pany must be ready with a new product platform to replace the one that is in decline, or it should be prepared to downsize its business. We discuss this in detail later in this chapter.

SOURCE: McGrath, M.E., "Product Strategy for High Technology Companies, McGraw Hill, 2001

Product Platform Examples

The concept of product platforms is a powerful one, but its application differs widely from platform to platform. For this reason, there is no single description of a product platform that applies in all cases. One example is different from another, and each company must work at understanding the characteristics of its own product platforms. The platform examples that follow illustrate a wide range of platforms with different characteristics.

APPLE, INTEL

Apple Computer's 25-Year Platform Strategy[5]

Like most companies in the last 25 years, Apple didn't manage its product strategy explicitly in terms of product platforms. It's fair to say that this description of Apple Computer's major product platforms and the product platform strategy it followed is a narrative of its actual strategy, not a case study of its intended strategy. Apple Computer has had a much publicized history of product development. Its major computer product platforms are outlined in Figure 3-2.

The Apple I was originally intended to be a hobbyist's build-your-own computer kit, but it was turned into an assembled microcomputer board. It was originally priced at $667, with a wholesale price of $500. The Apple II was derived from the Apple I.

In 1978, Apple began developing a powerful business computer that was a major departure from the Apple II platform architecture. The Apple III was its first major product platform failure. The Apple III platform was based on a Synertek 8-bit 6502A microprocessor running at 2 MHz, along with a built-in keyboard and a 143K internal disk drive. It used the Sophisticated Operating System, but it also ran in Apple II emulation mode, although not very well. The Apple III was announced in May 1980, but it was recalled for quality problems. In February 1981, Apple fixed the quality problems, dropped the price to $4,200, and then further reduced it to a base price of $3,500.

The Apple III Plus replaced the two original models of the Apple III in December 1983. Finally, with total sales of about only 120,000 units, Apple killed the product platform in April 1984 and wisely focused its resources on the Apple II and the Lisa and Macintosh product platforms. Four product platforms were too many to support.

