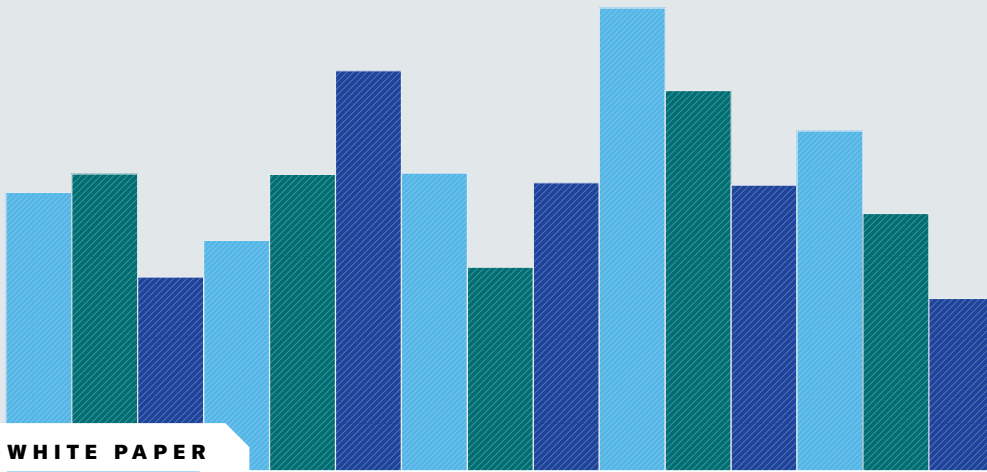




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WHITE PAPER

Understanding the AI PC: Where and When to Adopt



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Robert Hallock
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The Importance of Including AI Acceleration in Your Next PC Fleet Upgrade

As commercial organizations plan their next round of PC fleet upgrades, incorporating offline artificial intelligence (AI) acceleration technology into the PC assortment should be a top priority. At Intel, we believe in designing solutions that meet employees' AI demands, as well as helping businesses grow and be ready for anything.

AI PCs enable AI tasks to be executed locally rather than in the cloud, offering a range of security, productivity, and privacy benefits. By including AI acceleration in the next refresh request for proposal, businesses can ensure they stay competitive while also creating a more efficient and secure working environment.

Boosted Productivity and Creativity

Offline AI acceleration paves the way for advanced assistive features that can transform the way employees work. AI-enabled tools such as real-time transcription, natural language processing, and data analysis can streamline everyday tasks to reduce time spent on rote clerical work. Employees can focus on more creative and high-value activities. Many of these features are never-before-seen on a PC or are radically more accurate than primitive past attempts.

Improved Energy Efficiency for Longer Battery Life and Lower Costs

Offline AI acceleration can also improve the energy efficiency of fleet PCs. As the world's applications broadly transition into supporting AI features by 2026 or 2027, an AI-enabled refresh can ensure such features do not run on an accelerator that might be an order of magnitude slower and/or more power-hungry for the same work. These efficiency gains can directly facilitate longer battery life in laptops and mobile workstations. Moreover, these power savings may be statistically significant for the total energy consumption of large fleets, which additionally gives support to corporate sustainability goals.


Enhanced Security and Privacy for AI Workloads

One of the greatest advantages of offline AI acceleration is the improved security and privacy it offers. In traditional setups, AI workloads are often processed in the cloud, which requires sending large data sets over the internet. Sending data can raise glaring privacy concerns for sensitive information such as customer data, financial records, or intellectual property. Processing AI tasks locally keeps data within the organization's secure environment, minimizing exposure to potential data breaches, cyberattacks, or unauthorized third-party access.

The Bottom Line

Incorporating offline AI acceleration into the next PC fleet upgrade is a strategic decision that can offer significant benefits to commercial organizations. This report offers a deep dive into those specific benefits, providing clarity into the role of the AI PC and the possibilities it can unlock. By enabling powerful new assistive features, improved energy efficiency, and enhanced security, this technology equips businesses with the tools they need to stay productive, reduce operational costs, and safeguard their data. As the demand for intelligent, efficient, and secure systems continues to increase, upgrading to AI-accelerated PCs will ensure organizations remain competitive in an especially rapid time of change in PC architectures.

