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Inside Intel Inside[1]

It was February 2002, and Pamela Pollace, vice president and director of Intel's worldwide marketing operations, finished reviewing some recent market research and began preparing for an interview with a major magazine. Intel Corporation developed and sold a variety of products and services that were used as the building blocks for numerous electronic devices. The company was most well known for its microprocessors, which could be found in over 80% of the personal computers sold worldwide.

Given that the PC market was considered relatively mature, Pollace knew that one question the journalist would almost certainly ask was: "Is Intel planning to extend its 'Intel Inside' brand campaign to other product categories, such as cell phones, PDAs,[2] and so forth?" It was the same question she asked herself every day, and yet it was still a tough question to answer. The "Intel Inside" campaign was more than 10 years old, and there was no question that the campaign had succeeded in creating one of the most valuable brands in the world. But it was Pollace's primary responsibility to protect, sustain, and build that brand equity. The 15-year Intel veteran was familiar with all the arguments in favor of extending the brand, but she was also acutely aware of the risks: "In thinking about extending our brand, we are definitely exploring uncharted territory. . . . The biggest issue regarding extending the brand is whether—if we extend it—we will *dilute* the brand in some way. The cost of a mistake is damaging all the brand equity that we have worked so hard to build."

Background on Intel

Based in Santa Clara, California, Intel was a semiconductor company—number 41 on the Fortune 500 list—with over 83,000 employees and 2001 net revenues of $26.5 billion. (See **Exhibit 1** for selected financial statistics.) When Robert Noyce and Gordon Moore founded the company in 1968, their initial focus was on developing semiconductor memory for mainframe computers and minicomputers.

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[1] This case contains several words or phrases that are trademarks or registered trademarks of Intel Corporation or its subsidiaries: Intel®, Intel Inside®, Pentium®, Celeron®, Itanium®, Intel386™, Intel486™, Xeon™, and PlayQX3™.

[2] PDA stands for personal digital assistant.

Professor Youngme Moon and Christina Darwall of the HBS California Research Center prepared this case. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

By the early 1970s, Intel was developing microprocessors as well. A microprocessor is a silicon chip (a central processing unit) that controls the processing of data in PCs, servers, workstations, and many other electronic devices. Microprocessors—which represent anywhere from 20% to 40% of a PC's manufacturing cost—are also referred to as "chips," processors, or CPUs. They are distinguished by their instruction set, their bandwidth (bits processed per instruction), and their clock speed, which is measured in kilohertz (KHz), megahertz (MHz), or gigahertz (GHz). The higher the bandwidth and clock speed, the more powerful the chip.

Intel's first chip, the 4004, was introduced in 1971; it was a 4-bit microprocessor that ran at 108 KHz. Intel's second chip, the 8008, was introduced a year later; it was an 8-bit microprocessor that ran at nearly twice the speed of its predecessor. Two years later, as Intel pushed the clock speed of its chip further—from 200 KHz to 2 MHz—certain characteristics of the nascent microprocessor market were already beginning to emerge: Apparently, the product cycles were going to be short, and the performance curve was going to be steep.[3] (For additional details on the evolution of the microprocessor industry, see **Exhibit 2**.)

In 1977, Apple produced the first desktop computer (using a non-Intel microprocessor), marking the beginning of the modern era of desktop computing. Intel immediately set out to become the leading chip supplier in this market. By 1980, Intel had secured the contract for the IBM Personal Computer (later dubbed the PC), and within a few years, the company had garnered a 70% share of the overall desktop microprocessor market.[4]

Meanwhile, Intel's product development continued its rapid pace. In 1982, Intel introduced a 16-bit microprocessor that ran at 6 MHz to 12 MHz. The chip, which was called the 286, allowed users to run multiple tasks at the same time. This was followed, in 1985, with the 386 chip, which was a 32-bit microprocessor that ran at 16 MHz to 33 MHz. The 386 was notable in that it was the first microprocessor that could operate multiple operating systems, including DOS, Unix, and Windows.

A Marketing Experiment: Red X

Intel hit its first significant hurdle in the microprocessor market in 1988. Dennis Carter, who was technical assistant to Intel Chairman Andy Grove[5] at the time, elaborated: "By 1988, our 386 processor had already been out on the market for three years, which is a really long time in this industry. The problem was that no one was buying it; everyone was still wedded to our 286 chip. The 386 was a much better product, but it had only been adopted in high-end products such as servers. . . . PC manufacturers weren't yet displacing the 286."

The slow adoption of the 386 processor was particularly troublesome given that the company was now on the verge of launching its fourth-generation microprocessor, the 486 chip. Carter, who had both undergraduate and graduate degrees in engineering and an MBA from Harvard Business School, knew that the PC market had grown significantly in the prior decade; he thus wondered whether the problem had to do with Intel's marketing: "In the past, we had always focused our energy on marketing to the design engineers of computer manufacturers. But design engineers

[3] In 1965, before Intel's founding, Gordon Moore projected steep performance curves for the industry when he predicted that the number of transistors placed on a chip would double each year for the next 10 years. Subsequently, microprocessors followed the same pattern. In 1975, Moore updated his prediction to project a doubling of transistors every two years.

[4] Charles Boyd, "Managing Strategically: Intel's Strategy—Two Steps Ahead," http://www.mgt.smsu.edu/mgt487/intel.htm.

[5] Grove had been named Intel's chairman the previous year.

didn't have the same clout anymore. . . . It occurred to me that maybe the problem was that *end users* weren't aware of the product differences."

In early 1989, Carter convinced Grove to let him undertake a marketing experiment. According to Carter, Grove told him, "Here's $5 million. Spend a tenth of that, and if you prove your thesis, you can spend the rest."

Carter and a team of three others—including Ann Lewnes, who was in the corporate communications group—began by conducting some market research. The research confirmed Carter's suspicions: Most computer buyers believed the 286 was capable of doing everything they needed it to do; they therefore felt no need to upgrade to the 386 processor. In addition, the research revealed that many computer buyers were concerned that the software they used with their 286s would not be compatible with the 386 chip.

To change these perceptions, Carter's team decided to try a low-cost experiment using billboard advertising in a single market. They began by covering billboards in Denver with a large 286 enclosed in a circle. They then splashed a big, graffiti-style, red "X" over the numbers. After a few weeks, they added a large 386 enclosed in a circle. The 386 sat alongside the crossed-out 286, and the billboards promoted the fact that the 386 was now the same price as the 286 but with many more advantages.

Although many commuters undoubtedly scratched their heads over what Intel dubbed the "Red X" campaign, CIOs and IT managers apparently got the message; sales of the 386 processor began to pick up in Denver almost immediately. Subsequent market research revealed that customers had indeed changed their buying plans as a result of the limited six-week campaign.

