

# The Netbook Effect

Dinky keyboard. Slow chip. Tiny hard drive. And users are going crazy for them. How cheap little laptops hit the big time.

BY CLIVE THOMPSON

## Top 5 laptop makers:

1. Hewlett-Packard
2. Acer
3. Dell
4. Toshiba
5. Asustek

## Top 5 netbook makers:

1. Asustek
2. Acer
3. Hewlett-Packard
4. OLPC
5. Dell

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ARY LOU JEPSEN didn't set out to invent the netbook and turn the computer industry upside down. She was just trying to create a supercheap laptop. In 2005, Jepsen, a pioneering LCD screen designer, was tapped to lead the development of the machine that would become known as One Laptop per Child. Nicholas Negroponte, the longtime MIT Media Lab visionary, launched the project hoping to create an inexpensive computer for children in developing countries. It would have Wi-Fi, a color screen, and a full keyboard—and sell for about \$100. At that price, third-world

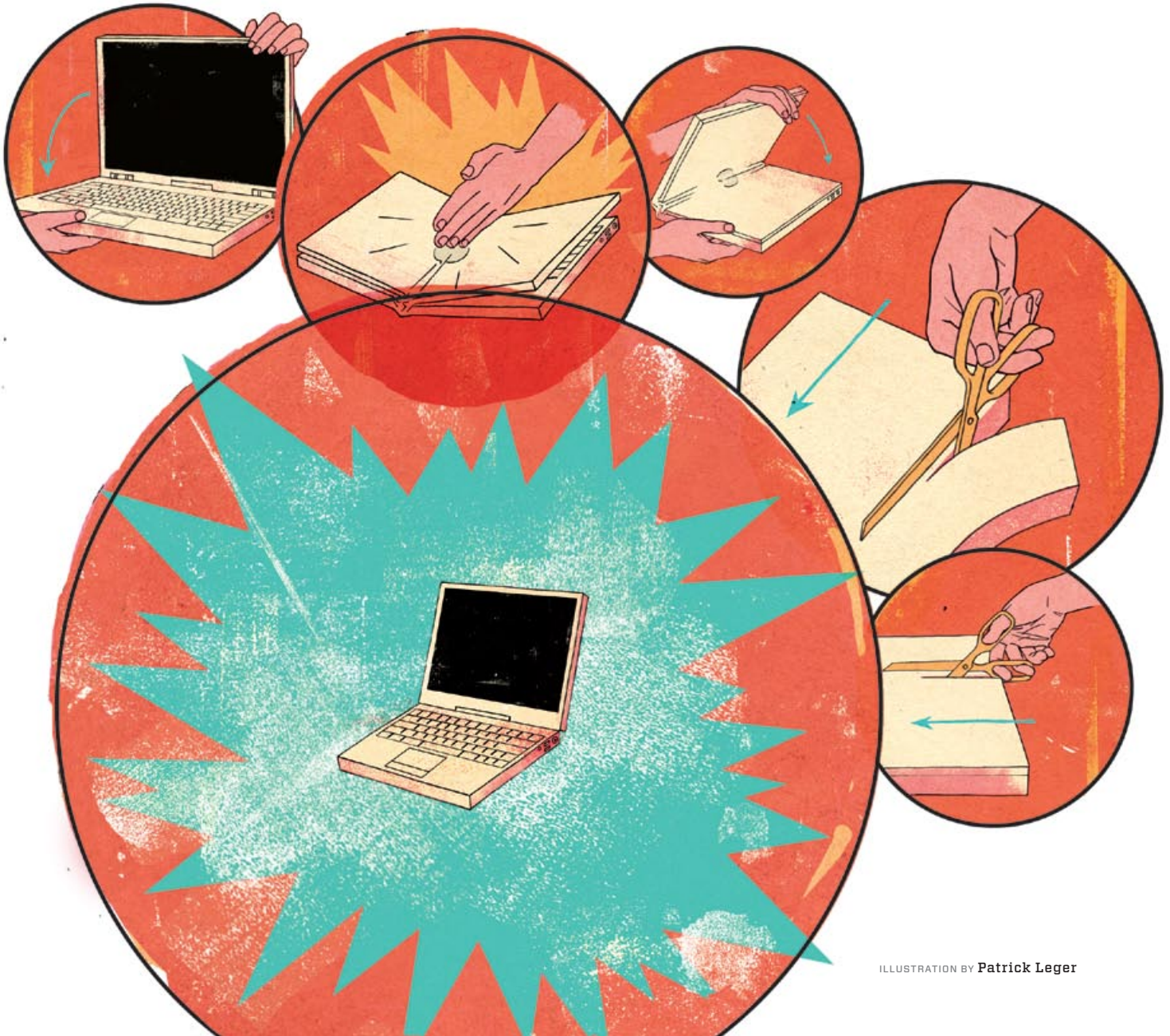


ILLUSTRATION BY Patrick Leger



## Spec Shot: Laptop vs. Netbook

Many netbooks trade the speedy onboard processors and roomy hard drives of a full-size laptop for online apps and small—but fast—solid state drives. The result? A formidable machine at a third of the price.

Lenovo ThinkPad T500 Laptop		Dell Inspiron Mini 9 Netbook
Intel Core 2 Duo P8400 2.26 GHz	<b>Processor</b>	Intel Atom N270 Single Core 1.6 GHz
Microsoft Windows Vista Home	<b>Operating System</b>	Ubuntu Linux 8.04
1 GB	<b>System Memory</b>	512 MB
80-GB hard drive	<b>Storage</b>	4-GB solid state drive
15.4 inches, 1280 x 800 pixels	<b>Screen Size</b>	8.9 inches, 1024 x 600 pixels
802.11b/g	<b>Wireless Access</b>	802.11b/g
\$959	<b>Price</b>	\$299

governments could buy millions and hand them out freely in rural villages. Plus, it had to be small, incredibly rugged, and able to run on minimal power. “Half of the world’s children have no regular access to electricity,” Jepsen points out.

The miserly constraints spurred her to be fiendishly resourceful. Instead of using a spinning hard drive she chose flash memory—the type in your USB thumb drive—because it draws very little juice and doesn’t break when dropped. For software she picked Linux and other free, open source packages instead of paying for Microsoft’s wares. She used an AMD Geode processor, which isn’t very fast but requires less than a watt of power. And as the pièce de résistance, she devised an ingenious LCD panel that detects whether onscreen images are static (like when you’re reading a document) and tells the main processor to shut down, saving precious electricity.

