Tech-Clarity

Are You Changing CAD Tools?

What You Should Know

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Executive Overview

If you are competing in today's global economy, it is not easy. Significant global competition plus pressure from new entrants and innovative start-ups make it difficult to stand out. To improve competitiveness, Tech-Clarity's study, Product Lifecycle Management Beyond Managing CAD, finds companies have shifted focus from market factors like time-to-market or cost to product-centric strategies. Design tools, especially CAD, are key to executing these product strategies. With the right design tools, companies are better positioned to quickly bring high-performing, high-quality, innovative products to market. Companies looking to upgrade these tools to keep up with competitors may want to consider switching CAD tools.

So what should you do if you find your CAD tool is holding you back? What if your company needs to update CAD tools? Why would you consider a change? What should you expect? Is it worth the time to convert archived data into a new format? Most importantly, do the benefits outweigh potential risks?

> *Business reasons rather than problems with CAD tools*
> *have become more influential when choosing a CAD tool.*

Tech-Clarity surveyed 192 companies to answer these questions. While there are many interesting findings, the most striking is that business reasons rather than problems with CAD tools have become more influential when choosing a CAD tool and are motivating factors behind the need to switch tools. Growing influencers include supply chains, relationships, the vendor's vision for design, and the CAD vendors' full breadth of offerings. This big picture view of CAD indicates higher levels of management make buying decisions and they view CAD as a strategic piece of a larger product development solution.

> *Management views CAD as a strategic piece of a larger*
> *product development solution.*

The biggest challenges of switching CAD tools are overcoming the learning curve and reusing legacy data. However, not all legacy data needs to be converted and in fact, companies only convert about half of it, 52%. Despite the efforts involved, companies who have made a CAD change tend to be very happy. Eighty-three percent (83%) rate their satisfaction a 4 or 5 on a scale of 1 to 5.

> *Since implementing their current CAD tools, Top Performers have reduced*
> *development time by 19%, development costs by15%, and the time to implement*
> *an ECO by 16%, putting them at a significant competitive advantage.*

The study also identified what successful companies look for. When selecting a new CAD tool, Top Performers are more likely to consider ease of use, Technical Support, software quality, and market share, which includes the size of the user community. Since implementing their current CAD tools, Top Performers have reduced development time by 19%, development costs by15%, and the time to implement ECOs (engineering change orders) by 16%, putting them at a significant competitive advantage. They have also been able to increase the number of design iterations by 17%, which leads to greater innovation.

Understand Business Needs for Design

It is very difficult to compete in today's global economy. The world has become smaller and the Internet has enabled even small companies to have a global presence. Not only do companies find they must defend market share against global competitors, but options like Kickstarter have reduced the barrier to entry for new startups with innovative offerings. Now companies must work even harder to differentiate themselves.

The leading strategies today are very product-centric.

Tech-Clarity's study, Product Lifecycle Management Beyond Managing CAD asked survey respondents how they differentiate themselves (Figure 1).
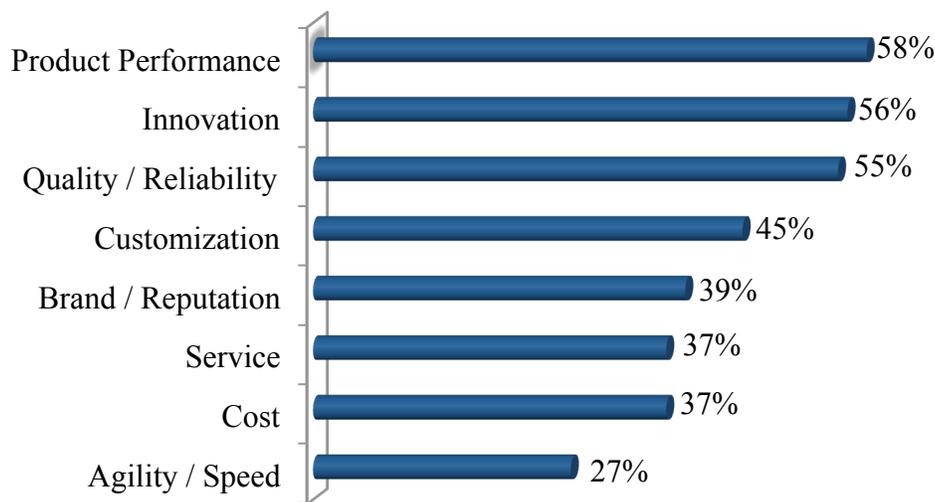

Figure 1 – Top Differentiation Strategies

The study finds, *"The leading strategies today are very product-centric…Respondents appear to be focused on getting the product right for the customer with less focus on market factors such as speed to market or cost, which have been higher drivers in past*

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surveys. Although they are not listed as ways to differentiate, we expect they are both still important factors for competitiveness in crowded, global markets."

