

What is CEO
Craig Barrett
up to? Hint:
It's about
much more
than computers.

INTEL

BY CLIFF EDWARDS

Barrett is convinced now is the time to strike deep into new territory. Communications, content, and consumer electronics, after years of false starts, are rapidly evolving from the old analog world to one of standardized digital products, the realm of Intel's power. Gung-ho consumers, surging broadband adoption, and rapid declines in the costs of hard drives, chips, and other key technologies are driving much of the world to digital content. Once photos, music, and video take digital form, they become the bits that Intel's chips can process, store, and zap across the Web. "Everything in the world is going digital," Barrett says. "Communications is going digital. Entertainment is going digital. We are able to bring our expertise into differ-

HOURS AFTER DRIVING ACROSS Craig R. Barrett's 500-acre Montana ranch, the Intel Corp. chief executive and half a dozen of his top execs hit the snow for a cross-country skiing jaunt. Kicking off a January, 2003, weekend retreat, the outing soon turned into a grim slog. With the sun setting and a winter chill deepening, the guests wondered aloud whether it was time to head back to the ranch. But Barrett showed no signs of ending the adventure. For three hours, he plowed ahead at a pace that left even the fittest of the team bone-weary. For Barrett's lieutenants, the message was clear: Turning back was not an option.

Just 15 months before he hands the CEO job over to President Paul S. Otellini and becomes chairman, the 64-year-old Barrett is pushing just as hard to secure his legacy. After a rocky start to his tenure in which Intel invested billions in new businesses that largely failed, Barrett has been racing to transform the chipmaker. He has since shaken up Intel's insular, engineering-driven culture. He has ignored the scorn of critics and plowed \$28 billion into cutting-edge plants and new technologies during the longest downturn in the chip industry's history. Today, Intel's manufacturing, always a cut above, is unrivaled throughout the semiconductor industry. "Everybody thought Barrett was crazy," says money manager Snehal Vashi of Henssler Equity Fund, which counts Intel shares among its \$1 billion in assets. "Rather than pulling back, he invested more, and that is bearing fruit."

Now Barrett is planning a last hurrah that may have some questioning his sanity all over again. At a time when some execs would be eyeing their pensions, Intel's chief is launching the most ambitious move beyond computers in the company's 35-year history. Forget Intel Inside. Think Intel Everywhere. Under Barrett's plan, Intel's powerful lineup of chips would be the guts of nearly every type of digital device on the planet. Cell phones. Flat-panel TVs. Portable video players. Wireless home networking. Even medical diagnostic gear. All told, the company is targeting 10 new product areas for its chips, primarily in the consumer-electronics and communications markets.

THOMAS BROENING

ent areas where we really had no unique capability before."

Translation: Barrett fully intends to upend the status quo in communications and consumer-electronics markets. Think of Intel as a silicon arms dealer. By hawking cutting-edge digital technologies, the chipmaker will offer weapons that upstart companies can use to knock existing players for a loop, while forcing entrenched companies to consider buying the same weapons. This fall, for instance, Intel plans to roll out a chip based on a technology called WiMax that could be used to deliver high-speed wireless Internet access throughout a small city for about \$100,000, one-tenth the cost of rolling out fiber-optic lines today. Either cable and phone companies buy into Barrett's vision, or their near-monopoly on broadband could be cracked by upstarts using WiMax. That's just the tactic that led to the dizzying popularity of Wi-Fi, a similar wireless technology, after Intel got behind it last year.

IF INTEL SUCCEEDS THIS TIME, THE PAYOFF could be huge. The consumer-electronics, wireless-handheld, and communications-equipment markets that Intel is targeting already use \$77 billion worth of semiconductors, and Intel has less than 6% of that total. If the company can boost its share to 10% in five years, as some analysts estimate, its revenues from the new markets would soar from \$4.4 billion now to about \$10 billion. Add that on top of the 11% growth expected in Intel's core computer-chip business, and Intel's revenues would rise by the 15% annual average that Barrett is targeting. "They're one of the few companies in the world that can dream of doing something that massive," says analyst David Lytel of the investment research firm Precursor Group.

