DIGITAL ENGINEERING WITH AUTODESK ON:

DIGITAL-ERA DESIGN DEMANDS MODERN WORKFLOWS

Research shows that increasing product complexity and a heightened focus on customer experience require solutions that democratize design tools and deliver seamless workflows.

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Produced by the editors of *Digital Engineering*

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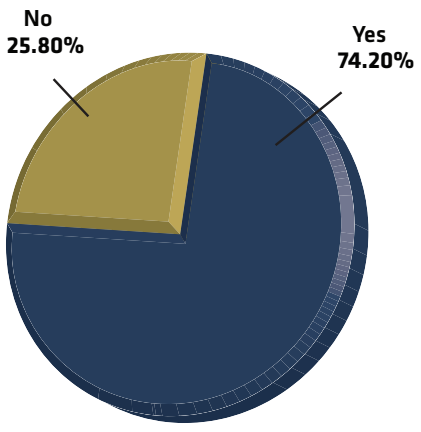
Many things in the world of engineering remain a constant: The creative spark, the iterative process, and a rigorous regimen of testing and prototyping. Yet with product complexity on the rise and digital transformation reshaping every facet of business, it's come time for design teams to bust out of traditional workflows to be better positioned for competitive advantage.

It's not just large-scale products like airplanes and automotive equipment that are becoming increasingly complex. With market forecasters projecting upwards of 20 billion connected "things" in use worldwide this year, mainstream consumer items like TVs and appliances as well as commercial offerings such as electric meters and wind turbines are being reimagined as smart, connected products and to some extent, systems of products. That means in addition to the standard mechanical and electronics content, product makeup is now more heavily weighted to include software, control systems, sensors and communications modules. This ups the requirement for engineering teams to revamp their tools and processes to support a multidisciplinary design approach that draws heavily on cross-functional collaboration.



Digital Engineering **surveyed its audience to gauge what kind of progress is underway to transform workflows and modernize existing tool sets.**

It's a far cry from traditional engineering workflows, in which the various engineering disciplines (software, mechanical and electrical) engage in a limited form of collaboration, typically accomplished through sequential hand-offs while working in siloed tool sets. Mechanical engineers, for example, would hunker down with 2D drawings and 3D CAD tools as part of their design process, while embedded systems specialists and electrical engineers tapped their own, specialized software platforms to handle their part of the design process.

In addition, within each of those groups are subsets of engineering users developing competencies in yet another set of disparate and siloed tools. A mainstream engineer may dabble in a bit of structural analysis as part of the primary design workflow, but the serious finite element analysis (FEA) or thermal fluid simulations are routinely handed off to a separate team of specialists, who have ample expertise and access to expensive FEA or computational fluid dynamics (CFD) software to get that part of the job done. It's the same scenario for machinists and manufacturing engineers, who may work in computer-aided manufacturing (CAM) software to create tool paths separately from the main 3D CAD and simulation platforms. There are also engineers who spend the bulk of their time performing sophisticated visualization and rendering tasks to showcase how a product might evolve with a high degree of realism prior to building physical prototypes.

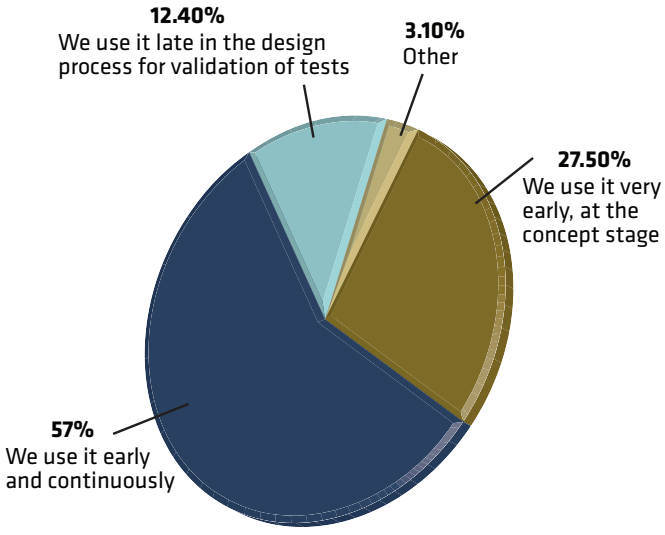
The reliance on siloed tools and traditional design processes is no longer effective, especially in light of more complex products. Manual handoffs among engineering disciplines and file translations between disparate design tools can be fraught with errors and needlessly extend the design cycle. In addition, these longstanding engineering workflows don't adequately support the exchange of critical design data early enough in the cycle when it is easier and less expensive to make changes.

