

# Cases for Part 2

## Case 2-1

### Wi-Fi

Engineers on runways in Seattle and Frankfurt are tinkering with antennas and satellite links. This isn't the usual avionics, though. Instead, Boeing Co. is preparing a brand new business: flying cybercafés. By early next year, more than 100 Boeing jets are scheduled to be equipped with speedy wireless technology known as Wi-Fi. For \$25 or so per flight, laptop-luggers will be able to log on to the Net while soaring above the clouds—shopping on eBay Inc., restocking their companies' inventories, perhaps even making voice calls over the Web. Boeing is so gung-ho on the new technology that over the next decade it hopes to outfit nearly 4,000 planes with Wi-Fi service. Says Scott E. Carson, president of the company's Connexion by Boeing unit: "Wi-Fi is on an explosive growth path."

After four years as a plaything for techno-geeks and home hobbyists, Wi-Fi is beginning to beam its way into Corporate America. Its superfast connections to the Web cost only a quarter as much as the gaggle of wires companies use today. And they're proving irresistible to businesses willing to venture onto the wireless edge. From General Motors to United Parcel Service to CareGroup, companies are using Wi-Fi for mission-critical jobs in factories, trucks, stores, and even hospitals. "We firmly believe that this is the tipping point," says Intel Corp. CEO Craig R. Barrett.

What is Wi-Fi? It's a radio signal that beams Internet connections out 300 feet. Attach it to a broadband modem and any nearby computers equipped with Wi-Fi receptors can log on to the Net, whether they're in the cubicle across the hall, the apartment next door, or the hammock out back. To date, Wi-Fi has grown on the scruffy fringes of the networked world. It shares an unregulated radio spectrum with a motley crew of contraptions, including cordless phones and baby monitors.

Yet Wi-Fi networks, known as hot spots, have popped up faster than fleas on a circus dog. Thousands of do-it-yourselfers worldwide have rigged antennas to create their own hot spots. They've joined together to form networks so that the public can zap e-mails and surf blogs for free, no matter where they are. From street corners in Sydney to mountaintops outside Seattle, some 5,000 free hot spots have emerged. This is Wi-Fi Nation. More than 18 million people worldwide have logged on, and the numbers are growing daily (Exhibit 1).

The challenge facing the tech industry is to transform this unruly phenomenon into a global business. This means turning Wi-Fi Nation into Wi-Fi Inc. That involves transforming a riot of hit-or-miss hot spots into coherent, dependable networks. It means coming up with billing systems, roaming agreements, and technical standards—jobs the phone companies are busy tackling. The goal, says Anand Chandrasekher, vice-president and general manager of the mobile-platforms group at Intel, is to "take Wi-Fi from a wireless rogue activity to an industrial-strength solution that corporations can bet on."

If successful, Wi-Fi has the power to fit the Internet with wings. A constellation of dependable Wi-Fi hot spots could extend dramatically the range and expanse of the Web, changing its very nature. The path ahead, analysts say, is sure to have its share of bumps. But it could lead to cascades of up-to-the-minute information zipping around offices, homes, even remote disaster sites. MeshNetworks Inc. in Maitland, Fla., is working on Wi-Fi systems that would allow emergency-response teams to create networks among themselves by simply turning on their laptops or handhelds—even if cellular or wired networks have been knocked out.

Corporations aren't waiting for fine-tuned industrial versions of Wi-Fi to hit the market. The potential productivity gains are so compelling that many are investing in custom-built systems. United Parcel Service Inc. is equipping its worldwide distribution centers with wireless networks at a cost of \$120 million. The company says that as loaders and packers scan packages, the information zips instantly to the UPS network, leading to a 35% productivity gain. IBM is devising Wi-Fi-powered systems to monitor the minute-by-minute operations of distant machines, from potato fryers at restaurants to air conditioners in computer labs.

Other tech titans are rushing in, too. Intel is spending \$300 million to market its Centrino computer chips, which come equipped for Wi-Fi. In March, Cisco Systems Inc. agreed to spend \$500 million for Linksys, a Wi-Fi equipment maker. For the first time, that will put Cisco into head-to-head competition with Microsoft Corp., which plowed into Wi-Fi network gear last year. And Cometa Networks, the new joint venture made up of Intel, IBM, and AT&T, is building a nationwide network of 20,000

**EXHIBIT 1 Why It's Taking Off**

Wireless networking, or Wi-Fi, is a runaway success. The grassroots movement has soared to 18 million users, up from 2.5 million in 2000. Now, the technology is quickly moving into the mainstream. Here's why it has caught on:

**Wi-Fi-Ready Devices**

Dell, Toshiba, and TiVo are building Wi-Fi into computers and digital recording devices. Over 90% of new laptops will be Wi-Fi-ready by 2005, up from 35% by yearend 2003.

**Nationwide Network Bets**

At least four commercial Wi-Fi networks are in operation or under development in the U.S. They include VoiceStream, Toshiba, Boingo, and Cometa Networks, which is backed by IBM, Intel, and AT&T. That will raise awareness and push prices lower.

**Broadband Lift-Off**

Wi-Fi is getting a boost from the popularity of broadband, which is growing 30% this year. That's because Wi-Fi is an inexpensive way to connect several household computers to a single high-speed Internet connection.

**Tech Titans Jump In**

Intel, Microsoft, Cisco, and IBM are pushing Wi-Fi just as hard as pioneers like Boingo are. In March,

Cisco bought Wi-Fi gearmaker Linksys Group for \$500 million. And Intel is spending \$300 million to promote its Centrino Wi-Fi chips.

**Rampant Innovation**

Wi-Fi technology is advancing fast. Intel and MeshNetworks are developing antennas that can reach for miles instead of today's 300 feet. Next: Wi-Fi-ready cell phones, PDAs, and hot spots on trains and buses.

**Falling Prices**

The price of Wi-Fi equipment is dropping. An antenna for a laptop now costs \$46, down from \$189 in 1999. Lower prices are opening the market to a broader group of buyers.

**Grassroots Phenom**

Pioneers in Portland, Ore., New York, Barcelona, and Sydney continue to expand community networks in parks, bars, and coffee shops. There are now 5,000 of these free networks worldwide.

Data: In-Stat/MDR, IDC, Yankee Group, Wireless Node Database Project

hot spots over the next three years. Phone companies, including Verizon Communications Inc. and T-Mobile USA Inc., are following suit. "You'd have to have your head in the sand to not see the news about hot-spot deployments," says Edward M. Cholerton, SBC Communications Inc.'s vice-president for Internet product management.

The giants are joined by legions of small fry. Last year alone, in the depths of the tech downturn, U.S. venture-capital firms pumped \$2.8 billion into 296 wireless startups, says researcher Thomson Venture Economics. And as more companies pile in, prices for Wi-Fi equipment are plummeting. Installing an industrial-strength hot spot costs only \$2,000 now, one-fifth what it cost two years ago. Home-gear prices are also in free fall. More than 50 companies are in the chip market alone, estimates Gartner Inc. As the tech powerhouses storm into the market, a painful wave of consolidation is all but assured.

Even for the mighty, this gold rush crosses hazardous terrain. Off-the-shelf versions of Wi-Fi are often unreliable and rough to install. This undermines confidence in the technology. And key initiatives are untested. Will corpo-

rate and consumer users dish out \$30 to \$50 a month for access to a nationwide grid of Wi-Fi hot spots? Will the number of subscriptions justify big network investments? "Can anyone make money in the home-networking or wireless world?" asks David Schmertz, a vice-president at Efficient Networks Inc., a broadband subsidiary of Siemens. "We're looking at that question hourly."

The riches won't flow until Wi-Fi security reaches industrial grade. Corporations are hankering for the power and flexibility of Wi-Fi networks, but many are postponing rollouts in strategic areas until they're convinced that hackers, spies, and competitors can't intercept wireless data. General Motors Corp. has deployed Wi-Fi in 90 manufacturing plants but is holding off on Wi-Fi at headquarters until next year. Why? Execs worry that until new encryption is in place, guests at a Marriott Hotel across the street could log on to GM's network and make off with vital memos and budgets. Industry analysts say a slew of airtight Wi-Fi security systems will be out next year. But delays or news of security breaches could pummel confidence in the technology.