Companies also find they can no longer focus on a single area. To be competitive, they must consider a variety of factors such as performance, innovation, quality, and personalization. This drives many companies to invest in the design process. Figure 2 shows the top reasons for design investment.
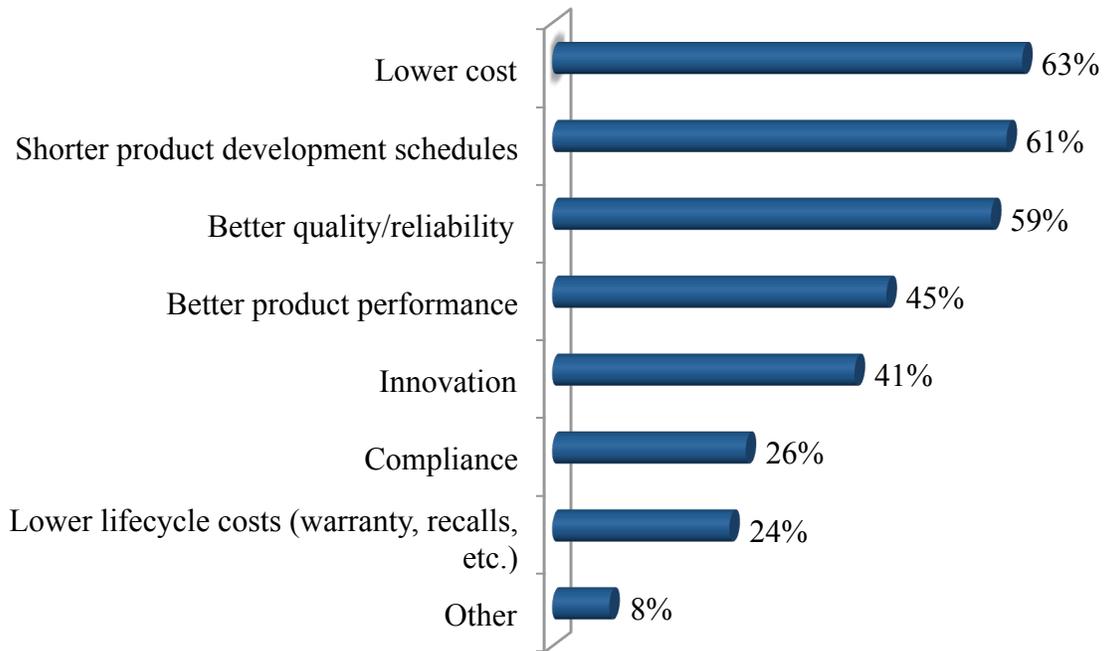

Figure 2– Business Needs Driving Investments in Design

Companies make investments to lower their costs as well as to improve efficiency. Both impact top and bottom lines. Quick product cycles shrink the window of opportunity for maximum revenue potential. Before long, products are superseded by even newer products, diminishing the opportunity for additional revenue. In addition, the faster a company releases its product, the smaller the development investment, making it easier to recoup those costs. Also, first to market has a competitive advantage for capturing market share, leading to higher revenues.

To be competitive, manufacturers must consider a variety of factors such as performance, innovation, quality, and personalization to differentiate products.

Additional cost savings can also come from IT. Tech-Clarity's <u>Consolidating CAD</u> finds that not only does consolidating CAD tools save licensing and hardware costs, but there are other benefits as well. The report states, "*From the IT perspective, consolidation provides the ability to focus resources on a smaller number of solutions. This reduces workload and cost and allows IT to provide a higher level of business support with today's lean organizations… Beyond cost savings, though, are even greater strategic benefits… For example, a single CAD environment can enable a 'design anywhere – build anywhere' strategy. This approach allows companies to rapidly adjust to market changes and resource shortages by offering the ability to transfer design or production to new facilities without concern for incompatible design data, tools, or processes.*"

What Drives a Change in CAD?

A potential design investment may involve a change in CAD tools. There are many reasons why a company may switch CAD tools. For example, Arihant, a water park and playground equipment manufacturer, sought a design solution that was easier and faster to use so the company could boost productivity. "*We needed to become more efficient to increase throughput*," says Assistant Manager–Design Mithun S. Mandal, "*Other goals related to switching platforms included better graphical representation of product designs, shorter design cycles, and enhanced recruitment.*" The change has certainly paid off. Since implementing their new CAD software, Arihant has realized meteoric growth, boosting annual revenues by 250 percent in just two years.

> *Since implementing their new CAD software, Arihant has realized meteoric growth, boosting annual revenues by 250 percent in just two years.*

In other cases, the current CAD tool may be working well, but it may no longer fit corporate goals for growth, as was the case at Hutchinson Hayes Separation. Hutchinson Hayes Separation manufacturers separation equipment to separate solids from liquids in a wide range of applications from meat rendering to oilfield, petrochemical to marine fuels and vegetable oils to biodiesel. "*Although we were successful using our old tools to support our standard product line, our business plan required us to develop new products for additional applications. To support the increased activity, we needed a 3D platform that would enable us to tighten up development and manufacturing*," says Sales Manager Hans van der Voort at Hutchinson Hayes Separation. "*By doing so, we could shorten delivery lead times and free up resources to go after new opportunities.*"

> *To support the increased activity, we needed a 3D development platform that would enable us to tighten up development and manufacturing.*
> *Hans van der Voort, Sales Manager, Hutchinson Hayes Separation*

