DIGITAL ENGINEERING WITH DELL & INTEL ON:

TOP 10

REASONS TO CHOOSE A WORKSTATION

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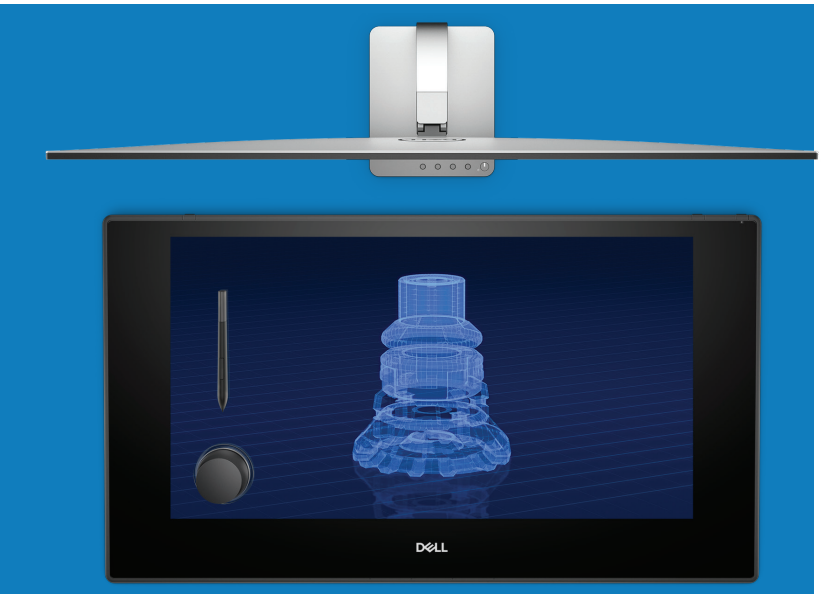
Produced by the editors
of *Digital Engineering*

PROFESSIONAL ENGINEERING TEAMS NEED PROFESSIONAL WORKSTATIONS

It seems every business sector—automotive, aerospace and defense, heavy industry, consumer goods, even agriculture—wants "smarter" products that will be part of the Internet of Things (IoT) and form the basis for connected factories of the future. For engineering departments large and small, that means today's design engineering teams are being asked to create more complex product designs, simulate more advanced mechanical and electrical phenomena, and virtually assemble components as part of larger systems—all in less time.



What is a Workstation?

For the purposes of this white paper, an engineering workstation is defined as a desktop/deskside, rack or mobile computer that can be configured with Intel® Xeon® processors, professional-caliber graphics processing units and error-correcting code RAM that is certified to run common CAD and simulation software packages.

Image: Dell and Getty Images/lucadp

Skilled engineers are at a premium, so the challenge can't always be met by adding more hands on deck. According to the World Economic Forum's "The Future of Jobs Report 2018," skills that will be in the highest demand in 2021 include many germane to design engineering: analytical thinking and innovation; technology design and programming; critical thinking and analysis; complex problem-solving; reasoning, problem-solving and ideation; and systems analysis and evaluation.

The 2018 Skills Gap in Manufacturing Study by Deloitte and The Manufacturing Institute shows that it already takes months to fill engineering positions. Survey respondents said it takes 17 weeks to fill engineering, research and scientist positions, compared to 15 weeks for software engineers, 14 weeks for digital talent and 13 weeks for supply chain talent.

To meet demands for more complex design and simulation in less time, leading companies are investing in technologies to make their employees as productive as possible. They're using more advanced software that can handle larger computer-aided design (CAD) models, run more detailed multiphysics simulations, and digitally prototype via advanced rendering technologies or even virtual reality. However, all of those applications require more computing and/or graphics power, and that's where some businesses are falling behind.

