

The Expansion of 3D into the Small to Midsize Market

3D CAD is a critical application with the promise to improve the productivity of engineers as well as cut substantial costs from product development budgets. Aberdeen Group's May 2008 *Best Practices for Migrating from 2D to 3D CAD* study found that users of 3D CAD report product profit margins that are 21% higher than users of 2D CAD. As 3D modeling technology has matured, more vendors have sought to develop solutions that fit the needs of the small to midsize organizations, and adoption has increased significantly. Over 67% of these manufacturers currently develop half or more of their product designs in 3D. However, while more of these manufacturers leverage these tools; there are steps they can take to see even more value from their investment in 3D CAD. In addition, those currently using 2D CAD may be surprised by some of the latest improvements in 3D CAD in terms of ease of use and the value their peers using 3D CAD are seeing from it. For those considering making the transition or looking to get more value from 3D CAD, this report will serve as a reference for how other SMEs are leveraging 3D CAD.

Pressures Driving the Use of 3D CAD

Manufacturers often turn to 3D modeling for the ability to develop more complex or higher quality products in shorter periods of time than would be possible with a 2D drawing (Table I). It should come as no surprise that SME manufacturers report the same top drivers. What is interesting, however, is that all of these pressures are reported more often by SME manufacturers than by their large competitors. With fewer resources at their disposal, the need to do more with less is often more intense for these companies, which could be driving the higher response rate for these top pressures. In particular, SMEs report shortened development schedules as a particularly strong driver, much more often than increased product complexity. Interestingly, these pressures are much less differentiated among large companies.

Table I: Top Pressures Driving Adoption of 3D by SMEs

	SME	Large
Shortened product development schedules	51%	43%
Demand for increased quality / reliability	44%	40%
Increased product complexity	31%	28%

Source: Aberdeen Group, May 2008

Sector Insight

Aberdeen's Sector Insights provide strategic perspective and analysis of primary research results by industry, market segment, or geography

Small to Midsize Definition

For the purposes of this study, small to midsize organizations will be defined as those companies reporting revenue between:

Under \$50 Million to \$1 Billion

Aberdeen Analysis

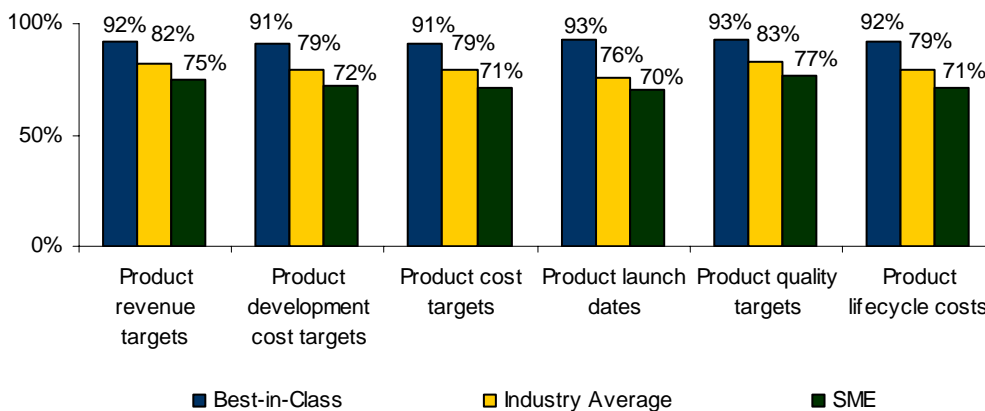
By and large, SME manufacturers are turning to 3D to speed up design processes. However, in order to begin to realize these benefits, organizations often must find a way to deploy the tools and train engineers to design in a new way while still adhering to the shortened development schedules that are driving them to 3D CAD in the first place. With many of an organization's competitors using 3D, to be competitive, these companies need to find ways to ramp up quickly without taking shortcuts.

In order to uncover how organizations can do this effectively as well as improve their use of 3D modeling tools, Aberdeen Group surveyed over 680 manufacturers regarding their 3D CAD implementations between April and May 2008. Aberdeen benchmarked respondents according to six key performance criteria. These criteria evaluated their ability to meet crucial product development targets, including the percentage of their products that meet the following:

- Product launch dates
- Product revenue targets
- Product cost targets
- Product development budgets
- Quality targets
- Lifecycle cost targets

Using these metrics, Aberdeen classified companies into the top 20% (Best-in-Class), the middle 50% (Industry Average) and the bottom 30% (Laggard) of performers. Figure 1 displays the performance gaps that define each category.