Understanding the AI PC: Where and When to Adopt



Enterprise IT departments are under pressure to meet a broad set of mandates, from keeping up with corporate demands to demonstrating ROI, managing security risks, addressing app development requests, and pushing forward on digital transformation. Amid this strain, many IT departments also face a new decision: when to upgrade to artificial intelligence (AI)-enabled PCs (AI PCs)—which contain architectural enhancements in the processor specifically for AI.

Many PCs purchased to enable the sudden shift to work from home in 2020 are reaching their end of life, and the refresh of these fleets spurred the PC market to return to growth in the fourth quarter of 2023 after eight consecutive quarters of decline, according to Stamford, Conn.-based research and analysis firm Gartner Inc.¹ The firm estimates a 3.5% increase in overall PC shipments in 2024. By the end of 2025, Gartner predicts shipments of AI PCs will represent 43% of all PCs.

AI PCs are widely regarded as key enablers of AI as its role in the enterprise rapidly expands. “AI is going to change the way we work and live. It’s going to change the type of tasks we do,” says Guayente Sanmartin, senior vice president and division president, commercial systems and displays solutions, for HP Inc., a multinational information technology company headquartered in Palo Alto, Calif. The performance, cost benefits, and security offered by AI PCs are well suited to enable the journey toward transformational uses of AI, she says. “There are certain moments in the history of technology, like [the] internet and cloud, that change everything we do. AI PCs are going to be one of those.”


Because of AI PCs’ relatively short time on the market, many IT decision makers have not yet taken a deep dive into their features and functions.

HIGHLIGHTS

Artificial intelligence (AI) PCs are widely regarded as **key enablers of AI** as their role in the enterprise rapidly expands.

The **performance, cost benefits, and security** offered by AI PCs are well suited to enable the journey toward transformational uses of AI.

With only a general impression of AI PCs, IT organizations **weighing PC fleet refresh decisions** must rely on forecasts, analyst recommendations, and their own data gathering.





“There are certain moments in the history of technology, like [the] internet and cloud, that change everything we do. AI PCs are going to be one of those,” says Guayente Sanmartin, senior vice president and division president, commercial systems and displays solutions, for HP Inc.

So as IT organizations approach the refresh decision, they must weigh the known benefits of non-AI PCs against the potential of AI PCs. AI PCs’ ability to run AI functions locally instead of or in addition to in the cloud promises key benefits in performance, productivity, cost-efficiency, privacy, data security, accessibility, and manageability. And as the hardware/software ecosystem around AI PCs rapidly expands, new features are likely to emerge that are better suited to local processing than the cloud.

This report will help enterprises make informed decisions about how and when to invest in AI PCs. It will explore what AI PCs can do, dispel misconceptions, and offer a detailed look at the benefits they offer. It will also explore how the enterprise hardware/software ecosystem is pivoting to take full advantage of local AI processing and how organizations can deploy AI PCs to maximize the value of their investments.

“Between the huge installed base of four-plus-year-old PCs and the transition to Windows 11, there was going to be a big PC transition happening around now anyway,” says Bob O’Donnell, founder, president, and chief analyst at TECHanalysis Research LLC, a Foster City, Calif., research firm. “Now there are AI PCs. As we upgrade anyway, it seems silly not to get the AI versions, even if it doesn’t pan out immediately. Companies that today are not starting to jump into the AI PC [space] will be left behind.”

Expanding AI Adoption

Artificial intelligence use is exploding across the enterprise. Organizations are experimenting with use cases and software developers are working diligently to introduce new AI-fueled capabilities, an effort that kicked into overdrive with the introduction of generative AI (gen AI). While new

productivity and content creation capabilities such as meeting summarization and marketing copywriting are already proving popular, they are widely viewed as the tip of the iceberg, with far more impactful use cases to come.

The per-user cost, energy consumption, data risk, and latency inherent in cloud-delivered AI, however, have made it clear that this model will not stand up as the exclusive enabler of AI processing in the future.

“Running all the workloads of AI, all the generative AI on the cloud, is impossible,” says HP’s Sanmartin. “There is not enough capacity. There is a huge benefit to have some workloads running on the PC.”