To build the laptop, dubbed the XO-1, One Laptop per Child hired the Taiwanese firm Quanta. It’s hardly a household name, but Quanta is the largest laptop manufacturer in the world. Odds are that parts of the machine on your desk, whether it’s from Apple, Dell, or Hewlett-Packard, were made by Quanta—possibly even designed by Quanta. Like most Taiwanese computer makers, it employs some of the sharpest engineers on the planet. They solved many of Jepsen’s most daunting engineering challenges, and by 2007, the OLPC was shaping up. The poor kids of the world would have their notebook—if not quite for \$100, for not a whole lot more.

Inspired (or perhaps a bit scared) by the OLPC project, Asustek—Quanta’s archrival in Taiwan and the world’s seventh-largest notebook maker—began crafting its own inexpensive, low-performance computer. It, too, would be built cheaply using Linux, flash memory, and a tiny 7-inch screen. It

had no DVD drive and wasn’t potent enough to run programs like Photoshop. Indeed, Asustek intended it mainly just for checking email and surfing the Web. Their customers, they figured, would be children, seniors, and the emerging middle class in India or China who can’t afford a full \$1,000 laptop.

What happened was something entirely different. When Asustek launched the Eee PC in fall 2007, it sold out the entire 350,000-unit inventory in a few months. Eee PCs weren’t bought by people in poor countries but by middle-class consumers in western Europe and the US, people who wanted a second laptop to carry in a handbag for peeking at YouTube or Facebook wherever they were. Soon the major PC brands—Dell, HP, Lenovo—were scrambling to catch up; by fall 2008, nearly every US computer maker had rushed a teensy \$400 netbook to market.

All of which is, when you think about it, incredibly weird. Netbooks violate all the laws of the computer hardware business. Traditionally, development trickles down from the high end to the mass market. PC makers target early adopters with new, ultra-powerful features. Years later, those innovations spread to lower-end models.

But Jepsen’s design trickled up. In the process of creating a laptop to satisfy the needs of poor people, she revealed something about traditional PC users. They didn’t want more out of a laptop—they wanted less.

By the end of 2008, Asustek had sold 5 million netbooks, and other brands together had sold 10 million. (Europe in particular has gone mad for netbooks; sales there are eight times higher than in the US.) In a single year, netbooks had become 7 percent of the world’s entire laptop market. Next year it will be 12 percent.