Based on the success of the experiment, Carter—who eventually became Intel's head of marketing—took the remainder of the $5 million and extended the campaign to 10 cities. At the time, there was significant skepticism among Intel managers about the idea of Intel marketing directly to consumers. Some were concerned about the mixed message associated with "Red-X'ing" Intel's most popular product; others were wary of the "graffiti" look of the Red X. But as Carter recalled, "Luckily, our Red X campaign was successful not only in Denver but in the other cities as well. By the time our test was completed, we'd created a bit of excitement in the company because it had worked."

The Intel Inside Campaign

Ironically, the Red X campaign was successful in promoting a product that, by 1989, was already obsolete. With new products slated to be introduced every other year or so, the team quickly realized that the company could not afford to brand each new generation of product that was released. (In addition, a judge had recently ruled that chip labels with just numbers—such as "286" and "386"—could not be trademarked.)[6]

In Carter's mind, the solution was to create an umbrella brand that could span successive generations of products. Carter explained the team's approach:

> We're all engineers, so we approached the challenge of developing an umbrella brand by doing lots of research. We looked at several possible umbrella brand names, but our research

[6] After the court ruling, Intel renamed its 386 chip the "Intel386."

showed that "Intel" was the best name to use. We then had several ad agencies give us proposals for taglines, and we ended up choosing a dark horse candidate because we really liked their tagline: "Intel. The Computer Inside."

Of course, Carter realized that a large-scale branding campaign might offend some of Intel's original equipment manufacturer (OEM) partners: "I could predict their initial reaction; the first thing they would ask me was, 'If Intel is the computer, then what are we?'" Given this, Carter had to figure out a way to enlist the cooperation of OEMs in the campaign.

Carter ended up designing a co-op advertising program modeled after the types of programs found in packaged goods industries. In the program, Intel's OEMs would be able to accrue co-op advertising dollars on the basis of their purchases of Intel chips.[7] These co-op advertising dollars could be used to pay for up to half the cost of any advertisement produced by the OEMs, as long as they put Intel's logo in their ads and on their computers. (Although Intel's tagline remained "Intel. The Computer Inside," the logo said simply "Intel Inside.")

Carter explained, "I had several goals: One, to create more advertising in the industry. Two, to get our logo on OEMs' products. And three, to get consumers to pay more attention to microprocessors."

Internally, many at Intel remained skeptical of the marketing program. In their eyes, Intel was embarking on a very ambitious journey, attempting to brand a highly technical component that end users could not even see. The media were also highly skeptical; as Pollace recalled, "I can't tell you how many press clips we have in the archives that say, 'It'll never work.'" However, in part because Grove was enthusiastic about the idea, Carter was given the green light to begin selling the program to OEMs.

Despite some initial hesitation, a number of OEMs—including Dell and NCR—signed up immediately, primarily motivated by the advertising dollars. The program officially launched in 1991, and by the end of the year, Intel had about 300 OEMs on board.

The first ad to come out of the co-op program ran in *The Wall Street Journal* in the spring of 1991 (see **Exhibit 3**). IBM ran the advertisement, which showed a horse running across the page. "Luckily the ad agency didn't put our logo under the horse's tail," Carter noted with a smile. This was followed by dozens of other advertisements from Intel's customers, all of which prominently displayed the "Intel Inside" logo.

The co-op ads were supplemented by Intel's own advertising campaign. In 1991, Intel ran "the measles ad," which showed a page full of Intel logos under the headline "How to spot the very best computers" (see **Exhibit 4**). Intel's first television advertisement (the "Star Wars" ad) hit the airwaves in 1992; it used cutting-edge special effects to take viewers on a sweeping trip through the innards of a PC before ending up at Intel's 486 processor.

The Pentium Processor Introduction

All of Intel's advertising was designed to explain why having "Intel Inside" was important. As Carter explained, the two attributes that Intel wanted people to associate with the brand were *safety* (reliability) and *leading technology*: "From the start, we believed our brand strategy had to follow our business strategy. Our engineers and managers had to look at our advertising and say 'that's right.'

[7] About 5% of the purchase price paid by an OEM for Intel microprocessors went into this market development fund.

Our strategy was to be a great semiconductor company, following Moore's Law—we made things better and more reliably. So emphasizing these two elements was appropriate given our strategy."

In 1994, the high-end Intel Pentium processor was introduced under the "Intel Inside" umbrella. To market the Pentium, Intel developed a series of twelve 20-second Pentium ads that could be used singly or in combination. The ads showed the many different kinds of activities that one could do with a computer, such as design a card, learn a new subject, or do astronomy. At about the same time, Intel developed its distinctive three-second "animated jingle" (also known as a "signature ID audio-visual logo"); the five-tone melody played at the end of every radio and television co-op advertisement. The company also started doing promotions in retail stores, using end-aisle displays and hands-on demonstrations.

By this time, virtually everyone at Intel had become convinced of the power of the company's brand advertising. Not only was there significant market research indicating that the campaign was working, there was anecdotal evidence as well. Carter recalled one such anecdote:

> I remember when we first spoke to customers—primarily IT heads—just prior to the launch of the Pentium processor. They all told us, "We'll never move to the Pentium because we love our 486s." We then went ahead and spent three months running a bunch of Pentium processor advertising. When we went back to those same IT guys three months later, they all told us, "We're only buying Pentiums now." Of course, these were guys who would never *admit* to being influenced by a bunch of ads . . . but the ads were obviously making a difference.

Throughout the "roaring" 1990s, the momentum behind the campaign continued to grow. When Intel's "Bunny People" characters made their debut during a break in the 1997 Super Bowl, they became an immediate hit. Bunny People dolls, originally intended only for promotional use, became the "toy-du-jour for Intel employees and industry diehards."[8]

By the end of the decade, more than 2,700 PC makers were participating in the program, and well over $7 billion had been invested by Intel and its partners in advertising that carried the Intel Inside logo. (In 2001 alone, approximately 150 million Intel Inside stickers were printed[9] and over $1.5 billion in Intel Inside advertising was generated.) Intel was now ranked the sixth most valuable brand in the world, alongside consumer powerhouses such as Coke and Disney.[10]

Most importantly, Carter believed that the Intel Inside program had contributed significantly to the overall success of the company:

> Because of the campaign, the microprocessor has come to be viewed as a very important component of the PC, which has probably kept us from getting squeezed on price and has allowed us to spend more on R&D than we otherwise could have. Our market segment share is definitely higher as a result. Also, the PC market would not have grown as quickly without the emergence and growth of PC magazines, which were fueled by Intel Inside advertising.