But the relatively nascent state of AI in the enterprise, and of the AI PC, means IT organizations have less information than they would prefer as they make decisions about how and when to invest in AI PCs. Amid this limited access and education, some IT pros are enthusiastic about the potential for AI PCs while others are not yet convinced.

“There’s the [sense], ‘Yes, this is great. This is part of innovation. This is the next evolution of PCs,’” says Seth Earley, founder and CEO of Earley Information Science Inc., a Carlisle, Mass.-based professional services firm. “But there’s also, on the side of the skeptics, the belief that this is just a more powerful PC. But it really is more than that. It’s really a different kind of PC.”

The sunset of Windows 10 software updates, security patches, and technical support on Oct. 14, 2025, is also a factor in fleet refreshes, imposing an additional time element on the decision of when to invest in AI PCs. Organizations running the Windows 10 operating system after that date put the security, performance, and reliability of their systems at risk, and upgrading existing hardware to Windows 11 incurs considerable time and cost.

Another trend impacting PC fleet decisions is the persistence of hybrid work and the opportunity for users to be able to perform AI-enabled tasks and access richer virtual meetings and more natural collaboration fueled by AI, whether they are working in or outside the office.

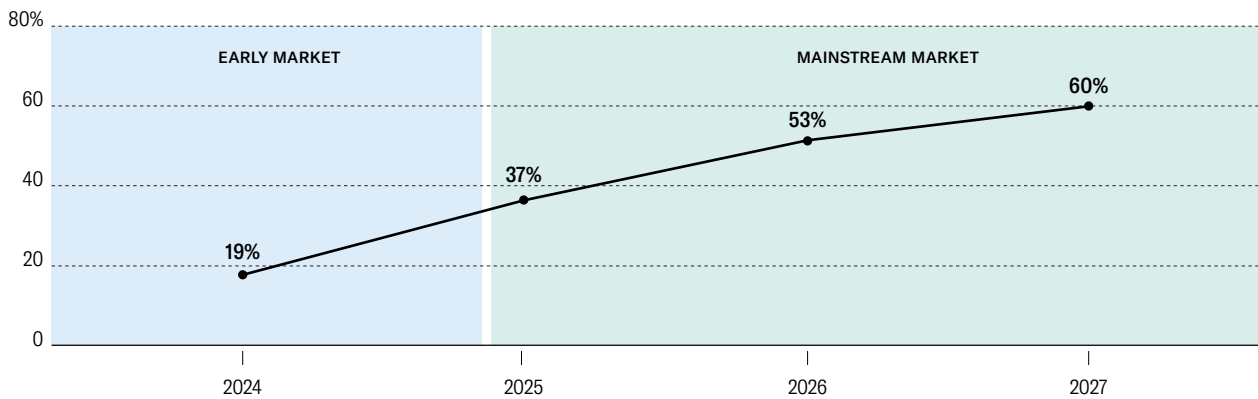
With only a general impression of AI PCs, IT organizations weighing PC fleet refresh decisions must rely on forecasts, analyst recommendations, and their own data gathering around use cases, user requirements, and past technology purchase experiences to optimize their plans.

Analyst forecasts vary in the details, but most see adoption of AI PCs steadily increasing to become the predominant model within five years. In its January 2024 report, “Now and Next for AI-Capable PCs,” Singapore-based global technology market analyst firm Canalys forecasts that nearly one in five (19%) PCs sold globally in 2024 will be AI-capable, and that figure will increase to 37% in 2025. **FIGURE 1** In 2026, the report suggests, more than half (53%) of PCs sold globally will be AI-capable.

FIGURE 1

Projected AI PC Global Adoption

Analysts predict AI PCs will pass the 50% mark by 2026



Source: Canalys, January 2024

Most predictions anticipate that notebooks will lead the way in AI PC adoption, with desktops following later.

As IT organizations consider whether their next PC fleet should comprise all, some, or no AI PCs, analysts recommend they gather everything they do know, including by assessing their organization's user base, use cases, and AI roadmap, and then learning all they can about the AI PC value proposition today and in the future.

"This is a moment for IT managers to learn the benefits, to get educated, and to look for personas and use cases that would offer the maximum benefits," says Sanmartin.