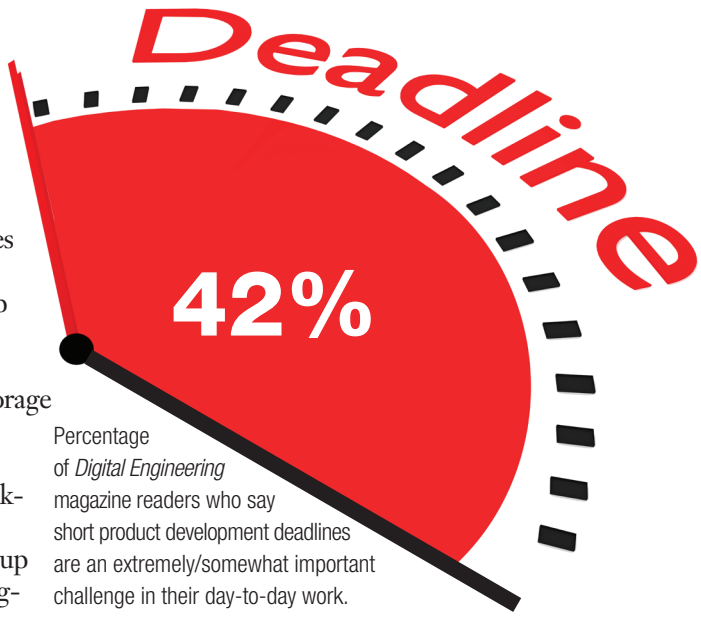
This paper examines the return on investment (ROI) of professional workstations for design engineering work as opposed to standard personal computers from three perspectives: the design engineer, the IT professional and executive management. All three have a stake in the investment. Professional workstations not only allow design engineers to meet product development deadlines, they relieve bottlenecks in the IT department and contribute to the company's bottom line via lower total cost of ownership (TCO) and by providing a competitive advantage.

10 WHY WORKSTATIONS MAKE SENSE FOR DESIGN ENGINEERS

You're a professional. You use professional design software. If you're not using professional workstations, you're likely spending valuable design time tweaking your software settings to cripple some of the functionality you've invested in because consumer PCs don't have the same processors, RAM and storage capacity of workstations. And then there's the waiting and waiting for your system to catch up with your demands and thought process. Reducing model details or running simplified simulations can help avoid some of the frustrating screen stutters and cursor lag common when working on a consumer PC. But given that your investment in software licenses is greater than the price difference between consumer PCs and workstations—which can amount to just a few hundred dollars—it really doesn't make sense not to make full use of the software by creating higher-fidelity models on a professional workstation.

9

Meet tight deadlines. In a December 2018 survey of *Digital Engineering* magazine's audience, 42% of respondents cited short product development deadlines as an extremely/somewhat important challenge. A modern workstation can help you do more in less time thanks to fast Intel® Xeon™ processors, professional graphics and the right type of memory and redundant storage suited to engineering workflows.



Percentage of *Digital Engineering* magazine readers who say short product development deadlines are an extremely/somewhat important challenge in their day-to-day work.

The Intel Xeon processors available in professional workstations are designed for heavy workloads common to design engineering. For example, they're available with up to 28 cores per processor and workstations can be configured with dual processors to meet your most demanding computational needs, such as modeling complex systems in CAD or advanced simulation with CAE software. Enterprise-ready Intel Xeon processors also have larger caches of on-die memory than their consumer counterparts, which is used to significantly speed up many applications, and they support more RAM than non-Xeon processors to provide better overall performance.

Meeting deadlines also means no place for PC downtime. Xeon processors support error correcting code (ECC) memory that protects against data corruption by automatically detecting and correcting memory errors, helping prevent the blue screen of death.

Finally, professional workstations also have multiple storage options, including combinations of fast solid-state drives, PCIe and RAID technology that provides redundancy, high storage capacity and speed.