A wild card is the possible overlap between Wi-Fi and the multibillion-dollar project for a high-speed cellular system known as Third Generation (3G). Like Wi-Fi, 3G promises a wireless Internet. It's coming onstream in Europe and Asia and will be spreading in North America in the next two years. As a phone system, 3G provides far broader coverage than Wi-Fi's constellation of hot spots. But Wi-Fi's hot spots are targeted precisely in the hotels, airports, and commercial centers where mobile Net surfers are most likely to be swarming. This upsets revenue projections for phone companies. Still, they're plowing ahead with Wi-Fi deployments on three continents, hoping they can bill customers for a menu of wireless services, including both Wi-Fi and 3G.

Wi-Fi represents a disruptive force. Yet if history is an indicator, it will ultimately pay rich dividends. The upstart technology appears to follow a pattern that has become common in the Internet age. New technologies surge from the grass roots, pushing companies to race madly, trying first to cope with the new sensations and later to transform them into businesses. This happened with the Net itself, and with Linux, the free software operating system. Now, the Internet has not only defined an age, it has spawned a host of successful companies. Some 40% of publicly traded Net companies are profitable today. Linux, developed within a populist movement similar in spirit to Wi-Fi, holds 13.7% of the \$50.9 billion market for server software and is breathing down Microsoft's neck.

Wi-Fi promises similar fireworks. And the beleaguered tech industry is counting on it for a welcome shot of growth. In the short term, the direct payoff is likely to be moderate. Wi-Fi spending on hardware and subscriptions is expected to reach \$3.4 billion this year and is growing at a 30% clip. Network buildouts over the next two years will chip in \$8.2 billion more. That's welcome in a downturn but not enough to sway a \$1 trillion global tech economy. And Wi-Fi subscriptions aren't likely to catch on until national networks are up and running, perhaps two years from now.

Instead, it's as an amplifier of other technologies that Wi-Fi packs its punch. It turns nearly every machine, from laptops to cash registers, into network devices. And it fuels demand for always-on broadband connections. This, in turn, paves the way for the next generation of Internet services. Analyst Christopher Fine of Goldman, Sachs & Co. compares the power of Wi-Fi to the networking of computers in the early 1990s or the telephone exchanges that spread in the 1920s.

Intel and computer makers are betting on it to spur laptop sales, which even without Wi-Fi carry profit margins

50% higher than those on desktops. Microsoft is pushing its Windows XP operating system, which is specially adapted to handle Wi-Fi. "You could say that Wi-Fi is the killer app that gets people to upgrade to Windows XP," says Pieter Knook, the company's vice-president for network service providers. On April 15, Intel announced that strong laptop sales, powered by Wi-Fi-ready Centrino chips, helped boost first-quarter profits.

The consumer-electronics industry is counting on Wi-Fi, too, to link a host of appliances in the home. Already, gadget-meisters are sending MP3 songs and videos from their computers to TVs and stereos via Wi-Fi. This could become a breeze over the next two years as the new generation of Wi-Fi rolls out, lifting connection speeds to 54 megabits—or nearly an hour of MP3 music—per second. Motorola, Nokia, and Ericsson are working on Wi-Fi phones that would let people move from Wi-Fi to cellular networks without even noticing. These should be ready in 18 months. In time, Wi-Fi could even feed data into smart networks in the home or factory to automatically monitor climate controls or industrial supply chains. "There's no upper limit to how you can use this technology," says Dean Douglas, vice-president for telecommunications at IBM Global Services. "In that, it's like the Web."

In its infancy, long before Wi-Fi took shape, the radio technology belonged to businesses. The year was 1985. The Federal Communications Commission had opened up slivers of the radio spectrum for experimentation. Researchers at a vanguard of companies, including NCR, Symbol Technologies, and Apple Computer, started building wireless networks. Their goal was to link everything from cash registers to auto assembly lines. But momentum slowed in the late '80s as the companies developed systems that didn't work together.

An NCR Corp. scientist named Vic Hayes stepped into the mess in 1990. Hayes led the movement toward a standard. It was a long and combative process, but in 1997, it led to the release of 802.11b, now known as Wi-Fi, or Wireless Fidelity. Two years later, Apple kick-started the market by adding Wi-Fi to its iBook portables for the then-stunningly low price of \$99.

The race was on. In cities worldwide, tech geeks began setting up wireless networks. Led by pioneers such as Rob Flickenger in San Francisco and Anthony Townsend in New York, these techies jerry-built Linux-based hot spots and cheap alternatives to expensive gear. Famously, they improvised antennas using empty Pringles cans. And in the 21st century equivalent of barn-raising, they united to link neighbors to the growing community networks. Says Townsend, who co-founded NYCwireless in 2000

with Terry Schmidt: "Our model of Wi-Fi is if you charge people to use it, it's not useful." Now the pair runs a business that builds community networks.

While Wi-Fi Nation was taking shape in the streets, a smattering of businesses were adapting the new networks to their own needs. At CareGroup Inc. hospitals in Massachusetts, engineers installed wireless systems to connect more than 2,000 doctors and nurses to the corporate system. This way, whether they were in emergency rooms or intensive-care units, they could access patient records, add observations to the database, and check on medicines. "It's cost-effective, and the doctors love it," says Chief Information Officer John D. Halamka, who estimates that the system helps reduce costly medical errors by 50%.

Early on, entrepreneurs saw opportunity in the burgeoning Wi-Fi community. Sky Dayton, founder of Internet service Earthlink Inc., believed that if anyone could unite the ragtag collection of hot spots and network communities into a secure nationwide network, there was a fortune to be made. In 2001, he founded Boingo Wireless Inc. The idea was to certify networks everywhere as

Boingo providers. Then, when subscribers paying up to \$50 a month turned on their laptops and saw a Boingo connection, they'd log in. Boingo, based in Santa Monica, Calif., and local providers would split the take.

It was a good idea. So good that lots of others came up with it, too. In the past two years, scores of networks have been launched, causing the number of commercial hot spots to mushroom to 16,000. Starbucks Corp. piled in, teaming with T-Mobile to offer consumers Wi-Fi surfing at more than 2,100 coffee shops for \$40 a month. Fast-food giant McDonald's Corp. has deployed Wi-Fi at 10 restaurants in New York and plans to add hundreds more hot spots by yearend. The idea there is less to make money on Wi-Fi services, which go for \$3 per hour, than to attract new customers and boost sales. McDonald's is offering a free hour of Wi-Fi with each Extra Value Meal.

To date, though, few commercial hot spots have thrived—and analysts have plenty of doubts about the new ventures at Boeing and McDonald's (Exhibit 2). Why? No carrier can offer seamless nationwide coverage, security is still touch-and-go, and many potential users feel it costs

## EXHIBIT 2 The Many Challenges Wi-Fi Faces

Wireless networking must overcome a slew of technological and economic hurdles to win its battle to join the mainstream.

### Challenge

### Solution

#### Standards Are Unclear

Wi-Fi developers harness different chunks of unlicensed radio spectrum. Some companies are holding back because there's no single standard.

Equipment makers are replacing transmitters with gear that covers the whole Wi-Fi spectrum.

#### Security Is Spotty

In the past, Wi-Fi systems have allowed unauthorized users to sneak onto networks and steal bandwidth and even data from private computers.

New systems have encryption software but are still playing catch-up with traditional corporate networks.

#### Prices Are Too High

Wi-Fi is cheaper than most other wireless Internet access, such as cell phones. But at up to \$50 a month, a subscription to a commercial Wi-Fi network is still too pricey for mass adoption.

Eventually, rival networks will drive the price to \$10 a month or less, or bundle it into a phone bill. That may be years away.

#### Range Is Limited

Wi-Fi hot spots provide Web access at 300 feet or less. And that range can be reduced by walls or even foliage.