Understanding AI PCs

Definitions of AI PCs vary, but they generally include architectural enhancements in the processor specifically for AI. They feature a central processing unit (CPU), a graphics processing unit (GPU), and an AI "accelerator" such as a neural processing unit (NPU) to handle AI tasks locally and more efficiently.

PC chip and device makers previewed a wide variety of benefits of AI PCs even before these new models hit the market. In a recent survey of 414 U.S. IT decision makers conducted by Needham, Mass.-based market intelligence firm International Data Corp. in August 2023, respondents anticipated that improved automation and efficiency (38%) would be the potential feature of AI PCs their users would benefit from most, followed by accelerated data analysis and insight (23%) and strengthened security and privacy (20%). **FIGURE 2**

To truly determine the value that AI PCs may offer a particular organization, however, it's important to take

a deeper dive into what makes AI PCs different and the implications of those features.

Delivering Performance, Productivity, and Cost-Efficiency

AI PC vendors promise better performance from AI PCs than their forerunners. In part, the gains will come from overall improvements in processor technology that make the machines faster and more energy efficient, complemented by significant battery life gains.

But chip and PC makers say adding an accelerator specifically designed for AI processing is what will enable the greatest performance increase, allowing organizations to divert at least some of their AI workloads to real-time, no-latency, local processing in a more hybrid approach to AI computation. They note that AI use cases involving personal productivity, such as instantly rendering a sketch into a professional image or personalization features that locate and summarize all relevant data on a given topic on the PC, are particularly well suited to local processing, as are those involving sensitive data such as in regulated industries.

"It really just comes down to how much data can I get, how fast can I get it, and how can that impact the models," says Ben Bajarin, CEO and principal analyst at Creative Strategies Inc., a San Jose, Calif.-based analyst firm. "Being that close to that sensitive data [and] that personal information, and being able to semantically index that, is something that you can do on a device that you can't do otherwise."

The ability to perform AI operations at very low wattage in the background, such as real-time, continual semantic analysis

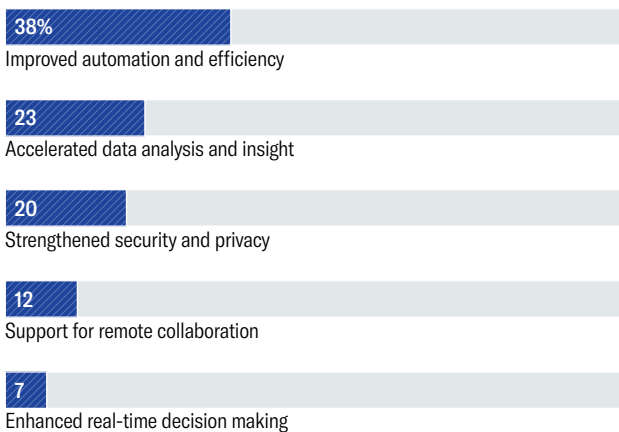


“The performance and efficiency increases of these products is so significant that users will gravitate toward [them] in the refresh cycle,” says Ben Bjarin, CEO and principal analyst at Creative Strategies Inc.

FIGURE 2

How AI PCs Will Assist Users

Automation and efficiency improvements lead potential end-user benefits



Source: International Data Corp., August 2023

of the local system—understanding how the user works, discerning the user’s goal, and helping the user achieve it faster—is a game changer, analysts concur. “The performance and efficiency increases of these products is so significant that users will gravitate toward [them] in the refresh cycle,” Bjarin says.

Executing AI processing on the PC can also be more cost-efficient than sending every call to the cloud, particularly when AI models are optimized for the AI PC’s processor, frameworks, and runtimes as developers begin releasing such features, a process expected to ramp up in 2025. “There will be lower costs to do local processing,” says Earley Information Services’ Earley. An AI PC “can do more processing on the edge, localize it, reduce that traffic, and reduce the cost of cloud computing, especially when you’re doing development.”

Some organizations are already experiencing productivity boosts from automating mundane tasks such as drafting emails, taking meeting minutes, or processing spreadsheets using AI. AI PCs offer the potential to perform these tasks

more quickly and with lower latency than when the cloud is used, because they are not reliant on the quality, reliability, or responsiveness of the network connection.