Pollace, who eventually took over as head of Intel's worldwide marketing (Carter retired in 1998), added:

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[8] "Invasion of the Bunny People," *Wired News Report*, December 12, 1997, http://www.wired.com/news/culture/0,1284,9137,00.html.

[9] These stickers were affixed to every computer that contained an Intel microprocessor.

[10] *BusinessWeek*/Interbrand estimated the value of the Intel brand at $34.7 billion in 2001.

I think the reason the Intel Inside program has been so successful is that we have always had the technology to back it up. You can't pull off a campaign like this without substance to back you up. We were the leading microprocessor company when the campaign began, and we've sustained that lead over time. In other words, we've always had a performance-based product that has delivered on our message.

Product Development in the 1990s

Sustaining this technological lead during the 1990s was not easy. Indeed, throughout the decade, Intel faced significant competition from other microprocessor manufacturers as well as other potential threats (see **Exhibit 5** for an abbreviated timeline). In 1991, Apple, IBM, and Motorola (the "AIM Alliance") banded together to produce chips based on RISC[11] architecture. This competition increased the pressure on Intel's engineers to create ever-faster processors.

Intel's strategy to counter these competitors was to achieve an overwhelming performance advantage with successive generations of processors. In order to ensure that the company remained ahead of the technology curve, Intel instituted overlapping development cycles in 1990. Previously, the company had waited until one generation of microprocessor was ready for production before beginning development of the next generation. Now, Intel began "doubling up" on its R&D, investing in and developing two generations of chips at the same time. As soon as the original Pentium chip was launched, that team would immediately begin work on the Pentium III processor; the team finishing up the Pentium II processor would then begin work on the Pentium 4 processor.[12] As a result of this "doubling up," the clock speeds of Intel's processors increased from 25 MHz in 1989 to over 800 MHz in 1999.

Intel was also concerned that the relatively small number of PC makers contributed to the slow adoption of new chips, since new chips were most likely to be adopted by market challengers looking for a competitive edge.[13] In addition, no PC maker—challenger or incumbent—wanted to begin buying the new generation of microprocessor before related PC components (e.g., chipsets, motherboards) were available to be used with the new chip. (Chipsets perform essential logic functions surrounding the microprocessor; motherboards combine microprocessors and chipsets to form the primary subsystem of a PC.) Intel therefore began designing, producing, and selling chipsets and motherboards in 1991. These product offerings encouraged more rapid adoptions of Intel's new chips by existing PC makers and made it significantly easier for new computer manufacturers to enter the market. By 1995, Intel had achieved a 28% market share of the worldwide chipset market, up from 10% in 1994,[14] and an approximately 15% share of the worldwide motherboard market[15]—both significant shares in these markets.

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[11] RISC (Reduced Instruction Set Computer) processors were designed to perform a smaller number of types of computer instructions so that they could operate at higher speeds.

[12] Although Pentium I, II, and III used roman numerals, "Pentium 4" did not, as "IV" had some negative connotations.

[13] For example, Compaq was the first to introduce a 386 computer when Compaq was challenging IBM, while Dell and Gateway were among the first to introduce Pentium processor-based computers when Dell and Gateway were challenging Compaq and IBM.

[14] Tom Mainelli, "Intel's Travails," PCWorld.com, October 4, 2000, http://www.pcworld.com/news/article/0,aid,30972,00.asp.

[15] Walt Custer, "Looking Better," *CircuiTree Magazine*, March 1997, http://www.ipc.org/html/Cmag397.ht.

In 1994, Intel was confronted with its first major product-related crisis when an end user discovered a minor flaw in the new Pentium processor. Because the flaw affected very few end users, Intel initially offered to replace the microprocessor only for those few who were directly affected by the problem. However, the flaw was highly publicized, causing a flurry of negative publicity. Carter remembered the crisis:

> I was at my kitchen counter talking on the phone to Andy [Grove]. After hours of discussion, he finally decided we would replace *all* the processors on the market. It was an agonizing decision because the Pentium processor was an excellent product and the flaw affected just a few isolated individuals. But we did it anyway; we ended up replacing thousands of microprocessors at a cost of $475 million.

Perhaps the biggest threat to Intel's market share occurred in the mid-1990s, with companies like Advanced Micro Devices (AMD), Texas Instruments, and Cyrix producing microprocessors compatible with Microsoft's operating system. These microprocessor clones paved the way for an influx of cheap PCs into the market. (See **Exhibit 6** for U.S. PC market share by price, and **Exhibits 7** and **8** for additional market segment data.) By 1997, low-cost desktops claimed 20% of the U.S. PC market, and Intel was scrambling to respond. After much internal deliberation, Intel entered the low-end market with its Celeron processor. Celeron was a "quiet" brand; it was not supported by advertising. Within a year, Intel had approximately 24% of the sub-$1,000 PC market (16% attributable to the Celeron processor and 8% attributable to the Pentium II processor) while AMD had 60% of that market segment.[16]

Intel in 2002

By early 2002, Intel had a full line of computer-related microprocessors whose prices ranged from $64 to $4,227 (see **Exhibit 9** for more information on Intel's processor families). The cost to develop a new microprocessor had risen to around $500 million, while the cost to build a new wafer fabrication facility had climbed to $2 billion to $2.5 billion. The microprocessor business remained a high-risk, potentially high-reward business—not for the faint of heart—and Intel remained committed to its position as industry leader.

Competition remained stiff, not only at the low end of the market but at the high end as well.[17] For example, in 2000 AMD had briefly threatened Intel's technological dominance by being first to break the 1 GHz barrier with a version of its Athlon chip. Intel had been caught between chip generations, and it had been the first time in recent memory that Intel had not had the fastest chip on the market.[18] Within days, however, Intel had begun marketing a limited-release Pentium III processor with 1 GHz speed, and within little more than a year Intel had been the first to introduce a 2 GHz chip.[19]

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[16] "Alternative Chips Rally at Low End," *Computer Retail Week/PC Data*, October 12, 1998, p. 2; "Cache Deal: Intel Slices Celeron Prices," *Computer Retail Week*, October 26, 1998, p. 1.

[17] Intel also developed the Xeon brand for servers in the late 1990s. The Intel marketing group believed that the server market might be "turned off" by the more consumer-oriented Pentium brand.

[18] Jonathon Angel, "Retreat and Persist," *Technology Marketing*, February 1, 2002.

[19] Thomas A. Thornhill, Calvin Lee, and Richard C. Shannon, "Intel Corporation," UBS Warburg Global Equity Research Report, December 28, 2001, p.1.

