothing determines eventual success as much as the staff and how they are trained. Simply put, you can implement any combination of 2D and 3D software but unless you have the right people using the right software tools in an optimal manner, you'll never achieve full productivity.

Here then, are some pointers I've found to be very helpful in getting the right people plugged into 2D and 3D CAD environments.



Staff motivation, placement and training is a key piece of making 2D/3D environments work optimally.

Understand 2D and 3D motivations. Not everyone will assimilate to 3D. Some users will be enthusiastic and make the switch easily, some will be hesitant, and others will feel most comfortable operating in 2D mode. By steering users to the software they're most comfortable using, you'll get the best initial productivity while enabling 2D users to become more 3D literate over time.

Not everyone wants 3D. You may encounter die-hard 2D advocates who either can't or won't learn your company's new 3D tools. If these users can be steered toward 2D software tasks for the long-term, they'll remain productive. Given that you'll probably have some processes that will be 2D



exclusively, there is a chance that keeping these users in 2D mode won't disrupt your operations.

Not everyone needs 3D. You may encounter casual CAD users who want to learn 3D even though it really isn't required in their job descriptions. An example that comes to mind is shop-floor users who really only need view and print functionality. Will you be able to retain these staffers even though you can't reward them with advanced 3D knowledge? Managing these users sometimes can be challenging.

Put the right people in 3D positions. Most of the staffing problems I see in hybrid 2D/3D environments involve selecting the wrong personnel for the 3D modeling jobs. By selecting users who demonstrate the ability to learn quickly while maintaining a positive and self-motivated attitude, you'll have fewer staffing problems and higher productivity. I've also noticed that rewarding those who exhibit positive learning techniques tends to gain senior management's approval more readily than does moving everybody to 3D. Practically speaking, not everyone will use 3D in a hybrid environment, so it is worth your while to make sure that those who make the move clearly demonstrate the necessary competency.

Summarizing – 2D/3D Synergy

Even as 3D software becomes more common, it is clear that 2D CAD lives on. So rather than viewing world in an all-3D or all-2D manner, think about ways in which you can use both system types in a way that makes good financial sense so all your NX users are fully productive.

Of course, you may need to rethink what tasks you wish to perform in 2D versus 3D to achieve the optimal synergy for your company but the tight integration between NX 3D, NX Drafting and NX DraftingPlus software will make the transition easy since all your information remains in NX formats managed flawlessly by your existing Teamcenter tools.

I think you'll find the effort required to find the synergistic balance between 2D and 3D for your company will result in an optimized design environment that maximizes all users' productivity levels.

About the Author

Robert Green is a nationally known author, teacher and consultant with 24 years of CAD experience in a variety of applications. You've likely read his work in *Cadalyst* magazine, *PE Magazine*, *The CAD Manager's Newsletter* or his new book *Expert CAD Management: The Complete Guide*.



As a consultant, instructor and public speaker Robert has taught thousands of students in CAD management, programming and CAD application usage since 1990. When Robert isn't writing or teaching, he heads CAD-Manager.com, which provides consulting and programming services for clients throughout the U.S. and Canada. Robert earned his degree in Mechanical Engineering from the Georgia Institute of Technology and resides in the greater Atlanta area.