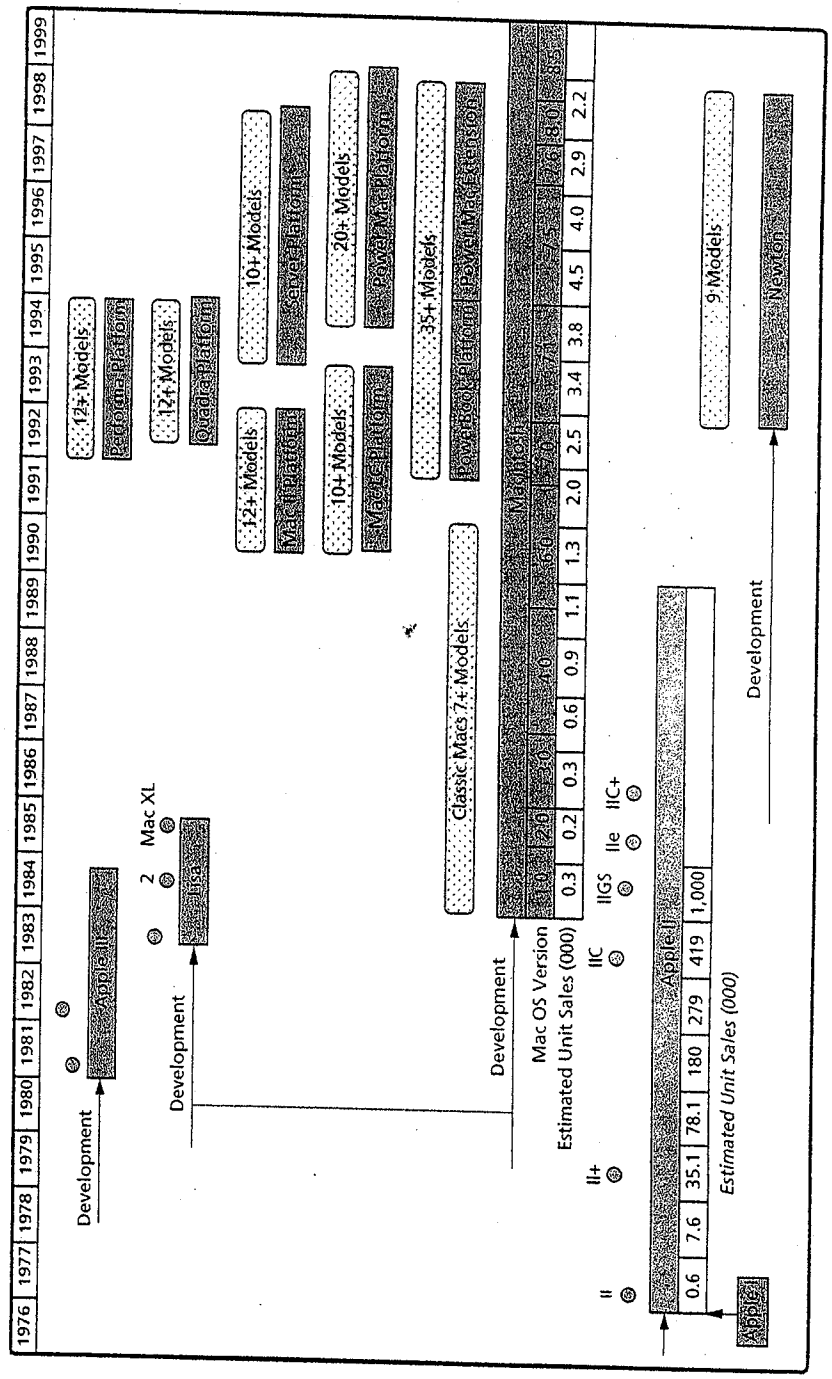

Figure 3-2 Apple Computer's platform strategy included 14 platforms in 25 years. (Source: Apple Computer; Owen W. Linzmayer, *Apple Confidential*, No Starch Press, 1999.)

When Steve Jobs and others from Apple visited the Xerox PARC laboratory in 1979, they were inspired to create the Lisa product platform. In exchange for the opportunity to invest in Apple, Xerox demonstrated some of its technology, including the graphical user interface, the mouse, and technology for networking computers and printers. Development of the Lisa took much longer than Apple anticipated, costing an estimated $50 million and taking 200 worker-years of resources (100 times more than the Apple II). Formally introduced in January 1983, the Lisa weighed 48 pounds and featured a Motorola 68000 microprocessor, two 860K floppy drives and a 5MB hard disk, a detachable keyboard, a one-button mouse, and a 12-inch, built-in monochrome display. Since the Lisa was incompatible with software on the market, seven applications programs were included to help justify the steep initial price of $10,000.

Even before the Lisa was shipped to the first customers, rumors began to circulate about a "baby Lisa," which was, of course, the Macintosh. The news diminished buyer interest in the high-priced Lisa. In September 1983, Apple reduced the price of the Lisa by 30 percent to $7,000 and introduced a high-end model, the Lisa 2. In January 1985, the Lisa 2 was renamed the Macintosh XL, and an emulation program was released to run Macintosh software in order to consolidate around a single brand. A short time later, in April, the Lisa was discontinued.

Apple began development of the Macintosh platform in 1979, and the first offering from the Macintosh platform was released in 1984; approximately 300,000 were sold in the first year. Seven different offerings were developed as part of what was later to become known as the Classic product family from the original platform, and more than 2 million units were sold.

In the 1990s, Apple created several derivative platforms from the original Macintosh platform. The Mac II and Mac LC platforms were launched in 1990. Eventually, each of these created more than 10 product offerings. In 1991–1992, Apple created the Performa and Quadra platforms, as well as the very successful PowerBook portable computer platform. The Power Mac PowerBook later extended the PowerBook platform. Collectively, the PowerBook and Power Mac extensions were responsible for more than 35 product offerings. Apple created the Power Mac and server platforms in 1993–1994. In 1998 and 1999, the iMac platform further extended the life cycle of the Macintosh platform.

