Special Report

The State of CAD Mobility

Part 1: Technology is Growing Up

A 2016 CAD study finds that mobile CAD adoption has stalled; however, recent advances in cloud-based CAD software and mobile hardware technologies suggest that use will accelerate in the next few years.

From the editors of

cadalyst

Sponsored by

Microsoft Surface

Special Report

The State of CAD Mobility, Part 1

Technology is Growing Up

A 2016 CAD study finds that mobile CAD adoption has stalled; however, recent advances in cloud-based CAD software and mobile hardware technologies suggest that use will accelerate in the next few years.

By Nancy Spurling Johnson and Cyrena Respini-Irwin

The State of CAD Mobility

Part 2 of this special report is available for complimentary download in the Cadalyst Library.

➤ ***Cover image:***
www.istockphoto.com/ styleTTT

Not so long ago, CAD was no more portable than a drafting table. CAD work was done within the confines of an office, by an engineer or designer seated at a desktop computer. Mobile workstations introduced some flexibility, but were typically too large and outlet-dependent to be used away from a desk, while laptop PCs often failed to deliver the computing and graphics power required to drive CAD applications. As tablet computers and smartphones became ubiquitous, mobile CAD apps proliferated, but most offered only limited functionality, such as model viewing and markup.

Today, advancements in hardware and software are converging to provide more fully featured, yet highly portable mobile solutions that enable more kinds of CAD work in more places, as we'll discuss in our two-part white paper series examining the state of mobile CAD technology. This installment, Part 1, will discuss current mobile CAD use, factors limiting mobile CAD adoption, and changes afoot in the market that we expect will accelerate growth. Part 2 will look at real-world applications of mobile CAD in the manufacturing industry and reveal what the future might hold for mobile CAD technologies and the users who will benefit from them.

The State of Mobile CAD Adoption

Across the CAD market, awareness of mobile CAD has reached 51%, up from 40% in 2014, according to the *Worldwide CAD Trends 2016 Survey* by Business Advantage Group. Adoption rates have dropped to 17%, however, after a bump from 21% in 2014 to 22% in 2015. Current use stands at 19% in the Americas as well as in Europe/Middle East/Africa (EMEA), and just 9% in the Asia/Pacific region. Among the 15 CAD technologies surveyed, respondents ranked mobile access to CAD as tenth in importance.

Among users in the manufacturing sector, the adoption rate is 12%, compared with 24% adoption in architecture/engineering/construction and 12% in other industry sectors. Current manufacturing use is significantly higher in EMEA (15%) and North America (14%) than in the Asia/Pacific region (4%).

The discrete manufacturing sector is driving adoption among manufacturing users worldwide, at 14%, with life sciences manufacturing leading adoption among market subsectors, at 24%. Adoption in the process manufacturing sector stands at just 6%; however, it

is poised for much faster growth, according to Business Advantage Group — specifically, a 450% increase in three to five years.

When examining the use of mobile devices for CAD applications, Business Advantage found laptop PC adoption to be hovering around 32% across all markets; mobile workstations, 18%; tablets, 5%; and mobile phones, 3%.

Although awareness and adoption of mobile CAD are relatively low now, the technology is poised to take off, predicts Business Advantage. Above-average growth is anticipated across the CAD market, to 37% adoption within three to five years. In manufacturing, the forecast is for 150% growth (to 30% adoption) in the next three to five years.

What's Holding Back Mobile CAD?

Mobility — along with other information technologies such as cloud computing and the Internet of Things — is considered a *megatrend*, and when it comes to technology adoption trends, CAD users typically are ahead of the curve. "The CAD industry is a leading indicator for many things, including technology and world economies," said Kathleen Maher, vice-president of Jon Peddie Research, in an interview with Cadalyst in 2015. "CAD engineers tend to be early adopters."

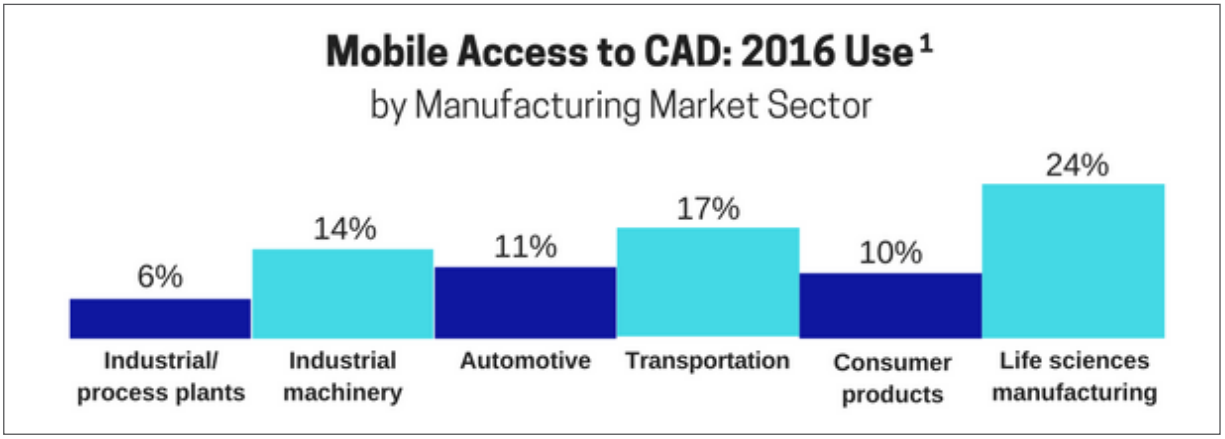
Why, then, is the percentage of mobile CAD users so much lower than the 66% of the general workforce that reports using personal devices for work purposes[2]?