Signal boosters are available now. New antennas with a range in miles are being developed.

#### Hidden Costs

A corporate hot spot can be had for \$1,000. But installation and maintenance can add \$3,000.

New gear drives down cost for big installations.

#### Inter-Operability

No carrier is national, let alone global. For coverage on the road, a user would have to subscribe to several networks.

Networks must create roaming agreements similar to those in the cell-phone industry.

too much. "We don't subscribe to any of these services," says Tripp McCune, senior vice-president and director of information technology at ad agency Deutsch Inc. "The coverage isn't widespread enough for our people to use."

The job now is to build Wi-Fi into a solid pillar of the networked world. And Intel is out to lead the charge. Last year, CEO Barrett put \$150 million into a Wi-Fi-oriented venture fund. He assigned 800 engineers to work on Wi-Fi, and in December he joined IBM and AT&T to launch Cometa. Unlike Boingo, Cometa will build its own hot spots. By next March, it plans to have 5,000 up and running.

The next job is to establish Wi-Fi as a global mainstay, and Intel is responding, naturally, with a chip. The Centrino family of chips, released in March with a \$300 million media campaign, embeds a Wi-Fi receptor into the innards of a laptop computer. The effect should be dramatic. By this summer, every Dell Computer Corp. laptop and 70% of Hewlett-Packard Co.'s consumer offerings will be Wi-Fi-ready. For most users, this should ease the transition into the new technology. The current process is so complicated that it often irks novices. Intel and Microsoft are hoping that with the new systems (Exhibit 3), Wi-Fi installation will eventually become as easy as activating a modem: click "yes" six or seven times and then "finish."

Wi-Fi isn't likely to become a rock-solid standard until hot spots are dependable. That's pushing more than 100 Intel engineers on a worldwide mission. They're labeling hot spots the world over as "Centrino-certified." The idea is to unify the Wi-Fi world around Intel's brand, giving Centrino the Wi-Fi equivalent of the *Good Housekeeping* Seal of Approval.

Across the industry, engineers are coming up with security systems to satisfy the most demanding customers. Cranite Systems Inc. in San Jose, Calif., sold security for the \$960,000 Wi-Fi installation at the U.S. Army's West Point Academy. Colonel Donald J. Welch, an associate dean for information and educational technology, says the military put the system through rigorous antihacking tests. "We don't want to be a launching pad [for hackers] to the Defense Dept.'s network," he says.

He has reason to be hypervigilant. Every step of the way, the technology manages to remind the Wi-Fi industry of the tough road ahead. At Intel's glitzy launch of its Centrino chips in March at the Hammerstein Ballroom in New York, CEO Barrett was on hand. The room shook to the sounds of *Goin' Mobile* by the Who. The crowd watched a live video hookup as an executive demonstrated how to use a Wi-Fi-equipped laptop to make a phone call. All he got, though, was dead air.

### EXHIBIT 3 Making Wi-Fi Work

Millions of people are setting up wireless networks. Here's how it's done, using a network with a PC and one or more laptops:

1. **Get a High-Speed Net Connection.** You can subscribe to a cable-modem or DSL phone service for about \$40 a month. The modem is usually free, and you can do the installation yourself in a few minutes.
2. **Buy a Wi-Fi Access Point.** The size of a clock radio, this box includes an Internet router and a two-way Wi-Fi radio. It costs \$100 to \$250.
3. **Connect Access Point to Modem and Desktop.** Plug cables into the back of the modem and PC. Install the software on the PC and follow the directions.
4. **Buy a Wireless Antenna for Each Laptop.** These credit-card size devices run \$30 to \$50.
5. **Install Antenna and Antenna Software on Laptop.** Install the antenna before you install the software, or it won't work properly.
6. **Congratulations!** Your network is up and running. Test the signal strength by wandering around with the laptop.
7. **Whoops!** The signal is weak. Most people find reception in their homes is hampered by walls and other obstructions. Signal strength will remain stronger if you move upstairs or downstairs just above or below the access point.
8. **Don't Panic!** You have options. You can buy a signal booster, which attaches to the router and costs about \$100. You can sometimes boost the strength of the router's signal online, with help from the manufacturer's service department.
9. **Telecommuting? O.K., Panic!** If you work at home with a laptop that has been configured for the office, you may need to reconfigure it with help of your employer.
10. **Expand!** Now that you have connected the desktop and the laptop to your network, you can buy another antenna to include your TiVo, digital home theater, or gaming console in the network.

As technology companies scramble to transform Wi-Fi into a business, they'll come up against a lot more dead air. But it will all be worth it if Wi-Fi lives up to its promise to unleash the Internet.

*By Heather Green, with Steve Rosenbush in New York, Roger O. Crockett in Chicago, and Stanley Holmes in Seattle.*

Source: "Wi-Fi Means Business," *BusinessWeek*, April 28, 2003, 86-92.

# Cases for Part 3

## Case 3-1

### Samsung Electronics (A)

To managers of Samsung Electronics' sprawling television plant in Suwon, South Korea, it seemed like a no-brainer. During the depth of the country's economic crisis in early 1998, the Korean won was wallowing at 1,800 to the dollar—less than half its value of a year earlier. That provided a golden opportunity to throw production lines into overdrive and flood export markets with TVs while the currency was still cheap.

But rather than giving the green light, Samsung Electronics President Yun Jong Yong rebuked his eager managers. Just a few months earlier, he had shut down the Suwon plant for two months because so many unsold TVs and other appliances had piled up in Samsung warehouses. The costs of carrying that inventory had been devastating to the company's balance sheets. Samsung wouldn't repeat the mistake. Declaring war on unsold inventory, Yun said Samsung factories would only produce goods after orders were in hand and profitability assured.

Putting profitability before gross sales is basic business common sense in the West. But it was a radical

concept at Samsung and other Korean conglomerates, which for decades had been obsessed with exports and record production runs. Now, Samsung Electronics managers hail Yun's profits-first decree as pivotal in a remarkable corporate comeback. "Shutting the TV plant sent a very strong signal to the staff," says Park Sung Chil, Samsung's director of supply-chain management. The just-in-time approach to production has enabled Samsung to shave \$3 billion in inventory costs and accounts receivable (Exhibit 1).

### High-End Focus

Yun is spearheading what may well be a revolution in Korean industry. Since he took the helm of the sprawling Samsung Group's electronics businesses in January, 1997, Yun, a 30-year company veteran, has been reversing many practices that have long characterized Korea's *chaebol*. Samsung Electronics has dramatically reduced its debts, sold or spun off dozens of assets unrelated to its core businesses, set up financial and managerial fire walls

#### EXHIBIT 1

#### Anatomy of a Turnaround

Source: *BusinessWeek*

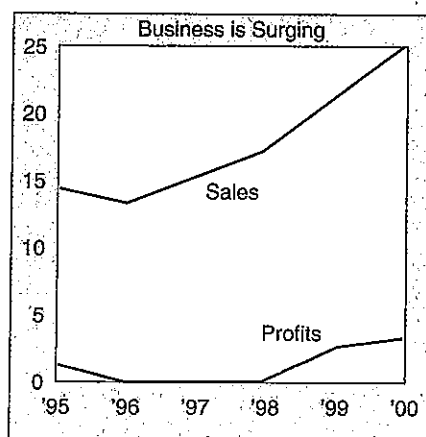
#### ANATOMY OF A TURNAROUND

**FINANCIAL RESTRUCTURING** Some \$10 billion in debt has been wiped out since 1997. Dozens of companies have been sold off or spun off. Stakes in money-losing Samsung Motor and computer maker AST have been written off.

**PROFITS FIRST** The old obsession with market share and setting production and export records is giving way to a focus on making money with high-end products based on innovative designs.

**STREAMLINING** Managers now strive to produce goods only after orders are placed and get them to customers within days, eliminating billions of dollars in inventory costs and accounts receivable.