There was also increasing segmentation among computer buyers, and it was apparent that different competitors were focused on various niche markets. For example, a 2002 Gamers.com survey showed that AMD had a 26% share of the video game players market. For its part, Intel dominated certain segments such as mobile/notebook computers, where the company had a 90% market share overall and nearly 100% of the corporate mobile computing market.[20] (See **Exhibit 10** for microprocessor market share by competitor and **Exhibit 11** for market shares in the PC-related market.)

In February 2002, during a period of recession for the microprocessor and computer industries, Craig Barrett—Intel's chief executive officer—told the company's independent software and hardware developers, "We have a simple saying at Intel that the only way out of a recession is basically to bring out new products, new technology, new capability, and then make the user excited about what we have to offer. . . . If ever there was a time when we needed to move faster down the technology curve, this is it."[21]

The Role of Marketing at Intel

Meanwhile, the role of marketing within Intel had grown. The company had recently made some organizational changes to better align its product "roadmap" with its marketing roadmap. As a result, engineers now provided input on the types of products in the pipeline, while marketing provided input on the types of products that would most likely appeal to customers. Ann Lewnes—one of the original members of the Intel Inside marketing team and now vice president of consumer marketing at Intel—commented on the process:

> We have more discipline now. In the past, our marketing teams did not work as closely with the technology teams. Now, after the marketing teams do market research on consumer needs, they talk to the technical folks to see how to turn those consumer needs into product features. As features other than speed have become important, input from marketing has become even more important.

The one thing that had not changed was the company's brand image. As Lewnes put it, "The core values of the brand have been constant all along. The emphasis is still on leading technology and safety." On the other hand, there was no question that Intel's advertisements had become bolder and more creative over time.

This was most evident in the company's recent campaign for the Pentium 4 processor. The Pentium 4 chip was considered to offer outstanding performance for digital media applications; Intel had thus focused much of its Pentium 4 processor advertising on digital media. However, the ads themselves had been controversial, featuring the Blue Man Group, a performance art group whose members appeared with blue greasepaint on their bald heads and necks. The tagline in the ads had been, "The Pentium 4 processor: The center of your digital world." Lewnes commented on the campaign:

> The technical press reamed us for these ads, saying we needed to provide technical details. But they simply didn't get it. I view the campaign as one of the biggest advertising breakthroughs in our 10-year history, as our research indicated that it had significant appeal and recognition worldwide. The Blue Man Group represents immense creativity, innovation,

[20] Thornhill, Lee, and Shannon (2001), p. 16.

[21] Craig Barrett, keynote speech to the Intel Developer Forum, February 25, 2002.

> and simplicity. Intel is very innovative in developing new products; we need to be just as innovative in marketing. My feeling is, if no one thinks a campaign is crazy, then maybe we haven't gone far enough.

Following on the heels of the Blue Man Group campaign, the marketing group launched the "Alien" series of commercials, which depicted aliens using Pentium 4 processors for a variety of applications. Print ads for the Pentium 4 chip focused on the processor's capabilities in the areas of digital photography and digital music and also used the tagline, "The center of your digital world." (See **Exhibit 12** for an example of a Pentium 4 processor print ad.) The Pentium 4 processor campaign was reported to have a budget of $300 million.[22] Looking forward, Lewnes added:

> Coke and Pepsi don't market their products by telling consumers, "We have a little more sugar and a little less caffeine." They market based on feelings and experiences. As PCs become an integral part of the lives of even more people, it is incumbent upon us as marketers to bridge the gap between the technical details and the emotional experience of using cutting-edge technology. This is why it's important that we talk to consumers about what's meaningful to them. Even in the PC market, our brand has to be breakthrough, relevant, and innovative.

Extending the Brand

As Pollace finished preparing for her interview with a major magazine, she glanced down at the market data in front of her. According to the latest numbers, sales of desktop computers appeared to be stagnating, while sales of portable digital devices—such as PDAs and cell phones—appeared to be growing at a healthy rate. (See **Exhibit 13** for sales of selected devices; see **Exhibit 14** for microprocessor usage by category; see **Exhibit 15** for a breakdown of Intel revenue by category.) Her thoughts turned once again to the question the journalist was sure to ask: Should Intel extend its branding campaign to new product categories?

Certainly, Intel did not dominate these non-PC markets the way it did the PC market. However, it did maintain a respectable presence in these markets with its StrongArm processor, which was used in several popular handheld computers such as Compaq's iPAQ. Moreover, the company was hoping to build share with its next-generation RISC processor, the XScale chip, which was designed to address data-intensive applications on handheld wireless devices.[23]

In addition, although Intel had just a 1% share of the cell phone chipset market (compared with Texas Instruments, which had 50%, and Motorola and Qualcomm, which each had 12%), the company was aggressively developing new products—some related to flash memory—for this market as well. (See **Appendix A** for more information on Intel's flash memory and the cell phone market.) Indeed, Intel had recently bolstered its commitment to the cell phone industry by announcing a joint effort with Microsoft. According to the plan, the two companies would develop a "template" for cell phones—using chips from Intel and software from Microsoft—that would be licensed to phone manufacturers.[24] Cell phones were becoming increasingly complex, and the cost of

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[22] Angel (2002).

[23] The company also continued to strengthen its community of hardware and software developers due to its Personal Client Architecture (PCA), a system-level architecture that allowed wireless handheld device manufacturers to develop their application processing system separately from the communications processing subsystem.

[24] David Pringle, "Microsoft, Intel to Create 'Template' for Phone that Competes with Nokia," *The Wall Street Journal*, February 19, 2002.

designing high-end cell phones was rising. (See **Exhibit 16** for the major components of high-end cell phones.) By providing a template, Intel and Microsoft hoped to reduce the R&D costs for cell phone makers and allow new entrants to participate in the market more easily.

Pollace knew that it made a lot of sense to try to leverage the company's formidable brand strength to build a stronger presence in these markets. As she put it, "The PC can be somewhat restrictive to our thinking. We need to be thinking about *computing*, which can encompass any number of different devices."

On the other hand, Pollace was well aware of the risks associated with extending the Intel Inside campaign. For starters, Intel was so closely identified with computers that it was unclear whether consumers would psychologically accept an extension of the brand to other product categories. In fact, the company had experimented with putting the Intel brand on other devices in the past, but it had retreated from these efforts when it had become apparent that the company could not make returns in these markets commensurate with the level of returns from the processor business. (See **Appendix B** for "Intel Outside" details.)

More generally, it was not clear that consumers would respond to *any* kind of "ingredient" branding campaign in these categories. Pollace elaborated: "The Intel Inside program was developed to make people care about what is inside their PC. Will consumers care about the silicon in their cell phones? And even if we try to make them care, we know that this will come with a big price tag—and it won't be effective unless we can show them exactly why our silicon is better than someone else's."

