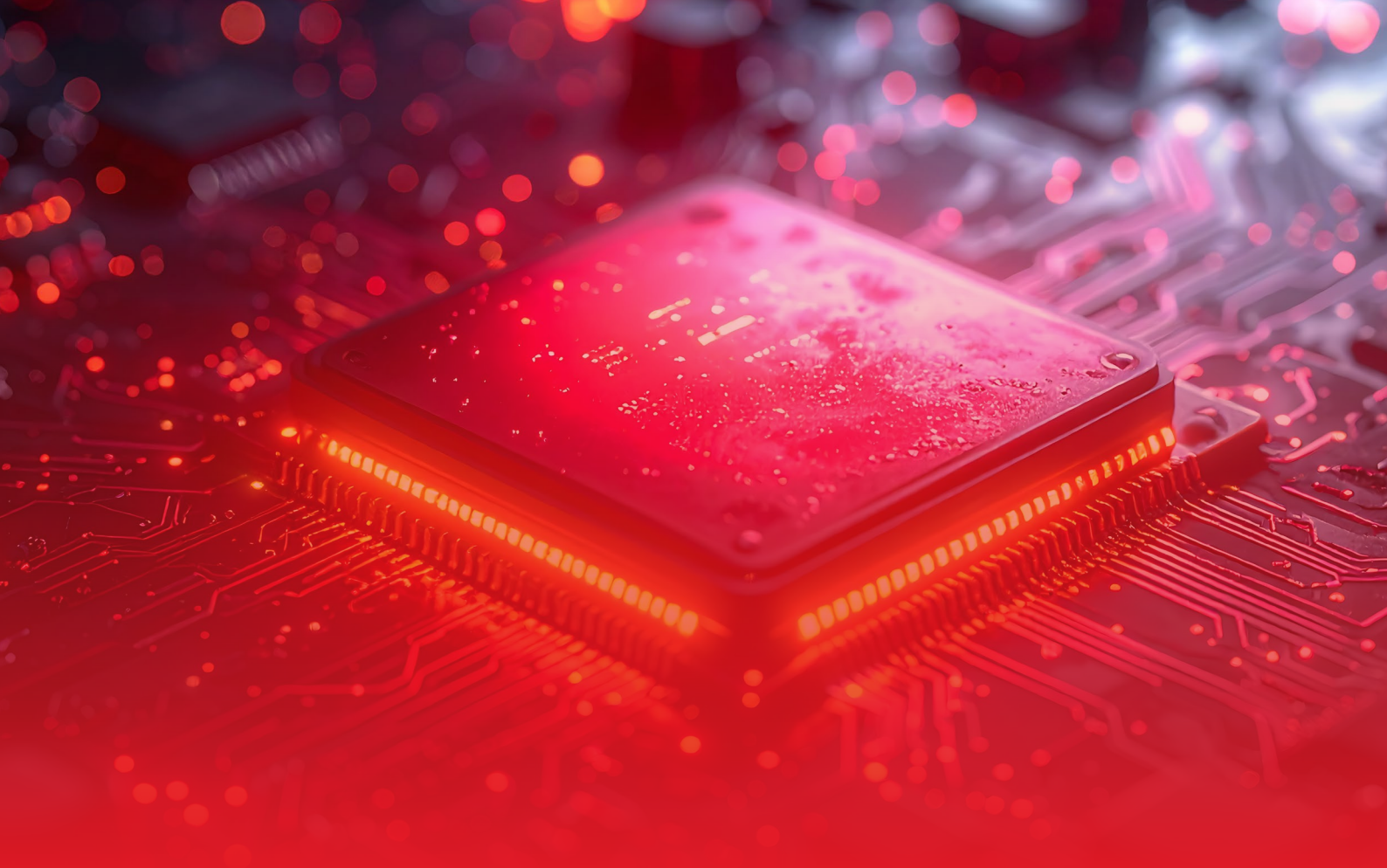


SNAPSHOT INSIGHT

The Snapdragon X Series reality check

What tech pros actually believe - and why some myths need debunking

situation publishing. | Snapdragon

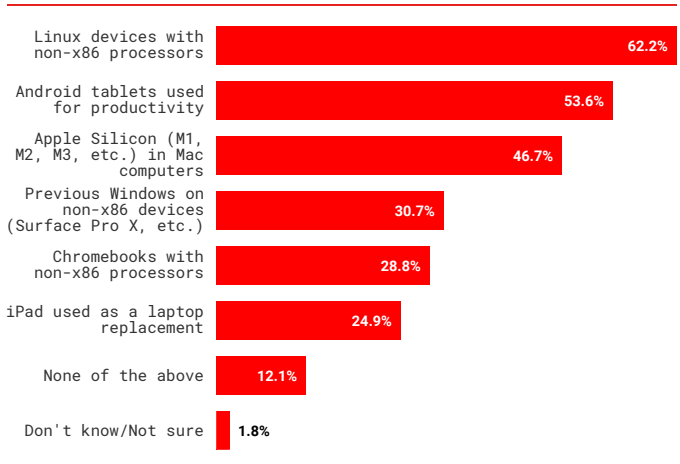
The Snapdragon® X Series processor family arrived in 2024 with a vision: genuine PC-class performance from a non-x86 architecture, combined with battery efficiency that's eluded traditional laptop chips for years.

The lineup spans from the flagship Snapdragon X Elite down through Snapdragon X Plus variants to the base Snapdragon X model, all built around the custom Qualcomm Oryon™ CPU architecture, purpose-designed for the demands of Windows computing rather than adapted from mobile chips.

While breaking x86's stranglehold on the PC market is an exciting proposition for many people, it represents a departure from the norm. Windows on non-x86 processors remains unfamiliar territory. Apple's M-series transition proved the concept could work, but that happened in a different ecosystem with different rules. The Windows world has decades of x86 baggage, along with memories of earlier attempts like Windows RT. So when a new non-x86 option appears for Windows laptops, skepticism comes pre-installed.