**DIVERSIFICATION** Once dependent on commodity memory chips for half of sales and 90% of profits, Samsung Electronics has greatly broadened its base to become a global giant in telecom devices, flat-panel displays, and digital appliances. Is investing in nonmemory semiconductors.



▲ Billions of Dollars

Source: Samsung Electronics.

Projections by Salomon Smith Barney.

between itself and other Samsung companies, and cut a third of its workforce. And it is striving to abandon its dependence on cheap commodity products to focus instead on high-end goods employing innovative designs.

The ultimate aim is to guide the company into the global electronics elite. With core strengths in micro-electronics, telecom equipment, PCs, and consumer appliances, Samsung is positioned in each major segment of the so-called "digital convergence" and aims to rank alongside the likes of Sony Corp. and Philips Electronics. In the coming years, Samsung plans to spin out a full range of Next Age products, from affordable digital televisions and "smart cards" loaded with movies and data to sleek wireless phones enabling users to access the Web, watch TV, and listen to music.

The management transformation is hardly complete. And many *chaebol* critics warn that the lack of accountability to outside shareholders means the founding families behind groups such as Samsung could resort to business as usual once they are safely out of crisis. "Sure, Samsung has built up competence in its core businesses," says Korea University finance professor Jang Ha Sung. "The problem is that changes in its financial and business structures could be temporary without a change in corporate governance."

### "Exemplary Student"

But there's little doubt the improvement has been dramatic. After weathering a harrowing free fall in profits and sales that started with the 1996 slump in memory chips, Samsung Electronics is stronger than ever. This year, Salomon Smith Barney figures the company should post a net profit of at least \$2.7 billion on a 24% increase in sales, to \$22 billion. The results even reflect a \$700 million write-off of Samsung Electronics' investments in cars and failed U.S. computer maker AST Research Inc. "Samsung has been an exemplary student," says Lee Hun Jai, chairman of the Financial Supervisory Commission, which is overseeing Korea's corporate and financial overhaul.

Of course, a strong rebound in demand for Samsung's bread-and-butter product, dynamic random access memory (DRAM) chips, accounts for a good chunk of this turnaround. Since June, prices for 64-megabit DRAMs have surged from around \$4 to \$10. Samsung, one of the few big memory chip producers that kept investing in capacity through the down cycle, benefited the most, blowing past Japanese rivals.

But memory chips are not the whole story. Although DRAMs probably will account for 45% of 1999 profits,

other sectors also are coming on strong. Samsung Electronics has emerged as the world's leader in thin-film transistor flat-panel displays for computers, another sector where prices have leapt. Samsung's telecom division, bolstered by soaring demand at home for its \$380 voice-activated SCH-A100 cell phone and a rising share of the U.S. cellular market, now ranks among the world's top six producers of wireless handsets. It also is the world's leading producer of computer monitors. All 15 of Samsung Electronics' main product groups, including the consumer-appliance unit that had lost money for five years, are now in the black. That's a claim Samsung couldn't make even in the fat mid-'90s.

Samsung Electronics' diversification means its business is much better balanced than before the crisis. In 1995, memory chips accounted for 90% of corporate profits and half of all sales. They now account for about 20% of sales, with the rest spread more evenly among computer and telecom products. Samsung also is making gains in nonmemory chips, where it badly lags U.S. and Japanese producers. The focus is now on chips used in Samsung's array of digital phones, TVs, cameras, and smart cards.

Samsung Electronics executives concede none of these vital changes would have occurred were it not for two disasters—the crash in memory-chip prices, followed in 1997 by Korea's financial collapse. A \$3.2 billion profit in 1995, when 16-Mb DRAMs fetched \$40 apiece, offset steady losses in many of the company's other businesses. When DRAM prices plunged, Samsung Electronics realized that its reliance on a volatile commodity product "was a very, very risky strategy," says Yun. The company long knew it had to improve efficiency, restructure, and pare back its workforce.

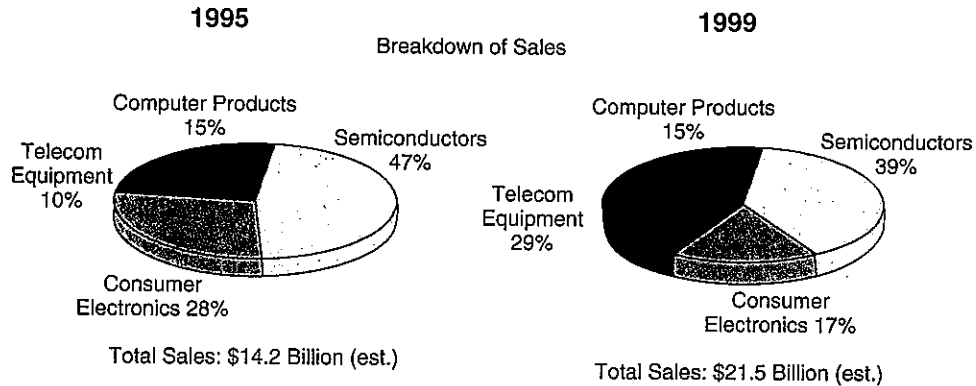
### Public Pressure

Nor did Samsung Electronics seriously tackle its wasteful manufacturing practices. In TVs, the company was carrying up to three months of excess inventory by 1997. Not only was Samsung paying to finance the inventory, but also prices for its electronics products were often 30% lower by the time they were sold. "In the past, we were evaluated by unit manufacturing cost alone," explains supply-chain director Park. "So we produced and produced and produced, not caring whether or not it was sold." At the same time, Samsung Group Chairman Lee Kun Hee was under intense public pressure for allowing the group's debts to pile up so high and for forcing affiliates such as Samsung Electronics to subsidize such ill-considered investments as a \$3.5 billion plunge into cars.

## EXHIBIT 2

### Growth Is Now Better Balanced

Source: Samsung Electronics.  
Projections by Salomon Smith Barney.



Since 1997, Yun has sold or spun off 57 businesses, from refrigerators and pagers to satellite receivers. Such asset sales have helped Samsung Electronics to slash debt by \$10.8 billion. It also has cut the number of employees from 84,000 to 54,000.

The restructuring helped persuade bankers to keep Samsung's credit lines open at a critical time in the semiconductor cycle. Betting the DRAM market would rebound, Yun kept adding cutting-edge capacity while the Japanese held back. The move paid off when the cycle turned to boom again. Just as important was better supply-chain management, which has halved inventory from an average of \$3.6 billion in 1997.

Samsung's next goal is to rank alongside the consumer-electronics giants of Japan and Europe. It has made the biggest strides in cellular phones (Exhibit 2). In Korea, the company expects to sell around 7 million wireless handsets this year. It already is marketing a new phone with a flip-up touch screen that allows users to send e-mails and access English/Korean dictionaries, the Bible, Buddhist songbooks, and games. Another phone has a built-in TV receiver; still another is small enough to wear as a wristwatch.

Samsung also is surging in the U.S. A team-up with Sprint PCS has helped it grab 19% of the CDMA phone market. One big hit is the SCH-3500, a \$149 set that dials numbers on voice command. By test-marketing innovative products in Korea, "when they hit here, they have a product that's absolutely ready to go to market," says Andrew Sukawaty, president of Sprint's PCS unit. "We don't go through the teething problems we go through with some other vendors."

Samsung is making a similarly bold bet on digital TVs, hoping to grab 10% of the market when prices fall within reach of middle-class families. Because digital home

appliances are evolving so rapidly, it's too early to tell whether Samsung Electronics will emerge a winner. Kimihide Takano, a Tokyo-based electronics analyst with Dresdner Kleinwort Benson Asia, warns that the consumer electronics sector is poised for a shakeout. To survive, he says, a company "won't be able to just churn out commodity products." That is a major reason why Samsung Electronics is now plowing much of its profits from DRAMs into nonmemory chips. By producing cutting-edge chips with telecom, graphics, and processing capability in-house, Samsung hopes to have an edge over rivals who depend on outsiders for key components.