Companies may also have other reasons for switching. To understand the primary factors, Tech-Clarity looked at both business reasons and CAD challenges. Business reasons are external to CAD and are impacted by management decisions, corporate initiatives, or the vendor relationship. Over the last seven years, with economic factors such as the recent recession, business needs have evolved, impacting the motivators for a CAD change. Figure 3 compares some of the top business reasons for changing CAD.
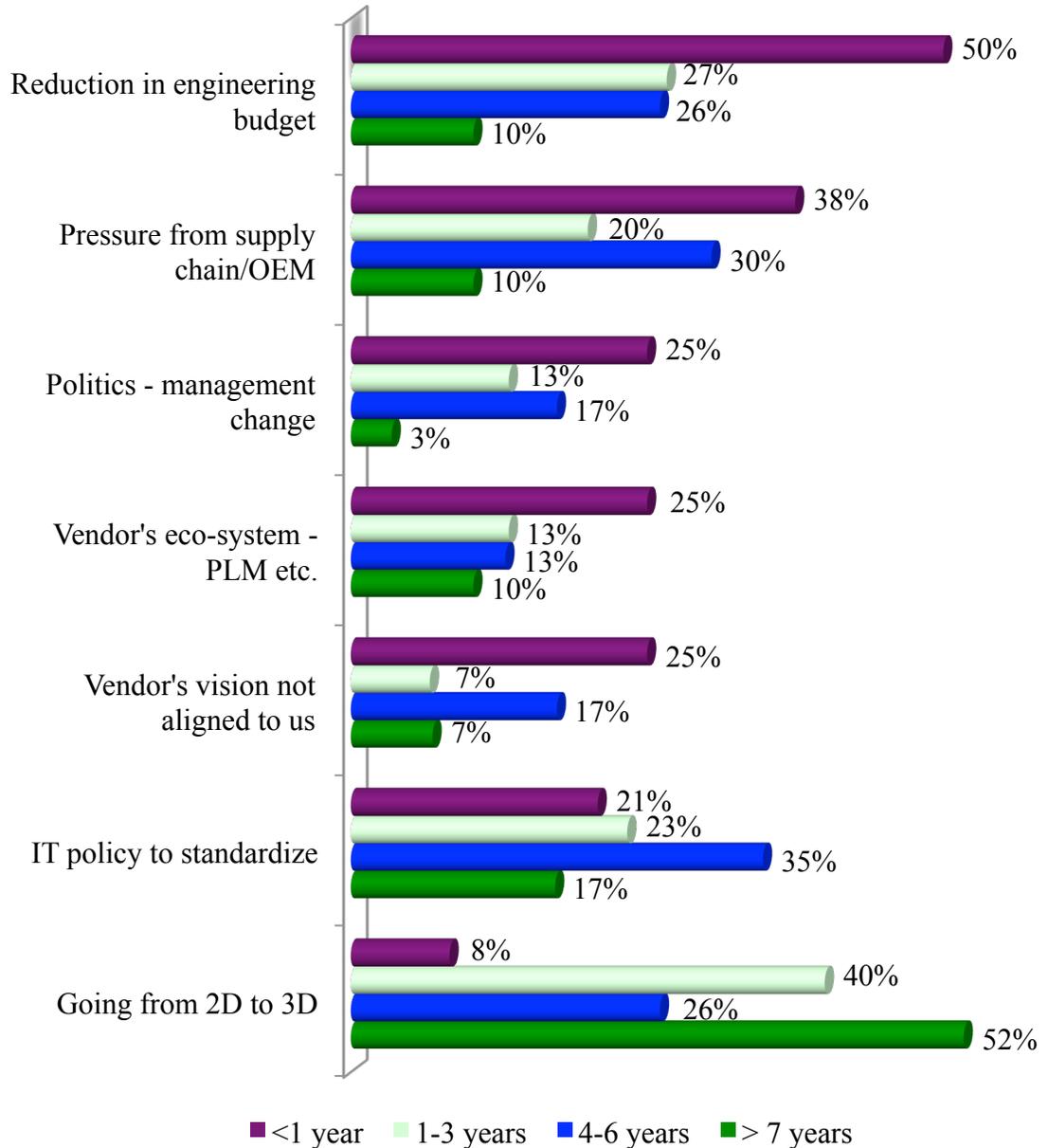

Figure 3– Business Reasons Driving a CAD Change

Companies who made a CAD change seven or more years ago, were often going from 2D CAD to 3D. Now, companies are driven by budget reductions. This could be because they are looking to achieve cost savings by consolidating CAD tools and the number of licenses. Interestingly, this was also a top driver four to six years ago, at the height of the recession, but the pressure was coming from IT rather than the engineering budget. Companies making a change now may also feel they will lower cost through efficiency improvements that better utilize resources and help release products more quickly. Compared to the past, companies are also much more influenced by supply chains or OEMs, internal politics, the CAD vendor's vision for design, and the CAD vendor's portfolio of products.

> *Compared to the past, companies are also much more influenced by supply chains or OEMs, internal politics, and the vision and portfolio of products offered by the vendor.*

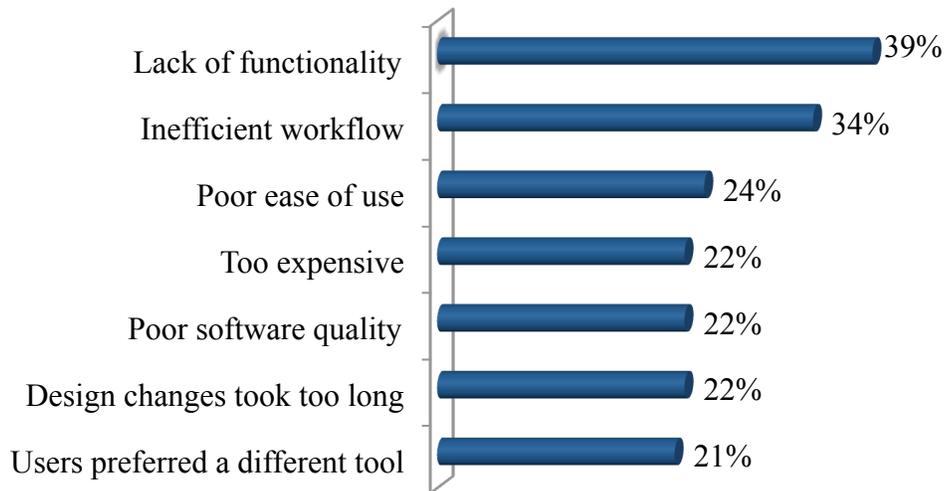Tech-Clarity also looked at challenges using CAD tools, which led to a change.

Lack of functionality	39%
Inefficient workflow	34%
Poor ease of use	24%
Too expensive	22%
Poor software quality	22%
Design changes took too long	22%
Users preferred a different tool	21%

Figure 4– CAD Challenges Driving a Change

While CAD tools have evolved significantly over the last seven years, interestingly, there is little difference between those who made a recent CAD change and those who did it seven years ago. The most common reason for making a change is the existing tool lacks needed functionality. An inefficient workflow, such as too many mouse clicks or a user interface that is not intuitive, is another top reason. In these cases, companies likely turn to a different CAD tool with an expectation that additional functionality and a more efficient workflow will improve their productivity.
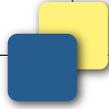
> *An inefficient workflow, such as too many mouse clicks or a user interface that is not intuitive is another top reason for changing CAD.*

This was the case at Induce Design, a design services company. The company transitioned to new 3D design software in 2010 because the solution was easier to use, provided a more complete set of modeling capabilities, and helped the design firm leverage design for manufacturability tools. "*I chose our design software as our primary tool because it's easier and more efficient for both modeling and engineering new product designs*," says Owner and Principal Designer Hrishikesh Borude. "*Our new CAD software simply is a better fit for the design and engineering needs of our studio*."