We surveyed 1,090 Register readers to measure their perceptions of non-x86 processors. They're a savvy bunch, averaging 4.6 out of five in technical expertise, with 92 percent rating themselves as advanced or very technical users. Still, their answers revealed a wide gap between perception and the current reality of PCs using Snapdragon X Series processors.

Which non-x86 architectures have you used in computing devices before?



Part of this perception gap stems from simple unfamiliarity. While nearly half (46.7 percent) had experience with Apple Silicon Macs, only around 30 percent of respondents had used previous Windows on non-x86 devices, with which they might have had varying degrees of success. The rest were evaluating based on experience with other devices ranging from tablets to Chromebooks, or for almost one in eight people, with no experience of non-x86 processors at all.

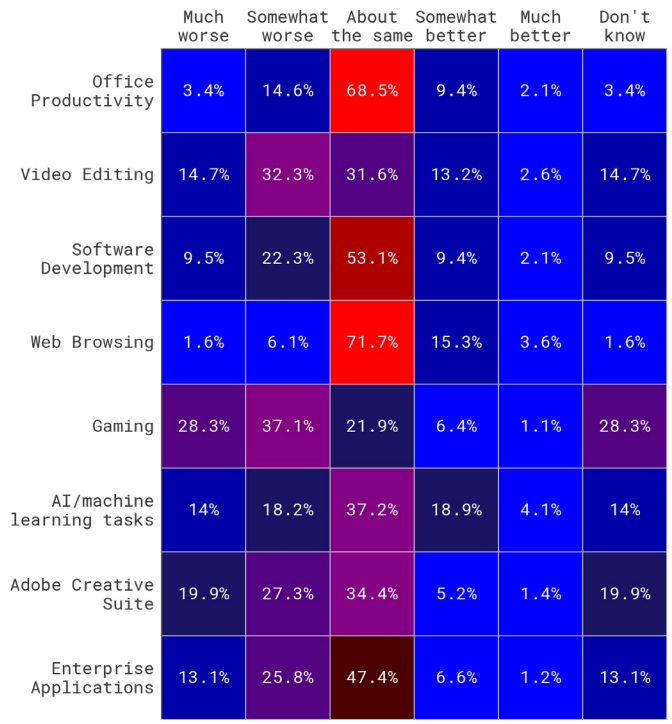
The survey data suggests there are myths worth addressing, even among those who should know better. "Things are different now," says Upendra Kulkarni, VP, Product Management (Compute Software) at Qualcomm Technologies, Inc.