“We started inventing technology for the bottom of the pyramid,” Jepsen says, “but

the top of the pyramid wants it too.” This bit of trickle-up innovation, this netbook, might well reshape the computer industry—if it doesn’t kill it first.



I WROTE THIS STORY on a netbook, and if you had peeked over my shoulder, you would have seen precisely two icons on my desktop: the Firefox browser and a trash can. Nothing else.

It turns out that about 95 percent of what I do on a computer can now be accomplished through a browser. I use it for updating Twitter and Facebook and for blogging. Meebo.com lets me log into several instant-messaging accounts simultaneously. Last.fm gives me tunes, and webmail does the email. I use Google Docs for word processing, and if I need to record video, I can do it directly from webcam to YouTube. Come to think of it, because none

of my documents reside on the netbook, I’m not sure I even need the trash can.

Netbooks have ended the performance wars. It used to be that when you went to an electronics store to buy a computer, you picked the most powerful one you could afford. Because, who knew? Maybe someday you’d need to play a cutting-edge videogame or edit your masterpiece indie flick. For 15 years, the PC industry obliged our what-if paranoia by pushing performance. Intel and AMD tossed out blisteringly fast chips, hard drives went on a terabyte gallop, RAM exploded, and high-end graphics cards let you play Blu-ray movies on your sprawling 17-inch laptop screen. That dream machine could do almost anything.

But here’s the catch: Most of the time, we do almost *nothing*. Our most common tasks—email, Web surfing, watching streamed videos—require very little processing power. Only a few people, like graphic designers and hardcore gamers, actually need heavy-duty

hardware. For years now, without anyone really noticing, the PC industry has functioned like a car company selling SUVs: It pushed absurdly powerful machines because the profit margins were high, while customers lapped up the fantasy that they could go off-roading, even though they never did. So coders took advantage of that surplus power to write ever-bulkier applications and operating systems.

What netbook makers have done, in effect, is turn back the clock: Their machines perform the way laptops did four years ago. And it turns out that four years ago (more or less) is plenty. “Regular computers are so fast, you really can’t tell the difference between 1.6 giga and 2 giga,” says Andy Tung, vice president of US sales for MSI, the Taiwanese maker of the Wind netbook. “We can tell the difference between one second and two seconds, but not between 0.0001 and 0.0002 second.” For most of today’s computing tasks, the biggest performance

# NETBOOKS PROVE THAT WE FINALLY KNOW WHAT PCs ARE ACTUALLY FOR. WHICH IS TO SAY, NOT ALL THAT MUCH.

drags aren't inside the machine. They're outside. Is your Wi-Fi signal strong? Is Twitter down again?

Netbooks are evidence that we now know *what personal computers are for*. Which is to say, a pretty small list of things that are conducted almost entirely online. This was Asustek's epiphany. It got laptop prices under \$300 by crafting a device that makes absolutely no sense when it's not online. Consider: The Eee's original flash drive was only 4 gigs. That's so small you need to host all your pictures, videos, and files online—and install minimal native software—because there's simply no room inside your machine.

Netbooks prove that the "cloud" is no longer just hype. It is now reasonable to design computers that outsource the difficult work somewhere else. The cloud tail is wagging the hardware dog.

**MOST CONSUMERS HAVE** never heard of Taiwan's quiet, unheralded PC firms, but they've been behind some of the most important hardware of the past three decades. Quanta first gained notice in the '80s for cleverly cramming new components into notebooks. Then, in 2001, Apple contracted

with the company to design its G4 notebook from top to bottom. The product was a spectacular success, and Quanta was soon doing engineering for every other major PC maker. Asustek and MSI, the two other giants of the Taiwanese laptop world, also branched out from motherboards into everything from LCD TVs to mobile phones. These companies are enormous: Quanta had sales of \$25 billion last year, more than marquee firms like Amazon.com, Texas Instruments, and Electronic Arts.

Even though the Taiwanese manufacturers remained subservient to the well-known PC brands, they soaked up tons of knowledge over the years. For instance, when Intel created its x486 chip in 1988, Asustek built a compatible motherboard before Intel could make its own board work. Later, Asustek was producing components for Apple laptops. "Nine times out of 10," recalls John Jacobs, a former Apple manager who now

covers the LCD market as an analyst for DisplaySearch, “when we said ‘Jump,’ they said ‘How high?’ That’s how Asustek learned a lot.”