What's required is a more flexible and less expensive way to equip a greater number of engineers with a full portfolio of multidisciplinary design tools. In addition, engineering teams prepared to engage in the Internet of Things (IoT) and transformative innovation require access to an integrated design platform specifically configured to foster seamless collaboration among the different disciplines. New subscription-style pricing and cloud-based engineering platforms can deliver the flexible workflows and cost efficiencies required for modern-day engineering beyond what's possible with standalone design applications and traditional software licensing schemes.

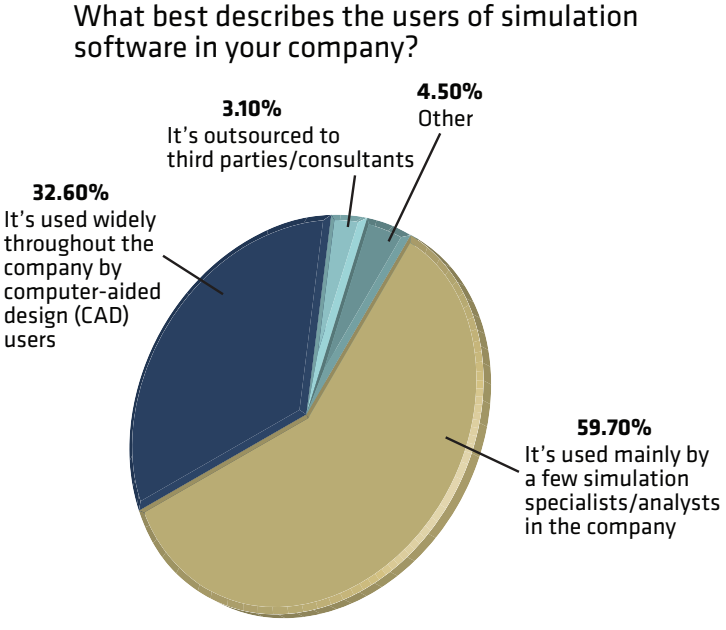
DE SURVEY: CANVASSING CURRENT WORKFLOWS

Digital Engineering surveyed its audience of highly engaged design engineers to gauge what kind of progress is underway to transform workflows and modernize existing tool sets. The upside: The majority of organizations have made significant strides advancing their design processes with simulation-driven design, visualization and CAM practices, however, there is still work to be done to promote and make these modern tools and workflows accessible to a wider audience.

Currently, nearly three quarters of respondents to the *DE* survey (74%) are integrating simulation into their design processes, many employing the tools early, at the concept stage (28%). An

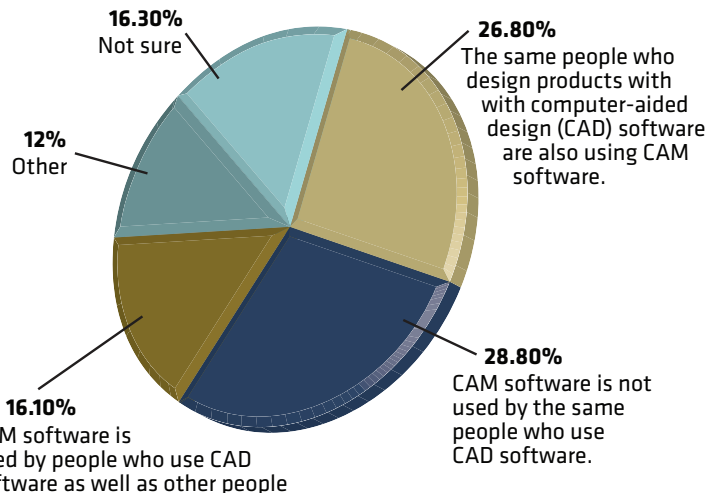


The majority of respondents who use simulation are using it early and often in the design process.



Of the 74% of respondents using simulation software, a third have made it part of their design engineers' workflow, as opposed to the majority who still silo it off to specialists.

Who uses computer-aided manufacturing (CAM) software in your company?