Since implementing the new design software, Induce Design has cut its design cycles by 30 percent and shortened the time to make design decisions by 30 percent. Borude attributes these productivity gains to the intuitive user interface of the new CAD software and the ability to communicate more effectively with clients.

> *Since implementing the new design software, Induce Design has cut its design cycles by 30 percent and shortened the time to make design decisions by 30 percent.*

Survey respondents were then asked to select the primary driver for making a CAD change. Interestingly, that the primary driver has changed over time. Trends show that business decisions rather than problems with the CAD tool have become more influential when deciding to switch CAD tools (Figure 5).

> *Trends show that business decisions rather than problems with a CAD tool have become more influential when deciding to switch CAD tools*

Four or more years ago, challenges with the CAD tool were more important. Now it is business reasons driving the change. Supply chains, vendor relationships, vendor vision, and the full portfolio of offerings are more influential in the choice of CAD tools, indicating that CAD tools have become a strategic piece of the overall product development solution.
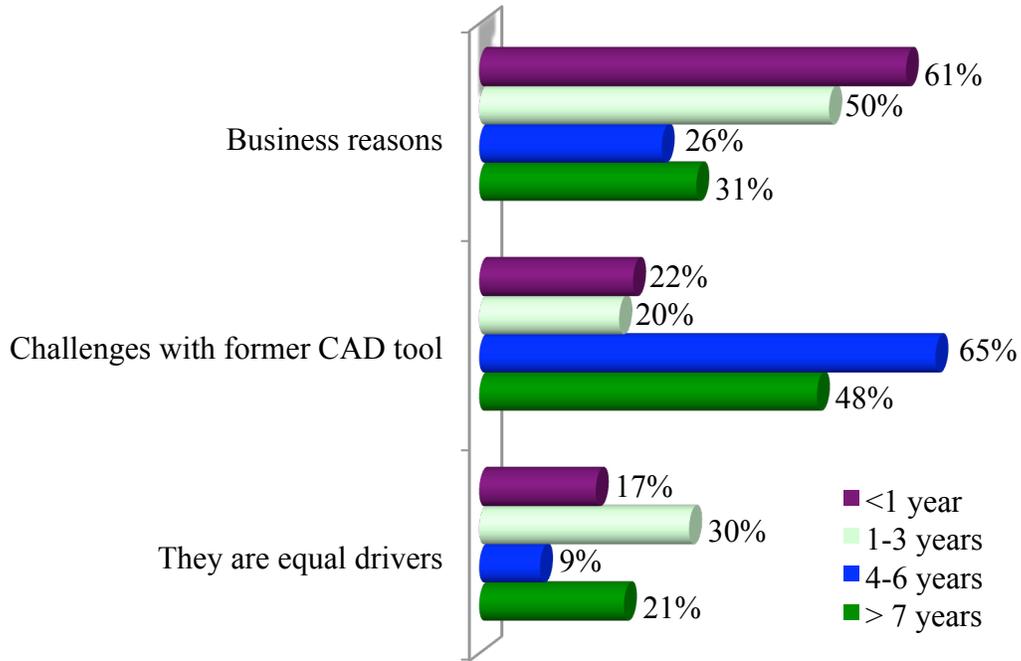
Figure 5– Primary Driver of Change over Time

Set Expectations for the Change

What should companies expect when making a CAD change? Figure 6 shows the top challenges.
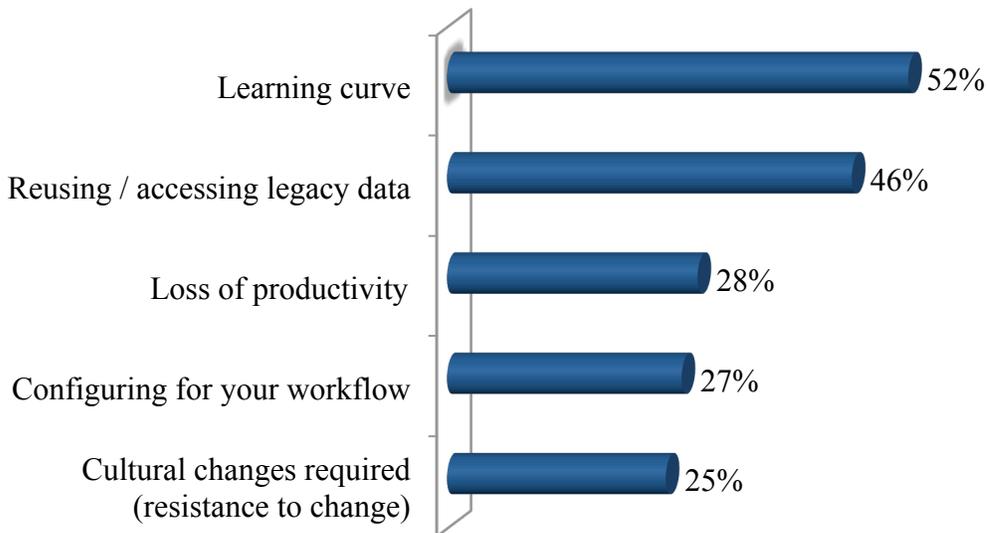

Figure 6– Top Challenges of Switching CAD Tools

Employee education is the most common challenge, followed by reusing legacy data.

