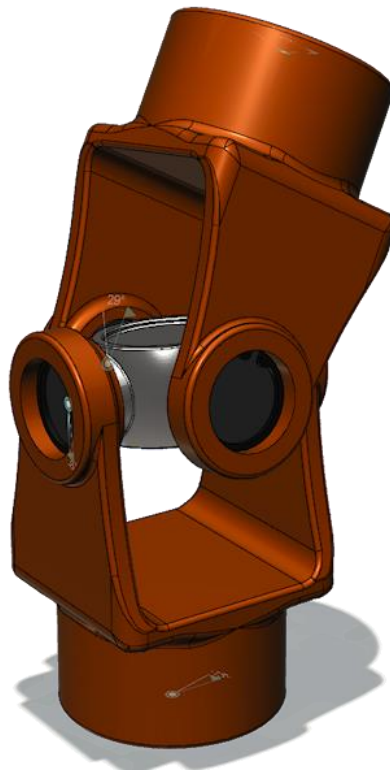


## CNCCookbook 2016 CAD Strengths and Weaknesses Report

What sorts of things would you want to know before purchasing a new CAD Software Package? These packages are expensive, you'll spend hours learning to use them effectively, and they make the difference between success or failure of your next CNC project. The choice you make will impact your productivity for a long time.

Here at CNCCookbook, we've been offering a different kind of analysis of these packages because it's based not on our view of the packages, but on the views of real users of the software as determined by our [2016 CAD Market Share and Usability Survey](#). The ratings and information here are drawn entirely from those survey responses. Moreover, when we ran the survey, the questions were open-ended. We didn't pick categories, we simply asked folks to tell us the 3 things they liked most about their CAM software and the 3 biggest frustrations they were having with it. The results



give an unprecedented view into how real users react to the various packages. In [Part 1 of the CNCCookbook 2016 CAD Survey we covered market share](#). In [part 2 we covered Customer Satisfaction](#). In this installment, we'll be covering the most common strengths and weaknesses the actual users of the packages reported. In the interests of having enough data points to make for a worthwhile survey, we will only be covering the Top 7 packages, though many more were reported in the survey. For each of the seven we received at least 20 responses from users, so the results are a reasonable cross-section of experience with the products that won't be too shaded by too few voices.

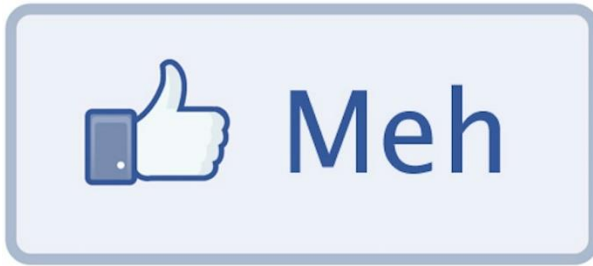
## Strengths Categories

The questions we asked were open-ended: give us the 3 most important strengths and the 3 most important weaknesses. We binned those responses into the following categories to make them comparable to each other:

- Ease of Use: Self-explanatory
- Support: Users mention support and education resources provided by the vendor
- Ecosystem: Users mention non-vendor resources including training, plug-ins, and vibrant user groups that can help. In some cases, the idea that the product is an industry-standard fits.
- Sketching and 2D Work
- Productivity: Users talk about either particular features or overall productivity—work gets done faster when productivity is there.
- CAM Integration
- Sheet Metal
- Parametrics: Many but not all of the packages are parametric, but that's not enough. Users have to mention particular aspects they like, such as the ability to drive constraints from a spreadsheet.
- Performance: Does the package feel snappy? Can it run on lower performance machine?
- Complex Shapes: Is the package particularly suited for complex shapes?
- Simulation: Is there simulation such as kinetic or FEA?
- Rendering/Graphics: Overall quality of rendering and graphics
- Assemblies: Ability to work with large assemblies
- Customizability
- Cost
- Import/Export: How well does the package work and play with others in terms of file formats?
- Mac: Does it run on a Mac? Many brought this up as important to them.
- Direct Modeling: There's an active move in the CAD world to allow non-parametric or Direct Modeling. Some users mention this as a strength.
- Workgroup: Version control or often just the ability to move from PC to PC seamlessly.

