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Best of the Best: Inside Andy Grove's Leadership at Intel

When Andrew S. Grove was a student of engineering at New York's City College in the mid-1950s, he faced a problem. The one-year scholarship he received as a Hungarian refugee was about to run out, and to speed up his graduation, he needed to take courses in the chemical engineering department. The chairman, Professor Al Xavier Schmidt, taught a crucial course—Chem E 128. Unable to schedule an appointment with Schmidt, Grove, then a young man of 20, waited outside the classroom one day and seized his chance to present his case to the formidable professor.

As Grove spoke, Schmidt, a short man with a fierce moustache, fixed his eyes on the nervous student and subjected him to an interrogation. "He cross-examined me on the spot," Grove recalls.

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“He asked me about my courses, who I took them from, and my grades.” Schmidt apparently liked Grove’s replies—he had failed one exam in physics but got an A in the subject the next time—and admitted him to his course. “He was testing me, testing my background,” says Grove.

That incident was an early example of a pattern that appears frequently in Grove’s life—converting a negative situation into a positive one through resourcefulness. As chairman and former CEO of Intel, a company he co-founded in 1968, Grove has repeatedly faced setbacks during the past 35 years but found ways to turn them into stepping stones. In the process, with Grove at its helm, Intel has grown into the world’s largest chipmaker, with 78,000 employees and more than \$30 billion in annual revenues in 2003.

That, in itself, is not unusual. Many companies and leaders profiled in this book have seen remarkable success during the past 25 years. Still, Intel occupies a special place among them. As the company that introduced the world’s first microprocessor in 1971, Intel has played a seminal role in the evolution of modern computing. It is impossible to conceive of today’s global, networked economy without Intel, or to imagine Intel without Andy Grove. As this chapter shows, Grove’s life and career consistently reveal his imagination, resolution, and integrity. That is why his leadership has lasted as long as it has.

This book argues that lasting leadership results from individuals possessing—and cultivating—certain qualities and combinations of attributes. While all the leaders featured here have some of these attributes, Grove stands out because he has personified so many of them in specific ways over a span of nearly 50 years.

Inspired by Schmidt, Grove developed a leadership style based on truth-telling. At a time when Intel was facing a crisis of mammoth proportions—triggered by Japanese inroads into the company’s core market of memory chips in the mid 1980s—he discovered an underserved market and rejuvenated the business. A decade later, confronted by another severe disaster involving a flaw in its Pentium microprocessors, Grove was forced to recognize how market conditions had changed. He was able to build the Intel brand (through the famous “Intel Inside” campaign) and used his savvy in managing risk to steer the company clear of antitrust regulators.

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Above all, Grove espoused and upheld values that have given Intel its unique corporate culture, or what he calls its “very strong immune system.”

A business leader who combines all these attributes and deploys them consistently over his or her life is not just rare; he or she is unique. That is why Wharton and *Nightly Business Report* named Andy Grove “most influential” among the Top 25 leaders profiled in this book. The attributes that make him special, however, are not unique; they are available to everyone. Learning how to nurture these qualities in yourself will not turn you into Andy Grove. It may, however, make you a better leader.

1936: Born in Budapest, Hungary, on September 2 and named Andris Grof. The secular Jewish family is modestly prosperous; his father, George, is a dairyman; his mother, Maria, a book-keeping clerk.

1938: The Grof family moves to the commercially vibrant Pest section of Budapest where George Grof expands the dairy business.

1940: An acute attack of scarlet fever nearly kills four-year-old Andris. The illness leaves him almost completely deaf for years, until surgery finally corrects the problem.

1942: George Grof is drafted into a work brigade in the Hungarian army, and he disappears for three years. During World War II, as Jews in Hungary are being rounded up, young Andris and his mother go into hiding, changing their name to Malesevic and moving in with Christian acquaintances.

ANDREW S. GROVE

The Challenge:

Dealing with the Pentium Flaw Debacle

Ask Andy Grove, chairman of Intel, about his toughest business challenge, and a pensive look appears in his piercing blue eyes. Two situations vie for the position. One is the time when Intel almost went under during the mid-1980s as a result of fierce competition from Japanese chipmakers. The second crisis—which is highlighted in this section—came a decade later, when the company was slammed by its customers and the media for a flaw in its Pentium microprocessors. The flaw eventually led to large-scale product replacements and ended with Intel taking a \$475 million write-off. “The net present value of the pain involved is hard to compare,” Grove says in his precise voice. “They both tore me up. It seems that the more recent one tore me up more, but that may be because it is more recent.”