Tech-Clarity explored the legacy data challenge further. Despite the advancements to support multi-CAD data, by far, the most common approach to legacy data is recreating it. Converting to a neutral format such as IGES or STEP comes next (Figure 7).
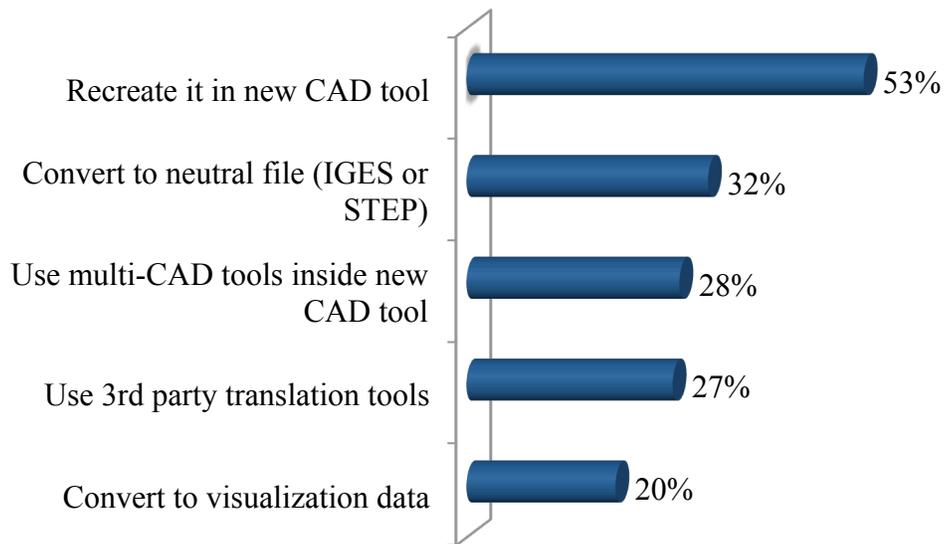
Recreate it in new CAD tool — 53%
Convert to neutral file (IGES or STEP) — 32%
Use multi-CAD tools inside new CAD tool — 28%
Use 3rd party translation tools — 27%
Convert to visualization data — 20%

Figure 7– Approach to Legacy Data

Overall, companies convert 52% of their legacy CAD data, but product complexity has an impact. Legacy data is more likely to be converted if it is complex (Figure 8).
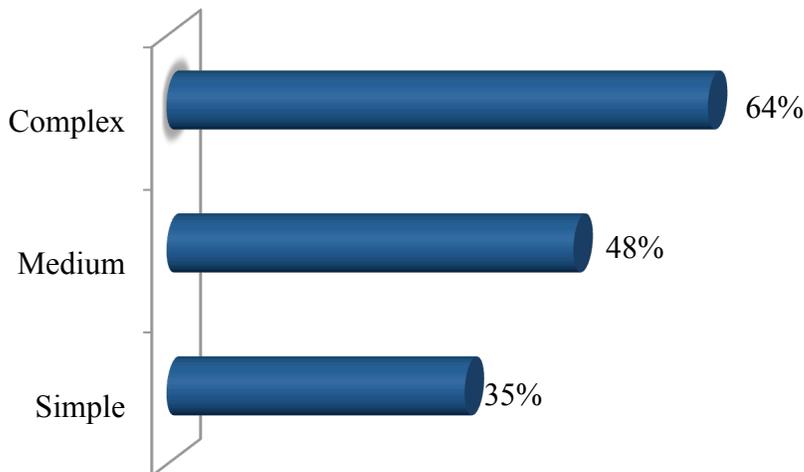
Complex — 64%
Medium — 48%
Simple — 35%

Figure 8– Amount of Legacy Data Converted

> *Overall, companies convert 52% of their legacy CAD data,*
> *but product complexity has an impact.*

Very complex models take a long time to recreate so it is worth the effort to convert them. On the other hand, since very simple models are easily recreated, it is harder to justify investing time for conversion. As a mechanical engineering manager at a communications company commented, *"The odds are you do not need to move all your legacy data into the new CAD tool. Keep one seat of the old CAD tool and move legacy data as needed. Odds are that most of the legacy data will not be needed in the future."*

Identifying Top Performers

To understand how the most successful companies approach a change in CAD tools, Tech-Clarity researchers identified Top Performing companies. Survey respondents were asked to rank their performance in relation to their competitors on four key design metrics. Respondents used a scale of one to five, with five being extremely effective. The top 20% were defined as Top Performers. Figure 9 shows the metrics used to define success and each group's respective performance.

> *Regardless of performance category, companies report significant*
> *improvements since implementing their new CAD tool.*
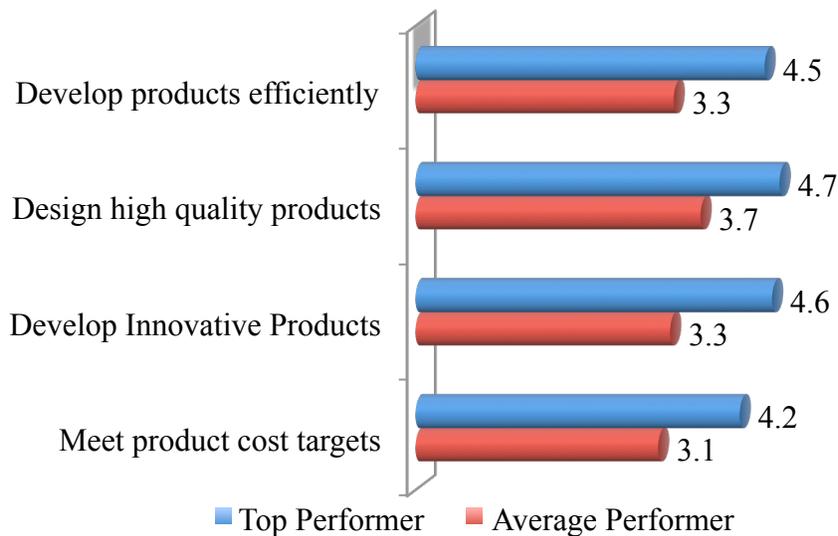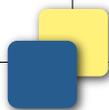

Figure 9 –Top Performers Defined

Table 1 quantifies the benefits enjoyed by Top Performers since implementing their current CAD tool.