The answer lies in the nature of CAD itself. While app-powered tablets and smartphones are fairly well suited to mainstream business tasks such as managing e-mail, in most cases they are not

Sources

› [1] Worldwide CAD Trends 2016 Survey, *Business Advantage Group.*

› [2] *The Future of Corporate ITL, CEB, 2013 (provided by Microsoft).*



Why is the percentage of mobile CAD users so much lower than the 66% of the general workforce that reports using personal devices for work purposes?

optimal for performing precise, compute-intensive CAD/CAE/CAM tasks — at least not yet. Limiting factors, which have not changed significantly since mobile CAD's inception, include:

Productivity barriers. Although mobile access to CAD can minimize user downtime, mobile interfaces do not exactly facilitate CAD productivity. The small size and light weight that make most mobile devices so convenient to carry also impose limits on crucial components of the user experience, such as screen size. Fingertips and touch-screen keyboards are cumbersome at best for data input and manipulation; a stylus is critical for accuracy and efficiency.

David Chadwick, marketing manager at Siemens PLM Software, says, "Screen size can be a limitation when working with large assemblies or parts with many complex features. In these cases, our users typically connect their mobile device to a large screen and use a 3D mouse and keyboard for geometry manipulation and data input."

Cédric Desbordes, sales and marketing executive for Graebert, advises users to consider how intensively they expect to use mobile solutions before settling on a particular screen size. "A smartphone is enough for viewing and some annotation, a large tablet will be preferred if you expect to modify drawings frequently, and medium-size tablets can offer a good compromise if you are traveling frequently and prefer a light device."

Security concerns. Manufacturers are particularly protective of CAD data, which represents high-value intellectual property (IP). Files stored on mobile devices can fall into the wrong hands when a tablet or phone is lost or stolen, and storing CAD data on an external cloud for mobile access is out of the question for companies that don't want IP stored outside the firewall. Enabling secure file access from mobile devices requires a new level of IT control and data management (which in turn requires additional staffing, time, and expense).

Internet connectivity. With cloud-based software and other Internet-connected apps, the ability to get work done is only as good as the user's Internet connection. Wi-Fi network access is inconsistent for most mobile users; cellular network access can circumvent lack of Wi-Fi but can be very expensive if work is time-consuming or involves transferring large datasets. Relying on an Internet connection for critical CAD work is risky, says Tom Salomone, worldwide manufacturing and AEC segment manager for Lenovo®. "Network bandwidth is limiting and can disrupt the design process, or make the process frustratingly slow."

Desbordes also discussed connectivity concerns. "When you are on the go, you cannot always rely on a good Internet network," he said. "Cloud is of course great to synchronize files with mobile, and most mobile CAD solutions will support that, but if you need the Internet to access the CAD features and cannot work offline, it is a serious limitation. This is why professionals expecting to use mobile CAD on the go should orientate their choice towards native applications able to work offline."

▲ *One development that could drive growth of mobile CAD: The Microsoft Surface Pro 4 is a tablet equipped to support full-fledged CAD software such as Solid Edge, shown here in a manufacturing environment. Source: Siemens PLM Software.*

Battery life. Mobile devices run on battery power, and when a battery dies, so can productivity. Battery life of mobile devices generally improves with each generation — and tablet and smartphone battery life will likely always outpace that of laptops and mobile workstations — but today the concern persists.

Lack of robust software and hardware development. Most mobile CAD apps today are limited to file viewing, annotation, and sometimes editing. Few full-fledged 2D and 3D CAD applications exist that run on the cloud, and even fewer tablets today possess the combination of operating system, processor, RAM, storage, and graphics power necessary to run robust CAD software, let alone more complex simulation or rendering.

When mobile CAD software and mobile device technology begin to deliver benefits that outweigh the drawbacks, the lure of mobile CAD will become hard for manufacturers to resist — and that's when the market will see mobile CAD adoption accelerate.