But for all their success, companies like Asustek and MSI were outsiders. And when Asustek released the Eee netbook, big firms like Dell, HP, and Apple did nothing for months. “All the other brands were thinking, ‘Oh, this is crap,’” recalls Lillian Lin, Asustek’s global marketing director.

Dell and HP weren’t going to pioneer a \$400 laptop, because they were already selling laptops for \$1,000. Why mess with a good thing? MSI had no laptop business at all, and Asustek had only a small business selling full-price machines under its own brand, mostly in Asia and Europe. Since the Taiwanese weren’t addicted to selling SUV-class computers, they could swoop in like Honda with smaller, more efficient models. They also knew how to design on the cheap

## THE TAIWANESE LAPTOP BUILDERS NOW HAVE THE ATOM-HACKING SMARTS THAT ONCE DEFINED AMERICA.

after years of producing motherboards with excruciatingly tiny margins.

In *The Innovator’s Dilemma*, Clayton Christensen famously argued that true breakthroughs almost always come from upstarts, since profitable firms rarely want to upend their business models. “Netbooks are a classic Christensenian disruptive innovation for the PC industry,” says Willy Shih, a Harvard Business School professor who has studied both Quanta’s work on the One Laptop per Child project and Asustek’s development of the netbook.

The Taiwanese firms, Shih argues, now have enormous clout in the PC industry. In

the US, we regard branding and marketing—convincing people what to buy—as core business functions. What Asustek proved is that the companies with real leverage are the ones that actually *make* desirable products. The Taiwanese laptop builders possess the atom-hacking smarts that once defined America but which have atrophied here along with our industrial base. As far as laptop manufacturing goes, Taiwan essentially now owns the market; the devices aren’t produced in significant volumes anywhere else.

If you had asked Taiwanese hardware CEOs a few years ago about their relationship with Dell, HP, and Apple, they’d have

told you that the American companies did the branding and sales while outsourcing their design and production to Taiwan. Today the view from Asia is increasingly the reverse. “When I talk to them now,” Shih laughs, “they say, ‘We outsource our branding and sales to *them*.’”

“BUT WHAT ABOUT Photoshop?” It’s the standard retort from those who dismiss netbooks as children’s toys. Sure, a dinky 1.6-GHz chip and Linux are fine for email and silly things like YouTube. But what about when you need to do some *real* computing, like sophisticated photo editing? The cloud won’t help you there, kid.

In the narrowest sense, this is true: A really powerful application like Adobe Photoshop demands a much faster processor. But consider my experience: This spring, after my regular Windows XP laptop began

crashing twice a day, I reformatted the hard drive. As I went about reinstalling my software, I couldn’t find my Photoshop disc. I forgot about it—until a week later, when I was blogging and needed to tweak a photo. Frustrated, I went online and discovered FotoFlexer, one of several free Web-based editing tools. I uploaded my picture, and in about one minute I’d cropped it, deepened the color saturation, and sharpened it.

I haven’t used Photoshop since.

Keep in mind that I *like* Photoshop. I’m not doing this to make any geeky ideological point about how bleeding-edge I am or how much I hate paying for boxed software. It’s simply that the hassle of finding my Photoshop disc now exceeds the ease of using FotoFlexer. The code for working with the browser-based app is a mere 900 KB, and “to the average user, that comes down really fast,” as Sharam Shirazi, CEO of Arbor Labs, which created it, points out to me.

My Photoshop experience is just one

example of how the software industry is changing. It used to be that coders were forced to produce bloatware with endless features because they had to guess what customers might want to do. But if you design a piece of software that lives in the cloud, you *know* what your customers are doing—you can watch them in real time. Shirazi’s firm discovered that FotoFlexer users rarely do fancy editing; the most frequently used features are tools for drawing text and scribbles on pictures. Or consider the Writely app, which eventually became the word processor part of Google Docs: When Sam Shillace first put it online, he found to his surprise that what users wanted most was a way to let several people edit a document together.

“It used to be, ‘I’m buying a paint program, and I’ll get the one with 5,000 features. I don’t know what 2,000 of those features are, but I’ll get it just in case,’” Shillace says. “Today it’s just, ‘Which one

is most easily available? Which one is ready online?" So applications are competing on merit; they're not competing on bulk."