Since Implementing Current CAD	Top Performers	Average Performer
Change in Development Time	19% Reduction	14% Reduction
Change in Development Costs	15% Reduction	10% Reduction
Change in Time to Implement ECOs	16% Reduction	8% Reduction
Change in Number of Design Iterations Evaluated	17% Increase	9% Increase

Table 1 – Benefits Since Implementing New CAD Tool

Regardless of performance category, companies report significant improvements since implementing their new CAD tool, but Top Performers see even bigger improvements. Companies find that with their new CAD tool, they are more efficient, which allows them to develop products in less time, for less cost. They also implement engineering changes more quickly. The ability to quickly make changes combined with efficiency improvements enable companies to evaluate more design iterations. Top Performers evaluate 76% more design alternatives than competitor. Evaluating more options and building off existing ideas leads to greater innovation.

In fact, the need to evaluate more design concepts was an important consideration when ElliptiGO, an elliptical bike manufacturer, selected their CAD tool. "*I knew that we would need to do a ton of iterations and analysis studies to get the design ready for commercialization and then support machining and production,*" stresses Brent Teal, Co-president at ElliptiGO.

Top Performers evaluate 76% more design alternatives than competitors, which is important for innovation.

While the efficiency gains companies enjoy after switching CAD tools seem appealing, how much effort is required to make that change? Table 2 shows the average training time, time to resume productivity, and the time to recoup the investment.

Since Implementing Current CAD	Top Performers	Average Performer
Training Time	6 Weeks	9 Weeks
Time to Resume Productivity	13 Weeks	21 Weeks
Time to Recoup Investment	46 Weeks	50 Weeks
Satisfaction with ROI of CAD Switch (scale of 1 to 5, with 5 being extremely satisfied)	4.7	4.0

Table 2 – What to Expect During a Change
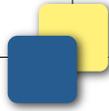
Top Performers report they spend less time on training, yet they resume productivity eight weeks sooner than their lesser performing competitors. The criteria Top Performers look for in a CAD tool likely contributes to this.

> ***Despite the time investments to make the switch, companies tend to be very happy with the return on their investment.***

Despite the time investments to make the switch, companies tend to be very happy with the return on their investment. Overall, companies rate it a 4.2 on a scale of one to five, with five being extremely satisfied. Considering they invest less to make the switch and see even better performance improvements, unsurprisingly, Top Performers are especially satisfied with their return, ranking their satisfaction a 4.7 out of five.

Identify the Right CAD Solution

What do Top Performers look for in a CAD solution? Compared to lesser performing competitors, Top Performers are more likely to look for ease of use, software quality, and the ability to work with multi-CAD data (Figure 10).
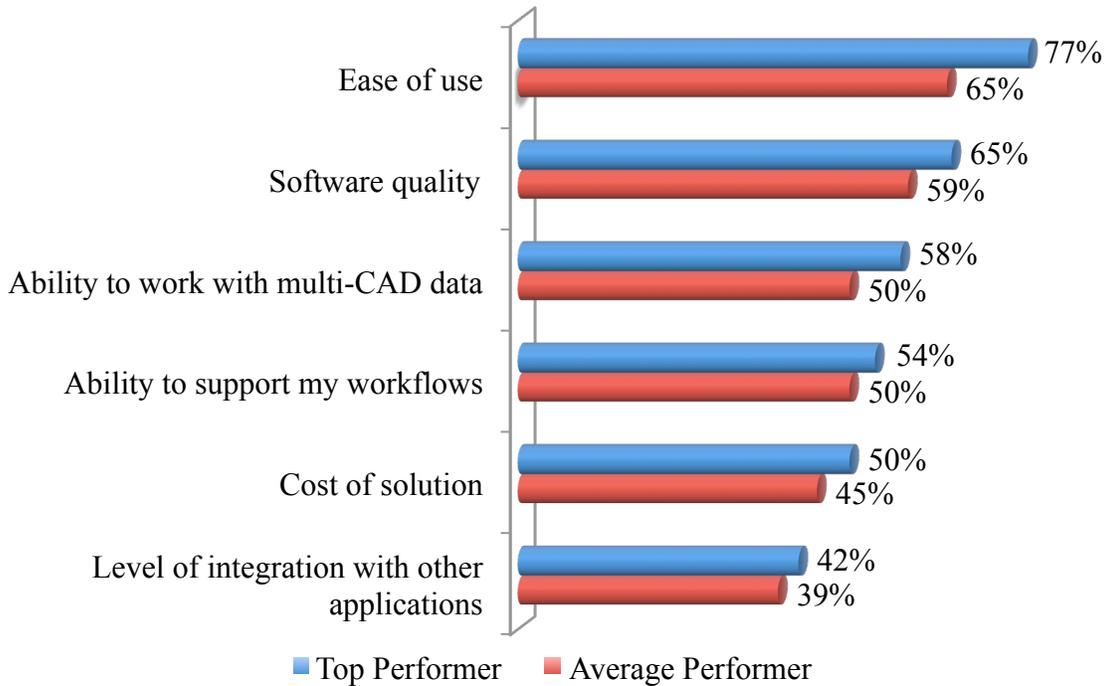

Figure 10 – Top Qualities Sought in a New CAD Solution

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Top Performing companies are 19% more likely than competitors to rate ease of use as a top quality of a CAD solution. This likely helps them resume full productivity eight weeks before their competitors, even with less training.