Sound risky? A bet-the-company gambit? At first blush, maybe. After all, Intel is investing about \$2 billion in everything from chip design to marketing to get into these new markets. But look closely, and you'll see how shrewd Barrett's strategy is in limiting the risk. As Intel pushes into new markets, it's doing as the Romans did and making sure that all roads lead back to the heart of its empire: the computer-chip business. If the new markets take off, they'll pump up demand for PCs and servers—bringing in new revenues for Intel even if it doesn't win big in those new markets. Take portable media players, which store TV shows and movies on a hard drive. If demand for them booms, Intel benefits because consumers will want beefier PCs to handle all the digital video they'll be loading onto their players. If Intel sells the chips in media players, too, Barrett grabs a share of the trade in today's Carthage and Rome. "With Craig's strategy, you get a double hit," says Charles E. Young, an Intel board member since 1974 and University of California at Los Angeles Chancellor Emeritus.

Even if one or two initiatives fizzle, Intel's world won't come crashing down. The company's core PC and server business should continue to produce solid results in the years ahead. A strong showing in the computer businesses is the primary reason Intel's profits are expected to jump 46% this year, to \$8.2 billion, as revenues rise 15%, to \$34.7 billion, according to investment bank Lehman Brothers. Still, those results will be boosted by an expected recovery in tech spending. Without help from new markets, Intel risks being chained to a slower-growth PC business, especially in light of competition from a rejuvenated Advanced Micro Devices Inc.

There is reason to be skeptical about Intel's chances in several of the new markets. The company's past attempts to expand beyond the computer market have, with few exceptions,

All Roads Lead to Intel

At the Core

PCs AND SERVERS

MARKET SHARE **83%**

MARKET SIZE **\$27 BIL.**

PROGNOSIS Although rival AMD is coming on strong, Intel's dominance in microprocessors seems rock-solid, especially since it has five factories with the most advanced technology to every one factory owned by competitors.

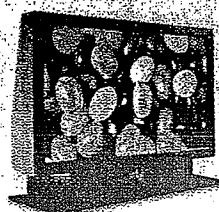
New Markets

FLAT-PANEL TELEVISIONS

MARKET SHARE **0%**

MARKET SIZE **\$10 BIL.**

PROGNOSIS Intel is developing processors for decoding TV signals that could cut the cost of some flat-panel screens in half this year.



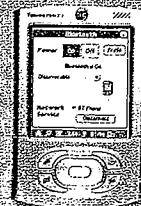
That could win it a neat slice of the market.

HANDHELDS

MARKET SHARE **50%**

MARKET SIZE **\$2 BIL.**

PROGNOSIS Intel's chips power half of all handheld computers, but growth prospects are dim. The market contracted 18% last year.



PHOTOGRAPHS BY GERRY GROPP (TV); INDEX STOCK (CELL TOWER)

Intel is branching out beyond computer chips to make semiconductors for a host of new products, from portable video players to flat-panel TVs. These products, in turn, are expected to boost Intel's core PC and server business. Here's how:

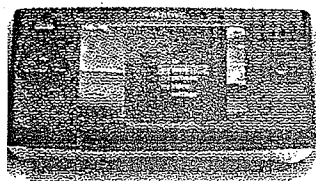


PERSONAL MEDIA PLAYERS

MARKET SHARE **0%**

MARKET SIZE **\$50 MIL.**

PROGNOSIS Intel is positioned to become a leading maker of processors and memory chips for these portable video players, but the demand is still tiny.



ENTERTAINMENT PCS

MARKET SHARE **90%**

MARKET SIZE **\$120 MIL.**

PROGNOSIS Intel-powered PCs designed to play movies or music in the living room are flying off the shelves. New designs due later this year could boost sales further.



WIMAX

MARKET SHARE **0%**

MARKET SIZE **\$0**

PROGNOSIS Intel's technology, which will be built into PCs next year, is supposed to deliver high-speed Net access within 30 miles of a transmission point. But wireless players favor competing technologies.

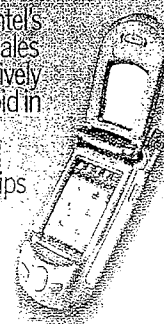


CELLULAR PHONES

MARKET SHARE **20%**

MARKET SIZE **\$9 BIL.**

PROGNOSIS Intel's memory-chip sales have been relatively strong, but its bid in digital signal processors and other phone chips has been a flop so far.



failed. In 2001, Intel backed out of making cameras and other consumer-electronics gear after key customers, including Dell Inc. and Hewlett-Packard Co., complained that it was competing against them. And in 2002, the chipmaker took a \$100 million charge when it pulled the plug on a foray into Web hosting.