That's a pretty long list—our respondents varied in their ideas of what features were most appealing.

## Strengths Popularity



Here are the most popular categories in order of popularity

- Ease of Use: 20% of responses named this one.
- CAM Integration: 16%
- Ecosystem: 8%
- Productivity: 8%
- Cost: 7%
- Parametric: 7%
- Simulation: 6%
- Support: 5%
- Sketching/2D: 4%
- Import/Export: 4%
- Assemblies: 3%

Everything else was 2% or less. For this audience of CNC'ers, the best CAD package is easy to use, integrated with CAM, has a vibrant ecosystem, is productive, cost-effective, parametric, has good simulation and support. Sketching/2D, Import/Export, and good support for Assemblies is also valued.

## Strengths Overview

Here are the category winners for strengths:

- **Best Ease of Use: 1. Onshape (38.1), 2. Solidworks (28.3), 3. Fusion360 (26.6)**
- **Best CAM Integration: 1. Fusion360 (54.4), 2. Inventor (19.4), Solidworks (14.2)**
- **Best Ecosystem: 1. Rhino3D (28.6), 2. Fusion360 (13.9), 3. Inventor (13.9)**
- **Best Productivity: 1. Solidworks (18.9), 2. Rhino3d (9.5), 3. AutoCAD (8.9)**
- **Best Cost: 1. Onshape (28.6), Fusion360 (17.7), Rhino3D (14.3)**
- **Best Parametric: 1. Pro/Engineer (23.8), 2. Onshape (14.3), 3. Solidworks (11.3)**
- **Best Simulation: 1. Fusion360 (12.7), Onshape (9.5), Solidworks (8.5)**
- **Best Support: 1. Onshape (14.3), Fusion360 (11.4), Rhino3D (9.5)**
- **Best Sketching/2D: 1. Pro/Engineer (14.3), 2. Rhino3D (9.5), Solidworks (5.7)**

- **Best Import/Export: 1. Inventor (13.9), 2. AutoCAD (11.1), 3. Rhino3D (9.5)**
- **Best Assemblies: 1. Inventor (8.3), 2. Solidworks (7.5), 3. Onshape (4.8)**

One other metric is what I'll call "Enthusiasm." Some of the packages are well liked, but nobody could say why or few did. Others people would've liked to be able to give more than just 3 strengths. That showed up in the survey as follows:

#1: Fusion360 (1.8)

#2: Rhino3D (1.6)

#3: Tied at 1.4 were Onshape and Inventor

It's interesting to see the relative newcomers, Fusion360 and Onshape doing so well in the survey while some of the market share leaders are not quite as well reviewed. I was also pleased to see one of my personal favorites, Rhino3D, do so well. It's not a parametric CAD program at all, yet it is well received. It makes me wonder what might happen if the Rhino3D people actually made the package parametric in a very modern way so you could choose to model either via Direct or Parametric means.

## Analysis



My own takeaways from the strengths area would be:

- CAM Integration in Fusion360 is huge. In no other category, and the #2 most important category to boot, did one package have such a huge advantage over its competition. Fusion360 is a very competent CAD package, but it is the integration of all the other components and especially CAM that really puts it over the top. One wonders what this means for the rest of the CAD world. Will they ultimately have to acquire CAM companies too? And if so, which partners are left that are viable?
- In ease of use, Onshape has done a good job beating Solidworks. That's what can happen when the original team behind a product like Solidworks reforms and gets a chance to change things based on all their years of experience and learning.
- Cost does not seem to be as big a driver as I would've expected, though it isn't inconsequential either. Still, it's clear that any vendor that thinks the only reason Onshape and Fusion360 are succeeding is cost are kidding themselves.
- Ecosystems such as plugins and other abilities for 3rd party software to integrate are huge. CAD packages are platform foundations for entire families of tools. Be sure to look at the ecosystem when you're choosing a vendor!
- This market feels like it is consolidating. The Old Guard that are already huge are not likely going anywhere. The new players Fusion360 and Onshape are really snapping

up share. It isn't clear what older packages can do to stay relevant if they're caught between the twin pincers of the Old guard and the New Innovators.