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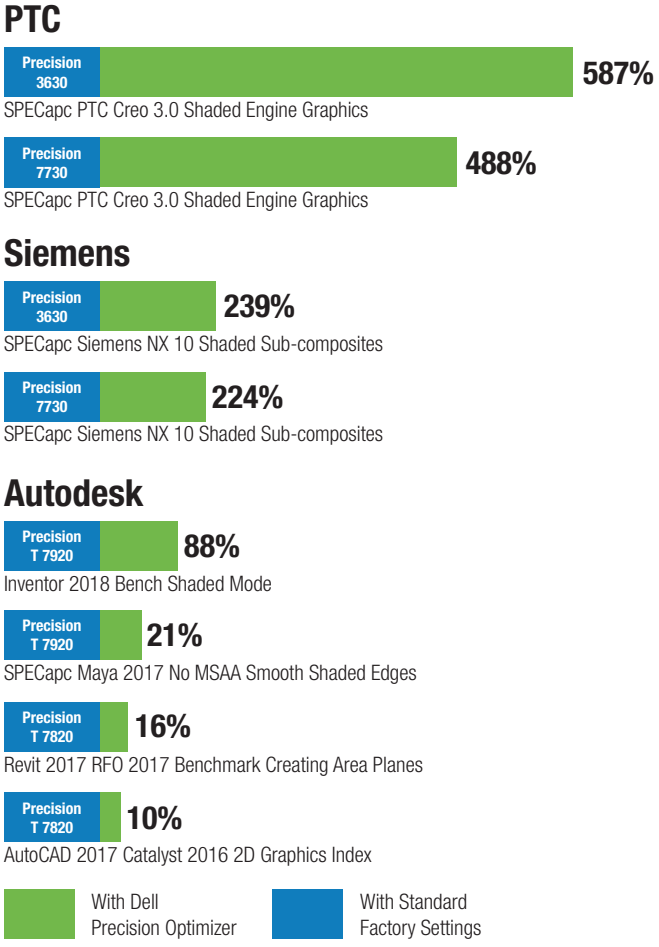
Lead or be left behind. Independent software vendors (ISVs) continuously update their products to provide more advanced features, squash bugs and take advantage of the latest hardware. Professional workstation providers work with ISVs to ensure their hardware is

> "We expect our employees to be high-performing too while working on projects. If they don't have the tools to do so, then that's an issue I need to address."
>
> — ***Chuck Smith***,
> *Director of Technology for Sherwood Design Engineers*

Dell Precision Optimizer Application Performance Increases



Dell legal claims based on internal testing using industry standard benchmarks. Actual performance can vary based on user's workload and system configuration.

compatible with the latest and greatest versions of engineering software. For example, Dell Precision workstations are certified for Dassault Systèmes CATIA and SOLIDWORKS; Autodesk Inventor, AutoCAD and Revit; PTC Creo; and Siemens PLM Software's Solid Edge, Tecnomatix and NX; among others. Dell also provides the Dell Precision Optimizer (DPO) free with every Precision workstation. This valuable, yet free software automatically configures your workstation to run your applications as fast as possible. Dell has shown it to increase performance by up to 239%, and DPO Premium has boosted application performance by up to 587%. DPO Premium uses machine learning to optimize the system according to each user's habits and workflow. It works with any application, whether from ISVs or users' own custom applications.

With a professional workstation, you can upgrade your engineering software without fear of hardware incompatibilities. But you need more than just the latest software to stay on the forefront of technology. For example, working on multiple, high-resolution displays can help you improve productivity and better visualize simulations and renderings. Professional workstations provide a range of options from leading GPU makers for discrete graphics cards to support visually intensive engineering workloads so you can iterate faster without compromising detail. Professional workstations even support the GPUs and RAM needed to run next-gen virtual reality (VR) applications that have become increasingly common for digital prototyping, as well as the demands of artificial intelligence (AI) work.

7

Don't wait, innovate. Hardware and software specs are only half the story when deciding on a new system. What professional workstations really offer you as a design engineer is the ability to get out of your way and let you perform the job you were hired to do. No more fussing with software settings to get the best performance, routinely waiting for reboots after system crashes, missing out on new software features your hardware can't support or waiting to run simulations over the weekend. Workstations disappear into the background, allowing you to focus on your work instead of your system. You'll be able to do more design iterations, multi-task, and try more "what-if" scenarios to arrive at better solutions in less time. As we note on page 7, even using conservative estimates, a current professional workstation provides about a month of increased design productivity per year. The best tools won't make you a better engineer, but the wrong tools can slow the speed of your innovation and time to market.

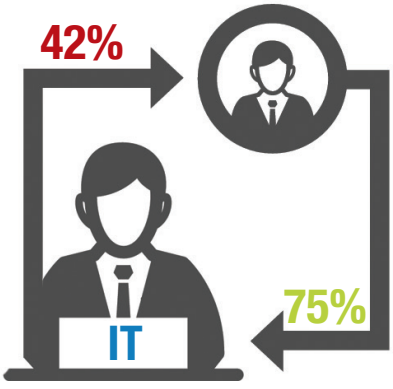
"We can drive product development, particularly around virtual reality, with Dell. Our future development will incorporate virtual reality headsets on-boarded from social media sites."