Now, several of Barrett's bets are on markets that depend on unproven technologies. Portable media players, for instance, may never catch fire beyond a handful of eggheads and

It has forged closer ties with customers, working to create products that fit their needs instead of designing products no one has asked for. And with \$13 billion in its coffers, one of the largest stashes in the tech industry, Intel can pour cash into sales and marketing, he says, persuading potential partners to take its plans seriously. "You start to generate a lot of enthusiasm to get the whole ecosystem lined up," Barrett says.

Building an ecosystem is not something Intel leaves to chance. The company's venture-capital arm, Intel Capital, increasingly is being used to seed outfits that help create a cottage industry around a new Intel product. Take Wi-Fi. Many months before the chipmaker launched its

Now, Barrett says, Intel is creating products that **fit customers' needs** instead of products nobody asked for

movie buffs. "Where they have the world's best understanding of the PC market, they may not have the best understanding of [consumer electronics]," says Gerard Kleisterlee, CEO of Royal Philips Electronics, the Dutch giant that makes both semiconductors and consumer electronics.

Even in promising areas where Intel has made headway, there have been recent gaffes. Last year, the chipmaker tried to push through a nearly 40% price increase for flash memory, the chips that store data after devices like phones or PDAs are turned off. But rivals didn't follow suit, and analysts estimate that Intel forfeited nearly \$1 billion in sales as Nokia and other cell-phone makers bought memory from rivals Samsung and AMD. Intel then tried to take on Texas Instruments Inc. in the market for digital signal processors, one of the key ingredients in cell phones. But cell-phone manufacturers stuck with TI, since they didn't think Intel's product was significantly better. Intel admits it misjudged the market, and rivals say Intel has a steep learning curve outside PCs. "What's the difference between us and Intel?" asks TI's incoming CEO, Richard K. Templeton. "We have customers."

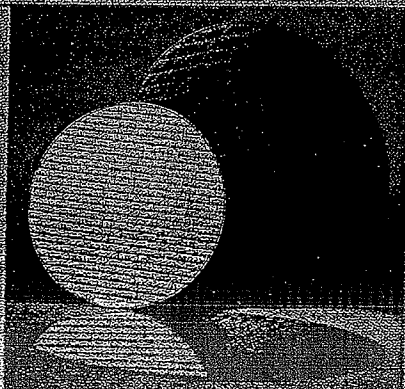
Maybe so, but Barrett knows a thing or two about fortitude. After sprinting up five flights of stairs at Intel's Santa Clara (Calif.) headquarters with more vigor than men half his age, he sits in an executive conference room and explains why Intel will succeed where it has failed time and again. Working with Otellini, he says he has examined the threads of failure from the past, and the two have woven together a strategy that avoids the old mistakes. He claims the chipmaker has become more market-savvy and better equipped to pick its fights in new markets.

Centrino product, which combines the low-power Pentium M processor and a Wi-Fi chipset, Intel Capital dedicated \$150 million to backing companies that supported the wireless technology. Among the beneficiaries was Cometa Networks Inc., which created "hot spots," or places where people could get speedy Wi-Fi links to the Net. Intel followed up the investments with a massive \$300 million global marketing campaign that set the industry abuzz. Now Intel Capital is using the same approach in its 10 target markets. On Jan. 7, the venture unit, which holds stakes worth \$1.3 billion in 344 companies, created a \$200 million fund to accelerate innovations in the digital home.

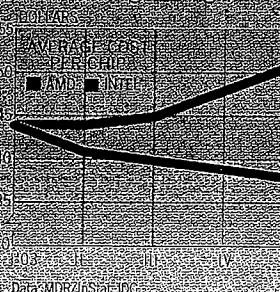
WHAT MAY HELP THAT SEED MONEY take root is that several customers say Intel is becoming more cooperative. In the past, the chipmaker tried to establish standards for new technologies on its own. But recently, it joined several standards-setting groups, including one for home-electronics gear and another for wireless technology. In one case, Intel even agreed to support a mobile-phone technology developed by Nokia Corp. "It's indicative of a difference in how they're approaching the market," says Anssi Vanjoki, manager of Nokia's multimedia group. Says Samsung Electronics Co. Senior Vice-President Chang Il Hyung: "Intel has certainly softened its stance and become a cooperative partner in new markets."