It happened in the fall of 1994. At that time Intel, which had \$10 billion in annual revenues, was already the world’s largest chipmaker. The company was busy preparing for the launch of the Pentium, its latest generation microprocessor—an operation that involved a heavy-duty manufacturing effort and a massive advertising campaign. As optimism about Intel’s prospects increased, the company’s stock soared. In the last week of November, it traded in the high 60s after a Merrill Lynch analyst predicted a big increase in fourth-quarter sales.

Under the radar screen, however, trouble was brewing. Several weeks earlier, discussions had

begun in various Internet newsgroups about a flaw in the Pentium's floating point unit, the part of the chip that handles advanced number-crunching. Intel executives, including Grove, didn't pay much attention. They were aware of the flaw and, after a thorough examination, concluded that it was insignificant. According to Grove, the design error "caused a rounding error in division once every nine billion times." This meant "that an average spreadsheet user would run into the problem only once every 27,000 years of spreadsheet use."

Soon, however, the online discussion caught the attention of trade publications, which started writing about it. Matters came to a boil on November 22, 1994, the Tuesday before Thanksgiving. A CNN crew showed up at Intel's headquarters in Santa Clara, California, and the next day, the cable news channel aired a nasty piece about the Pentium flaw. Soon the story began to appear in *other* publications in the U.S., and then in other parts of the world. For example, *The New York Times* ran an article titled, "Flaw Undermines Accuracy of Pentium Chips." Customers, too, were up in arms, because news reports said Intel had already shipped two million computers with Pentium chips. Says Grove, "We had a daily monitor of incoming nasty calls, of customer complaints."

Grove's reaction, as usual, was to set the record straight. On Thanksgiving Day, he wrote a memo and posted it on the Internet, identifying himself as the CEO of Intel, and pointing out that while the floating-point unit did have an error, it would only affect "users of the Pentium processor who are engaged in heavy-duty scientific/floating-point calculations." Much to his amazement, not only did people pooh-pooh his arguments about the Pentium flaw, but they also didn't believe that he had written the memo.

1950: At age 14, he aspires to become a journalist and is a reporter for the youth newspaper, which is under the influence of the government. After a relative is imprisoned without trial, the newspaper stops publishing Andris's articles. The experience turns him off journalism. "I was crushed as only a slighted adolescent can be," he later writes. "I did not want a profession in which a totally subjective evaluation, easily colored by political considerations, could decide the merits of my work." He turns from journalism to science.

1956: In December, as Soviet tanks crush Hungary's October rebellion, Andris and a friend escape from Hungary, initially crossing the border into Austria and then sailing to the U.S. The International Rescue Committee, a relief organization, helps bring him from Vienna to New York City. Later he Americanizes his name to Andrew Grove.

1956: Enters City College of New York to study engineering. Meets Professor Al Xavier Schmidt, chairman of the Chemical Engineering department, who gives Grove a job and becomes his mentor.

1958: Marries Eva Kaston in New York; he had met her the previous year while working as a busboy at a holiday resort in New Hampshire where she worked as a waitress.

1960: Graduates from the City College of New York with a bachelor's degree in chemical engineering. Knowing that Grove loves America but hates New York, a professor suggests Grove might prefer California.

1963: Completes his Ph.D. at the University of California at Berkeley.

1963: Joins the research and development laboratory of Fairchild Semiconductor. Founded in 1957, the company initially started out making transistors for IBM and other customers, but the company became well known after researcher Robert Noyce co-invented the integrated chip in 1959.

1967: Becomes assistant director of R&D at Fairchild Semiconductor, working under Gordon Moore, one of the top chemists of the century.

1967: Publishes his first book, *Physics and Technology of Semiconductor Devices*. It is widely used in schools and colleges.

1968: Co-founds Intel—short for Integrated Electronics—with Moore and Noyce. The company initially focuses on making integrated chips.