While its manufacturing prowess is clear, Samsung Electronics has its work cut out showing it can also succeed as an innovator in specialty-chip design. But this year, the nonmemory unit hopes to earn up to \$200 million on sales of \$1 billion, with 50% sales growth expected in 2000. By next year, it hopes to supply half of Samsung's internal needs for telecom chips. Samsung also is making chip sets for digital TVs. And soon it will market Alpha microprocessors under license from Compaq Computer Corp. Rivals aren't counting Samsung out. "This is a company that is investing in technology and new equipment to stay ahead," says Kenji Tokuyama, who will head NEC's new DRAM venture with Hitachi. "We regard it as a formidable competitor."

A bigger question may be whether Samsung Electronics will maintain its financial discipline long enough to fulfill Yun's vision, especially if the government's *chaebol* watchdogs let down their guard. Insider practices and an obsession with expansion are deeply ingrained in Korea's industrial psyche. But the memories of Korea's economic catastrophe will be impossible to erase. If Samsung Electronics continues to win applause for profits and innovation—rather

than size—it could have plenty of motivation to finish the job of reshaping a sprawling conglomerate into a focused, truly global enterprise.

*By Moon Ihlwan and Pete Engardio in Seoul, with Irene Kuniti in Tokyo and Roger Crockett in Chicago*

Source: "Samsung: The Making of a Superstar," *BusinessWeek*, December 20, 1999, 137, 138, 140.

## Case 3-2

### McDonald's Corp.

Richard Steinig remembers beaming as if he had won the lottery. There he was, all of 27 when he became a junior partner with a McDonald's Corp. franchisee in 1973, just a year after starting as a \$115-a-week manager trainee in Miami. "It was an incredible feeling," says Steinig. His two stores each generated \$80,000 in annual sales, and he pocketed more than 15% of that as profit. Not bad at a time when the minimum wage was still under \$2 an hour and a McDonald's hamburger and fries set you back less than a dollar, even with a regular Coke.

Fast-forward 30 years. Franchise owner Steinig's four restaurants average annual sales of \$1.56 million, but his face is creased with worry. Instead of living the American Dream, Steinig says he's barely scraping by. Sales haven't budged since 1999, but costs keep rising. So when McDonald's began advertising its \$1 menu featuring the Big N' Tasty burger, Steinig rebelled. The popular item cost him \$1.07 to make—so he sells it for \$2.25 unless a customer asks for the \$1 promotion price. No wonder profit margins are no more than half of what they were when he started out. "We have become our worst enemy," Steinig says.

Welcome to Hamburger Hell. For decades, McDonald's was a juggernaut. It gave millions of Americans their first jobs while changing the way a nation ate. It rose from a single outlet in a nondescript Chicago suburb to become an American icon. But today, McDonald's is a reeling giant that teeters from one mess to another.

Consider the events of just the past three months: On Dec. 5, after watching McDonald's stock slide 60% in three years, the board ousted Chief Executive Jack M. Greenberg, 60. His tenure was marked by the introduction of 40 new menu items, none of which caught on big, and the purchase of a handful of non-burger chains, none of which were rolled out widely enough to make much difference. Indeed, his critics say that by trying so many different things—and executing them poorly—Greenberg let the burger business deteriorate. Consumer

surveys show that service and quality now lag far behind those of rivals.

The company's solution was to bring back retired Vice-Chairman James R. Cantalupo, 59, who had overseen McDonald's successful international expansion in the '80s and '90s. Unfortunately, seven weeks later, the company reported the first quarterly loss in its 47-year history. Then it revealed that January sales at outlets open at least a year skidded 2.4%, after sliding 2.1% in 2002.

Can Cantalupo reverse the long slide at McDonald's? When he and his new team lay out their plan to analysts in early April, they are expected to concentrate on getting the basics of service and quality right, in part by reinstituting a tough "up or out" grading system that will kick out underperforming franchisees. "We have to rebuild the foundation. It's fruitless to add growth if the foundation is weak," says Cantalupo. He gives himself 18 months to do that with help from Australian-bred chief operating officer, Charles Bell, 42, whom Cantalupo has designated his successor, and Mats Lederhausen, a 39-year-old Swede in charge of global strategy (Exhibit 1).

But the problems at McDonald's go way beyond cleaning up restaurants and freshening the menu. The chain is being squeezed by long-term trends that threaten to leave it marginalized. It faces a rapidly fragmenting market, where America's recent immigrants have made once-exotic foods like sushi and burritos everyday options, and quick meals of all sorts can be found in supermarkets, convenience stores, even vending machines. One of the fastest-growing restaurant categories is the "fast-casual" segment—those places with slightly more expensive menus, such as Cusi, a sandwich shop, or Quizno's, a gourmet sub sandwich chain, where customers find the food healthier and better-tasting. As Lederhausen succinctly puts it: "We are clearly living through the death of the mass market."

If so, it may well mark the end of McDonald's long run as a growth company. Cantalupo seemed to

## Case 4-2

## Hennes &amp; Mauritz

Stefan Persson, chairman of Swedish retailer Hennes & Mauritz, vividly remembers his company's first attempt at international expansion. It was 1976, the year H&M opened its London store in Oxford Circus. "I stood outside trying to lure in customers by handing out ABBA albums," he recalls with a wry laugh. Persson, son of the founder and then age 29, waited for the crowds. And waited. "I still have most of those albums," he says.

Don't cry over that vinyl, Stefan. ABBA is still hot, but H&M is even hotter. Hotter than Shakira in July. Hotter even than harem pants—incidentally, an item flying out of H&M's stores this season. (Warning to female shoppers: If you don't want to be a fashion pioneer, those pants may not be for you. Try the peasant blouse instead.)

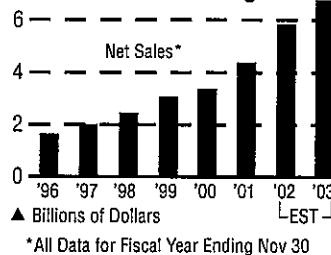
A slowing global economy, lackluster consumer spending: There's little sign of either at H&M. While rivals retreat from disastrous foreign forays and retailers across Europe and the U.S. struggle to post a profit, H&M's pretax income is set to hit \$833 million in 2002, a 34% increase from the previous year, on sales of \$5.8 billion, according to Keith Wills, Goldman, Sachs & Co.'s European retail analyst (Exhibit 1). The growth is being fueled not only by expansion: Wills also estimates same-store sales will be up between 4% and 5% this year. H&M has \$1 billion in cash. Its market capitalization of \$15 billion outstrips that of Gap Inc. and Zara International, its closest competitors (Exhibit 2). And at current sales levels, the chain is the largest apparel retailer in Europe. Although the stock has bounced around this year, it has nearly doubled since 1997 and has far outperformed the Stockholm index. This isn't a store chain. This is a money machine.

If you stop by its Fifth Avenue location in New York or check out the flagship at the corner of Regeringsgatan and Hamngatan in Stockholm, it's easy to see what's powering H&M's success. The prices are as low as the fashion is trendy, turning each location into a temple of "cheap chic." At the Manhattan emporium, mirrored disco balls hang from the ceiling, and banks of televisions broadcast videos of body-pierced, belly-baring pop princesses. On a cool afternoon in October, teenage girls in flared jeans and two-toned hair mill around the ground floor, hoisting piles of velour hoodies, Indian-print blouses, and patchwork denim skirts—each \$30 or under. (The average price of an H&M item is just \$18.) This is not Gap's brand of classic casuals or the more

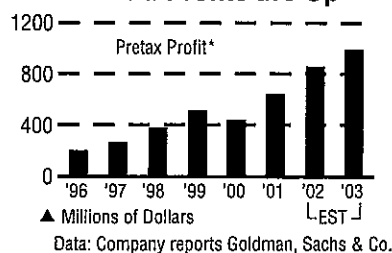
EXHIBIT 1

### H&M: A Swedish Success Story

#### Sales are Soaring . . .



#### . . . And Profits are Up



grown-up Euro-chic of Zara. It's exuberant, it's over the top, and it's working. "Everything is really nice—and cheap," says Sabrina Farhi, 22, as she clutches a suede trench coat she has been eyeing for weeks.