Top Performing companies are 19% more likely than competitors to rate ease of use as a top quality of a CAD solution.

In addition to the CAD tool, the vendor relationship is also an important consideration. With CAD playing a more strategic role in development, manufacturers need a vendor who is a true partner. Figure 11 shows the top qualities companies value in a CAD vendor.
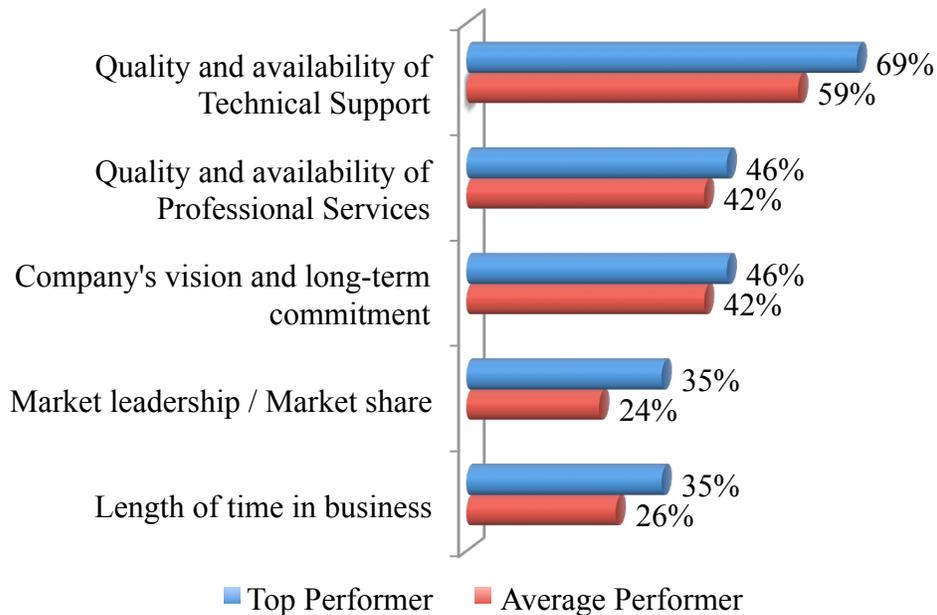

Figure 11 – Top Qualities in a CAD Vendor

Top Performers are 18% more likely than their competitors to rate quality Technical Support as their top criteria for a vendor. Good phone support provides Top Performers with yet another resource to supplement training and enable engineers to quickly resume full productivity. Technical Support can come both from the vendor and VAR (Value Added Reseller) channels. What's important is that engineers have easy access to help.

USSC, a manufacturer of seating for a variety of vehicles, credits the support of their VAR with helping facilitate the deployment of their new CAD tool. "*Our VAR did an excellent job supporting the process,*" explains Jeff Krueger Director of Product
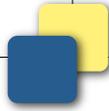
Development. "*They held weekly conference calls with us, supported us at every step, and made us aware of what we could do with our new CAD software*."

Top Performers are also 47% more likely to consider market share.

Top Performers are also 47% more likely to consider market share. Market share makes it easier to find partners and suppliers who are working with the same design tools. It also makes it easier to find a resource pool from which to hire. Hiring trained users means the company doesn't need to invest in additional training. This was part of the selection criteria at USSC. They evaluated different CAD tools against a range of criteria including ability to hire trained designers and engineers, partners and customers using the solution, and pervasiveness within the supply chain. USSC chose the CAD solution that gave the company more freedom to work with partners, customers, and other integrated technologies.

A larger pool of trained users to hire from was also important to water park and playground equipment manufacturer, Arihant. Assistant Manager–Design Mithun S. Mandal notes, "*In addition to providing greater accuracy and a much better graphical representation of our products, it's much easier to recruit talented designers and engineers who already know how to use it*."

It's much easier to recruit talented designers and engineers who already know how to use it.
Mithun S. Mandal. Assistant Manager–Design, Arihant

The many factors to consider when selecting a CAD tool can be overwhelming. Considering this advice from a configuration manager can help maintain perspective, *"The non-financial aspects of CAD: culture, ease of use, vendor support, customer support, etc. are the real cost drivers and will affect your bottom line, not annual subscription price."*

Extend CAD

Extended applications are another important consideration. Survey respondents rated their importance using the following scale:

- 5: Essential part of the CAD solution
- 4: Should be part of CAD solution
- 3: Nice to have as part of CAD solution
- 2: Can be separate functionality not part of CAD solution
- 1: Do not care about this functionality

Overall, companies prefer extended applications as part of their CAD solution, ranking them between "nice to have" and "should be part of the solution" (Figure 11). As products increase in complexity, respondents assign a higher importance rating on extended applications.