In 1987, Apple began development of an entirely different product platform: the Newton, a personal digital assistant. The defining technology of the Newton was its ability to recognize handwriting as the primary user interface. Development of this new platform proved to be much more ambitious than Apple estimated. After approximately $500 million in development costs, the first Newton was shipped in 1993. Eight different models of the Newton were created over its five-year life cycle. Yet, while personal digital assistants became an important market, the Newton was a failure. Its defining technology, handwriting recognition, wasn't valued by the market.

(end of Apple)

OPTIONAL

Microsoft's Windows NT Platform History

Microsoft's Windows NT operating system is related to, but different from, its Windows 95/98 platform. NT is a more complex 32-bit platform primarily for use on servers as a networking operating system. Microsoft began development of NT in 1988 and released the first version of the platform, Windows NT 3.1, in 1993. The second version, Windows NT 3.5, released in 1994, was faster and more stable. In 1995, with Windows NT 3.51, Microsoft made NT compatible with its Windows 3.5 desktop applications. These were improved versions of the NT platform, rather than replacement platforms.

In 1996, Microsoft released Windows NT 4.0, which was more a platform replacement than an improvement. It was much larger (19 million lines of code compared with 10 million) and was able to run large, data processing tasks. A 1997 revision extended the platform to cluster computers together for large jobs. Microsoft started to replace Windows NT 4.0 with Windows 2000 in March 2000. The much larger platform had an estimated 30 million lines of code.[6]

OPTIONAL

AT&T's Service Platforms

Even a gigantic service business such as AT&T can be understood better by looking at its major service platforms in 1999.

- *Long-distance communications*, AT&T's primary service platform, supported a number of products. In 1999, the business long-distance product family was approximately $24 billion and the consumer long-distance product family was approximately $22 billion.
- *Wireless communications* was AT&T's fastest-growing platform, with a 40 percent growth rate and approximately $7.5 billion in revenue.
- AT&T expanded into a *cable television* service platform through acquisitions, making it potentially the largest cable television business in the United States. The wide range of product offerings from this platform included different service options and entertainment packages.
- AT&T's new *broadband* platform used its cable TV network to provide high-speed Internet access through Excite@Home, in which it had majority control.
- *Local phone service*, a new platform that used the cable TV network, was perhaps AT&T's most strategically important service platform.

INTEL

Intel: An Evolving Platform Strategy

Intel developed its first microprocessor product platform, the 4004, in 1971, followed by the 8008 six months later. The 8008 microprocessor was used in embedded products such as digital scales, traffic lights, and gasoline pumps. Intel developed an improved version, the 8080 microprocessor, in 1974.

Intel introduced the 8086 16-bit platform in 1978, and the 8088 8-bit platform in 1979. IBM selected the 8088 as the basis for its personal computer, and Intel's microprocessor business was born. The 8086/88 platforms performed from 5 to 10 MHz, much faster than previous platforms. Intel continued to introduce new product platforms every few years, as illustrated earlier in Figure 3-8.

Up until this time, Intel's platform strategy was limited. It developed only one product offering from each platform. Starting with the 80286 platform introduced in 1982, Intel began to release multiple products for each platform. The 286 was a 16-bit platform that offered products that ranged from 6 to 12 MHz. It incorporated on-chip memory management and was the first microprocessor that offered software compatibility.

The 80386 platform introduced in 1985 was based on a new 32-bit architecture that increased performance to 12 MHz. Intel designed a range of products from this platform, including the DX family and the SX family. The 80486 platform replaced it in 1989. The 80486 platform had a built-in math coprocessor and performance that ranged from 25 to 33 MHz. The product line strategy for this platform is described in Chapter 4.