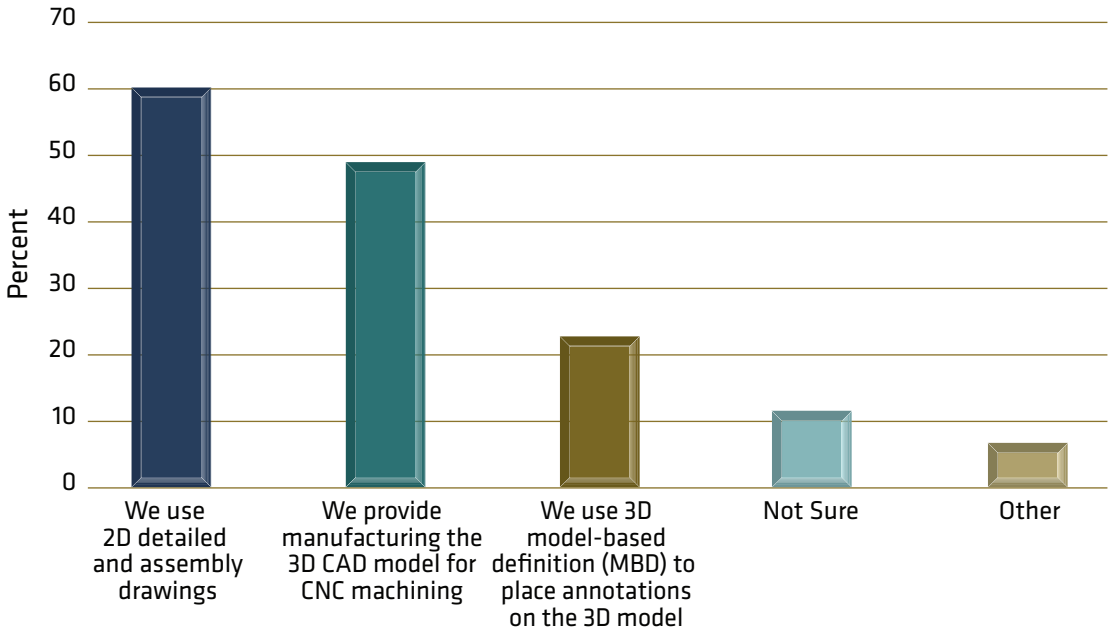


CAM software is used at 72% of respondents' companies, but only 29% of companies silo it away from CAD users, which means CAD users at 43% of respondents' companies have access to CAM software.

even greater number (57%) are using simulation software at the front end as well as continuously throughout the design phase, the survey found. However, while simulation-led design practices are widely embraced, the software is still relegated to a select group of users. Nearly 60% of respondents said simulation software was mainly employed by a handful of experts or simulation analysts within the company, while only 33% said it was tapped by the majority of CAD users. The findings point out the need to democratize simulation so it can be used beyond a small cadre of experts, thus helping to avoid bottlenecks, reduce development time, and cut back on costly engineering change orders (ECOs).

Respondents that haven't yet integrated simulation into their design processes are holding off for a variety of reasons, the survey found. Forty-seven percent say simulation software is still too expensive for their limited budgets, while 27% say the current tools are too complicated and there is a lack of available training. "Most current tools have a steep learning curve, which limits their usage to specialists and makes adopting new tools costly and time consuming," one survey respondent said.

How does your company provide design files to manufacturing?



Two-dimensional assembly drawings are still the most popular way to get designs to manufacturing departments among survey respondents.

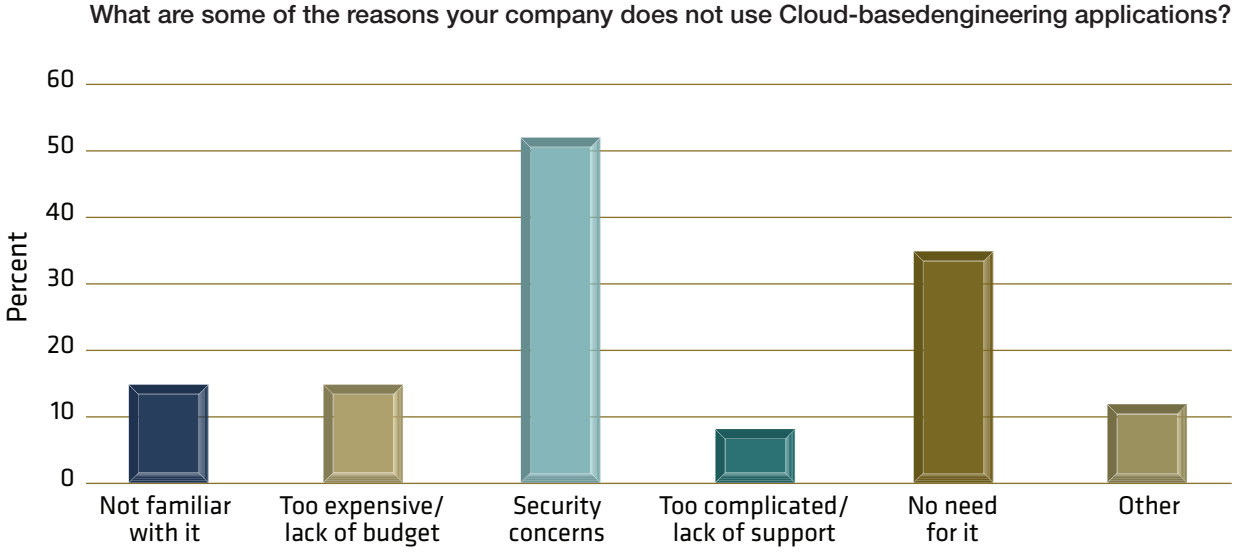
The trend toward subscription-based pricing and cloud-based software make it more affordable and accessible to integrate simulation into engineering workflows. As opposed to having to spend upwards of $10,000 on a single user license, software providers are serving up simulation and other design tools in affordable monthly subscriptions that can be accessed anywhere. Autodesk Collections, for example, groups essential tools for specific users and workflows—product design collaboration, for instance—for a starting fee of $300 a month with the ability to cancel at any time.