Companies prefer extended applications as part of their CAD solution, ranking them between "nice to have" and "should be part of the solution."
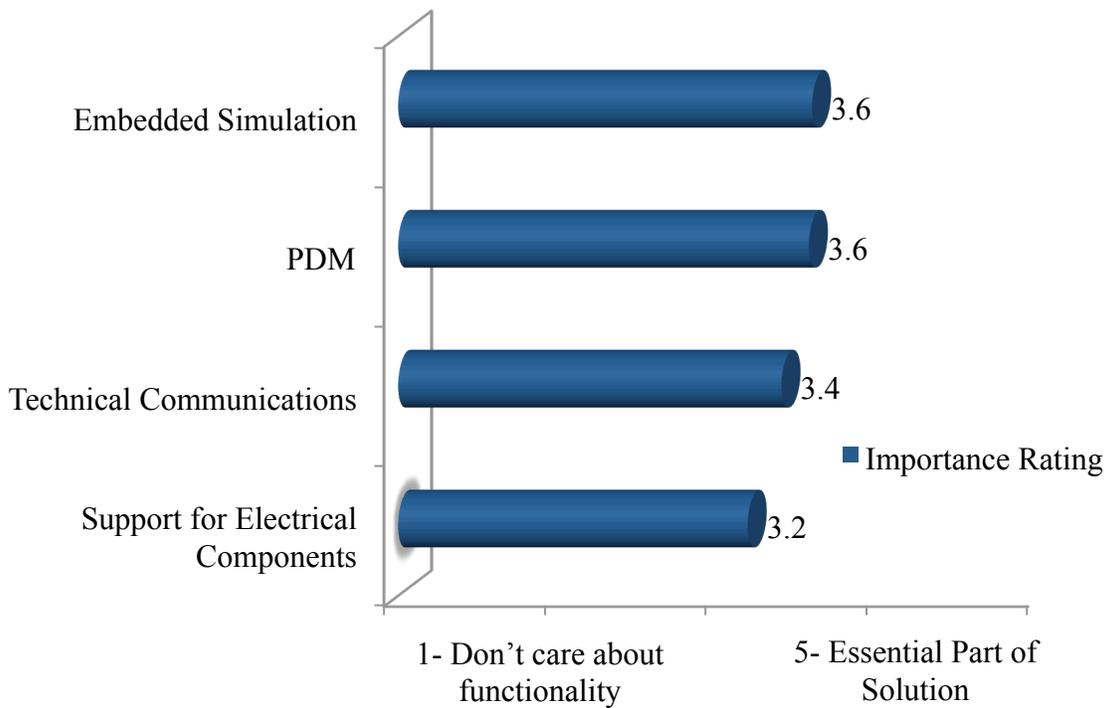

Figure 12 – Importance of Embedding Extended Applications in CAD

Integrated extended applications are important to Harvard Apparatus, a manufacturer of laboratory equipment for bioscience research products. "*We moved all our design work to a CAD tool that is easier to use, has integrated analysis capabilities, and is better for sheet-metal and plastic part design. We realized that with its additional functionality and file transfer capabilities, it was better for our company*," says Engineering Manager Mark Davis.

Conclusion

An increased focus on products can help companies as they struggle to compete in today's global economy. Quickly developing high-quality, innovative products more economically helps companies differentiate and stand out from competitors. Investments

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in the design process can help companies achieve this. CAD tools in particular, have a significant impact on the design process. CAD has evolved significantly over the last decade and those who find their existing tool no longer meets their needs or will not support plans for growth, may want to consider switching CAD tools. In many cases, companies have found a switch in CAD tools has had a very positive impact on their business.

Top Performing companies are more likely to consider ease of use and support resources when selecting a CAD tool. This contributes to their ability to realize even more value, in less time, from their new solution.

Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Understand the business goals of your design process and ensure your CAD tool will support them. If not, consider a change.
- Consider other factors beyond the features and functions of the CAD tool, but also the ability to collaborate with your supply chain, market share including available community, the vendor's vision, the relationship with the vendor, and the needs for other supporting design tools
- Consider extended applications as part of the CAD solution such as embedded simulation, PDM, technical communications, and support for electrical components.
- Avoid overestimating requirements for training and loss of productivity by considering ease of use as well as available resources such as Technical Support, market share, and potential hiring pools.
- Convert only the legacy data you need. It is likely you will only need half of it.

About the Author

Michelle Boucher is the Vice President of Research for Engineering Software for research firm Tech-Clarity. Michelle has spent over 20 years in various roles in engineering, marketing, management, and as an analyst. She has broad experience with topics such as product design, simulation, systems engineering, mechatronics, embedded systems, PCB design, improving product performance, process improvement, and mass customization. She graduated magna cum laude with an MBA from Babson College and earned a BS in Mechanical Engineering, with distinction, from Worcester Polytechnic Institute.

Michelle began her career holding various roles as a mechanical engineer at Pratt & Whitney and KONA (now Synventive Molding Solutions). She then spent over 10 years at PTC, a leading MCAD and PLM solution provider. While at PTC, she developed a deep understanding of end user needs through roles in technical support, management, and product marketing. She worked in technical marketing at Moldflow Corporation (acquired by Autodesk), the market leader in injection molding simulation. Here she was instrumental in developing product positioning and go-to-market messages. Michelle then joined Aberdeen Group and covered product innovation, product development, and engineering processes, eventually running the Product Innovation and Engineering practice.

Michelle is an experienced researcher and author. She has benchmarked over 7000 product development professionals and published over 90 reports on product development best practices. She focuses on helping companies manage the complexity of today's products, markets, design environments, and value chains to achieve higher profitability.

About the Research

Tech-Clarity gathered and analyzed 192 responses to a web-based survey on designing software-intensive products. Survey responses were gathered by direct e-mail, social media, and online postings by Tech-Clarity.

The respondents were comprised of 42% who were individual contributors and 39% were manager or director level, and the remaining 19% were from VP and executive levels.

The respondents represented a mix of company sizes, including 49% from smaller companies (less than $250 million), 7% between $250 million and $1 billion, 13% between $1 billion and $5 billion, and 11% greater than $5billion. 20% chose not to disclose their company size or did not know. All company sizes were reported in US dollar equivalent.

The responding companies were a good representation of the manufacturing industries, including Industrial Equipment and Machinery (35%), Automotive (23%), Architecture, Engineering, and Construction (20%), Aerospace and Defense (14%), Consumer Products (14%), High-tech and Electronics (12%), and others. Note that these numbers add up to greater than 100% because some companies indicated that they are active in more than one industry.

The respondents reported doing business globally, with most companies doing business in the North America (67%), about one-third doing business in Western Europe (34%), about another one-third doing business in the Asia-Pacific regions (32%), Eastern Europe (13%), and Latin America (10%).

Respondents included manufacturers as well as service providers and software companies, but responses from those determined not to be end users of CAD software (including software vendors and consultants) were not included in the analysis. The majority of companies were considered to have direct involvement in designing and developing products and the report reflects their experience.