Figure 1: The Maturity Class Framework



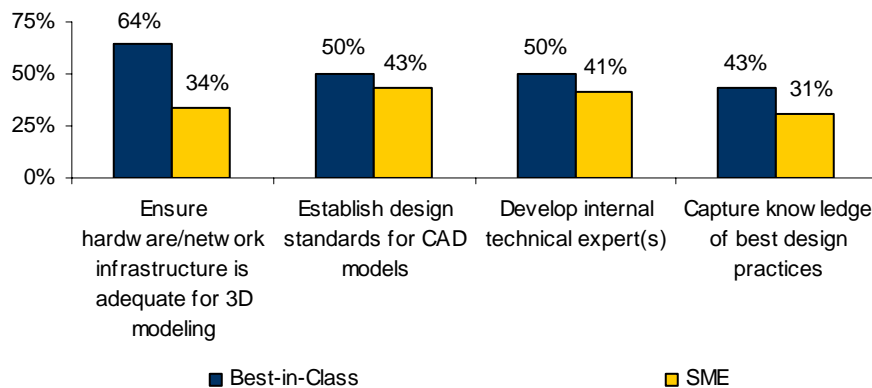
Source: Aberdeen Group, May 2008

The Best-in-Class enjoy a significant advantage over their peers, while SMEs are performing at or slightly below the Industry Average. These manufacturers fall the furthest behind in their ability to hit target launch dates which the Best-in-Class are 33% more likely to meet. The Best-in-Class are also 20% more likely to meet quality targets. With both speed and quality the top pressures driving the use of 3D, and shortened product development schedules as a particularly strong pressure for these companies, SMEs can benefit significantly by looking to the example of the Best-in-Class.

Strategic Actions Supporting the Use of 3D CAD

Given the significant advancements 3D CAD has made over the last few years in terms of ease of use and its availability at a lower price point, Aberdeen determined it would be more relevant to look at those that have implemented 3D CAD within the last five years as their experiences would be more similar to someone implementing 3D CAD now.

Figure 2: Strategic Actions of the Best-in-Class and SMEs to Improve the Use of 3D CAD



Source: Aberdeen Group, May 2008

The top strategy reported by SMEs (43%) to improve their use of 3D CAD is to establish design standards for CAD models. This is also in adoption by half of the Best-in-Class, and provides consistency in models and saves time in the long run when models are reused. Next, SMEs focus on the development of an internal expert. Again, this is a popular strategy among the Best-in-Class as well. An internal expert provides an informal level of support within an organization's 3D user community. This is also the idea behind the fourth most popular strategy of SMEs: the capture of best practices.

Ensuring the hardware infrastructure is adequate for 3D is also a top strategy of SMEs, but it is also an area where they lag behind the Best-in-Class significantly. In fact, the Best-in-Class are nearly twice as likely as SMEs to focus supporting 3D design tools with the hardware infrastructure it requires. 3D modeling applications requires more computational power to

"We use 3D CAD which make updates and revisions very quick. We are also better able to foresee interferences and collisions. If parametric capabilities are used the time can be reduced even further."

~ Engineer
Industrial Equipment
Manufacturer

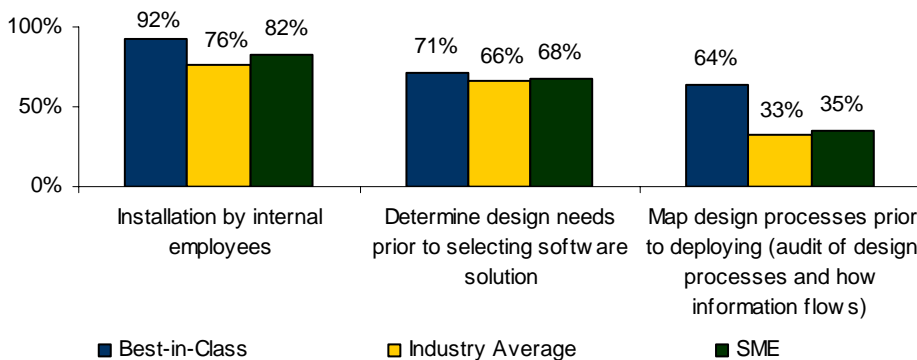
calculate, process, and display three dimensional models. Inadequate workstations can impact the processing time of these tools, which can make them unnecessarily frustrating to work with and even inhibit some of the advantages of 3D CAD, particularly the enhanced speed of design processes.

What Does an SME Implementation Look Like?