But how are they different, and what historical misconceptions is the Snapdragon X Series team trying to overcome? Let's look at what the technically sophisticated crowd gets wrong about Snapdragon X Series processors, and what the reality looks like when you dig past the assumptions.

What's driving the push to migrate

When it came to performance, Register readers expected mediocrity across the board. We asked how various tasks would perform on PCs using Snapdragon X Series processors compared to traditional x86 machines, and the results showed deep skepticism about everything from office productivity to gaming and software development. Only AI/ML tasks, web browsing, and video editing got any benefit of the doubt, and even those expectations were modest.

How do you expect these tasks to perform on a non-x86 PC (like devices powered by Snapdragon X Series processor) compared to traditional x86 PC?



Enterprise workloads faced particular skepticism. That's a problem, because office productivity and enterprise applications are precisely where these processors shine in business deployments.

This reflects outdated perceptions that non-x86 architectures target mobile devices only. While it's true that the Snapdragon X Series comes from a rich heritage of power-sipping processors, its target market is not smartphones.

"The chips were derived from the phone and tablet segment, which is lower in wattage with a lower physical form factor. It offered great performance for that segment, but low performance compared to a PC," Kulkarni says.

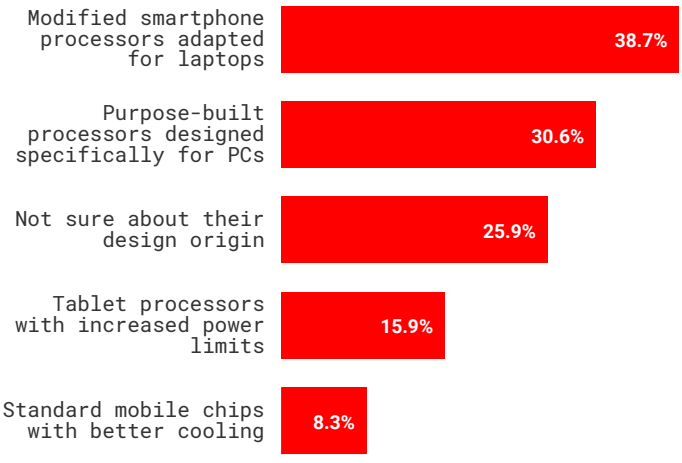
These perceptions don't show much awareness of the Qualcomm Oryon CPU architecture that powers the Snapdragon X Series. But here's what's actually under the hood: a 12-core CPU complex where each core has its own cache hierarchy for fast memory access, instruction-level parallelism that enables concurrent multi-threaded execution, and micro-architectural techniques designed to maximize work per clock cycle while minimizing empty clocks.

The real story comes out in the usage data, which shows that 93 percent of actual time spent on Copilot+ PCs using Snapdragon X Series processors happens in natively-running Windows apps..

A purpose-built processor

Concerns over performance likely stem from misconceptions over what Snapdragon X Series processors are actually for. When asked about the origins of the processor family, 38.7 percent of respondents believed it was a modified smartphone processor range adapted for laptops. Another 25.9 percent admitted they weren't sure about the design origin, while 15.9 percent thought they were tablet processors with increased power limits. Only 30.6 percent got it right, labeling the Snapdragon X Series as purpose-built processors designed specifically for PCs.