Manufacturing Muscle

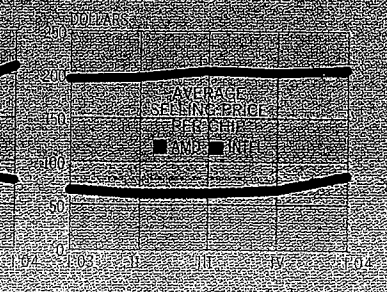
Intel's heavy investments in new chip plants have led to manufacturing efficiencies that rivals, like AMD, are struggling to match



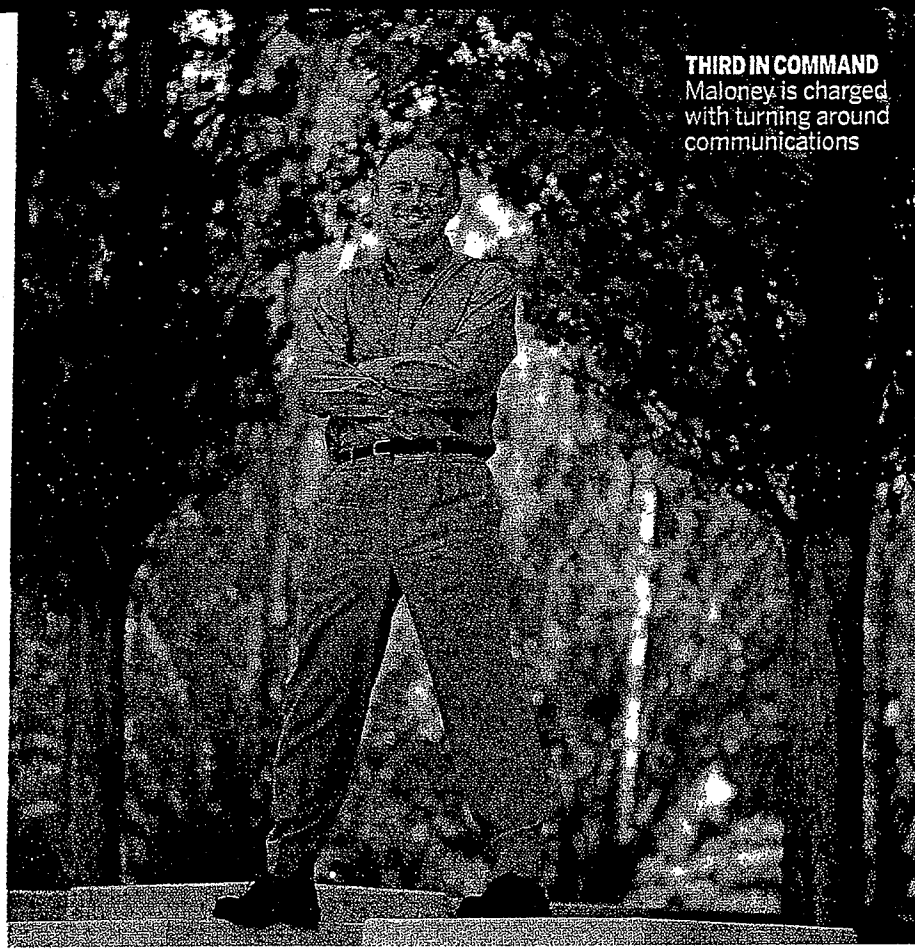
Intel's cost advantage is growing.



and its chips pull in more revenues



Data: MDR/InStat/IDC



THIRD IN COMMAND
Maloney is charged
with turning around
communications

More than anything, it's Intel's manufacturing that makes it a fearsome force this time. In late 2002, Barrett debated with his board because he wanted to keep investing heavily in new plants while hanging on to all of Intel's older plants. If the long downturn persisted, some board members feared, that could burden Intel with too much capacity. During a series of board meetings that fall, Barrett convinced the doubters.