— ***Tim Luxford***,
Defense Consultant, Simulation and Training, Prolinx

WHY WORKSTATIONS MAKE SENSE TO IT PROFESSIONALS

6 **Power users need powerful computers.** As an IT professional, you're facing your own set of challenges. You may be responsible for supporting many types of computing use cases across a large enterprise or you may be your small company's IT guy by default. It's easy to fall into the mindset of one size fits all or to try to save a few bucks upfront. But every user's computing needs are not the same, and you'll be wasting time and money in the long run if you don't recommend a professional workstation solution for power users.

According to a Forrester Consulting thought leadership paper commissioned by Dell, 75%of surveyed respondents want their voices heard in choosing the technology that will make them more productive. However, only 42% of respondents believe improving employee productivity is a critical or high priority for their IT department.



Three-fourths of employees want a say in the IT procurement process, but less than half think improving productivity is a critical or high priority to the IT department.

—Forrester Consulting

Design engineers are power users who need a computing platform that can handle compute- and graphics-intensive workloads, multitasking and fast I/O access. Engineers may be able to get by for a time with a PC instead of a workstation, but you'll get more calls for support and upgrades as they struggle to be productive. For engineers, productivity is directly affected by the computing solution they use. You don't want to put your some of your company's highest paid talent on inferior machines.

5 **Make your life easier.** By upgrading the engineers in your company to professional workstations, you will increase their productivity and yours because you'll spend less time maintaining them. Workstation components are thoroughly tested, from the motherboard to the keyboard, because workstations are designed for 24x7 operation.

For example, Intel Xeon processors that are available in professional workstations work in conjunction with error correcting code (ECC) memory, which can detect and correct many types of data corruption. Memory errors are a widespread issue in non-ECC computers. In research conducted by Google and the University of Toronto, a third of computers encountered at least one recoverable memory error per year. "In 70-80% of the cases an uncorrectable error is preceded by a correctable error in the same month or the previous month," the researchers wrote, "and the presence of a correctable error increases the probability of an uncorrectable error by factors between 9–400." ECC memory helps prevent those errors that cause crashes and data corruption, as well as the downtime and expense necessary when you replace the bad RAM. To further bolster data integrity, Reliable Memory Technology (RMT) Pro from Dell works with (ECC) memory to detect and correct memory errors in real time. RMT Pro ensures bad memory is not revisited so the memory module can still be used instead of being replaced, saving you time and effort. The bad memory cells are quarantined so they are never accessed again and do not cause a "blue screen of death."

> "We're a young and innovative firm, and our Dell solutions reflect that. To attract the right people, an employer needs to succeed at every level, and our IT plays a part in creating our firm's positive image."
>
> — **Dr. Carsten Mahrenholz**, *CEO of COLDPLASMATECH*

Commercial-class systems also provide IT with more manageability options, including In-

"It made no sense for designers to be working with high-powered workstations at their desks and then making presentations at client sites with tablet devices. We wanted them to have the same kind of capabilities on the move and on-site as in the office."

— ***Alexander Graf**, Client Administrator, KNAPP*

tel vPro technology, which can be used to manage, diagnose and update remote systems.

Whether you manage a large team of IT support or you're your own IT department, Dell Services are available to help you simplify workstation planning, deployment and support, from integrating workstation solutions into your IT environment, to 24x7 workstation and application IT support, to automating your migration processes and more.

For instance, with the popularity of mobile computing and bring-your-own devices, security is one of the top concerns among IT professionals. According to the latest mobile security report by global mobile connectivity firm iPass, more than half (57%) of organizations suspect their mobile workers have been hacked, or caused a mobile security issue, in the last 12 months. Overall, 81% of respondents said they had seen Wi-Fi related security incidents in the last 12 months. Dell Precision workstations are available with Dell Data Protection malware, authentication and encryption endpoint security solutions to help you maintain your company's security.

More than half of IT professional suspect their mobile workers have been hacked, or have caused a mobile security issue, in the last 12 months. Eighty-one percent of respondents said they had seen Wi-Fi related security incidents in the last 12 months.