H&M is also shrewdly tailoring its strategy to fit the U.S. market. In Europe, H&M is more like a department store—selling a range of merchandise for men, women, teens, and children. Its U.S. stores are geared to younger, more fashion-conscious females. And while the pricing is cheap, the branding certainly isn't. H&M spends a hefty 4% of revenues on marketing. This year's photo ad campaign was shot by fashion-world legend Richard Avedon.

Behind this stylish image is a company so buttoned-down and frugal that you can't imagine its executives tuning into a soft-rock station, let alone getting inside a teenager's head. Stefan Persson, whose late father founded the company, looks and talks more like a financier than a merchant prince. A penny-pinching financier, at that. "H&M is run on a shoestring," says Nathan Cockrell, a retail analyst at Credit Suisse First Boston in London. "They buy as cheaply as possible and keep overheads

## EXHIBIT 2 Clash of the Clothing Titans

	Style	Strategy	Global Reach	Financials
<b>H&amp;M</b>	Motto is "fashion and quality at the best price." Translates into cutting-edge clothes.	Production outsourced to suppliers in Europe and Asia. Some lead time is just three weeks.	Has 809 stores in 14 countries. More than 88% of sales come from outside Sweden.	Estimated 2002 pretax profit of \$833 million on sales of \$5.8 billion.
<b>GAP</b>	Built its name on wardrobe basics such as denim, khakis, and T-shirts.	Outsources all production. An average of nine months for turnaround.	Operates 656 stores in Canada, Japan, and Europe, which produce 8% of sales.	Estimated 2002 pretax profit of \$554 million on sales of \$13.8 billion.
<b>ZARA</b>	Billed as Armani on a budget for its Euro-style clothing for women and men.	Bulk of production is handled by company's own manufacturing facilities in Spain.	Runs 507 outlets in 30 countries, but Spain still accounts for 50% of sales.	Parent Inditex does not break out sales.

Data: Company reports, Santander Central Hispano, BNP Paribas, Goldman, Sachs & Co.

low." Fly business class? Only in emergencies. Take cabs? Definitely frowned upon. To rein in costs, Persson even took away all employee mobile phones in the 1990s. Today, only a few key employees have cell-phone privileges.

But that gimlet eye is just what a retailer needs to stay on its game—especially the kind of high-risk game H&M is playing. Not since IKEA set out to conquer the world one modular wall unit at a time has a Swedish retailer displayed such bold international ambition. H&M is pressing full-steam ahead on a program that will bring its total number of stores to 844 by the end of 2002, a nearly 75% increase in the past six years. With the Nov. 1 opening of its latest Manhattan store, near Macy's, H&M will have 45 outlets in the U.S. It plans to open a further 20 American stores by yearend 2003. "No other European retailer has managed to expand so successfully beyond its own borders," says Wills.

Nevertheless, H&M is pursuing a strategy that has undone a number of rivals. Benetton tried to become the world's fashion retailer but retreated after a disastrous experience in the U.S. in the 1980s. Gap, once the hottest chain in the U.S., has lately been choking on its mismanaged inventory and has never taken off abroad.

Persson and his crew are undaunted. "When I joined in 1972, H&M was all about price," he says. "Then we added quality fashion to the equation, but everyone said you could never combine [them] successfully. But we were passionate that we could." Persson is just as passionate that he will be able to apply the H&M formula internationally.

What's that formula, exactly? Treat fashion as if it were perishable produce: Keep it fresh, and keep it moving. That means spotting the trends even before the trendoids do, turning the ideas into affordable clothes, and making the apparel fly off the racks. "We hate inventory," says H&M's head of buying, Karl Gunnar Fagerlin, whose job is to make sure the merchandise doesn't pile up at company warehouses. Not easy, considering that H&M sells 550 million items a year.

All major fashion retailers aim for fast turnaround these days, but H&M is one of the few in the winner's circle. All merchandise is designed in-house by a team of 95 in Stockholm. To keep costs down, the company out-sources manufacturing to a network of 900 garment shops located in 21 mostly low-wage countries, primarily Bangladesh, China, and Turkey. "They are constantly shifting production to get the best deal," says Johan Tisell, an analyst at Enskilda Securities in Stockholm.

Working hand-in-glove with suppliers, H&M's 21 local production offices have compressed lead times—meaning the time it takes for a garment to travel from design table to store floor—to as little as three weeks. Only Zara whose parent, Inditex, owns its own production facilities in Galicia, Spain, boasts a faster turnaround—a mere two weeks. Meanwhile, Gap Inc. operates on a nine-month cycle, a factor that analysts say is to blame for its chronic overstock problem.

H&M's speed maximizes its ability to churn out more hot items during any season, while minimizing its fashion *faux pas*. Stores are restocked daily—although

sometimes, even that's not enough to meet demand. When the Manhattan flagship opened in the spring of 2002, crowds grew so large the store had to be restocked hourly.

Faster turnaround means higher sales, which helps H&M charge low prices and still earn gross margins of 53%, a key measure of a retailer's profitability. But cheap and fast don't cut it unless the fashion sense is there. H&M's young designers find their inspiration in everything from street trends and films to the bazaars of Marrakesh. Despite the similarity between *haute couture* and some of H&M's trendier pieces, copying from the catwalk is not permitted, swears Margareta van den Bosch, head of the design team. "Whether it's Donna Karan, Prada, or H&M, we all work on the same time frames," she says. "But we can add garments during the season."

Although H&M sells a range of clothing for women, men, and children, its cheap-chic formula goes down particularly well with the 15-to-30 set. Are you lusting after that Dolce & Gabbana corduroy trench coat but unwilling to cough up \$1,000-plus? At \$60, H&M's version is a steal. Sure, it's more Lycra than luxe and won't last forever. But if you're trying to keep *au courant*, one season is enough. "At least half my wardrobe comes from H&M," says Emma Mackie, a 19-year-old student in London. "It's really good value for money."

Acquiring this deft touch has taken decades. H&M founder Erling Persson, who died on Oct. 28 at 85, began his career working for his father delivering cheese to Stockholm restaurants. During a visit to New York in 1947, Persson marveled at the success of retailers such as Macy's. Upon his return, he launched small women's clothing chain Hennes—Swedish for "hers." The store's low prices proved a huge hit in Sweden, where retailing, as in the rest of Europe, was at that time still dominated by pricey department stores. By 1968, Hennes had

morphed into H&M with the acquisition of Swedish men's retailer Mauritz, and its stores were dotted across Scandinavia. But it wasn't until after Stefan joined the company that H&M's international expansion really took off.

Persson's goal now is to enter a new country every second year. This year, the Swedish retailer is stepping into Portugal, Italy, Canada, and Eastern European nations may be next. The make-or-break market for H&M, though, will be the U.S., since 9 of the 13 European countries in which H&M operates are mature markets for the retailer. Breaking in hasn't been easy. Many of the U.S. outlets that H&M opened in 2000 were too big. The entire top floor of its massive 5,400-square-meter store in Carousel Center in Syracuse, N.Y., now sits empty. Poor location was another teething problem. H&M blundered when it set up shop in suburban Livingston Mall in Newark, N.J. The mall is dominated by numerous inexpensive chains such as Express, Old Navy, and Wet Seal, making it hard for H&M to stand out.

But H&M is learning from its mistakes. During the third quarter, it managed to halve the losses from U.S. outlets, to \$6 million, and these are expected to break even by the end of 2002. "They've been quite sensible compared with other European retailers in the U.S.," says Wendy Liebmann, founder of WSL Strategic Retail in New York.

For H&M founder Erling Persson, however, the company's expansion at times seemed a bit too fast. "Sometimes, he asked me: 'Why are you in such a hurry?'" says Stefan. The answer is easy: When you're hot, you don't stop to cool off.

*By Kerry Capell in Stockholm, with Gerry Khermouch in New York*

Source: "HIP H&M," *BusinessWeek*, November 11, 2002, 106–110.