Perhaps the biggest risk associated with extending the brand was diluting the equity the company had worked so hard to establish in the PC market. The Pentium brand still accounted for approximately half of Intel's current sales;[25] thus, Pollace knew that it was important to keep the momentum in the PC market going: "I don't buy in to those who say the PC is dead. Performance of computers is still very important. However, consumers have changed, so we have to make sure that we are in tune with that. Our big challenge is to illustrate, or 'bring to life,' all the things that people can do with their Pentium processor-based computers today."

[25] N. Quinn Bolton and Allan Mishan, "Intel Corporation," CIBC World Markets Inc. Equity Research Report, October 17, 2001, p. 21.

Exhibit 1 Selected Financial Statistics for Intel Corporation (in millions of dollars except for employees)

Year	Revenue	Cost of Sales	R&D	Operating Income	Net Income	Additions to PP&E	Net PP&E	Employees
1991	4,779	2,316	618	1,080	819	948	2,163	24,600
1992	5,844	2,557	780	1,490	1,067	1,228	2,816	25,800
1993	8,782	3,252	970	3,392	2,295	1,933	3,996	29,500
1994	11,521	5,576	1,111	3,387	2,288	2,441	5,367	32,600
1995	16,202	7,811	1,296	5,252	3,566	3,559	7,471	41,600
1996	20,847	9,164	1,808	7,553	5,157	3,024	8,847	48,500
1997	25,070	9,945	2,347	9,887	6,945	4,501	10,666	63,700
1998	26,273	12,088	2,509	8,379	6,068	4,032	11,609	64,500
1999	29,389	11,836	3,111	9,767	7,314	3,403	11,715	70,200
2000	33,726	12,650	3,897	10,395	10,535	6,674	15,013	86,100
2001	26,539	13,487	3,796	2,256	1,291	7,309	18,121	83,400

Source: Intel Corporation financial summaries 2002, http://www.intel.com/intel/finance/pastfin.

Note: Additions to PP&E refer to capital additions, i.e., additions to property, plant, and equipment.

Exhibit 2 History of Selected Microprocessors

Company	Microprocessor	Year of Introduction	Number of Transistors	Bus Width and Other Design Features	Speed	Comments
Intel	4004	1971	2,300	4 bits	108 KHz	Arithmetic manipulation
Intel	8008	1972	3,500	8 bits	200 KHz	Data and character manipulation
Intel	8080	1974	6,000	8 bits	2 MHz	Used in MITS Altair 8800, the first microcomputer
Motorola	6800	1974	4,000	8 bits		
RCA	1802	1974	N/A	8 bits 16-bit addressing	6.4 MHz	Considered one of the first RISC-related chips
Zilog	Z80	1975	8,500	64 K memory	4 MHz	Used in the Osborne, Kaypro, Apple II, Commodore, Oric, and Acorn. Very low-priced chip.
MOS Technologies	6502	1976	9,000	8 bits 256 bytes RAM	12 MHz	Used in Commodore PET, Commodore 64, and early Atari machines. A low-priced chip.
Intel	8086	1978	29,000	16 bits 1 MB memory	5,8,10 MHz	
Intel	8088	1979	29,000	8 bits	4–8 MHz	Used in first IBM PC, later in the XT
Motorola	68000	1979	68,000	16 bits	8–16 MHz	Used in Commodore Amiga, Apple's Lisa, and Macintosh
Intel	80286	1982	134,000	16 bits	6–12 MHz	Used in IBM PC AT but not until 1984
Motorola	68020	1984	190,000	32 bits	16–33 MHz	Used in Macintosh II
Intel	386	1985	275,000	32-bit design	16–33 MHz	First used in Compaq's DESKPRO, later in IBM PS/2. Users could run multiple applications at the same time
Sun	RISC	1985	N/A	32 bits	20–25 MHz	Used in Sun Sparcstation 1, 300
Stanford	R2000	1986	110,000		12 MHz	First RISC (reduced-instruction set) microprocessor
Sun	SPARC	1987	N/A	32 bits	36 MHz	Used in Sun-4 workstation
Motorola	68030	1987	N/A	32 bits	16–50 MHz	Used in Macintosh
Intel	486	1989	1,200,000	64 bits	25–50 MHz	Mimicked some aspects of RISC design chips
IBM	RISC 6000	1990	N/A	32 bits	20–50 MHz	IBM RISC/6000 workstation
Intel	Pentium	1993	3,100,000	64 bits	60–166 MHz	Used in Compaq DESKPRO, IBM, and compatibles
Apple/IBM/ Motorola	601	1993	2,800,000	32 bits	50–120 MHz	First chip in PowerPC family of RISC chips jointly developed by AIM Alliance. Used in IBM PowerPC, Apple Macintosh line.
Apple/IBM/ Motorola	Power PC (RISC 6000)	1994	N/A	64 bits	60–150 MHz	Power Macintoshes, Power Computing PowerWave

Company	Microprocessor	Year of Introduction	Number of Transistors	Bus Width and Other Design Features	Speed	Comments
Intel	Pentium Pro	1995	5,500,000	64 bits	150–200 MHz	First used in high-end servers, then mainstream business workstations, then mainstream PCs
Cyrix	6x86 class	1996	3,200,000	32 bits	100–150 MHz	Compaq used chip in first sub-$1,000 PC, the Presario
AMD	K6	1996	4,300,000	64 bits	120, 133 MHz	
IBM/Motorola	PowerPCG3	1996	6,500,000	64 bits	233–333 MHz	Used in all Apple computers as well as Unix machines from IBM and Motorola's computer group
Intel	Pentium with MMX technology	1997	4,500,000	64 bits	166–233 MHz	Optimized to process video, audio, and graphical data. Used in Dell and Gateway 2000 computers.
AMD	K6/PR-233	1997	8,800,000	64 K primary-cache RISC-based chip	233 MHz	Launched at same time as Pentium II processor but priced $56 lower than Pentium II processor 233 MHz chip
Intel	Pentium II	1997	7,500,000	64 bits MMX technology	233–400 MHz	Used in Compaq DESKPRO and compatibles
IBM/Motorola	PowerPCG4	1998	10,500,000	64 bits	400–800 MHz	
Intel	Celeron	1999	28,100,000		500–800 MHz	Designed for value-conscious market segment
AMD	Athlon	1999	22,000,000		700 MHz	
Intel	Pentium III	1999	9,500,000	64 bits	733 MHz	
AMD	Athlon (K7)	3/6/2000	22,000,000		.85–1.2 GHz	
Intel	Pentium III	3/8/2000	24,000,000		1 GHz	Limited release
Intel	Pentium 4	2000	42,000,000	64 bits	1.4–2.2 GHz	
Intel	Xeon	2001	42–55,000,000		1.7 GHz	Targeted at high-performance workstations
AMD	Athlon XP	2001	37,500,000		1.67 GHz	
Intel	Itanium	2001	25,400,000	64 bits	733 MHz	Designed for high-end servers and workstations; codeveloped with Hewlett-Packard

Sources: Casewriter research, adapted from Marvin Taylor, "The History of the Microprocessor," April 14, 1997, http://www.sit.wisc.edu/~mptayloy/microprocessor.html; "How Stuff Works," http://www.howstuffworks.com/microprocessor1.htm; "Processor Hall of Fame," Intel Museum Web site, http://www.intel.com/intel/intelis/museum/exhibit/hist_micro/hof/tspecs.htm; "Processors," Bond University School of Information Technology, http://www.it.bond.edu.au/core110/002/lectures/four.pdf; Andrius T. Benokraitis, "The First Microprocessor and Beyond," http://www.acm.vt.edu/~andrius/work/microproc; and "AMD Athlon Processor Technical Brief," Advanced Micro Devices, Inc., December 1999, pp. 6–7.