Small to midsize businesses are more likely to install 3D software themselves rather than relying on an outside source or consulting services to perform the installation. They also take the time to understand their own design processes and identify what they really need in a design solution prior to selecting the solution. In the execution of both of these steps, these manufacturers are nearly on par with the Best-in-Class.

The Best-in-Class take one additional step that is overlooked by many SMEs. These leaders are nearly twice as likely as SMEs to map out the design process in order to get an understanding of how information is created and how it flows. By performing these audits of design processes, the Best-in-Class are better able to identify the 3D CAD solution that fits their needs the best. This is also a step that can support SMEs in two of their core strategies: establishing design standards for CAD models or capturing best practices for design.

Figure 3: Capabilities Supporting the Implementation of 3D



Source: Aberdeen Group, May 2008

Preparing Employees for 3D Design

One of the top challenges of implementing a 3D modeling approach to product design uncovered by Aberdeen's [Best Practices for Migrating from 2D to 3D CAD](#) study is training engineers on 3D design tools. Training employees to design in 3D was reported as a top challenge by 36% of respondents, regardless of whether an organization implemented 3D in the past two years or more than six years ago.

To overcome this challenge and support employees in using 3D CAD, both SMEs and the Best-in-Class leverage standard drawing templates (Table 2). This ensures drawings are consistent and contain all required information. It also saves time as engineers do not have to waste time adding the same

standard information to every drawing. Following the same idea, SMEs and the Best-in-Class also take advantage of 'start' models. These are 3D CAD models with standard company parameters such as coordinate systems, standard views, or even layers already created in them. Both templates and 'start' models provide for more consistent modeling practices among engineers in addition to saving the time of creating them for every design model. However, it should be noted that the Best-in-Class place themselves in a better position to take advantage of these tools by mapping their design processes prior to deployment so they really understand what should be standardized.

Table 2: Capabilities Supporting Employee Training and Use of 3D CAD

	Best-in-Class	Industry Average	SME
Standard templates for drawings (standard title block, views, etc) defined	100%	93%	93%
Employees attend instructor led training sessions on how to use software	86%	80%	79%
Employees use online tutorials to learn specific functionality	86%	79%	78%
New designs developed using 'start' models that contain standard company parameters (coordinate system, layers, views, etc.)	86%	74%	74%
Training material/documentation defining best practices	86%	67%	62%

Source: Aberdeen Group, May 2008

SMEs recognize that to be truly productive, employees need proper training. As such, they are about as likely as the Industry Average and nearly as likely as the Best-in-Class to send employees to instructor-led training in the use of 3D tools. Supporting their 'do-it-yourself' approach to implementation, SMEs also make use of online tutorials to allow engineers to learn specific functionality as needed and on their own schedule. Finally, to make sure this information is captured and made available as a reference, training materials and best practices are documented. While the majority of SMEs do this (62%), it is a very prevalent practice for the Best-in-Class with 86% of these leaders also capturing best practices from training materials.

What Functionalities Are Important to the SME User?

If SMEs take a more cautious approach to the widespread use of 3D design tools, this does not mean that these manufacturers are necessarily taking advantage of fewer capabilities of 3D tools. In fact, a majority of small to midsize manufacturers are leveraging a rather robust set of 3D functionalities (Table 4).

The two functionalities used most by SMEs are assembly modeling and the creation of production drawings based on the 3D drawings. This makes a lot of sense as these are two of the biggest benefits of working in a 3D environment over a 2D environment. In 3D, it is far easier to identify interferences in the assembly. By creating production drawing based off of the 3D model, the process of creating orthogonal views is far more automated and the process of accurately updating each view individually

every time a change is made is eliminated. In addition, there will not be errors from inconsistent information represented in the orthogonal views.

Table 4: Functionalities

	SME
Assembly modeling	90%
Production drawings based on 3D models	88%
Libraries of existing parts	76%
Sheet metal design	68%
Tables to manage similar standard parts	63%
Structural analysis	62%
Industrial Design modeling	55%
Design translation tools for converting formats	53%
Advanced surfacing	52%

Source: Aberdeen Group, May 2008

Further, to save time in the modeling process, 76% of SMEs take advantage of libraries of standard parts that are commonly used. Rather than recreating standard parts over and over again, the designer can locate the part from the library and reuse it, often saving considerable time. SMEs also leverage tables that help to manage similar parts. This is particularly effective with common or standard parts such as bolts. Rather than creating individual models for each bolt used, a table can be used to manage the different variations of the same part by storing the possible varying dimensions such as lengths and diameters.