How do you expect these tasks to perform on a non-x86 PC (like devices powered by Snapdragon X Series processor) compared to traditional x86 PC?



"That's clear data showing respondents think these processors are phone or tablet-based chips," laments Kulkarni. The perception makes sense given the history of Windows on non-x86 processors. Earlier implementations did use chips derived from phone and tablet lines, which came in at the lower end of the performance spectrum. Those facts created lasting impressions, but the industry has moved on.

In reality, the Snapdragon X Series isn't a smartphone chip pulling double duty. It's a ground-up design built for both single-threaded and multi-core PC workloads from the start.

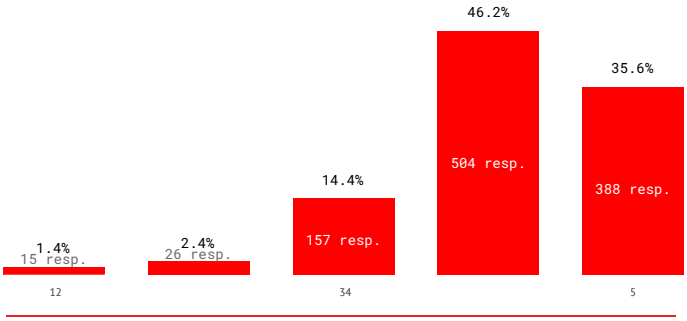
That doesn't mean the design team didn't learn something from mobile processors as they engineered something to push PC-focused chip design forward, though. Aside from its power-saving architecture, it also inherits AI/NPU matrix multiplication architectures built on 20+ years of development. But the team designed everything from CPU performance through to cache hierarchies and thermal envelopes for PC requirements.

"We've seen what you can do when you purpose build a processor for a segment, and that's exactly what's happening here with the Snapdragon X Elite," says Kulkarni. "It is not a souped-up version from a different business."

Beyond the video playback myth

Perhaps with this misconception in mind, survey respondents were positive about a feature in the Snapdragon X Series that you'll typically find in smartphone processors: battery life. Expectations here were high, averaging 4.1 out of 5. More than 81 percent expected somewhat or much better battery life than x86 processors. That optimism stems from the phone-centric chips that most people know Qualcomm Technologies for, which delivered strong battery numbers but at the cost of performance.

How would you rate the expected battery life of a laptop powered by Snapdragon compared to a traditional x86 laptop?



"That is the perception we need to change," says Kulkarni. "The new Snapdragon chips are both fast and power efficient."

That shift in perception also calls for an understanding of how the x86-based PC industry has gamed battery life metrics for years. Most vendors cite local video playback numbers, which sounds impressive until you understand what's really happening. Local video playback only taxes the codec engine and display, Kulkarni says, while the multi-core CPU complex sits idle. It's a convenient test case that doesn't tell the whole story when it comes to real workloads.

Real-world metrics tell a different story than video playback tests. Users of Windows PCs that run on the Snapdragon X Series can expect over twice the battery life on Teams calls, 58 percent longer for web browsing, and 40 percent longer for Office 365 apps . These are the workloads people actually use.

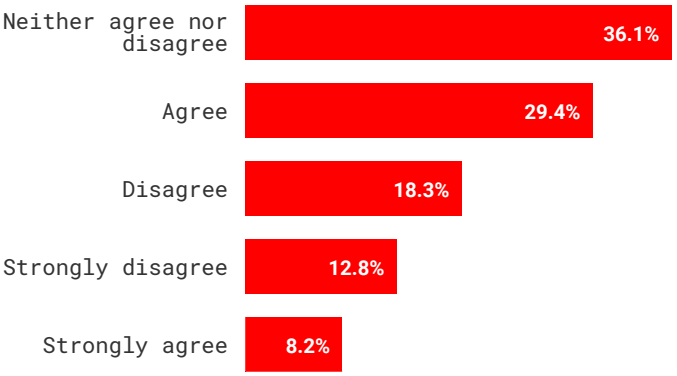
"This extra long battery life is a fantastic benefit that was retained from the phone line while we also fixed the performance," Kulkarni notes.