Exhibit 3 The First Intel Inside Co-op Ad

Source: Intel Corporation.

Exhibit 4 The Intel Inside Brand

Source: Intel Corporation.

Exhibit 5 Threats to Intel During the 1990s (as portrayed in the media)

Year	Threat	Response
1990	Having had the microprocessor market more or less to itself, Intel saw "looming competition" on the horizon.	Intel began "doubling up" on its R&D, investing in and developing two generations of chips at the same time.
1991	Basic PC design was not advancing, and Intel management worried that the PC might lose ground to the Macintosh or Sun.	Intel started selling chipsets and motherboards that allowed new competitors to enter the PC market more easily.
	Apple, IBM, and Motorola (AIM) joined in an alliance to develop a microprocessor architecture, PowerPC, based on RISC principles.	
1992	Many Intel microprocessor clones appeared, led by Advanced Micro Devices (AMD), whose market share reached 25% of the 386 market.	Intel slashed Intel386 prices as the clones appeared.
1994	A minor flaw in the Pentium microprocessor was highly publicized.	Intel replaced thousands of Pentium chips at a cost of $475 million.
1997	Cheap PCs grabbed a large market share.	Intel introduced two chip generations in one year.
1998	The Federal Trade Commission sued Intel for allegedly using coercive tactics to control intellectual property.	Intel successfully defended the suit by showing that the company was actually losing share in certain market segments such as the low end, where Intel lost nearly half its share (from 80% to 45%)
	Intel lost ground in the "value" PC segment.	Intel launched its segmentation strategy by introducing Celeron for the value segment and announcing development of the Intel Xeon brand for the high end. The company also launched a concerted companywide effort to get Intel chips designed into new products.
2000	AMD introduced the first 1 Gigahertz chip, an Athlon.	Intel announced limited production of a 1 GHz Pentium III processor two days later and was first to announce a 2 GHz chip, one year later.

Source: Casewriter research, adapted from Charles Piller, "The Cutting Edge—The Chips Are Down: Intel Faces Serious Threat to Its Dominance," *Los Angeles Times*, February 22, 1999, p. C1; Todd Wasserman, "Intel's Inside Track," *Brandweek*, May 7, 2001, pp. 52–56; Robert D. Hof, Larry Armstrong, and Gary McWilliams, "Intel Unbound," *BusinessWeek*, October 9, 1995; Andy Reinhardt, Ira Sager and Peter Burrows, "Intel," *BusinessWeek*, December 22, 1997; Robert D. Hof, "Inside Intel," *BusinessWeek*, June 1, 1992; John Burgess, "Rivals Chip Away at the Intel Edge," *The Washington Post*, January 19, 1992, p. H1.

Exhibit 6 U.S. PC Market Share by Price (% of market)

PC Price	1995	1996	1997
Under $1,000	3	5	20
$1,000–1,499	24	23	24
$1,500–$2,000	26	25	26
Over $2,000	47	47	30
Total	100	100	100

Source: Casewriter research, adapted from "Computers and Chips Prognosis 1998," *BusinessWeek*, January 12, 1998, p. 88.

Exhibit 7 Worldwide PC Customer Segmentation (no. of units shipped)

Customer Segment	1995	1996	1997	1998	1999	2000	2001E
Business	38,830	46,828	55,421	61,886	75,342	86,295	81,745
Consumer	19,446	22,612	25,418	29,255	37,107	44,078	40,404
Education	2,924	3,140	3,377	3,533	3,855	4,135	4,270
Total	61,200	72,580	84,216	94,674	116,304	134,508	126,419

Source: Casewriter research, adapted from Steven M. Fortuna and Michael Hillmeyer, "PC Hardware," Merrill Lynch Research Report, October 1, 2001, p. 6.

Note: Units include desktops, notebooks, and servers.

Exhibit 8 Worldwide PC Form Factor Segmentation (no. of units shipped)

Form Factor	1995	1996	1997	1998	1999	2000	2001E
Desktop	51,155	59,530	67,998	75,874	92,377	104,337	97,046
Notebook	9,096	11,682	14,365	16,477	20,879	26,652	25,676
Server	949	1,368	1,853	2,323	3,048	3,519	3,697
Total	61,200	72,580	84,216	94,674	116,304	134,508	126,419

Source: Casewriter research, adapted from Steven M. Fortuna and Michael Hillmeyer, "PC Hardware," Merrill Lynch Research Report, October 1, 2001, p. 6.

Exhibit 9 Intel's Microprocessor Product Families

Microprocessor	End Markets	Clock Speed	Price per Unit as of 12/27/01
Itanium—IA 64	Servers & Workstations	733–800 MHz	$1,177–$4,227
Xeon		1.4–2.0 GHz	$ 183–$ 455
PIII Xeon		700 MHz–1.0 GHz	$ 133–$3,692
Pentium 4	Desktop Computers	1.3–2.0 GHz	$ 133–$ 401
Pentium III		850 MHz–1.2 GHz	$ 143–$ 241
Celeron		766–950 MHz, 1.0–1.2 GHz	$ 64–$ 103
Mobile PIII—M	Mobile Computers	500 MHz–1.2 GHz	$ 187–$ 722
Mobile Celeron		500–933 MHz	$ 96–$ 144

Source: Casewriter research, adapted from Thomas A. Thornhill, Calvin Lee, and Richard C. Shannon, "Intel Corporation," UBS Warburg Global Equity Research Report, December 28, 2001, p. 10.

Note: Price per unit is applicable for purchases of 1,000 units.