## Weaknesses Categories

In analyzing Weaknesses, we included all the same categories as strengths, but added a few more that came up:

- **Stability:** Bugs and crashes.
- **File Management:** This category reflects difficulty managing files particularly with respect to the Cloud. None of the Cloud software yet has a model that makes management of local files and particularly integrating them with other software such as CAM seamless.
- **Cloud:** This category largely reflects folks who are opposed to Cloud software in general. No specific feedback was given for why.

Some thoughts in terms of common themes:

- Support complaints usually boiled down to issues with the user's ability to find answers via documentation and training. But, a close second would be unhappiness around support policies.
- Import/Export was all about the ability to exchange files with other software, such as CAM.
- Assemblies boiled down either to the lack of the feature or the inability to work with complex and large assemblies.
- File Management was largely a pain point for Cloud packages. None make it easy to do local backups or to exchange files with software installed on the local machine.
- Workgroup complaints almost exclusively boiled down to difficulty interfacing with 3<sup>rd</sup> party or poor quality of integrated PDM solutions.

## Weakness Popularity

In order of popularity, here are the areas users complained about:

- Cost: 16.2%
- Productivity: 15.1%
- Stability: 12.7%
- Ease of Use: 10.4%
- Support: 8.5%
- Import/Export: 7.7%
- Sketching/2D: 7.3%
- Assemblies: 6.2%
- CAM Integration: 5.8%
- File Management: 5.4%
- Complex Shapes: 5.0%
- Performance: 4.6%
- Workgroup: 3.1%

Everything else was 2% or less. It's interesting to see Cost as the #1 complaint, and as we'll see it was reported most often for one package in particular, by a wide margin.

Productivity is a vague term but it boiled down to complaints about how productive one could be with each package. Stability was also a surprising common complaint, particularly when we consider that many of these packages are extremely mature. It actually wasn't the new kids on the block that got dinged the worst on stability.

## Weaknesses Overview

Here are the category “winners” (hard to view these as wins given they’re weaknesses!) in each area:

- **Most Cost Complaints:** 1. Solidworks (24.7), 2. Onshape (16.7), Inventor (16.0)
- **Most Productivity Complaints:** 1. Pro/Engineer (31.0), 2. Rhino3D (30.8), 3. AutoCAD (25.8)
- **Most Stability Complaints:** 1. Solidworks (24.7), 2. Fusion360 (14.9), 3. Onshape (8.3)
- **Most Ease of Use Complaints:** 1. Pro/Engineer (27.6), 2. AutoCAD (19.4), 3. Onshape (16.7)
- **Most Support Complaints:** 1. Fusion360 (17.0), 2. Pro/Engineer (10.3), 3. AutoCAD (9.7)
- **Most Import/Export Complaints:** 1. AutoCAD (12.9), 2. Inventor (10.0), 3. Onshape (8.3)
- **Most Sketching/2D Complaints:** 1. Fusion360 (14.9), 2. Onshape (8.3), 3. Inventor (8.0)
- **Most Assembly Complaints:** 1. Solidworks (10.4), 2. Inventor (8.0), 3. Rhino3D (7.7)
- **Most CAM Integration Complaints:** 1. Fusion360 (10.6), 2. Inventor (10.0), 3. Onshape (8.3)
- **Most File Management Complaints:** 1. Fusion360 (17.0), 2. Rhino3D (15.4), 3. AutoCAD (6.5)
- **Most Complex Shape Complaints:** 1. Solidworks (10.4), Onshape (8.3), Fusion360 (4.3)
- **Most Performance Complaints:** 1. Onshape (8.3), Rhino3D (7.7), Solidworks (6.5)
- **Most Workgroup Complaints:** 1. Pro/Engineer (6.9), AutoCAD (6.5), Inventor (4.0)



## Weakness Analysis

This is a fascinating category because the contestants are all powerful programs that aren't exactly lacking in strengths. But the way they've implemented those strengths does not always result in the most positive user feedback.