In 1993, Intel introduced the Pentium platform, with five times the performance of the 80486. In 1995, it introduced the P6 architecture with the release of the Pentium Pro platform, which incorporated a second die with a high-speed memory cache to accelerate performance. Performance increased to 200 MHz.

At this point, Intel changed its platform strategy. The original strategy had been to design ever more powerful processors aimed at the top end of the computer market segment as previous-generation platforms migrated to the lower-end market segment. Intel's new strategy used one core technology as the foundation for developing several platforms tailored to meet the needs of multiple markets with multiple products. This strategy made sense for Intel, because there was sufficient volume in each market segment to begin to view each as a market and tailor a specific platform for each market. Intel was also able to develop and leverage a common architecture to reduce the investment in each platform.

Intel developed the MMX technology with a new set of instructions designed to enhance multimedia. This was incorporated into all platforms using the P6 architecture. The Pentium II platform was introduced in 1997. Intel optimized its design to deliver exceptional performance for business applications. A derivative platform was created for mobile applications. In 1998, Intel introduced two new platforms using the same architecture. The Intel Celeron platform was developed to meet core computing needs at an affordable price. The Pentium Xeon platform was developed for higher-end server and workstation computers and integrated large caches into the processor.

The Intel product platform strategy shows an interesting evolution over the last 25 years. It shifted from a single product per platform, to leveraging numerous product offerings from each platform, to customizing unique platforms for each market while using a common architecture. The transition illustrates not only the growth of its markets but also an evolution of Intel's platform management skills.

FROM TECHNOLOGY/PRODUCT PLATFORMS TO PRODUCT LINES

Intel's 486 Microprocessor Product Line Strategy

The Intel 486 microprocessor is an excellent example of product line strategy and a product line plan. Intel introduced the Intel 486 DX microprocessor in 1989 as the first in a new family of 486 products based on a new platform intended to replace the 386 product line. The 486 featured 1.2 million transistors on a computer chip and had twice the performance of the 386 product line. At the same time, the Intel 486 DX was 100 percent compatible with the previous generation of software developed for the 386.

Figure 4-1 illustrates the Intel 486 product line plan. It diagrams the introduction time frame and relative performance of each product. The table at the bottom of the figure shows how well the products cover various market segments. Fully shaded boxes indicate complete segment coverage, while partially shaded boxes indicate partial segment coverage.