“There was a *huge* amount of discourse on the web claiming that it wasn’t I who had written it,” Grove says. “I typed the f^{***}king thing with my own two fingers [but] nobody believed what it said, and nobody believed that I wrote it. Everything I said in it was true, and I wrote it. I was shocked.”

Outraged customers began demanding replacement chips for their computers. Sticking to Grove’s policy of insisting that the error was minor, Intel initially resisted replacing the chips unless the customers could establish that the chips would be used for advanced math calculations. As *Information Week* wrote in an article titled, “Intel to Users: ‘Humbug!’,” “Users, upon reaching Intel’s 800 number, apparently go through a lengthy interview process to see if Intel deems them worthy of receiving a corrected chip. If you can’t convince Intel that you may encounter the bug in daily life, you just don’t make the cut.” Soon, jokes ridiculing Intel were making the rounds on the Internet, including a top-ten list of reasons to buy a Pentium machine. “Reason number 10.0000001: Your current computer is too accurate.”

By December, the volume of complaints declined a little, and Grove began to feel optimistic that the worst might be over. Unexpectedly, another blow fell. Grove arrived at his office one Monday to find a message with a news flash on his desk. It said, simply, that IBM had stopped shipments of all Pentium-based machines. According to Grove, “All hell broke loose again... The phones started ringing furiously from all quarters. The call volume to our hotline skyrocketed. Our other customers wanted to know what was going on. And their tone, which had been quite constructive the week before, became confused and anxious. We were back on the defensive again in a major way.”

Why did Intel respond to the Pentium flaw crisis the way it did, in a manner that one observer called “a textbook example of how not to handle a delicate situation”? In part, it followed from Grove’s approach, modeled as it was after his former chemistry professor’s tough, no-nonsense style of stating the facts and refusing to bow before pressure. In retrospect, says Grove, he thinks he “mishandled the floating-point debacle about as badly as possible. By the way, Schmidt probably cheered me on as I mishandled that situation. I stuck with the facts and told our customers to get with it.” It was apparent, however, that Grove’s “Schmidt approach,” while it may have worked in previous situations, was not only ineffective during the Pentium flaw crisis but was making matters worse. Eventually, “after a number of days of struggling against the tide of public opinion, of dealing with the phone calls and the abusive editorials, it became clear that we had to make a major change,” according to Grove. When this realization sank in, Intel reversed its policy. The company announced it would replace anyone’s chip who wanted it replaced. It set up a huge operation to answer customer phone calls—staffing it initially with volunteers who wanted to help cope with the disaster. Ultimately, as Intel replaced hundreds of thousands of chips, the crisis passed. When it ended, Intel had to take a \$475 million bath. “It was the equivalent of half a year’s R&D budget, or five years’ worth of the Pentium processor’s advertising spending,” says Grove.

While Grove’s “Schmidt-style” response may have aggravated the Pentium flaw crisis, it alone was not responsible for the way he dealt with it. As he explained two years later in his book *Only the Paranoid*

1971: Researchers at Intel invent a new kind of integrated chip, the microprocessor, which can be programmed to do calculations. This allows microprocessors to become the “brains” of a computer. The 4004, a four-bit silicon chip, packs as much computing power as the ENIAC, the world’s first electronic computer—which filled a room—in a chip smaller than a thumbnail.

1972: Intel develops an eight-bit microprocessor, the 8008, with twice the power of the 4004.

1976: Intel researchers create the Multibus, a mechanism that makes it possible to interconnect large numbers of microprocessors. This innovation is used to develop products such as automatic teller machines.

1979: Grove becomes president of Intel.

1983: His book, *High Output Management*, is published. The book is translated into 11 languages.

1987: Becomes CEO of Intel; G.P. Putnam’s Sons publishes *One-on-One with Andy Grove*. Grove is a “Dear Abby of the Workplace,” offering business advice as a columnist for Knight Ridder.

1994: Controversy explodes around Intel as it releases flawed Pentium chips; after initially saying the problem is minor, Intel changes direction and agrees to spend \$475 million to replace the flawed chips.

1994: In December, Grove's doctors diagnose cancer of the prostate. He reads all the research he can find on the subject and decides upon his own treatment.