## Case 4-4

### Sun Microsystems Inc. (A)

Late last June, Sun Microsystems Inc. President Edward Zander got the kind of call every tech executive dreads. After eBay Inc. suffered a 22-hour outage of its Web site and a spate of smaller crashes, CEO Margaret Whitman called to tell Zander that the problem was a bug in Sun's top-of-the-line server. Sun would learn something just as startling over the next few days of round-the-clock meetings with eBay: The Internet upstart didn't have a clue about running a \$1 million-plus computer. The company hadn't provided sufficient air conditioning to keep the machine cool. And even though there had been a software problem with the machine for which Sun had issued a patch many months before, eBay had simply neglected to install it. The list went on—fueling the sentiment, as one Sun manager put it, that “selling computers to some of these dot-coms is like giving a gun to a 5-year-old.”

That's when Zander realized things could get much worse. For most dot-coms, starting their business on a Sun server is almost a given. Already, more than 40% of the servers found in the computing centers that house most Web sites are Sun's, and that market is expected to boom as everyone from new Net companies to the click-and-mortar crowd set up shop online. “It suddenly hit me,” says Zander. “How many future eBays are buying their first computer from us this very minute?” Adds Sun CEO Scott G. McNealy: “It was our Pentium moment,” comparing the eBay incident to the lesson Intel Corp. learned in 1994 after the chip giant angered customers by initially trying to downplay a bug in its new Pentium chip. “That's when we realized it wasn't eBay's fault,” says McNealy. “It was our fault.”

McNealy and Zander didn't need another wake-up call. Since then, the two have been tearing apart Sun and rebuilding it in an effort to make the Net as reliable as the telephone system. Just as AT&T became Ma Bell, providing that always available dial tone, Sun is shooting for no less than Ma Web, the supplier of super-reliable Web tone. To do that, Sun is moving far beyond Web servers to providing many of the technologies required to make this possible: storage products, a vast array of e-business software, and consultants that not only supply all the gear but also hold customers' hands every step of the way (Exhibit 1).

### Safe Bet

If the duo can pull it off, Sun could emerge as the King of the Net—every bit as dominant as Big Blue in its

mainframe heyday or Microsoft Corp. in the PC era. Just as high-tech managers used to say, “No one gets fired for choosing IBM,” Zander aims to have the same said of Sun. “I want to be the safe bet for companies that need the most innovative technology,” he says.

Sun hopes to go down in the history books as that rare company with the vision to change an industry and the ability to cash in on that vision. Since it was founded in 1982, Sun has promoted the notion that “the network is the computer,” a view of computing where the action isn't on desktop PCs but on big central servers where computing can be doled out in easy-to-use chunks, wherever and whenever desired. With the explosion of the Internet and rapid deployment of high-bandwidth networks, Sun's vision finally is becoming a reality. “McNealy held out for the pot of gold,” says Bill Raduchel, a former Sun executive who is now chief technologist at America Online Inc. “It took a decade to play out, but now the pot of gold is here.”

That's why Sun has been on a tear. In the most recent quarter, revenue climbed 35%—more than any other computer company, including PC darling Dell Computer Corp., which grew 30%. Sun is growing faster than at any time since 1991, when it was one-fifth the size it is today. And with gross profit margins of 52%, it is the most profitable computer maker in all of techdom.

McNealy vows this is just the beginning. Known for having the strategic vision, slickest sales reps, and hottest new products—but not the best service—Sun has made reliability the top priority. That means pumping up the services business and overhauling the way the company designs and sells its products. In the past year, Sun has reduced the number of configurations it sells from thousands by pushing customers to choose from under 200 models. And now, managers and sales reps are compensated largely on customer satisfaction. What's more, McNealy, a sometime golfing buddy of General Electric Co. Chairman John F. Welch, has become a convert of GE's Six Sigma quality program that builds in checks to make sure customers' operations stay up and running. By far, the boldest element of McNealy's plan is software. Sun is trying to define and dominate a new category of software that combines many of today's e-business software segments, including e-mail, e-commerce portals, and programs for serving up Web pages and wireless applications. The idea: Wrap a suite of applications into one fail-safe whole available on any Sun server. On July 17, iPlanet, Sun's Net software joint

**EXHIBIT 1 The Net Effect**

Almost from its founding in 1982, Sun has pursued a vision in which computing power resides on huge servers, whisking data and other services to PCs, handheld gadgets, and other devices. Thanks to the Web, Sun's vision is becoming reality. So Sun is honing its strategy, management techniques, and technology to become the dominant computer company in the Internet Age.

**STRATEGY**

**Redefine Net Software:** Today, hundreds of niche software outfits hawk a mind-numbing patchwork of applications. Sun wants to create a new category of software that combines many Net programs into one super-reliable whole that's included with its server.

**As Reliable as the Phone Network:** Sun is moving beyond just hardware to offer pretested configurations that include storage, Net software, and popular applications. That's how telco switchmakers like Lucent and Nortel managed to make the phone network fail-safe.

**Lock Up the Service Providers:** Having guessed right that software would be delivered over the Net rather than as CDs to be installed on PCs, Sun has the early lead with companies that will deliver the software—from Net newbies to huge telcos.

**MANAGEMENT**

**Central Authority:** On July 1, Sun created into one uber-sales operation, rather than fiercely independent server, software, chip, and services units. That way, customers can deal with one salesman. More important, engineers are working together to design resilient systems by making sure, for example, that Net software can detect chip or disk-drive failures.

**No More Cowboys:** Sun has been known as the freewheeling cowboy of the computer business. Now it's adding big-company processes—such as extensive audits of a customer's tech operations before taking the order.

**TECHNOLOGY**

**The Grand Design:** Sun is the architect of some of the sexier elements of the Web, such as its Java Net software. Now engineers are focusing on keeping the Net running all the time—like how to build backup systems to avoid failures in chips, servers, software, and networks.

**Pay-as-You-Grow:** Sun is working on hardware and software components that allow fast-growing customers to add what they need without ever having to scrap old equipment.

**The Storage Is the Network:** New VCR-sized storage devices that can be located anywhere on the Net—instead of just in central data centers—putting information closer to users.

**LEADERSHIP**

**Forging Industry Standards:** With Java a Net standard, Sun continues to push its Jini technology, which promises to let any digital device talk to any other. That way, your browser-equipped cell phone could print on any nearby Jini-ready printer.

**Setting Ground Rules:** Not all Net companies know how to operate around the clock. So Sun has a program to lay out best practices, from how to ensure backup to how to prevent data centers from becoming overheated. Some 300 companies have qualified for this stamp of approval of the Net Age.

venture formed with AOL last year, unveiled the new suite, along with an audacious goal: Within 18 months, the company expects to hit the \$1 billion mark in e-commerce software sales, according to Margaret Brea, iPlanet's vice-president of marketing. By 2005, she says Sun could have a \$5 billion to \$10 billion

software business. Other executives, however, say it may take a buying binge to get there.

Put it all together, and Sun is designing its own take on an old trend: vertical integration, in which it sells software, hardware, and services as one—just like telecom equipment makers Lucent Technologies or Nortel.

Networks Corp. do with their phone switches. "The computing model of tomorrow is the telecom model of today," says Masood Jabbar, Sun's senior vice-president of sales. How does Sun fit in? It plans to make the "big frigging Webtone switches," as McNealy calls them—the powerful servers that can whisk billions of bits around the Net, along with the software that manages Web pages, dishes up data, and executes transactions. "The world's moving in our direction at 8 gazillion miles per hour. Our biggest problem is just trying to keep up," says McNealy.

That's why he has lit a bonfire under Sun. After the eBay incident, Zander called a meeting of all managers and read them the riot act. Late last summer, his staff identified 14 key initiatives, such as new processes for conducting customer audits, with one of Zander's top vice-presidents in charge of each. And on July 1, McNealy reorganized Sun, combining fiercely independent sales operations within product units into one single sales organization. Now, customers see one sales rep for their entire business, instead of being bombarded by reps from different divisions. And McNealy has created a Customer Advocacy Organization to make sure all divisions are putting reliability and customer satisfaction first. Division president Mel Friedman, for instance, has authority to request the redesign of any Sun product for suspected glitches. Says Breyer: "It's about Sun growing up."