Processor architecture also makes a big difference. Traditional laptop chip designers think in watts, whereas the Snapdragon X Series designers used their experience in mobile processing to think in microwatts and milliwatts. That affects how the power distributes around the chip based on workload, managed by sensors that understand what's actually running.

The native app revolution

Application compatibility worries run deep among our survey base. Only 37.6 percent of respondents agreed or strongly agreed that their daily Windows apps would run properly on PCs using Snapdragon X Series processors. Another 31 percent disagreed, while 36 percent sat on the fence. That's a lot of skepticism about whether apps will actually work.

How much do you agree with this statement: "Most Windows applications I use daily would run properly on a PC powered by Snapdragon"



The usage data tells a different story though. The fact that 93 percent of app time using Snapdragon X Series processors happens in native Windows apps proves the ecosystem's compatibility with popular applications, as does the fact that 99 percent of the top 200 enterprise applications run on these processors.

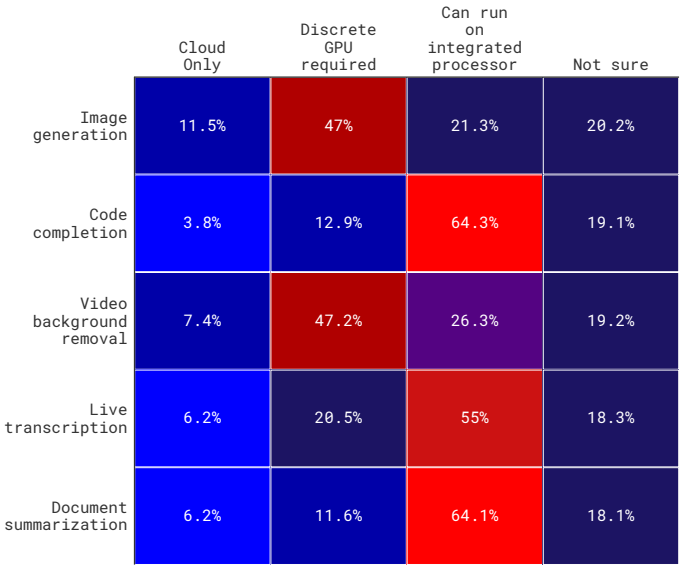
Native compilation for non-x86 architecture is now arguably the norm for Windows-based application vendors. Over 1,000 applications now run natively compiled for non-x86 processors, including the entire Microsoft Office suite, Adobe Premiere Pro, DaVinci Resolve, Chrome, Firefox, Teams, and Zoom.

Microsoft's PRISM emulation supports everything else. This technology performs better than you'd expect. In many cases, emulated code runs faster on Snapdragon X Series than native x86 code runs on traditional processors, says Kulkarni. That's not sleight of hand; it's what happens when you have enough raw performance headroom.

On-device AI: breaking free from cloud and GPU dependence

The survey asked where AI tasks must be processed for good performance, whether in the cloud only, on a discrete GPU, or on an integrated processor. The responses revealed uncertainty about what integrated processors can actually handle. In truth, things have come a long way. Image generation, code development, video background removal, live transcription, and document summarization all run on the integrated 45 TOPS NPU without needing cloud connectivity or discrete GPUs.

For each AI task below, indicate where you believe it MUST be processed for good performance:



Three years ago, this wasn't possible. Any AI workload on a PC either ran on a power-hungry discrete GPU or got sent to the cloud. The 45 TOPS NPU changed the equation with a mixture of dedicated circuitry for AI and quantized models. Now there's a shift happening from GPU to NPU for AI processing, says Kulkarni, who tells us that NPUs deliver between two to three times better performance per watt than GPUs for the same AI tasks.