CAM, another critical component for modern-day design, is not being leveraged as effectively as it could be, the *DE* survey suggests. Seventy-two percent of respondents say CAM software is being used at their companies, and 43% of companies have CAD-using engineers who also use CAM software vs. 29% who separate CAD and CAM users. This indicates that an integrated CAD/CAM platform, not a disparate toolset, is better suited to support a seamless design-to-manufacture workflow. With such a configuration, modern engineers gain much needed visibility into manufacturing requirements, including those for CNC, 3D printing, casting, injection molding, and other production methods.

There are other challenges with traditional engineering workflows that impede the transition to digital-era design. For one thing, while 3D design practices are well-entrenched, detailed 2D assembly drawings at still in play for 60% of the responding companies. Even most of those using 3D models to collaborate with downstream partners still provide a 2D detailed drawing (87%), indicating a need for a suite of integrated products that deliver seamless workflows between key tools.

CLOUD-BASED DESIGN PLATFORMS READY FOR LIFT OFF

While cloud-based engineering software is relatively new, it is starting to gain ground. More than a fifth of the *DE* survey respondents (22%) have begun using cloud-based design tools, primarily for file storage and sharing (74%), design collaboration (56%), and design (45%). The lion's share of those not yet deploying cloud-based engineering applications (68%) are reticent due to security concerns



Among the 68% of respondents who are not using the cloud for engineering applications, security is the No. 1 reason.

(cited by 52% of respondents). "Security is our biggest concern holding back adoption of the latest technologies," one respondent said. "Our work is performed in a very challenging, secure environment."

Security in the cloud has been an ongoing issue for many organizations interested in modernizing tools and workflows, in part because the cloud is relatively new and there's an unproven level of trust. In reality, however, research shows most cloud services are more secure than enterprise software deployments. In fact, market research firm Gartner cautioned that most data breaches tend to involve on-premise data centers, and said 95% of security issues and failures of cloud services will be tied to customer missteps rather than the cloud vendor by 2020. Need a point of reference? Consider the highly publicized lawsuit filed by Waymo, formerly Google's driverless car division, against Uber's Anthony Levandowski, which alleges the engineer stole trade secrets not through the cloud, but by swiping design files off an on-premise system.

While security concerns are expected to abate as more users turn to cloud computing, know that there is a difference between software that is sold as a subscription and installed locally vs. software that is completely on the cloud. The former may use the cloud to check licensing rights, but is like any otherwise like any other non-cloud application.

Demand for more complex products designed in less time is likely to convince more engineering organizations to adopt modern design tools delivered via subscription. "We want to have more seats for simulation software and training to support them, but cost and priorities seem to be an issue," admits one survey respondent when asked about what's holding the organization back from adopting modern design technologies. Another respondent is also hamstrung due to the constraints of traditional licenses and standalone applications. "The inability to show an ROI (return on investment) for investing in simulation software when compared to outsourcing the analysis" is an issue, the respondent said.

Subscription software licenses and the trend toward integrated engineering tool suites can mitigate these obstacles and make the latest software advances accessible to mainstream engineers, not just a select few. By democratizing access to modern-day engineering tools, companies are assured of the design horsepower required to innovate and compete in the age of digital transformation.

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