1996: *Only the Paranoid Survive: How to Survive the Crisis Points That Threaten Every Company* is published by Currency/Doubleday. In this book, Grove explains his concept of strategic inflection points—make-or-break situations that bring about a sea change in an industry—with examples from Intel's experience. *Forbes* magazine calls it "probably the best book on business written by a business person since Alfred Sloan's *My Years with General Motors*."

1997: Becomes chairman and CEO of Intel.

1997: *Time* magazine names Grove "Man of the Year."

1998: Steps down as CEO but remains chairman; named "Distinguished Executive of the Year" by the Academy of Management.

Survive, Intel at that time was going through a "strategic inflection point," or a key turning point, when the rules by which the company did business changed.

The rules changed, ironically, because of the success of another initiative, the "Intel Inside" marketing campaign. During its relatively brief history, Intel had pioneered the development of innovative memory chips and microprocessors. It had set the standards for its products and marketed them to computer makers (rather than computer users). "Whatever problems we had in the past, we used to handle with the computer manufacturers, engineer to engineer, in conference rooms with blackboards, based on data analyses." A few years before the Pentium crisis hit, however, Intel had embarked on an aggressive marketing campaign to build the Intel brand. Its "Intel Inside" slogan was plastered on billboards, appeared in TV commercials, and, in China, even on bicycle reflectors. By the time the campaign ended, Intel had become a world-famous brand with international name recognition.

As a result, when the Pentium crisis hit, the customers who were concerned were not just engineers (who might have understood why a minor design flaw was not a big deal) but millions of non-technical folks who didn't give a hoot about intricate mathematical arguments. They just knew they wanted an accurate chip to replace a flawed one. Grove was still trying to communicate about product standards according to the old rules, without realizing that as a result of its marketing campaign, Intel's customer base had fundamentally changed. Intel was no longer an industrial products company; it had evolved into a mass consumer products company.

Another factor, Grove realized in retrospect, was also at work. He still thought of Intel as an innovative start-up, but the external view of the

company was that it had grown into a global IT giant. As such, when thousands of customers thought Intel was not responding to their complaints about the Pentium's flaw, they lambasted it as they might any insensitive big-business mega-corporation. Here, too, Grove's perception of Intel was at odds with that of its customers.

That disconnect was brought home strongly to Grove after Christmas 1994. One Sunday, Grove was speaking to Dennis Carter, Intel's head of marketing, about having survived the crisis. Carter said, "I'm glad you called, because I have drawn completely the opposite conclusion. We may have survived, but it was shocking how little public goodwill there was for us to tap into. It was as if the public was just waiting for us to stumble." Carter argued that "Intel would have to change its approach to business dramatically: It would have to court its public, be sensitive to the needs of vast numbers of customers, and build equity of goodwill."

Grove was livid. "I told him to go f*** himself," he says. "I didn't have the patience to listen to bullshit like this. Again, Schmidt probably cheered me on. We talked for hours. I was standing in front of the kitchen phone. And as usually was the case when Dennis and I fought, Dennis won." Intel had learned its lesson: It implemented several actions to win back the public's trust and confidence. Eventually it won a spot on *Fortune* magazine's list of most admired companies.

Grove's experience shows that when faced with a challenge of such enormous magnitude, just being a truth teller may not be enough; it is equally important to be a fast learner, recognizing how the rules of the game have changed and adapting to the new realities. Grove, with some help from his colleagues, was able to do just that. "So, did I learn? Yeah," he says. "But did I learn from the incident? Hell, no."

2001: In November, *Swimming Across: A Memoir*, is published. The book is an account of the first 20 years of Grove's life, beginning with his childhood in Hungary up until his move to California. Grove tells media host Charlie Rose that he did it mainly for his grandchildren.

2004: Grove is named the "most influential" business leader of the past 25 years by *Wharton* and *Nightly Business Report*.

Leadership Lessons

About Schmidt: Telling the Truth

Schmidt captivated Grove as a teacher from the very first lecture. As Grove remembers, Schmidt came to the class and wrote a problem on the board. “It seemed very complicated, though in retrospect it was very simple,” he says. “He tortured us with it. After making it more and more complicated, he showed us how to solve it with one long line of conversions. At the end of that class, Professor Schmidt said, ‘Our statistics show that 60% of you will be unable to finish this course, and that is alright with me. The rest of you will approach problems in the fashion I just showed you.’ I was just blown away.”