Tapping Remote Resources

As it turns out, that time is upon us. Those who embrace today's cloud-based computing will find a wealth of mobile CAD possibilities that didn't exist even a few years ago. Where a robust Internet connection is available, users can obtain workstation-like storage capacity through their mobile devices. For example, Chadwick notes, "The smaller solid-state drive (SSD) capacities of mobile devices can limit the ability to carry a large number of design projects with you, but the easy availability of cloud-based file-sharing software is a simple solution to this problem."

Even more significantly, the cloud is finally bringing full-fledged CAD software to the mobile device. Salomone of Lenovo explains: "CAD running through a browser is emerging with companies like Onshape, where the real power is in the cloud. The application actually runs on a server, and the tablet is accessing a virtual machine on that server." Autodesk has moved aggressively into the arena with its 360 collection of cloud-based software and services. Other CAD companies have or are working on cloud solutions that can be accessed on a tablet, Salomone notes.

Cloud connectivity also means users can operate desktop CAD via less-powerful mobile devices while the processing carries out on burlier hardware located elsewhere. For example, a CAD user can rely on a full-powered CAD workstation primarily, but when mobility is a must, tap into it via remote-access tools running on a tablet, such as HP's Remote Graphics Software (RGS) .

Without an Internet connection, of course, cloud computing is a moot point. In that scenario, Simon Floyd, director of Innovation and Product Lifecycle Management Solutions at Microsoft®, sees a hybrid model, where CAD runs locally to provide optimal performance and availability, and evolves to provide virtual services in the cloud to increase capacity and capabilities when a network connection is present.

As hardware becomes ever more refined, we can expect to see the line blur between mobile devices and mobile workstations.

Full OS Support Expands Options

Mobile hardware technology is advancing as well, resulting in tablets able to run full-fledged CAD natively. Tablets and smartphones based on mobile operating systems (OS), such as iOS or Android™, are limited to running those apps designed for its OS. But a Microsoft Windows®-based mobile device can run full versions of Windows-based CAD software — a category that includes most popular CAD applications on the market.

The Microsoft Surface® Pro 4 tablet runs on Windows 10 and is equipped with a full keyboard and Surface Pen stylus. It is available with an Intel® Core™ i5 or Intel® Core™ i7 processor, Intel™ HD graphics, and up to 16 GB RAM and 1 TB of storage.

"If a tablet runs the Windows 10 operating system, I would argue as much real work can be performed on it as on a laptop, notebook, or desktop workstation, provided the size and complexity of the work fits within the mobile form factor [RAM, CPU, and GPU limits]," says Floyd.

Chadwick at Siemens PLM Software shares a similar observation: "The feedback we get from our Solid Edge users is that the performance of high-end tablets, such as the Microsoft Surface Pro, is excellent for designing complex parts and medium-sized assemblies." Complex finite-element analysis (FEA), however, such as that conducted in Solid Edge Simulation, is better supported by a high-end workstation than a mobile device, he notes.

As hardware becomes ever more refined, we can expect to see the line blur between mobile devices and mobile workstations. Already, the market is seeing mobile workstations that are more akin to tablets in terms of portability, offering features such as 360-degree hinges that allow the keyboard to be rotated behind the screen, placing the unit into tablet mode. The Microsoft Surface Book is a highly portable, touchscreen laptop that can be configured with a workstation-like processor, RAM, storage, and graphics.

"I believe the demand for mobility solutions will continue to grow," Floyd sums up. "The demand for a seamless experience without compromises will be the main driver, as will enabling natural user interfaces that provide touch, pen, and keyboard/mouse

controls to exist simultaneously and persist from desktop to laptop to tablet to phone."

In Conclusion

Only a short time ago, mobile CAD was limited to relatively simple tasks such as file viewing and markup — and critics were quick to point out that mobile CAD was not viable for accomplishing "real" CAD work. Today, the most productive and most compute-intensive CAD work still is best carried out using a full-size monitor and input device connected to a professional CAD workstation, but recent software and hardware advancements have made mobile access to full-fledged 2D and 3D CAD viable for the first time in CAD history. Simulation, rendering, data management, product lifecycle management, and many other CAD-related applications are now mobile as well, thanks to cloud-based computing. As these technologies continue to improve CAD productivity and cost-effectiveness, it won't be long before mobile CAD adoption begins to accelerate.

Learn more about the Microsoft Surface Pro tablet and Surface Book laptop for supporting full-fledged CAD applications.

This white paper was written and produced by the editors of Cadalyst, the leading publication covering computer-aided design and related software and hardware technologies for the AEC, civil engineering, and manufacturing markets, and sponsored by Microsoft.

About the authors: *Nancy Spurling Johnson is content director of Longitude Media, publisher of Cadalyst, and Cyrena Respini-Irwin is editor in chief of Cadalyst.*

Microsoft and Surface are trademarks of the Microsoft group of companies. All other trademarks herein are the property of their respective owners.

©2016 Longitude Media, LLC. Reproduction in whole or in part is strictly prohibited without written permission of the publisher.