Now Intel looks ready to wage its own campaign of shock and awe. By 2005, five new factories will be able to churn out chips using 12-inch wafers the size of a dinner plate, printed with 90-nanometer circuit lines just 0.1% the width of a human hair. Each plant will slash chip costs in half by producing 2½ times more product than older-generation fabrication plants. That gives Intel the ability to produce 1.25 million processors a day—a staggering 375 million a year. Because of the expense of these fabs, rivals TI, AMD, and IBM will have only one plant each with such advanced equipment in that time period. TI concedes that its capacity to produce the latest-technology chips will be limited to about 250,000 chips a day. “No one can go toe to toe with Intel right now,” says analyst Joseph Osha of Merrill Lynch & Co., which has done investment banking for Intel in the past.

Although Intel is taking a financial risk by investing so much in capacity, it's modest. The company's leading-edge factories will be kept running full tilt, since they're the most efficient and most capable of producing the cutting-edge chips for PCs, servers, and Intel's other established markets. Intel's seven older plants are the ones that will be used to supply the new markets, as well as commodity products like memory chips. In the worst-case scenario, with weak demand in most of the new markets, Intel may have to shut two or three of these older factories. Since the plants and equipment were paid off when they

made PC chips, there would be no write-offs. Instead, Intel would sell off the gear and shutter the facility, a process the company says costs no more than \$5 million per plant.

Most challenging among the new markets will be communications, where Intel's past arrogance alienated potential partners. In December, Barrett removed Ronald J. Smith as head of Intel's Wireless Communications Business and folded the unit into the Communications Group, headed by Executive Vice-President Sean M. Maloney. Barrett's third in command now has the monumental task of turning around the combined operations, which together lost \$858 million last year on \$4 billion in revenues.

After the success of Wi-Fi, Maloney's next great hope is for WiMax. The wireless technology is similar to Wi-Fi in that it provides high-speed Net access to computer users anywhere within the range of an antenna. The difference is that while Wi-Fi's range is 200 feet, WiMax's range extends to some 30 miles. If the technology works as billed, a company could put a WiMax node on an existing cellular tower and make service available throughout metro St. Louis or St. Petersburg for as little as \$100,000. “With its much lower costs,

it catches the vision of all the operators,” says Zvi Slonimsky, CEO of Alvarion Ltd., a WiMax equipment maker.

Trouble is, vision doesn't pay the bills. The major telecom players, including Verizon Communications Inc., have been building broadband networks for more than a decade using their existing copper wires and fiber-optic lines. To serve customers who want fast wireless connections to the Internet, most of the telecom giants have picked out Third Generation, or 3G, technologies that compete with WiMax. Verizon's chief technology officer, Mark A. Wegleitner, says the company tested WiMax in Virginia and found it “satisfactory.” But, he says, the company has no plans to use the technology, since they've already started writing checks for 3G gear.

OTHER COMPANIES MAY BE MORE OPEN to WiMax. Qwest Communications International Inc. doesn't have its own wireless network and hasn't invested in third-generation gear. CEO Richard C. Notebaert says he's looking carefully at WiMax, particularly because providing broadband over copper phone lines is expensive in much of the Denver carrier's sparsely populated territory. Startups in the U.S. and abroad may gravitate to the technology because, for the cost of one or two towers, they could compete with phone and cable companies in selling broadband. AT&T, Sprint, and BellSouth also joined the WiMax Forum recently to keep tabs on the technology, although none has committed to deploying it.

Barrett may find it easier to shake up the \$100 billion consumer-electronics industry. Traditionally, heavyweights such as

Sony Corp. and Philips have designed their own parts, then constantly tinkered with the technology. Besides costing loads of dough, that process can give customers headaches if they purchase gear made by different companies and want everything to work together.

Now, Intel plans to change those old ways. The company is pushing for more standardization and has persuaded companies such as Samsung to use similar parts and software in their

large-screen costs in half by the end of this year, to less than \$2,000 for a 60-inch projection-TV set. If Asian TV makers or HP make sets using the technology, Intel could muscle in on TI and even Sony. "It was a peaceful marketplace. Now people from the outside are coming in like hunting tribes," grumbles Sony Electronics President Hideki Komiyama.