NETBOOKS ARE SO CHEAP, they're reshaping the fundamental economics of the PC business. Last October, British mobile-phone carrier Vodafone offered its customers a new deal: If they signed a two-year contract for high-speed wireless data, Vodafone would give them a Dell Mini 9 netbook. That isn't quite the same as getting a free computer; after all, Vodafone bills users \$1,800 on that two-year contract, so it can afford to throw in the netbook. (In December, RadioShack offered a similar deal: a \$99 Acer Aspire

dows XP this summer, driving customers to its more lucrative Vista operating system. But when Linux roared out of the gate on netbooks, Microsoft quickly backpedaled, extending XP for another two years—specifically for netbooks. Most experts guess that Redmond can charge barely \$15 for XP on a netbook, less than a quarter of what it previously sold for. (Microsoft corporate vice president Brad Brooks assures me the company is earning "good money" on the devices and plans to make sure its next OS, Windows 7, can run on netbooks—Vista performs poorly on them.) For its part, Intel is selling millions of its low-power Atom chips to netbook manufacturers. "We see this as our next billion-dollar market," says Anil Nanduri, Intel's technical marketing man-

As Shih told me, "I was talking to the chair of one of the major Taiwanese notebook manufacturers, and he said, 'This is where my next billion customers comes from.' And he was not referring to the US." He meant the BRIC countries—Brazil, Russia, India, China—where billions of very price-conscious customers have yet to buy their first computer. And the decisions they make—Windows or Linux? Microsoft wares or free cloud apps?—will have enormous influence on how computing evolves in the next few years.

Netbooks could drive production of even crazily cheaper, lighter-weight computers. "If everything you're doing is online, then the netbook becomes a screen with a radio chip. So why do you need a motherboard?" OLPC designer Mary Lou Jepsen says. "Especially if you want the batteries to last. Why not just make it a screen and a really cheap \$2 to \$5 radio chip?" The cloud is also probably going to get powerful in ways that now seem like fantasy. AMD is working on an experimental 3-D graphics server farm that would run high-end video-games, squirting a stream out to portable devices so you could play even

## YOU CAN'T CHARGE MUCH FOR HARDWARE ANYMORE. BUT PEOPLE WILL FORK OUT FOR THE ABILITY TO COMMUNICATE.

netbook for anyone who signed up for two years of AT&T's 3G service.)

What these deals signal is that computers are developing the same economics as mobile phones. Hardware is becoming a commodity. It's difficult to charge for. What's really valuable—what people will pay through the nose for—is the ability to communicate.

So netbooks have sent a sort of hot-cold shudder through the computer industry. Sure, it's great to have an exploding new product category. But this is a category in which it's incredibly hard to make a dime: At \$300, a netbook sells for barely more than the sum of its parts—and sometimes less. "The profit margins on these things are nonexistent," chuckles Paul Goldenberg, managing director of Digital Gadgets, which created a line of netbooks under the Sylvania brand. "Everyone is saying 'We're losing money now, but we'll make it up on volume, right?'"

Nearly every company in the PC industry has had its game plan uprooted by netbooks. Microsoft had intended to stop selling Win-

ager—except that the company makes only a fraction of the money on an Atom chip as on a more powerful Celeron or Pentium in a full-size laptop.

The great terror in the PC industry is that it's created a \$300 device so good, most people will simply no longer feel a need to shell out \$1,000 for a portable computer. They pray that netbooks remain a "secondary buy"—the little mobile thingy you get after you already own a normal-size laptop. But it's also possible that the next time you're replacing an aging laptop, you'll walk into the store and wonder, "Why exactly am I paying so much for a machine that I use for nothing but email and the Web?" And Microsoft and Intel and Dell and HP and Lenovo will die a little bit inside that day.

The decision is probably out of American hands. Indeed, living in the US—where netbooks are only just taking off—it can be hard to grasp just how popular the devices have become in Europe and Asia and the degree to which they're already altering the landscape.

the most outrageously lush games without a fancy onboard processor. Patrick Moorehead, AMD's vice president of marketing, recalls that in 2007 gamers had to buy special powerful desktop machines loaded with RAM and \$600 graphics cards to play *Crysis*: "Now imagine you've got servers running *Crysis* and streaming it to an iPhone or a netbook, sending just the vectors that let you navigate the game."

Because this is the future of hardware. For a few users who need a high-performance device, PC makers will offer ever-more-blisteringly fast, water-cooled boxes with screens the size of your living room—at \$2,000 a pop. For everyone else—lawyers looking for something to do on the train, women desperate for something that fits in their handbag—netbooks will dominate. It's the rise of the very small machines. [W](#)

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