Exhibit 10 Microprocessor Market Share (% of factory revenues from worldwide shipments)

Vendor	1994	1995	1996	1997	1998	1999	2000
Intel	73.2	75.4	78.8	79.5	79.6	80.6	78.0
AMD	8.6	6.2	2.5	3.7	5.8	6.5	8.4
Motorola	5.2	4.6	5.6	4.8	4.9	4.7	5.6
Sun Microsystems	0.0	0.0	0.9	2.3	1.8	2.2	2.2
IBM	2.2	4.2	3.4	2.2	2.3	1.4	1.3
Cyrix	2.0	1.5	0.8	1.3	0.0	0.0	0.0
All Other	8.8	8.1	8.0	6.2	5.6	4.6	4.5
Total	100	100	100	100	100	100	100
Total Revenues from Shipments ($ billions)	11,437	14,269	18,949	23,755	25,484	28,652	31,489

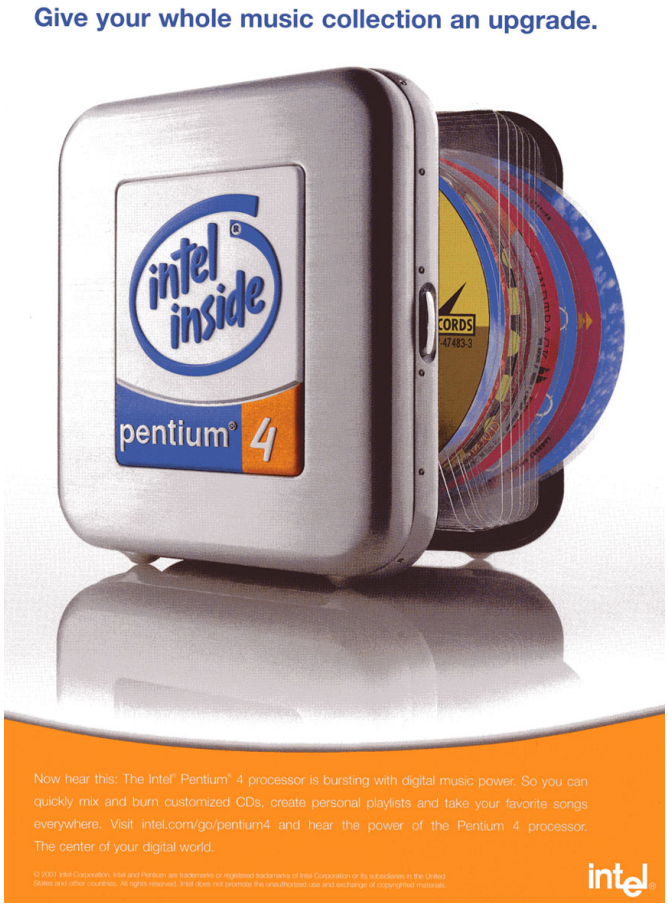
Source: Casewriter research, adapted from Gregory S. Wowkun and Nimal Vallipuram, Dresdner Kleinwort Wasserstein, April 15, 2002; "Revenues from Shipments of Microprocessors Worldwide by Vendor," Gartner Dataquest (July 1997, May 1998, June 1999, June 2000); "Revenue from Shipments of Microprocessors Worldwide, by Vendor," Gartner Dataquest, July 2001.

Exhibit 11 PC-related Microprocessor Market Share (% of factory revenues from worldwide shipments)

Vendor	1999	2000	2001
Intel	81.0	82.2	78.7
AMD	15.9	16.2	20.2
All Other	3.1	1.6	1.1
Total	100	100	100

Source: Casewriter research, adapted from Jack Robertson, "Intel Regained Ground from AMD," *EBN Online*, January 2002; Dean Takahashi, "Intel Can't Get Rid of AMD so Easily," *Red Herring*, February 1, 2002; John G. Spooner, "AMD Scores Points Against Intel in 2001," CNET News.com, January 24, 2002, http://news.com.com/2100-1001-822642.html; John G. Spooner, "AMD Betting on 650MHz Athlon Chip," *ZDNet News*, August 8, 1999, http://www.zdnet.com/2102-11-501207.html; J.P. Vicente, "Investors Line Up for the Semi Swing," *Red Herring*, June 13, 2001, http://www.redherring.com/mag/issue99/1540019554.html; "Microprocessors," *EBN Online*, June 6, 2001, http://www.ebnonline.com/article/OEG20010604S0102.

Exhibit 12 Pentium 4 Processor Print Ad



Source: Intel Corporation.

Exhibit 13 Worldwide Sales of Selected Devices (millions of units sold)

Type of Device	1997	1998	1999	2000	2001e
Mobile Phones	108.0	172.0	284.0	413.0	390.0
Desktop Computers	65.4	73.9	90.9	102.3	92.9
Portable Computers	14.2	15.6	19.9	26.1	27.3
Personal Digital Assistants	.6	.8	1.3	3.5	12.8

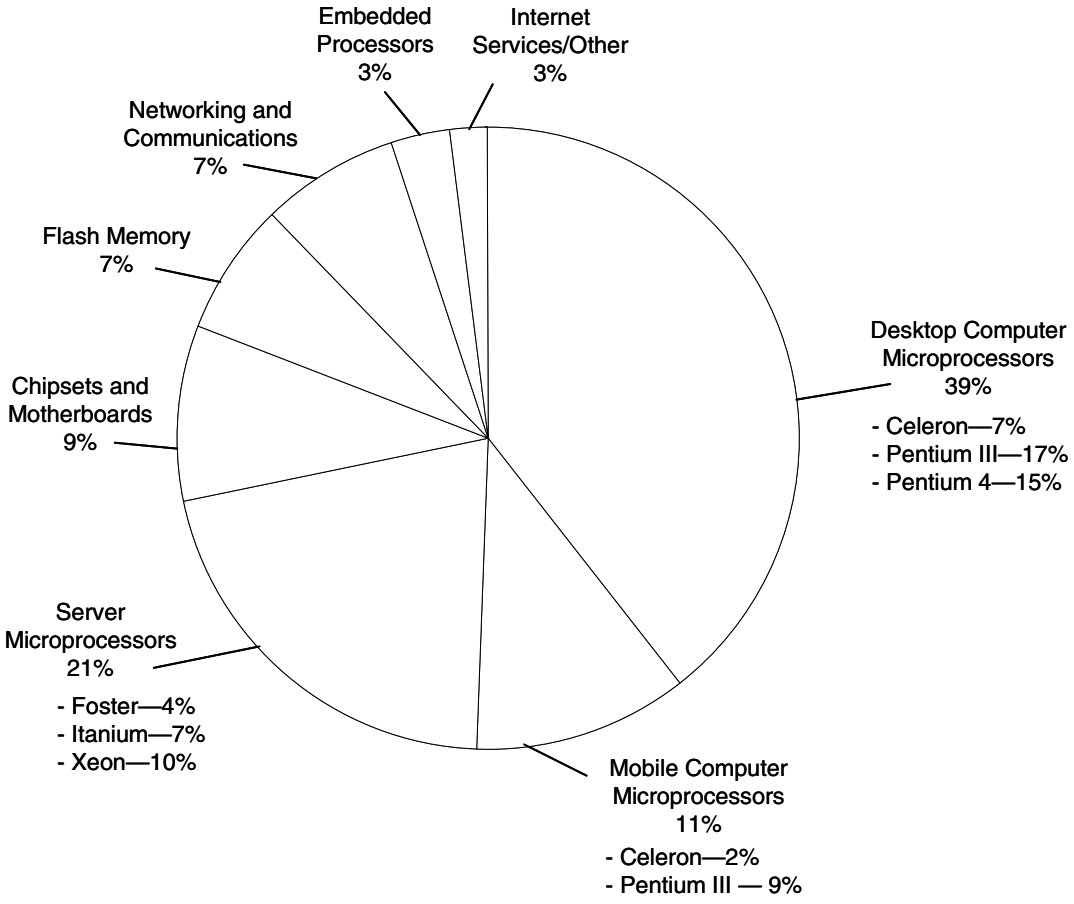
Source: Casewriter research, adapted from Anne K. Bui, David Daoud, Roger L. Kay, and Alan Promisel, "Worldwide PC Forecast Update 1999–2005," Banc of America Securities Report, August 2001; "World View Connected," *Computers Today*, July 1–15, p. 199, http://www.india-today.com/ctoday/01071999/master5.html; Doris Evers, "Mobile Phone Sales Fall for the First Time," March 11, 2002, http://www.infoworld.com/articles; "Market Engineering Research for the Handheld PC Market 1995–2005," Frost & Sullivan Report #5845-71, 1999, pp. 5–10.