Even as Intel pushes into new markets, it will need to defend its flank. Last April, rival AMD launched its new Hammer line of

microprocessors, hoping to break Intel's lock on the market for server chips. Most of today's chips process data in chunks of 32 bits at a time, but the Hammer chip for servers, called Opteron, also can process data at double the rate with

Execs say Intel's technology could cut the price of some flat-panel TVs in half by the end of this year

products. That approach makes products easier to use—and gives the chipmaker the opportunity to sell more processors, sound, and graphics chips for digital TVs, cameras, and portable video players. Intel is counting on the faster product cycles and distribution capabilities of traditional PC partners such as HP, Gateway, and Dell, as well as a growing collection of Asian contract manufacturers, to give it a leg up. "Intel is a key partner of ours, and they're going to be a key player in the consumer space because so many of the consumer devices are based on Intel chips," says HP CEO Carleton S. Fiorina.

Intel's prospects look bright. Take Barrett's bet on a high-definition display technology called liquid crystal on silicon, or LCOS. Intel is committing nearly \$500 million to producing the chips, whose mirror-like surfaces reflect light to produce a digital image. Execs promise Intel's manufacturing will help slash

no performance trade-offs. Opteron quickly gained a foothold in the server market, and Intel's rival is hungry for more. "We are going to reinvent our position in the market," says AMD CEO Hector de Jesus Ruiz.

To counter the threat, Intel on Feb. 18 revealed it is adding 64-bit capabilities to its popular Pentium and Xeon chips. Pressure from key server makers HP and Dell forced Intel to move up the 64-bit introduction by at least six months, according to two sources at Intel and HP. Intel's move could marginalize its other 64-bit chip, Itanium 2, which is targeted at high-powered server systems (page 64). Intel says it will activate the 64-bit capabilities in its new Pentium 4 chip as soon as PC software that requires the feature is available. "You can be fairly confident that when there is [64-bit] software, we will be there," says Otellini.

Soon enough, it will be Otellini who will be making the

Intel's Fierce New Rivals

Intel's expansion into new markets will pit it against powerful rivals. Here's how the competition will stack up.



THE DIGITAL HOME

THE COMPETITION Intel isn't just going up against the giants, but many that have teamed up. To share costs, Sony, Toshiba, and IBM have partnered to create a chip for the new Playstation 3 set-top boxes, and digital TVs. And Philips Semiconductor, Motorola, and STMicroelectronics have a chip research and manufacturing alliance.

THE BOTTOM LINE Intel's technology may give it the edge in some markets, such as flat-panel TVs. But the industry is too fragmented with competing technologies for there to be one clear winner.

WIRELESS

THE COMPETITION Texas Instruments and Qualcomm reign in chip design and manufacturing, with key phone customers: Nokia and Samsung. Motorola makes its own chips. Broadcom, Airgo Networks, and others are developing chips for wireless data.

THE BOTTOM LINE The relative concentration of this industry gives Intel its best chance to grab big market share. But the chipmaker has to draw customers to its Internet-on-a-chip concept—and hope the market for PDA phone combos takes off.

COMMUNICATIONS

THE COMPETITION Agere, Applied Microcircuits, and Motorola have worked with Lucent, Nokia, and Siemens for years to produce infrastructure equipment. They have established track records but face intense pressure from customers to standardize parts and lower costs.

THE BOTTOM LINE Intel's strength is making standardized, low-cost chips, which helped it become the No. 1 supplier of processors for network routers last year. Still, with many competing chipmakers, Intel's share of the \$41-billion market may top out at 15%, up from 5% now, analysts say.

PHOTOGRAPH BY ROB DOYLE/BW; PHOTO ILLUSTRATION BY DAVID RUDES/BW

strategic decisions at Intel. A 30-year veteran who has focused on sales, marketing, and the PC business, Otellini doesn't have the deep roots in manufacturing that Barrett has. Still, he vows that he'll continue to bet just as big on manufacturing as the company's other leaders. Even a junior employee, he says, understands the value of Intel's manufacturing leadership. "And there's 45,000 other manufacturing people to help nudge me if I don't remember that," he says, laughing.