In the Strengths Category, I introduced an "Enthusiasm" metric for how likely users were to list a strength. For the Weaknesses, I have a similar "Grouchiness" category showing how likely users were to complain by package. Here is the "Grouchiness" ranking from most to least likely to complain:

1. Autodesk Inventor: 1.39
2. Pro/Engineer: 1.38
3. Solidworks: 0.73
4. AutoCAD: 0.69
5. Rhino3D: 0.62
6. Fusion360: 0.59
7. Onshape: 0.57

If we combine the Enthusiasm and Grouchiness scores (the latter obviously being subtractive), we can get an overall sense of the balanced response. From most Enthusiastic to most Grouchy, here is that list:

1. Fusion360: 1.25
2. Rhino3D: 0.95
3. Onshape: 0.86
4. Solidworks 0.49
5. Autodesk Inventor: 0.03
6. AutoCAD: -0.2
7. Pro/Engineer: -0.52

This list makes quite a lot of sense to me. It jibes with the overall sense one gets after reading through all the detailed individual responses. Let me see if I can add some color:

- Fusion360: Users are generally very enthusiastic about this product. Yes, it does have its weaknesses, but it is a fantastic value, the integrated CAM Package (HSMWorks) is excellent, it is well supported, and it is coming along strong.
- Rhino3D: It's community loves this product, and being part of it, I can't blame them. If you don't need Parametric CAD, it is easily the most productive CAD package out there. If they added Parametric capability and Assemblies, it would be scary good and might start to challenge everyone.
- Onshape: Also extremely well liked and evolving rapidly.
- Solidworks: Most agree this package does what is expected of a market leader—it is highly productive and complete. But for the first time there is

tremendous negative feedback in a lot of areas, especially cost. Others have really shown it is possible to deliver very good solutions at much lower price points. I was also very surprised to see how many stability complaints there were. Perhaps its price point raises expectations, or perhaps the latest release needed more testing. It's unclear what Dassault Systems can do about all this or what it means for Solidworks in the long run, but I would be worried if I were them. They dare not make any missteps and they need to think far ahead.

- Inventor has some rough edges. Autodesk has somewhat penalized itself. For example, a lot of the individual complaints involved the feeling that if CAM was free with Fusion360, it ought to be free with Inventor too. Clearly Autodesk could fix that problem, but it is interesting to see it is impacting itself as much as the competition is.
- AutoCAD and Pro/E: Two Old School players that are still useful but very much showing their age.

## Conclusion

We live in a wonderful time for CAD. There is tremendous competition driving incredible value to lower price points for CAD users. Based on the feedback I saw, I would have a hard time not limiting my choices to one of four packages were I evaluating a new CAD package:

- Solidworks: Best of the tried and true offerings, but very expensive.
- Fusion360: Awesome integrated CAD and lots of power.

These are the two to look at for CNC'ers because they integrate CAM well and they both include great parametric CAD and Assemblies.

If you're strictly interested in overall CAD productivity, then your evaluation list should look like this:

- Solidworks: Best of the tried and true offerings, but very expensive.
- Fusion360: Awesome integrated CAD and lots of power.
- Rhino3D: Superior productivity, but lacking in parametric CAD and Assemblies.
- Onshape: Great ease of use. Desperately needs a CAM partner. Unclear how well it can work and play with your existing CAM.

In fairness to Rhino3D, there are integrated CAM solutions available, I just couldn't put it in the same category as the other two despite my love of it due to the lack of Parametric CAD and Assemblies.

In the end, users are smart. I don't see a lot here not to agree with wholeheartedly and it's all based on the day to day experiences of real CAD users.