As we all know, though, growing up is hard to do. For Sun to shake off its upstart ways, it will have to make the shift from an engineering-driven company to a full-service company. That means mastering software sales, a historic weakness, and building up consulting to help companies design their e-business around Sun gear. And it must do all this while holding off heavyweights such as IBM and Hewlett-Packard. The stalwarts may have been slow to grok the Net, but they have a legacy of ultra-dependable products that could be a major advantage. "Sun rode the wave of dot-coms, but those companies have different needs now. And taking care of those needs is IBM's and HP's forte, not Sun's," says Bruce L. Chovnick, senior vice-president at Network Solutions, a Web registry company that recently ditched a Sun high-end server for a mainframe from IBM.

McNealy will have to stare down other challengers, as well. At a time when servers based on Sun's new UltraSparc3 chip are a few months late, longtime PC industry rivals are massing for yet another assault on the server market. Using Microsoft's four-month-old Windows 2000 program or the free Linux operating system, PC makers will continue to chip away at the market for less powerful servers—especially after Intel

brings out its new IA-64 chips, due by year end. "Customers are willing to pay high prices and go with the safe bet [Sun] in these early days of the Net. But ultimately, we'll be able to redefine the economics of the Internet," says Compaq Computer Corp. CEO Michael D. Capellas. Adds International Data Corp. analyst Jean S. Bozman: "Everyone is shooting at Sun, there's no question about it."

The company with the most ammunition is Microsoft. On June 22, Microsoft announced its version of Sun's Webtone scheme—an initiative dubbed .net that is designed to make the Web much easier to use. In it, unrelated Web sites, Net services, and traditional Windows software programs can be linked together to do useful things—say, to get your bank's Web site to transfer money to your e-broker, who buys a stock and then records the trade to your Microsoft Money program on your PC. Such complexity requires software expertise, snorts Microsoft CEO Steve A. Ballmer, "and Sun's not really a software company." Counters Sun chief scientist Bill Joy: "I've been writing about network-based computing for 20 years. Microsoft embraced it last week."

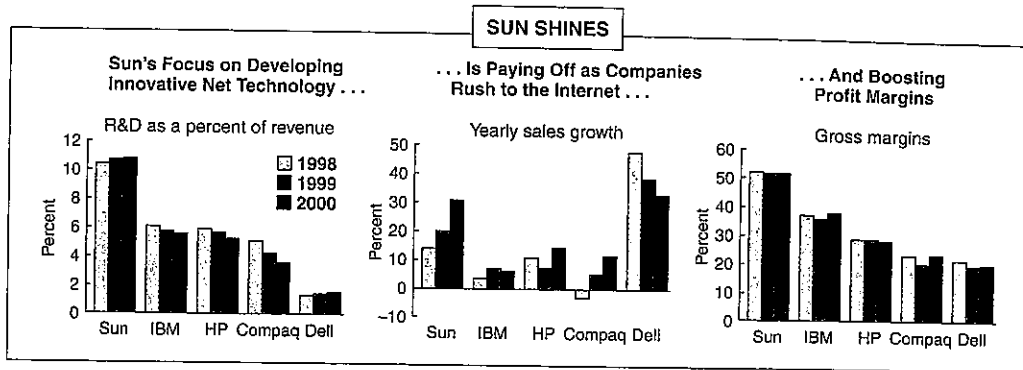
Sniping aside, Sun faces even more software challenges. Throw into the mix programs such as Napster that make it easy to link files directly from PC to PC, altogether bypassing huge servers, and some analysts think McNealy & Co. could face a resurgence of powerful PCs that can store and move data around the Net. That could put a squeeze on server profits. Sanford C. Bernstein & Co. analyst Toni Sacconaghi thinks profit margins for Sun's servers could fall from the mid-50s to the low-30s within three years. So it's crucial that Sun crank up sales of hugely profitable software and storage products, with gross profit margins of 80% and 60%, respectively.

Only then can Sun continue to fund its \$2 billion research-and-development effort and keep spending at an industry-leading rate of 10% of revenue. If it can't, Sun may find itself boxed into a high-end corner of the computer industry, adding to the list of once proud computer companies such as Digital Equipment Corp. that have been whittled away by PC makers.

Sun has managed to outfox the doomsayers before. In the early 1990s, when profits collapsed for the technical workstations that brought in 90% of the company's revenue, McNealy bet the next big opportunity would be servers. He poured billions into developing technologies such as the Solaris operating system. Now, servers and related gear bring roughly 80% of Sun's \$11.7 billion in sales. Even more remarkable is Sun's assault on the high-end server market once dominated by IBM mainframes. While the market for \$1 million-plus servers shrank 17.8%

## EXHIBIT 2

Source: Data;  
Sanford C.  
Bernstein & Co.



last year, to \$11.4 billion, Sun's revenue has rocketed 28% because of runaway sales of its e10,000 Starfire machines, according to IDC (Exhibit 2).

Unlike high-tech dynasties such as IBM or Microsoft, Sun's grand plan is not based on locking customers into its own proprietary technology. IBM and Microsoft modulated the flow of new technology in the mainframe and PC eras largely by maintaining control of technical interfaces that others would need to create compatible programs and peripherals. But Sun wants to dominate Internet-style—that is, by doing as much innovation as possible, licensing leading-edge work as the standard for others, and then racing to stay ahead.

That puts the pressure on Sun's big thinkers, like Joy (Exhibit 3). For starters, Joy and Sun's other technologists have coined the term "Net Effects" to describe the challenge of keeping up with spiraling demand as a billion people use the Net more often, from more devices, and in different ways over the next few years. To keep pace, Sun's servers will have to accelerate in power at a rate at least 100 times faster than Moore's Law, which holds that chips double in speed every 18 months, says Sun chief technologist Greg Popadopolous. Sun is working on two tracks—massive single machines with millions of micro-processors, as well as distributed computing schemes so the computing load can be divvied up between smaller machines linked by high-speed networks.

Sun also is betting it can leapfrog the competition by giving customers the essential software they need to run their e-businesses in one neat, foolproof package. Today, companies face a blizzard of offerings—application servers to host and handle e-mail, Web servers to manage and send out Web pages, and portal programs on which to give the sites a unique look and feel. While these stand-alone software products may deliver the latest bells

and whistles, it costs a fortune in consulting fees to make them work together.

Sun's approach is different. iPlanet packs snazzy programs into a suite known as the Internet Service Deployment Platform. Don't be fooled by the clunky name. Using this suite, customers can get up and running quickly because Sun has made sure the software works in sync. With the price starting at \$500,000, Sun isn't looking to undercut the competition. Instead, customers will save on installation. "This could cut my development time by 30%," says Norbert Nowicki, a senior partner with Computer Sciences Corp., an El Segundo (Calif.) computer services consultancy.

Sun isn't the only company offering such a suite. Oracle, IBM, and Microsoft do, as well. But none of those companies is the dominant provider of the computers on which the software must run. "Sun isn't just dragging the software along anymore," says Goldman, Sachs & Co. analyst Laura Conigliaro. "It can be a serious driver of new business." Especially with partner AOL using the software suite internally and promoting it to its Net customers. "AOL is customer No. 1 for iPlanet," says David Gang, an AOL executive who recently became iPlanet's executive vice-president. "If we can build products that satisfy AOL, it should work for everyone else."

The irony of McNealy's software approach is that he's stealing a page from the Microsoft playbook—a twist on Microsoft's "embrace and extend" strategy of absorbing fresh technologies into its Windows software. Instead, Sun wants to either bundle or weave Net software into its Solaris operating system. The process already has begun. While competition used to be fierce in the market for arcane directory software, where companies store their databases of employees, customers, and suppliers, now