There's also Barrett. In 2005, he is expected to take over as Intel's chairman from co-founder Andrew S. Grove, who will

become chairman emeritus. For many more years, Barrett will be around to argue that, like his guests on the snowy turf, Intel must slog through the semiconductor boom-and-bust cycles and focus every ounce of energy on growing new businesses. The alternative is being left out in the cold. ■

—With Moon Ihwan in Seoul and Andy Reinhardt in Paris

BusinessWeek **online** For an interview with Intel Chief Executive Craig Barrett and a look at Intel Capital, go to www.businessweek.com/magazine/extra.htm

PRODUCTS

Goodbye to the Chip of the Future?

When Intel and Hewlett-Packard released the Itanium server chip they had jointly developed three years ago, detractors quickly labeled it "the Titanic." Delivered two years late and at a cost of \$2 billion, the chip was billed as the future of computing because it could process data 64 bits at a time, twice the amount of other chips. But Itanium performed poorly on its maiden voyage, chewing through data even more slowly than Intel's own 32-bit chip. Potential customers gave it a chilly reception, especially because so little software could take advantage of its 64-bit capabilities.

On Feb. 17, Intel Corp. Chief Executive Craig R. Barrett sank Itanium's last hopes for gaining broad success. He announced that Intel will reconfigure its own 32-bit chips, the Xeon for servers and the Pentium 4 for desktops, so that by midyear they also will be able to process 64-bit software. With Intel throwing its weight behind other products that can handle 64-bit applications, Itanium looks doomed to niche status.

The Itanium experience is a timely reminder of how Intel's culture may make it challenging to expand into new markets. The company's forays into consumer electronics and communications depend on its ability to cooperate effectively with other companies. But Itanium is a symbol of the go-it-alone arrogance of the company's past. When Intel was developing the chip, critics outside and even inside the company said it was unreasonable to require software companies to rewrite millions of lines of

code so their software would run at 64 bits. Indeed, that became a critical flaw. Although Intel is showing signs now of becoming more humble, such missteps mean it will have to work hard to win over potential customers.

No question, Barrett needed an alternative to Itanium. Last April, rival Advanced Micro Devices Inc. began selling its Opteron server chip, which can handle both 32-bit and 64-bit applications. The

customers have been demanding more choices in the servers they buy.

How did AMD outmaneuver Intel? The plucky underdog bet that existing chip technology would continue to double its performance every 18 months—just as Intel co-founder Gordon E. Moore had predicted in what became known as Moore's Law. Although Intel also believes in Moore's Law, it felt the Itanium architecture would be superior. AMD's gamble paid off. In the 10 years since Intel announced it would develop chips for 64-bit applications, 32-bit chips have grown to account for 91% of the server market.

Now Intel is making up for its misstep. It still holds 96% of the mainstream server market, according to IDC. And by adding 64-bit extensions to its Xeon line, it has the

A Troubled History

Itanium's development was long and costly—and customers didn't rave when it finally debuted in 2001. Now it appears doomed to niche status.

1994 Intel and Hewlett-Packard say they're collaborating on a 64-bit microprocessor later called Itanium.

2001 After two-year delay and \$2 billion in development costs, Itanium is released to lukewarm reviews.

2002 The chipmaker releases Itanium 2, citing improved performance.

2003 Rival Advanced Micro Devices releases its Opteron server chip. Its ability to handle both 64-bit and 32-bit tasks wins on the latest reviews.

2004 Intel adds 64-bit capabilities to its 32-bit Xeon chips, raising questions about the need for Itanium 2.

flexibility helped Opteron grab 3.9% of the mainstream server market by December, according to researcher IDC. "It's not 64 bits that most people want right now. It's performance and value," says Peter N. Glaskowsky, editor in chief of *Microprocessor Report*.

Even Hewlett-Packard Co. is hedging its bet on Itanium. On Feb. 24, HP revealed that it will begin selling servers with AMD's Opteron alongside Intel's products. Chief Technology Officer Shane V. Robison says HP's relationship with Intel is "the deepest partnership in the industry" but adds that

option of starting a price war if AMD makes more headway with corporate customers. The move helped keep Dell Inc., the world's second-largest server seller, from defecting to AMD by giving it a 32- and 64-bit product to sell against Opteron offerings from Sun Microsystems, IBM, and HP. Dell President Kevin B. Rollins says his company has no plans to use AMD chips.

By developing an alternative to Itanium, Intel looks plenty capable of defending its server dominance. But the chip of the future doesn't have a very bright one.

—By Cliff Edwards in San Mateo, Calif.