Sheet metal design is also a part of many 3D CAD tools, and 68% of SMEs are using them. For those that design sheet metal parts, sheet metal functionality contains many automated features to accelerate the design process such as adding bends, reliefs, or flattening the part. Fifty-three percent (53%) of these manufacturers are also leverage design format translation tools making it easier to work with models from partners or other designers that were created in a different third party CAD tools. Fifty-two percent (52%) of these manufacturers are also leveraging advanced surfacing capabilities, which provide greater flexibility when creating the exterior surface of a model. Advanced surfacing capabilities are often used when product aesthetics are particularly important.

Finally, the use of analysis is growing in popularity for SMEs, 62% of whom leverage structural analysis functionality. Software analysis enables designs to be explored and tested in a virtual environment, before building a physical prototype. It can also be used to optimize the design by testing and evaluating different conditions to determine which values will yield the best performance.

Selecting a Vendor

Selecting the right CAD application is an important choice as it will govern most of the day to day activities of the engineers who are developing the

company's latest products. Making sure they have access to the tools that will allow the engineers to develop new innovations, quickly, at a competitive cost is key to the company's success. Table 5 presents the top criteria considered by SME manufacturers when choosing a CAD solution provider.

Table 5: CAD Vendor Selection Criteria of SME and Large Organizations

	Large	SME
Cost of solution offered	28%	48%
Ease of use of solution offered	34%	42%
Quality and availability of Technical Support (phone support)	21%	25%
Recommendations by peers	19%	25%
Commitment to customer service	22%	24%
Demonstrated success in similar projects	29%	24%
Breadth of solution offered	25%	16%
Quality and availability of Professional Services (onsite support)	13%	12%
Company's vision and long term commitment	21%	12%
Scalability of solution offered	25%	11%
Domain expertise	16%	11%

Source: Aberdeen Group, May 2008

"Our local reseller provides a very strong training and continuing education program, which helped with both continuing skills development and training of new hires. We also set a mandatory requirement for new designs and drawings to be in 3D to help force the transition."

~ Scott E. Davis
Director,
Global Documentation Systems
Symmetricom

When SMEs were asked what was the most important criteria when selecting a CAD vendor, it came as no surprise that cost was the number one criteria followed by ease of use (48% and 42% respectively). However, after that, SMEs found it most important that they used a CAD vendor that was committed to them and available to assist and support them. The quality and availability of Technical Support was also top requirement with commitment to customer service not too far behind. This suggests that SMEs place a great deal of importance on the partnership with the CAD vendor. Being smaller in size, they may not have the IT resources to support the software so knowing their CAD vendor will be on the phone to help when needed is important. When they have a question about the software, they want to know that someone will be there to help and guide them through it. They also look to their peers for advice. Also important is the CAD vendor's ability to demonstrate their solutions success with projects similar to theirs.

Key Takeaways

Working in a 3D CAD environment can offer a lot of value. However, to maximize the benefit of 3D CAD, there are several considerations to take into account. The following recommendations will help SMEs see the greatest return from 3D CAD:

- **Support 3D CAD with the right hardware.** Best-in-Class companies are nearly twice as likely as SMEs to ensure that they provide adequate hardware infrastructure for 3D tools. While 3D CAD offers many benefits such as being able to detect interferences and easily visualize the entire model, the additional information is more intensive to process. Hardware upgrades deliver noticeable improvements in performance. By using adequate hardware, employees are far less likely to run into frustrating performance issues.
- **Promote best practices with documentation, start parts, and templates.** Within the first 6 months of installing 3D CAD, identify best modeling practices and document them so that all engineers are aware of them and can benefit. The Best-in-Class are twice as likely as the Industry Average to do this. Create models that have basic company parameters in them. This promotes consistency in the models and saves engineers time because they will not need to recreate the same information for each model.
- **Perform an audit of design processes.** The Best-in-Class are nearly twice as likely as SMEs to map design processes prior to deploying 3D CAD. This helps these leaders understand what tools will best fit their needs, as well as where they will provide the most value. It will also help them identify which CAD extended functionality will be most beneficial to supporting the design process to help them realize the greatest productivity gains. This step can help manufacturers optimize the value they see from 3D design tools as they will be focused on improving on what they already do.

For more information on this or other research topics, please visit www.aberdeen.com.

Related Research

[Best Practices for Migrating from 2D to 3D CAD](#); May 2008

[The Best Kept Secret of Top SMB Product Developers? Finding the Shortest Path to PLM Value](#); July 2008

[Beyond Engineering, New Applications of 3D Drive Top Line Growth](#); August 2007

[The Transition from 2D Drafting to 3D Modeling Benchmark Report](#); September 2006

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