“The ability to crank out an analysis quicker that’s more effective and impactful, I buy into 100%,” says Patrick Moorhead, founder, CEO, and chief analyst of Austin, Texas-based technology industry analyst firm Moor Insights & Strategy.

Faster answers enable users to reach goals more quickly, and that translates into improved productivity, says G. Dan Hutcheson, vice chair and senior research fellow at TechInsights Inc., an Ottawa, Ontario-based information platform covering the semiconductor industry. But until use cases are tested and proven on AI PCs running a specific organization’s workflows, those gains can be difficult to quantify in advance. So when it comes to investing in AI PCs on the basis of increasing productivity in the future, “it’s often a matter of faith,” says Hutcheson.

Elevating Privacy and Security

Perhaps one of the most noteworthy benefits of AI PCs is the ability to perform advanced AI processing without exposing data to the cloud. Performing local AI processing and taking advantage of security functionality built right into the chip or through software added by the device manufacturer offers the potential to significantly bolster cybersecurity and enhance data privacy. This approach enables users to benefit from using a large language model (LLM) while ensuring that sensitive data does not leave the device, or at least, the intranet.

“It’s trust in the data sovereignty,” says Creative Strategies’ Bjarin. In AI PCs, security is “already there on the chip side. I think enterprises are just going to need to be convinced that it meets their security bar for their policies and procedures.”

While AI already enables key security functions on PC platforms, AI PCs are building on those capabilities with chip-level AI PC security measures such as threat detection technology, which uses local AI to learn the user’s typical behavior and then applies machine learning to identify abnormal activities. Other AI functions include phishing detection, identifying in-memory threats, automating

complex security protocols, improving patch and security updates, and strengthening antivirus and anti-malware protection.

As AI PCs and the ecosystem of software and utilities around them continue to evolve, “you’re going to see some incredible security software be able to protect these PCs like we’ve never seen before,” says Moor Insights & Strategy’s Moorhead. “What’s coming is the ability to use literally about 25 times the amount of AI performance to secure the PC without bogging it down.”

Given the near-constant headlines about substantial data breaches, “We’re going to want to be much more careful about our data in the future. And maybe AI PCs are going to be a way to protect that,” says Earley.

Enabling Offline AI and Sustainability

Local processing capabilities will also enable access to AI in use cases where connection to the cloud is temporarily or persistently unavailable or presents excess risk. Workers traveling or working in remote areas, or in signal-free environments such as certain health care and industrial settings where wireless signals cannot penetrate the walls, can run AI models even without robust access to the cloud. In certain regulated industries, stringent data security requirements make running AI locally a safer approach by reducing the risk of data leakage and privacy violations that could occur while data is being sent to the cloud for processing.

“I’m working with a medical equipment manufacturer, and one of the things that’s super, super important is local processing capabilities,” says Earley. “In X-ray, imaging, or radiology departments with lead walls there’s no internet connection; everything has to be processed on that laptop.”

AI PCs are also designed to minimize energy consumption. In fact, within the device itself, the energy consumption of the primary AI processor, the NPU, is measured in milliwatts, while CPU and GPU consumption are measured in watts, according to Sanmartin. NPUs “basically sip battery life instead of consuming it like CPU[s] and GPU[s],” says Bajarin. “To run massive models at sub-five watt[s] is something we’ve not been able to do before on a PC.”

That limited energy use is dwarfed by the amount of energy used for AI computation in the cloud. Today, AI computations are run almost entirely via cloud processing, and that is taking its toll. According to the World Economic Forum’s (WEF) April 25, 2024, website article, “How to Manage AI’s Energy Demand—Today, Tomorrow and in the Future,” the energy used to run AI tasks is already experiencing an annual growth rate of 26% to 36%. By 2028, WEF analysts say, AI could be using more power than the entire country of Iceland did in 2021. In fact, some companies have gone on record admitting AI energy use is putting their carbon neutrality goals in peril.²



“As these companies are trying to meet their sustainability goals five, 10 years out, that’s where this really plays a big role, because you’re not sending all that data back to the cloud,” says G. Dan Hutcheson, vice chair and senior research fellow at TechInsights Inc.