— iPass Mobile Security Report

Invest in Your Future. Workstations are intended to be expanded and configured for specific engineering workflows, so they are easily scaled up to meet changing requirements. They can be configured with dual processors, the latest discrete GPUs (and the power supplies to run them), tons of RAM and terabytes of PCIe-based storage right out of the gate, or easily upgraded as your users' needs change.

For example, VR, artificial intelligence and interactive photorealistic rendering were cutting edge just a few years ago and are rapidly approaching mainstream. Even entry-level professional workstations let you try out these new, compute-demanding workflows and scale up to fully benefit from them. That's not the case if you invest in a typical consumer PC.

WHY WORKSTATIONS MAKE SENSE TO EXECUTIVE MANAGEMENT

Time is money. Engineers are among your company's most valuable employees because they are the lifeblood behind your intellectual property. What you may not know is how much time they spend waiting for a large CAD model to load or a thermodynamic simulation to run. Saving a few dollars upfront on PCs vs. workstations can have big consequences over time. You want to keep your top talent working, not having to take several coffee breaks each day as the system catches up.

2 **Workstation provide a quick return.** It's not difficult to estimate your workstation ROI in terms of dollars and cents. According to the May 2017 National Occupational Employment and Wage Estimates from the United States Department of Labor, the mean annual salary was 99,580 for electrical engineers and $91,500 for mechanical engineers. Let's be conservative and say you employ an engineer earning $80,000 a year who spends about a third of the approximately 250 working days a year actually using design engineering software. We won't even include overhead that could double that cost. Even with that conservative estimate, it is costing you more than $26,500 a year for that design work. That's 83 days of total design engineering work at $320 per day. If that engineer had a professional workstation that increased his/her design productivity by just 36%, you would gain the equivalent of almost 30 more days of design productivity, which equates to $9,561.60 a year.

The 36% design productivity boost is a conservative estimate. Benchmark studies published by *DE* on behalf of ANSYS, Altair, Autodesk, COMSOL, Dell and Intel show a time savings ranging from 4X to 9X when comparing simulation runs on modern workstations and software vs. their three-year-old equivalents.

Yet, even given those conservative estimates, an investment in a professional workstation would pay for itself in less than six weeks.

Workstation ROI by the Numbers

Time spent doing design work:
$80,000 / 250 working day per year = $320 per day
A third of 250 working days = about 83 days per year