Real applications are already using these integrated capabilities. DaVinci Resolve and Premiere Pro use NPU-accelerated AI for video editing tasks including object selection, background replacement, and image creation. Zoom handles background replacement and eye tracking locally on PCs powered by Snapdragon X Series, while Visual Studio generates code using the NPU. And live captioning runs entirely on-device too.

"To run AI workloads from here on, needing a GPU or needing a cloud is not necessary for the right size of workloads," he explains. General-purpose foundational models using parameters in the hundreds of billions still need cloud infrastructure, but the models that excel at discrete tasks run locally now.

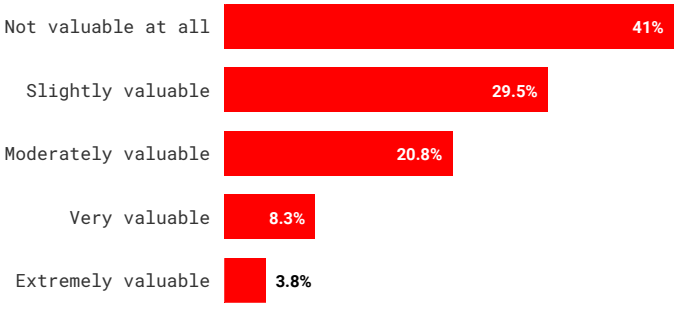
The benefits of integrated AI capabilities stack up quickly compared to cloud AI. Users can enjoy latency-free performance with no ongoing subscription costs, and data stays local.

And unlike discrete GPUs, these integrated system-on-chip configurations run AI without draining the battery.

The 5G disconnect

Seventy percent of respondents see minimal value in built-in 5G connectivity for their next laptop. 41% deem it entirely worthless. That perception gap reveals how PC users still think about connectivity differently than they do with their phones.

How valuable would built-in 5G connectivity be in your next laptop purchase?



"Today, we humans interact most with two devices: a phone and a PC," says Upendra Kulkarni, VP, Product Management (Compute Software) at Qualcomm Technologies, Inc. "Your phone's always connected. Your PC? Only when there's Wi-Fi."

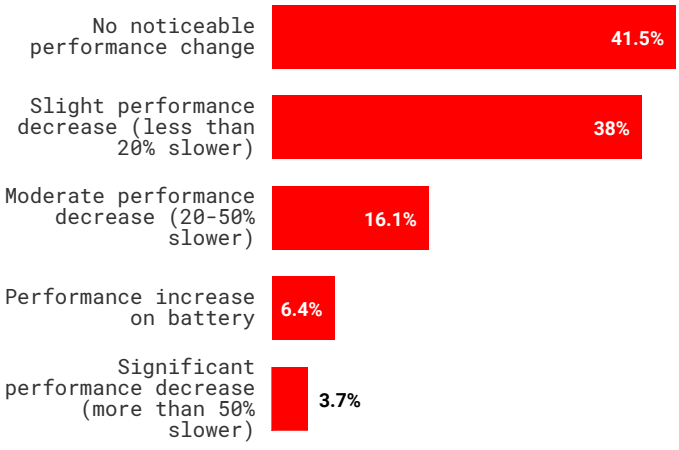
The real-world gap is starker than most realize. With 5G, try comparing your phone's cellular speed against airport or Starbucks Wi-Fi. The difference is dramatic. For enterprise users in oil fields or large factories, cellular connectivity means PCs work anywhere there's cell coverage, with no hunting for Wi-Fi zones.

The shift hasn't happened yet because we're still psychologically tethered to Wi-Fi hotspots. But for mobile workers, that limitation is already looking like yesterday's bug, while 5G is today's feature.

Consistency that x86 can't match

Respondents to our survey had a realistic view of performance consistency, with 41.5 percent expecting no noticeable performance change when running on battery power, while 38 percent anticipated only a slight decrease under 20 percent. Combined, nearly 80 percent expected the same performance or minimal performance loss when unplugging a PC with Snapdragon X Series processors under the hood.