Schmidt soon was to help Grove in another way. When he learned the young man’s scholarship was about to run out, Schmidt called Grove to his office. He asked how much money Grove would need, pulled out a long slide rule, did some calculations, and offered Grove a job at \$1.79 an hour—estimating that by working 20 hours a week he could make as much money as the scholarship paid. Almost speechless with surprise, Grove agreed. As he later said, “So I ended up working for crusty Professor Schmidt, running his copies and his errands, typing with two fingers, filing, whatever—and supported myself through my remaining years of college that way.”

The years that Grove worked for Schmidt helped shape his style as a leader. Schmidt was “down to earth, had no airs, said what he had on his mind, took no nonsense from anyone, did what he said he would do.” Almost everyone who encountered Schmidt was terrified of him (except for his secretary, who terrorized the formidable professor). Grove, too, was a resolute truth-teller. Years later, in a book that offered management advice, he was to write: “Be straight with everyone. I hate it when people are not honest with me, and I would hate myself if I weren’t straight with them. This isn’t an easy principle to stick to. There are always many reasons (better to call them excuses) to compromise a little here or there. We may reason that people are not ready to hear the truth or the bad news, that the time isn’t right, or whatever. Giving in to those tempting rationalizations usually leads to conduct that can be ethically wrong and will backfire every time.”

Grove and Moore: Teamwork at the Top

After finishing his Ph.D. at the University of Berkeley, Grove joined Fairchild Semiconductor, where he encountered the second person who helped him mold his leadership style. Gordon Moore, the legendary chemist who headed research operations at Fairchild, is now widely known for “Moore’s Law,” which predicted that the number of transistors placed on a computer chip would double every two years—the phenomenon that has made it possible for the computer industry to produce increasingly powerful computers at declining prices. Moore took Grove under his wing. “He guided me from a freshly minted Ph.D. to a reasonably knowledgeable technologist in the semiconductor industry,” says Grove.

Soon Grove left Fairchild with Moore and Robert Noyce, the highly respected scientist who had invented the integrated circuit in 1959, to co-found Intel. Grove’s leadership qualities, already evident as Moore’s deputy at Fairchild, now gained freer rein. Moore, who became Intel’s chairman and CEO, was very different from Schmidt. Despite Moore’s brilliance, “if I had relied on his leadership style, I would have been in deep trouble because Gordon is not an activist,” says Grove. “My role was to be exactly the opposite of Gordon.”

One example sharply reveals the difference between Moore and Grove. One time, Grove went to Moore to discuss an issue related to plastic packaging. Moore delivered a lecture on the history of plastic packaging, the various problems that had been encountered in its evolution, and the solutions that were implemented. Grove took notes. By the time Moore had finished, it was as if Grove had taken a course on plastic packaging. “Moore has encyclopedic knowledge of the technologies that are relevant to our business,” says Grove. “But he was not an activist. That was not his thing to do.” As a consequence, acting on knowledge he gained from Moore to achieve objectives became Grove’s “thing to do.” He did what it took to get results.

Moore was once asked what Intel would have been like without Grove. Moore’s response, says Grove, was, “It would have been a much more pleasant place and a whole lot smaller.” The corollary question might be what Intel would have been like without Moore. Says Grove, “The answer is: It would have been an Intel without Andy Grove. Gordon came to the conclusion in the first

half-hour that I interviewed with him at Fairchild that I would be the person to succeed him there. In a minor detail, that turned out to be wrong, but I did become the person to succeed him at Intel.” Grove says Moore first told him in 1971 (when Grove was just 33) that he had him in mind to run Intel. “It was a compliment that I didn’t take literally at all,” says Grove. “But he acted on what he said. He brought me along and tutored me. If he hadn’t been there, I would have been a happy, productive engineer and I might have done pretty well, but I don’t think I would have ended up running the company.”