The energy-efficient performance of AI PCs may help organizations salvage their net-zero sustainability efforts. “As these companies are trying to meet their sustainability goals five, 10 years out, that’s where this really plays a big role, because now you’re not sending all that data back to the cloud, crunching it in a huge, high-powered computer system,” TechInsights’ Hutcheson says.

Supporting IT

Introducing a new type of PC requires enterprise IT departments to build new knowledge and skills in order to procure and support these devices and integrate them into system management tools and workflows. However, the particular capabilities of AI PCs are designed to offer IT departments more assistance in those pursuits while maintaining the familiarities of already-existing business platforms. As AI PCs continue to evolve, the capabilities of the AI accelerator itself, as well as the software many PC manufacturers are adding to their AI PC platforms, will continue to lighten the support burden.

“The more that can be baked into the AI PC architecture, the more abilities to self-diagnose and self-repair will reduce the demand on IT help desks,” says Earley, thus positively impacting IT metrics such as uptime, call deflection, and problem resolution.

Enterprise IT environments “are getting so complex, the stacks are so interconnected and so much is based on [application programming interface] machine-to-machine protocols that it really becomes very difficult for humans not only to understand the complexity but to take into consideration all those factors to be able to make a decision around the solution,” Earley continues. Built-in agents that can observe device activity, probe and test other systems, and deconstruct problems will be valuable support tools.



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“That would be analogous to what a human would do, but with greater reliability, repeatability, and scalability,” he adds.

Onboard AI can also help IT departments expand the skills of their talent. “It raises the capability of your lower-skilled workers,” says Hutcheson. “You can take someone [who] is new to the job and have them perform like someone with two or three years’ experience, and the person with two or three years’ experience perform like someone with five to 10 years’ experience.”

Developers are considered ideal early adopters of AI PCs, leveraging the devices to provision sandboxes over which they have full control. “Software developers are already aggressively using [AI PCs] and figuring out how they can speed up their software and their application deployment time within an organization,” says Bajarin.

Beyond these use cases, for enterprise users, AI PCs “also give them the opportunity to rethink their network infrastructure,” says TECHanalysis’ O’Donnell, “because shifting some of the AI inference directly onto the PCs is also going to change how companies think about their network traffic. In fact, there are a bunch of factors that I think will get reconsidered and re-architected based on a wider installed base of AI PCs.”

Accessing AI PC-Ready Software

Understanding AI PCs’ current and future potential is foundational for making investment plans. Among the decisions IT organizations must make is when and how to adopt. For many enterprises, software feature availability and access play a significant role in determining when the return on investment in AI PCs will begin.

Software developers, assisted by device makers’ software development kits; the emergence of small language models, which are scaled-down versions of large language models tuned to support specific tasks; device-level software; and other tools, are working expediently to develop AI-enabled features that leverage local AI processing. While some apps, such as those for video editing and background blurring for meetings, have already appeared, AI PC-enabled features are expected to appear in earnest in enterprise software starting in 2025.

Knowing the AI roadmap of key hardware and software partners and the ecosystems in which they operate is a key

step in making AI PC investment decisions. Some analysts liken the rollout of AI PCs to that of the first Apple iPhone, when the App Store featured just a handful of apps, but then use cases and app availability quickly multiplied and the value proposition became clear.

Sanmartin says 60% of the independent software vendors (ISVs) HP works with already have gen AI features, and “we are helping ISVs to take advantage of features that are already done that are optimized to run on their own device or having their workloads developed to run on the NPU.” The company is also developing its own software to help deliver better, persona-specific experiences by function and industry, she says.

“The biggest reason that the software folks would even do on-device AI is twofold,” says Moorhead. “First, it lowers their costs. The more that you can do on the device that’s already been paid for, the less you have to hit their cloud.” Second, developers are also seeking to ward off competition from startups unveiling innovative AI PC-specific applications, he says. To optimize the AI experience for their customers, developers are “doing a hybrid approach, which is, ‘Let’s put as much as we can on-device AI and then be able to intelligently hit the cloud’” as need warrants, he says. The shift to local AI could also impact the structure of per-seat licensing for access to AI software features.