Exhibit 14 Worldwide Microprocessor Usage (% of revenues)

Market Segment	2000 Actual	2005 Projected
Computers	46	38
Communications	24	27
Consumer Electronics	15	21
Industrial & Government	9	6
Automobiles	6	8
Total	100	100

Source: Casewriter research, adapted from James Detar, "Intel's Tepid Outlook Highlights Iffy Recovery for Chip Industry," *Investors Business Daily*, March 21, 2002.

Exhibit 15 Estimated Intel Revenue Breakdown by Product Category (2001)



Source: Adapted from N. Quinn Bolton and Allan Mishan, "Intel Corporation," CIBC World Markets, Inc., Equity Research Report, October 17, 2001, p. 21.

Exhibit 16 Selected Components of High-End Cell Phone Handsets

Component/Product	Selected Suppliers	Approximate Price (February 2002)
Reference design	Texas Instruments Intel Motorola Qualcomm Ericsson Microsoft	$ 5
Flash memory	Intel STMicroelectronics	$ 20
Baseband chip	Texas Instruments Philips Motorola Qualcomm Intel	$ 30
Radio chip	Motorola RF Micro Devices Philips Infineon	$ 35
Complete handset	Nokia Motorola Samsung	$200

Source: Adapted from David Pringle, "Microsoft, Intel to Create 'Template' for Phone that Competes with Nokia," *The Wall Street Journal Online*, February 19, 2002.

Appendix A

Intel's Flash Memory Products

In early 2002, Intel had a 27% market share of the worldwide flash memory market, with AMD in the number-two position with 14%. Approximately 60% of Intel's flash memory went into the cell phone market, where bits per system were rising rapidly. The average flash memory per handset had grown from about 16 MB (megabytes) in 2000 to 27 MB in 2001 and was projected to rise as high as 50 MB in 2002. In Japan, cell phones already sported approximately 60 MB of flash memory.[26]

Intel's remaining 40% of flash memory shipments went into devices such as PDAs and set-top boxes. The amount of flash memory in PDAs was also increasing rapidly, doubling from 16 MB in 2000 to 32 MB in 2001 and projected to hit 64 MB in 2002.[27]

Intel planned to integrate flash memory onto cellular baseband chips, a move that some analysts believed was a revolutionary approach that could "reshape the competitive landscape for wireless."[28] Texas Instruments, the market leader in cell phone chips, was also developing integrated products but was taking a very different technical approach.

Intel management believed that as wireless devices "moved towards data," cell phones would "move into the Intel world."[29] In early 2002, an industry analyst asked the question that everyone wanted to know the answer to: "Is the PDA morphing into a cell phone or is the cell phone morphing into a PDA?"[30]

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[26] Jonathon Joseph, "Intel Corporation: Flash Outlook Continues to Improve," Salomon Smith Barney Report, February 26, 2002.

[27] Joseph (2002).

[28] Rick Merritt, "Intel, TI Tip Flash, RF Integration for Cell Chips," *Electronic Engineering Times*, April 8, 2002, p. 1.

[29] Merrit (2002).

[30] Darrell Dunn, "AMD Makes Handheld Computer Play as Intel Tries to Build on Early Success," *EBN Online*, February 11, 2002, http://www.ebnonline.com.

Appendix B

Experimenting with "Intel Outside"

In 1998, Intel began to develop, manufacture, and sell a series of branded consumer electronics, toys, and digital cameras. The idea was to reduce the company's dependence on the PC market and to emphasize the importance of the PC as the "nerve center" for home entertainment and education. The Connected Products Group first introduced a line of digital cameras.[31] Intel also introduced the Intel Play QX3 microscope, whose imaging chip displayed magnified objects on a PC via a USB cable. The microscope was designed to be part of a planned line of high-tech toys from Intel and Mattel. Other products included the "Sound Morpher," which allowed voices to be recorded and stored on PCs and then digitally altered; the "Pocket Concert," an MP3 player with 128 MB of RAM and an FM tuner; and wireless mice, keyboards, and gamepads.[32] Several of the products won awards and had features that consumers found attractive.

However, in late 2001, Intel announced that the Connected Products Division would be phased out because the businesses did not meet the company's requirements for long-term growth potential. Lewnes commented on the company's foray into consumer products: "When we expanded into consumer products, it was really great from a brand standpoint, though not as good from a business standpoint since we couldn't make enough money in those businesses. But the consumer business experiment was a good test to see if we could manufacture and sell an end product."

Carter added that he believed that putting Intel "on the outside" was a good marketing move because "it humanized us."

[31] Michael Kanellos, "Intel Axes Its Consumer Electronics Unit," CNET News.com, October 18, 2001, http://news.com/2100-1040-274675.html.

[32] Mark Hachman, "Intel Designing MP3 Player, Web Pad for 2001," *Tech Web*, January 2, 2001, http://content.techwe.com/wire/story/TWB2001010250001.