When a laptop runs on battery power (unplugged), what performance change do you expect from a PC powered by Snapdragon?



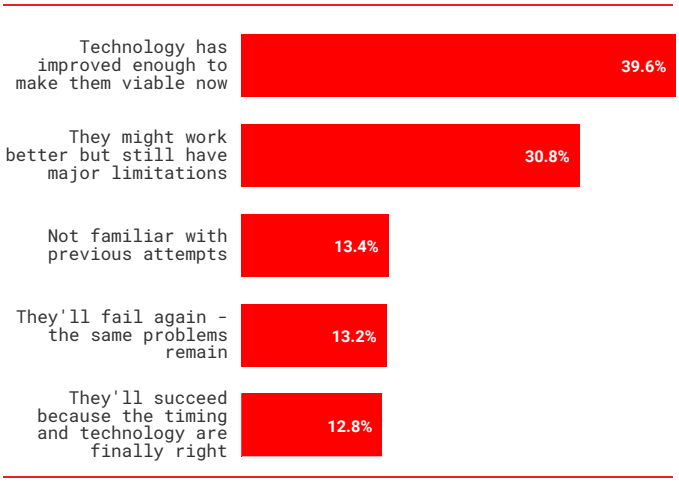
Snapdragon X Series processors deliver on those expectations, but x86 laptops? Not so much. That's fundamental to how those processors manage power, capping performance to preserve battery life and throttling down the CPU when mains power stops. Benchmarks show the pattern clearly: Intel Core Ultra drops to 47-54 percent of plugged-in performance across single-core and multi-core workloads .

Snapdragon X Series processors maintain maximum performance when unplugged because of that microwatt-level power architecture. You unplug from AC and keep working at peak speed for the duration of the battery charge. For the 35 million U.S. employees working remotely , unplugged performance directly affects productivity. Keeping battery performance stable means no hunting for outlets during meetings, and no performance anxiety when the battery icon turns yellow. "No compromise on battery life, no compromise on performance," is how Kulkarni summarizes it. This is what makes Windows on Snapdragon architecture different.

Why this time is different

There's no doubt that the ghost of Windows RT still lingers. When asked about whether current PCs powered by Snapdragon X Series might succeed or fail, 30.8 percent believed they might work better but would still carry major limitations, while 13.2 percent expected outright failure.

Non-x86 Windows PCs have been tried before. What best describes your view on why current Snapdragon X Series PCs might succeed or fail?



"Some of these myths are now myths, but they were facts once," Kulkarni says, acknowledging that Windows RT and early low-end chips derived from phone lines could have done a better job running PC-class workloads. "We had to erase that technical debt," he adds.

Three things changed fundamentally. First, design teams created purpose-built silicon instead of adapted mobile chips. Second, the ecosystem matured, with Microsoft's PRISM emulation increasing in performance and software vendors (perhaps buoyed by Apple's market muscle) flocking to support non-x86 architectures natively.

Third came the AI inflection point. The 45 TOPS NPU addresses the shift toward on-device AI that x86 vendors are now scrambling to match.

Kulkarni is hopeful. After all, 39.6 percent thought technology has improved enough to make them viable now, while a little over one in eight people were completely confident that timing and technology have finally aligned. Perhaps the tide is finally turning, if not yet surging.

"This is truly a new class of device," he concludes. "This is no more the old non-x86 architecture PC. This is now a purpose built device that is addressing all of the challenges of this segment."

[i] *Provided by Qualcomm. Based on aggregated app usage data from Copilot+ PCs in US, UK, CA, FR, AU, DE, JP as of August 2024.

[ii] https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/Reduce-IT-Costs.pdf

[iii] Provided by Qualcomm. Based on aggregated app usage data from Copilot+ PCs in US, UK, CA, FR, AU, DE, JP as of August 2024.

[iv] https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/Unplugged-Performance-The-Truth-About-Battery-Life.pdf

[v] https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/Unplugged-Performance-The-Truth-About-Battery-Life.pdf

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