

## AN IN-DEPTH REVIEW OF THE COMPUTER INDUSTRY AND COMPUTER HARDWARE JOBS



### Industry Overview

What gets more powerful every year but is worth less and less? Easy, the computer. Processors, following Moore's law, double in speed every 18 months, while computer prices, following ever more efficient globalized manufacturing processes, deflate every retail season.

Computer hardware, as we use the term, means central processing units (CPUs), including memory and storage—in other words, the machine on which you run an operating system and application software and to which you attach peripherals (keyboards, mice, printers, etc.). Also included in our definition are the servers, electronic security, and storage devices used in the data centers of many corporations.

Computer hardware and software are useless without each other. But working together they store, modify, and exchange data: words, pictures, and numbers—everything from correspondence to news photos, from drawings of jet aircraft to shipping manifests, from news releases to financial reports, from census statistics to stock quotes, from maps to e-mail.

The competition among computer hardware companies is particularly intense. On the one hand, in the traditional-PC market, companies' products have largely become commodified, with constant downward price pressure (and narrowing profit margins) being the result. On the other hand, there are the markets for innovative new products, like tablet PCs and ultra-minimal desktops, that are not yet fully commodified. Here, the race is to develop products at breakneck speed so you can be first to market. And if a company falters, it instantly becomes a target for larger companies looking to acquire new businesses. No doubt about it: Computer hardware is a cutthroat business.

There are definite geographic concentrations in the hardware industry despite its worldwide reach. It's often noted that high-tech companies are usually located near colleges and universities, and there's a good deal of truth to that, as many companies come out of research done at such institutions. Silicon Valley is near San Jose State, the University of California at Berkeley, and Stanford University. Route 128 is near the educational mecca of Cambridge, Massachusetts. Research Triangle in North Carolina and the area around Austin, Texas, are also good examples. Still, there are other places within North America where you'll find major companies; for example, Gateway is in North Dakota.

Most major corporations in computer hardware reach across national borders. International sales normally account for a large percentage of most hardware companies' bottom lines, and India, Japan, China, and other Asian locations are hotbeds of hardware manufacture and design.

After the tech bust of the early 2000s, the demand for computers of all flavors, from servers to PCs, evaporated as companies around the world found themselves with too much computer hardware on their hands and cash-strapped consumers became reluctant to buy or upgrade PCs. However home users turned the tide in 2003–04, buying powerful new machines to handle photo, video, and other demanding applications. PC shipments were up almost 15 percent in 2004. Now businesses are expected to take up the slack as they enter the midpoint of a hardware replacement cycle.

### Outsourcing

In the hardware world, an increasing number of manufacturers are outsourcing product and component development and manufacturing overseas. Some companies are only doing top-level design in the United States, leaving production and more basic design tasks to cheaper labor in the Philippines, China, and elsewhere. What this means is that product managers and project heads may have to travel a lot more than in previous generations; it also means that many North America-based jobs are being lost. Increasingly, the task of American PC companies is to be expert in marketing and distribution while simply outsourcing manufacturing and portions of the design work—the logical extreme of this trend is IBM's sale of its PC division to Lenovo of China.

### Consolidation

Related to outsourcing and commodification, consolidation of the industry makes sense as computers become familiar products that require fewer very different design and manufacturing approaches. Let a few giant companies manufacture more units at lower cost while sharing marketing and distribution costs across a larger organization. **Hewlett-Packard** came home with Compaq for billions, and rumor has it that Gateway is a prime takeover target.

### Global Players

China may become the world's largest economy by 2030, so what could be more natural than companies from the Chinese-speaking world entering the top ranks of PC manufacturers? Taiwanese company Acer became the fifth largest PC manufacturer in 2004, the same year Chinese manufacturer Lenovo bought part of the oldest big name in computing, IBM.

### Third World Markets, First Class Profits

Looking much like a rugged version of **Apple's** Mac Mini, the Personal Internet Communicator is designed by chip maker **AMD** for the Indian market. The simplified computer, which comes bundled with Internet access, is priced to appeal to that portion of India's growing population with disposable income. The computer costs just \$230 with a monitor. In China basic PCs already cost little more.

### Linux

This cheap, open-source operating software (read: Linux code is available for free on the Web) is moving into the mainstream. Pushed by the desire to lower costs, companies of many stripes have taken a new interest in Linux instead of more expensive operating systems such as Windows or Unix. At the same time, Intel has begun optimizing its chips for Linux in addition to Windows. The result: Hardware manufacturers such as **IBM**, **Dell**, and **Hewlett-Packard** have begun optimizing their PC and server products for Linux.

### How It Breaks Down

For job seekers, one way to segment the industry is by the type of computer hardware the company makes. Other differentiating factors include industry and application focus and sales-and-distribution methodology: mail order, Internet, or retail.

### PCs (Desktop and Laptop)

The PC market is perhaps the most visible segment of the high-tech hardware market, with computers becoming more and more common at work, home, labs, and school. Established players here include Dell, Hewlett-Packard, and Apple, which make desktop and portable computers, many of which are powerful enough to replace high-end specialized workstations and to use for **3D rendering**, **molecular modeling**, **computer-aided design (CAD)**, and **video editing**. Portable computers represent a growing overall share of the personal computer market.

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### Peripherals

A peripheral is usually understood to be an external product added to a computer, such as a new mouse, speakers, or memory stick (think manufacturers like Kensington, Logitech, and KeyTronic), all the way up to monitors, scanners, and printers. However, a peripheral can also be something added into a computer, such as a 3-D video card or an internal modem.

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### Servers

There are many types of servers—those big boxes that, among other things, are the glue that holds the Internet together. In addition to Web servers, which pass back and forth all of the HTML and image files that end up on your screen, there are local area network (LAN) servers, wide area network (WAN) servers, file servers, mail servers, database servers, and more. Every time two computers (termed "clients" in this context) connect over a network, a server is involved.

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### Job Prospects

In the last few years, the job market has been tight to an almost unprecedented degree. That situation is now easing somewhat, with new job creation and movement within the industry. As always, keep your eyes open for companies that need help.

Opportunities in the computer hardware industry are not only for computer engineers, computer scientists, and others with technical skills, but also for people with financial, marketing, sales, and product management backgrounds. Job seekers with technical expertise and a computer science degree attract the most opportunities and the sweetest compensation packages, whether they work as engineers, product managers, or in marketing. Opportunities in fields such as sales, customer support, and technical writing go to individuals with good people skills, a strong customer-service bias, and the ability to communicate complex ideas in plain English, respectively. If that sounds like you, give computer hardware a close look—but be prepared to get up to speed on the technical side.

High-tech companies are generally more active and open in regard to their job openings. Their own websites are valuable resources as to vacancies, and the corporations usually maintain a high-profile recruiting presence at colleges and universities. Don't overlook internships—in addition to providing training, companies often hire from within their internee pool. Even if you're not interested in working for the megacorp that is offering a summer program, what you learn there adds to your value in the eyes of smaller companies.

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