Over time, the bond between Grove and Moore grew uncannily deep. Grove recalls a meeting when some 20 Intel executives were sitting around a table, discussing an issue. From the corner of his eye, he saw Moore and noticed a subtle change of expression on his face. Grove knew that Moore would never interrupt or enter a discussion if something bothered him. Grove stopped the discussion at once, and asked, “Gordon, what’s the matter?” and then Moore went on to explain what was on his mind. “Gordon produced ideas that he never would have voiced—thoughts that would never have received the hearing they deserved—until he expressed them and I amplified them,” says Grove. “I didn’t read his mind; I read his body, his face.” Later, Moore told Grove, “You’re getting to be scary. You know me as well as my wife.”

In contrast, Grove and Noyce were essentially friends; Grove didn’t regard Noyce either as a guide or role model. Asked how he, Moore, and Noyce worked together at Intel, Grove points to Peter Drucker’s 1954 book, *The Practice of Management*, in which Drucker argues that the activities that make up a chief executive’s job are too varied to be performed by a single person but should be divided between three: a “thought man,” a “man of action,” and a “front man.” Grove says that during the 1970s, that description applied to Intel’s three co-founders. Moore, with his encyclopedic mind, was the “thought man;” Noyce, a charming man who had enormous standing in the semiconductor industry, was Intel’s public persona or the “front man”; and Grove, with his Schmidt-inspired, no-nonsense style, was the “man of action” who got things done.

By the 1990s, Grove increasingly took on the public role that Noyce had played in the 1970s, while Craig Barrett, now Intel’s

CEO, became the “man of action.” In other words, these roles aren’t static; they change over time.

From Chips to Microprocessors: Targeting an Underserved Market

Intel’s core business, which initially focused on memory chips, also changed over time. The way in which that change came about is now a well-documented part of Intel’s history. As Grove tells the story in *Only the Paranoid Survive*, Intel went through a “crisis of mammoth proportions” as it “got out of the business it was founded on and built a new identity in a totally different business.” Grove says that although this experience was unique to Intel, the lessons it teaches are universal.

The episode also offers an excellent instance in which Grove, as Intel’s leader, rescued the company from potential extinction by discovering an underserved market and turning the company around by catering to it.

When Moore, Grove, and Noyce first started Intel, their goal was to produce memory chips. Its first product was a chip with a 64-bit memory. Over time, the company developed chips with increasing numbers of transistors packed in closer proximity. Initially, Intel owned 100% of the market because it had invented these products. In the early 1970s, some U.S. competitors, such as Unisem and Mostek, made their appearance. “If you don’t recognize the names, it’s because these companies are long gone,” notes Grove. By the end of the decade, the U.S. had about a dozen memory chip companies that competed with one another, but Intel still was a dominant player in the memory game.

By the time the 1980s came, the nature of the business changed. Japanese chip makers entered the market in a big way—Grove describes it as “overwhelming force”—offering better quality and beating the U.S. chip makers on price. In an effort to beat back this competition, Intel tried to ramp up its manufacturing efforts. “During the 1970s, we were parallel to our competition,” says Grove. “In the 1980s, the competition became better than us, but we didn’t respond until Craig [Barrett] took charge of it.” As Intel kept improving its manufacturing and laboratory operations to keep pace with the competition, Grove adds, it went from being

an “okay manufacturer” to a “superb manufacturer, though it didn’t happen overnight.”

Despite Intel’s efforts, the Japanese producers kept gaining ground. “Their principal weapon was the availability of high-quality product priced astonishingly low,” Grove wrote. By the mid-1980s, Intel’s memory chip business continued to head south, with steadily declining sales and rising inventories. Grove felt that he and his colleagues at Intel had lost their bearings and were floundering for direction.

In the middle of 1985 came a watershed moment. As Grove explains in a frequently quoted passage from *Only the Paranoid Survive*, he was sitting in his office with Moore, then Intel’s chairman and CEO, discussing their situation. “Our mood was downbeat. I looked out the window at the Ferris wheel of the Great America amusement park revolving in the distance, then I turned back to Gordon and I asked, ‘If we got kicked out and the board brought in a new CEO, what do you think he would do?’ Gordon answered without hesitation, ‘He would get us out of memories.’ I stared at him, numb, then said, ‘Why shouldn’t you and I walk out the door, come back, and do it ourselves?’”