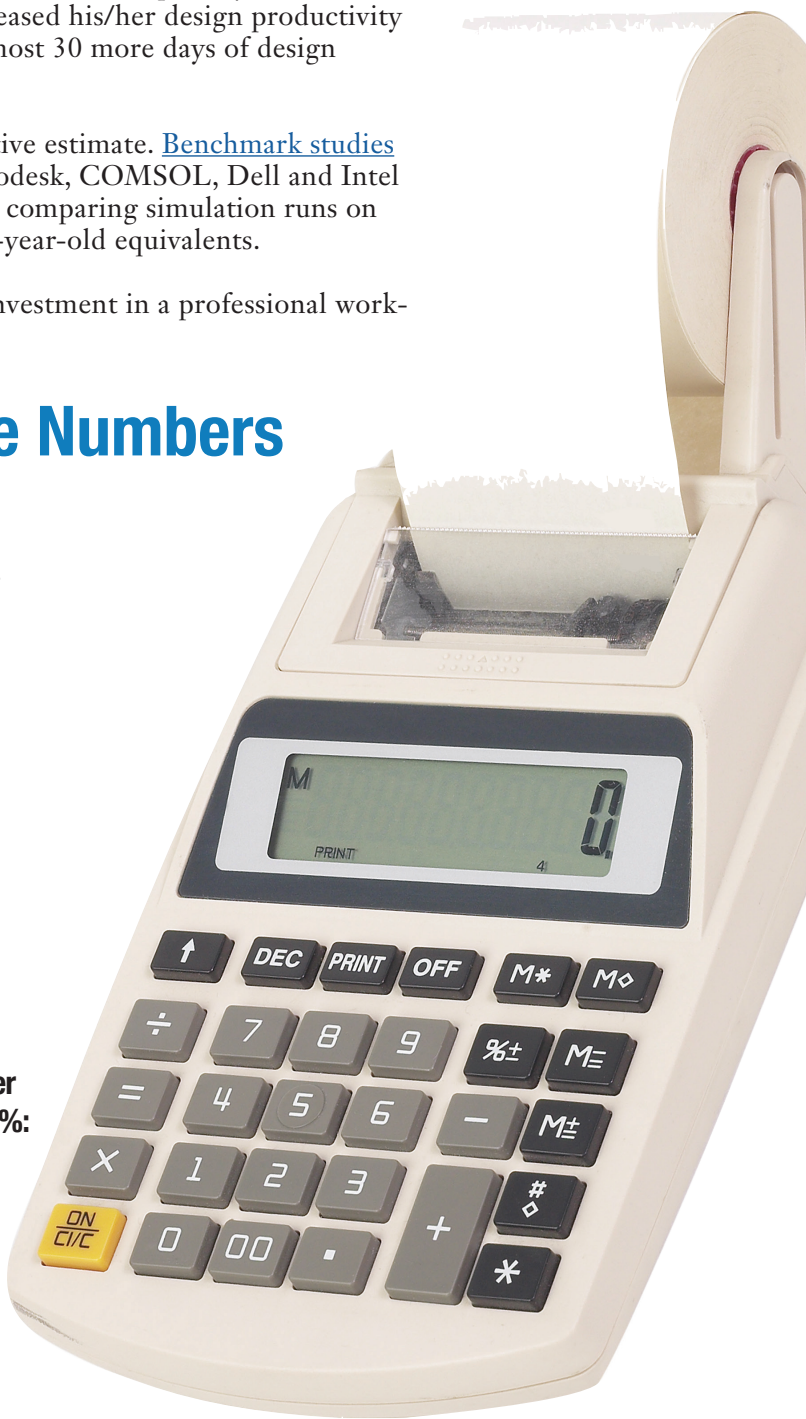
Annual cost of an engineer's design work:
$320 per day for 83 days = $26,560

Additional time spent doing design work by being 36% more productive:
83 days x 36% = 29.88 days

Annual benefit from increasing design productivity:
$320 a day for 29.88 days = $9,561.60.

Annual benefit if also using Dell Precision Optimizer to improve design productivity by a conservative 5%:
$320 a day for 34.03 days = $10,889.60.

ROI of a Dell Precision Tower 5820 series that starts at $1,181 (Dell price at press time):
Less than 6 weeks



Stay ahead of market forces. Of course, idle engineers represent a much greater lost opportunity cost than the numbers on a profit and loss statement will show. Every minute in downtime they spend is a minute they could have been designing the next big product, finding a significant recall issue before it went into production or making your company's products better than your competitors' products.

Keeping pace with the digital disruptions that are driving markets and creating new ones starts with the professional design engineers on the front lines. Designers and engineers are creating and improving the products that will dictate the future of your organization.

Design engineers can enlist a spate of new technologies to help them meet your needs for quickly designing more complex products—from 3D CAD, to advanced simulation software to life-like rendering applications and VR and AI. But, if they're wasting time trying to run those professional applications on PCs instead of professional workstations, they could be costing your company market share.

Dell offers a wide range of professional workstations featuring the latest Intel processors that are certified for professional design and engineering workflow software.

For more info, visit:

Precision Workstations:
DellEMC.com/Precision

Workstation Advisor:
Dell.com/wsadvisor

Dell Precision Optimizer:
Dell.com/optimizer

ISV Certification Search:
PrecisionWorkstations.com

By the Numbers:

Choosing Professional Workstations

Make a Month of Time

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	**29.88**	31	32	33	**34.03**

■ *Design engineering productivity gained per year by investing in current, professional workstations:* ***29.88 days.***

■ *Design engineering productivity gained per year by investing in current, professional workstations that use the free Dell Precision Optimizer:* ***at least 34.03 days****.*

■ *That's like saving* ***$10,889.60*** *per year by investing in a $1,200 Dell Precision Tower.*