Cloud providers will also play a role in determining how to split the computing load between the cloud and the AI PC, adds O’Donnell.

But with the broad range of ways to leverage local AI to enable new functions, such as real-time, live translation so colleagues can each participate in a meeting in their own language, it’s not clear that it will take a “killer app” to drive AI PC adoption.

“Part of the reason why there’s so much excitement about this technology in general is it’s proving interesting and capable and valuable across a ton of different tasks. And to me that speaks to the fact that there is not one killer app,” O’Donnell says.

Assessing Organizational Needs

In addition to the availability of local AI features from their enterprise software providers, organizations must also consider the varying needs of their users, the costs associated



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“AI is a top three priority in terms of both research and deployment, where funding is coming from. Anything that fits the objective of the AI strategy is going to be in play,” says Creative Strategies’ Bajarin.

with cloud versus local processing, and the timing of the expected return on investment for AI PCs.

Not every user has the same AI needs. So analysts recommend organizations talk to users and consider the differing requirements of different personas to determine who will gain the most from AI PC functionality, especially early on, to establish which users should receive new devices first. Talk to stakeholders, including executives, IT management, and potential users, about how they envision using AI and what they could achieve if they had local AI capabilities, says Earley. HP’s analysis of its own user base breaks down into four personas: model leaders—multitaskers who are highly mobile, tech savvy, and desire portability and social connection—knowledge workers, frontline workers, and technical experts. Each persona is associated with different levels of urgency and use cases for AI PCs.

Another step is indexing the organization’s data, adds Bajarin—how much is there, how much is structured and unstructured, and how that will change over time. That indexation will determine what size models are needed and where it makes the most sense to run them. “Establish a point of view of what AI is going to mean to your organization and have a tip-of-the-spear mentality, finding where the productivity boosts are going to be and where your priorities are for productivity and improvement,” he advises.

When considering the comparative costs of AI computations, Sanmartin recommends looking at cloud costs; compute costs; charges associated with using cloud-based GPUs, CPUs, and other resources; data transfer costs; storage costs; and licensing fees. For local AI, she advises considering initial costs for a hyper-formatted AI PC equipped with specialized processors, maintenance and upgrade costs, and energy consumption.

“When you start to look at those different factors, you can build some financial projections,” helping drive decision making on the acquisition and rollout plan that will best support the organization’s larger goals, says Earley.

Bottom line, IT organizations know that AI PCs will eventually become the default. But forging an optimal path to migration toward a fully AI-enabled PC fleet is dependent

on a host of factors that makes the right formula different for each organization.

“One thing that we’ve heard from organizations is that while even if they’re not fully aligned on what all of the AI PC features mean, they want to future-proof their fleet,” says Bajarin. “They don’t want to get stuck in a situation where this plays out very favorably and they don’t have the right units.”

Embracing the AI PC Opportunity

AI PCs represent an important milestone in the nascent AI era, promising key benefits in performance, productivity, cost efficiency, privacy, data security, sustainable energy use, and manageability. The ability to run AI locally opens up a rich new frontier in the rapid evolution of AI in the enterprise, and that has the attention of boardrooms.

“AI is a top three priority in terms of both research and deployment, where funding is coming from,” says Bajarin. “Anything that fits the objective of the AI strategy is going to be in play.”

An aging PC fleet and the sunset of Windows 10 support are also driving factors supporting investment in AI PCs. But because these are still early days for both AI-enabled enterprise software and the AI-enabled PC, organizations are faced with the need to make refresh investments without a full picture of their fast-evolving AI requirements and the comparative value of local and cloud AI computation.

To fill the gap, analysts recommend organizations gather everything they do know, from the state of their current fleet to the anticipated use cases and user needs of their employees to the AI roadmaps of their hardware/software partners and overall organizational goals. Still, in addition to the hard-numbers business of assessing value and projecting ROI, decision makers have to consider the bigger picture and how they can leverage AI PCs to set up their organizations to succeed in the next wave of innovation.

“I think AI PCs are a great thing for the enterprise,” says O’Donnell. “They’re opening up a big vista of opportunities. We’re not sure exactly what all of them are, but it seems clear enough to be able to say this is going to be a big deal.”

Endnotes

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