As Grove discovered, getting Intel out of memory chips was easier said than done. The more difficult question was, when Moore and Grove walked back through the door again, on what market should they focus? Most of Intel’s organization—including its manufacturing and R&D facilities—was geared toward producing memory chips. More importantly, the mindset of every Intel employee had long been focused on trying to beat the company’s rivals. Turning that around and getting Intel to focus instead on a different line of business was hardly easy. And yet, such an opportunity did exist. It was an underserved market: microprocessors.

Since 1981, Intel had been supplying microprocessors for IBM PCs. As demand for personal computers exploded, demand for Intel microprocessors grew as well. In addition, its next generation microprocessor, the 386, was about to go into production. Grove made the case—resisted at first by employees and then gradually accepted—that Intel should leave the declining memory business and concentrate R&D and manufacturing efforts on producing better microprocessors. As a result, Intel’s fortunes gradually swung up again.

Grove's leadership in turning Intel away from memory chips and toward microprocessors helped Intel retain its lead. It might otherwise have gone the way of Mostek, Unisem, and other chipmakers whose names no one now remembers.

Intel Inside: Building a Brand

While Intel continued on its growth path, it faced a unique problem on the branding front. Most of its customers were computer makers, who used Intel's increasingly powerful microprocessors—286, 386, and so on—but the average computer user was no more aware of Intel than an average car driver is of the company that made the engine for his or her automobile. Consumers knew that Compaq or IBM had made their computers, but few were aware of Intel's role in producing the chip inside them.

Intel also faced a related problem: Its products were identified by numbers rather than names. When other chip makers offered products identified by similar numbers, Intel had a difficult time differentiating its products from those of its rivals. For example, other microprocessor manufacturers wanted to produce their own "386" product, and Intel was powerless to stop them because the numbers could not be trademarked. Again, Intel was vulnerable because its brand was not as strong as it could be.

Determined to change this situation, Intel embarked at the end of the 1980s on its Intel Inside campaign. As Grove observes, it "was the biggest campaign the industry had ever seen—in fact, it ranks up there with big-time consumer merchandising campaigns. Its aim was to suggest to the computer user that the microprocessor that's inside his or her computer is the computer."

Intel spent massive amounts of advertising dollars on its campaign, consciously targeting a new customer base. Rather than selling to computer companies, as it had in the past, the messages targeted the emerging mass market of computer users. (As previously noted, this shift in Intel's customer base came back to haunt the company a few years later when it faced the Pentium floating-point unit crisis.) In addition, Intel partnered with computer manufacturers to display Intel's logo in their advertising campaigns. This met with some resistance among manufacturers who thought Intel's emerging brand identity might reduce their ability to distinguish their own brands from that of their competitors.

All in all, the campaign was a huge success. Grove believes that by 1994, “our research showed that our logo had become one of the most recognized logos in consumer merchandising, up there with names like Coca-Cola or Nike.”

Push, but Mitigate: Managing Risk

As Intel’s brand recognition spread, the combination of its higher profile with its growing clout prompted some to wonder whether it might face pressure from antitrust regulators. In many ways, its market dominance resembled that of another IT giant that had prospered with the proliferation of personal computers—Microsoft. To be sure, from time to time Intel did face antitrust inquiries, but these never assumed the enormous proportions faced by Microsoft.

Grove was acutely aware of this potential danger. When the company was getting ready to introduce the 386 microprocessor, executives in Intel’s legal department turned to him to say that Intel might potentially be heading into a monopoly situation. As Grove remembers, they asked, “We need to decide how we are going to play this. Do you want to play this aggressively, or would you rather stay on the safe side of the line?”

Grove and his colleagues had two examples before them of the consequences of antitrust actions. “The first example was AT&T—and this was two or three years after the modified final judgment [that mandated the breakup of the company],” says Grove. “The second was IBM, which had been in litigation forever.” Grove decided the way Intel would approach the issue was “not pushing it to the line. That meant that even though we may be in trouble, we could avoid going down the AT&T path.”

So, where did Grove draw the line? “There are certain rules that you can make combinations of products more attractive,” he says. “You can be aggressive about the conditions under which you do that.” For example, one reason why Microsoft in 2004 faced antitrust problems in Europe was because of its decision to bundle software for audio and video formats with its Windows operating system. Intel, however, under Grove’s direction, resisted going down that path. “We left a lot of money on the table,” Grove says. “Generally, we are very conservative in our business philosophy. We never push it to that last ounce. That philosophy continues.”