Meet Deadlines

Autodesk

Precision T 7920 — **88%**

Inventor 2018 Bench Shaded Mode

Precision T 7920 — **21%**

SPECapc Maya 2017 No MSAA Smooth Shaded Edges

Siemens

Precision 3630 — **239%**

SPECapc Siemens NX 10 Shaded Sub-composites

Precision 7730 — **224%**

SPECapc Siemens NX 10 Shaded Sub-composites

With Dell Precision Optimizer

With Standard Factory Settings

PTC

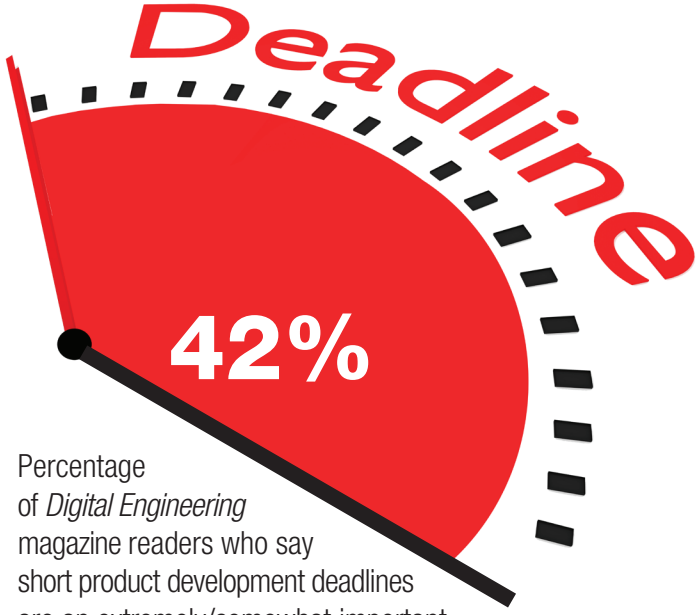
Precision 3630 — **587%**

SPECapc PTC Creo 3.0 Shaded Engine Graphics

Precision 7730 — **488%**

SPECapc PTC Creo 3.0 Shaded Engine Graphics

— Dell legal claims based on internal testing using industry standard benchmarks. Actual performance can vary based on user's workload and system configuration.



Percentage of *Digital Engineering* magazine readers who say short product development deadlines are an extremely/somewhat important challenge in their day-to-day work.

— DE, *December 2018*

■ *Dell Precision Optimizer automatically adjusts computing resources to enhance software productivity.*

Attract and Retain Talent

Weeks to Fill Positions

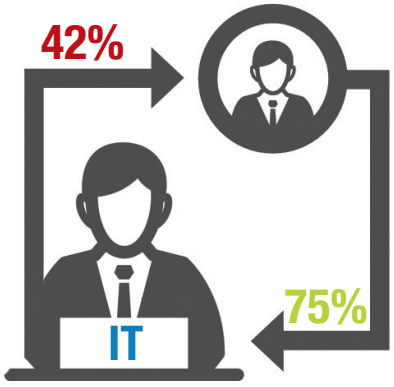
17 engineering, research and scientists

15 software engineers

13 supply chain talent

— *2018 Skills Gap in Manufacturing Study by Deloitte and The Manufacturing Institute*

■ *Design engineers are power users who want to work for employers who understand their need for workstations that can handle compute- and graphics-intensive workloads.*



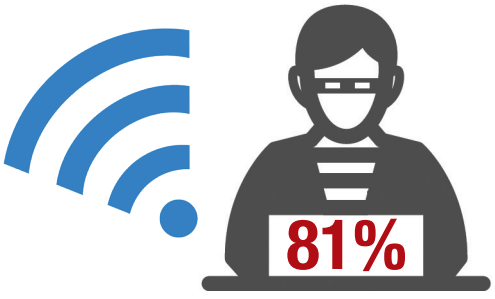
Three-fourths of employees want a say in the IT procurement process, but less than half think improving productivity is a critical or high priority to the IT department.

— *Forrester Consulting, April 2018*

Improve Security

More than half of IT professional suspect their mobile workers have been hacked, or have caused a mobile security issue, in the last 12 months. Eighty-one percent of respondents said they had seen Wi-Fi related security incidents in the last 12 months.

— *iPass Mobile Security Report 2018*



■ *Dell Precision workstations are available with Dell Data Protection malware, authentication and encryption endpoint security solutions.*

Dell offers a wide range of professional workstations featuring the latest Intel processors that are certified for professional design and engineering workflow software.

■ ***Learn more:*** *DellEMC.com/Precision*