Grove's guarded approach to the antitrust issue explains in part why Intel, while it was blasted in the media during the Pentium crisis, still has generally not faced the kind of hostility that has hounded Microsoft. It also says a lot about Grove's attitude toward managing risk. "I am a very cautious risk taker," Grove says. "And I mitigate. I push, but I mitigate the risk by over-preparation. Push, but mitigate. It's like trust, but verify. I am comfortable with risks that I am prepared for."

Beyond the Signing Sheet: Building Intel's Corporate Culture

As Grove emphasized his values through repeated actions and decisions, these became part of Intel's DNA. The company developed a unique corporate culture. Nowhere is this clearer than in Grove's answer to a question about mistakes he has made during his career. His response: "Every attempt I ever made to hire a senior person for the company failed. No exceptions."

Grove doesn't know if the mistake lay in trying to hire outsiders "because there was a systemic problem: Intel has a very strong immune system, and only autologous transplants work. Or I didn't understand the criteria by which we could identify people who fooled the immune system." A related error, Grove believes, was that he did not fire people sometimes a year or two years after he realized he should get rid of them. "About people I had hired, I was a ridiculous wimp," he says. "I would rationalize and say, 'I haven't tried X.' That is not my general image—but my general image is wrong in this regard. Every single time it caused pain and suffering to the organization. It led to a lot of wasted time on my part. But the same kind of attitude also allowed a lot of people to become successful. It gave them time to find their footing and succeed. So, on balance, it was probably good—but I wish I knew where to cut my losses earlier."

Hard as he found it to fire people he hired, Grove long believed in setting fair standards of discipline at Intel. One of his most unpopular actions was instituting a so-called signing sheet that people had to sign if they were more than five minutes late for work. "It was one of my more controversial management moves," he recalls. "Absolutely nothing was done with those sheets," but the engineers were furious. "It was as if we had seduced their

sisters. What really got me going was watching people drift in and out. This was during the 1970s, with hippies and flower children. That was the kind of environment in which we were trying to build an organization. We had Hispanic women who were paid a dollar above minimum wage to work in our factories. If they were five minutes late, they got a tardy mark. If they had three 'tardies' in a month, they faced disciplinary action. These people who made products that paid our salaries had to be at their workstations on time, no matter what the traffic or the situation with their children. But these highly paid engineers could do what they wanted. It seemed the height of unfairness."

Intel's corporate culture also played a role when it came time for Grove to choose his successor as Intel's CEO. Barrett got the job, says Grove, because of his "knowledge, integrity, and leadership." Grove's tongue-in-cheek definition of leadership is someone whom people follow. "I tried teaching leadership," he says. "It is such a hokey bunch of psychobabble. I tried to substitute the psychobabble with something useful—such as the definition of a leader as someone whom people follow. People followed Craig. He always had his act together. Every job he had, he exceeded everyone's expectations."

An important attribute Grove saw in Barrett is that he has the "right kind of ambition." That, Grove explains, is crucial. "An individual's productivity depends on ambition. If you plot productivity on a vertical axis and the degree of ambition on a horizontal axis, the curve goes through a peak. If you have too little ambition, you don't push or work hard. If you have too much ambition, you put yourself ahead of others, elbow them out of your way, people stop trusting you, and your output drops. You need just the right amount of ambition. Craig was always ambitious, but in a healthy fashion. He had ambition for his team to win. He wouldn't put himself ahead of anyone else. He has his head screwed on right; he was never political, never competed with his peers. He's just a very competent, well-put-together guy."

Fifty years from now, how would Grove like people at Intel to remember him? "People will probably remember me for the signing sheet," he says with a laugh. "Inasmuch as I'm remembered, it will be for all the mythical good things—the turkey was big, the popcorn was fresh, the trains ran on time...except for the signing

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sheet, he was a good guy. That is probably how I will be remembered by people who think they know me.”

Then the twinkle in Grove's eyes gives way to a quiet thoughtfulness. “What I would like to be remembered for is helping build an organization that sustains itself long afterward,” he says slowly. “A bit like Sloan. He did pretty damn well.”