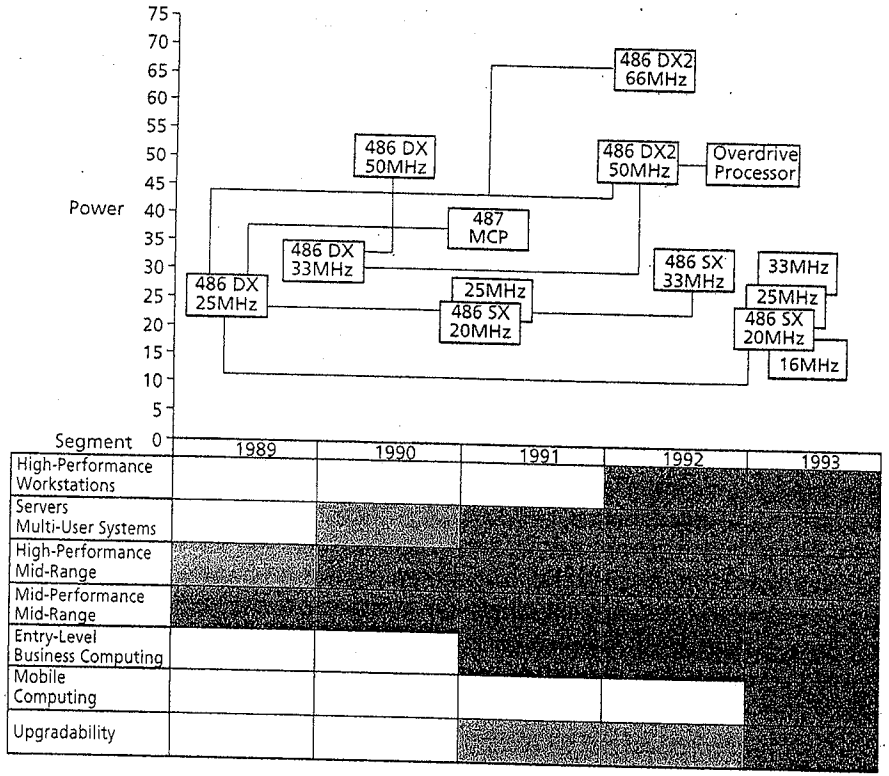

Figure 4-1 As Intel's 486 product line expanded, it progressively covered more market segments from 1989 to 1993.

The 486 was among the most powerful and complex microprocessors developed at that time. It integrated many system-level functions, including a 32-bit integer processor unit with an instruction set and a variety of addressing modes. The 486 DX was available in 25- and 33-MHz versions to serve the high-performance requirements of the midrange computing environment. The 50-MHz version of the 486 DX was introduced in June 1991 for the large server and high-end workstation segments.

Intel introduced the 486 SX product in April of 1991 for the entry-level business computing segment. The new microprocessor used the same architecture, but was less complex, less powerful, and less expensive than the DX products. Technically, the SX had a lower bus bandwidth (16 MB instead of 160 MB), had less memory addressability, and did not have an integrated math coprocessor. The 486 SX replaced the high-end processor in the 386 product line, the 386 DX. The 25-MHz 486 SX had twice the processing power of the 33-MHz 386 DX.

Intel's strategy was to overlap the two product lines (386 and 486) by providing more power at a higher price with the 486 DX versions. The overlap provided a continuing 386 market for almost two years. Then in 1991, Intel cannibalized the 386 market with the SX low-cost version of the 486 product line and ceded the 386 market to AMD and other competitors.

Intel also provided two 486 products that upgraded the performance of the SX processors, enabling customers to initially buy a lower-cost PC and then upgrade later on. The first was the 487 Math CoProcessor (MCP), which performed floating-point mathematics. The second was the OverDrive Processor, which doubled the 486 SX's internal speed using the DX2 speed-doubling technology.

The Intel 486 DX2 incorporated the speed-doubling feature, which let the microprocessor run at 50 MHz while interfacing with the system at 25 MHz. Computers using this processor could be designed for high performance without the complex issues of high-speed design.

The last set of products in the 486 product line was the Intel 486 SL, which specifically targeted the mobile computer segment. The features of this product were designed to reduce the power requirements and manage power at a system level.

The rollout of the 486 product line took four years. By the time the rollout was complete, it covered all major segments of the microprocessor market. Intel's sales of 486 microprocessors increased to 27 million units in 1993 and to an estimated 40 million units in 1994.

To accomplish this product line rollout, Intel developed a product line strategy detailing the products expected. Development of some of these products had to begin even before the initial 486 product was introduced. Fortunately for Intel, it understood the market from its 286 and 386 product line experience, and could base its 486 product line strategy on this experience.

The product line plan in Figure 4-1 is historical, but the same format could be used as a plan for a new product line. It combines three elements. First, it defines the anticipated time-phased plan for the introduction of products in the product line. Second, it matches this schedule to its coverage of the various market segments. Finally, it shows expected unit sales based on the time-phased plan. If additional products and coverage of market segments are important, then this plan becomes the best way to develop a sales forecast for a new product line.

Once a product line strategy is developed, the resulting product line plan links to the product development schedule. This schedule shows when development is anticipated to begin for each product in the product line plan. This is an iterative process. When the development plan for the product line is prepared, it may reveal that too many projects are scheduled at once, or that insufficient resources are available to complete the

work required. The development schedule needs to be adjusted to meet these constraints, which may force a change to the product line plan. If this change is acceptable, it is made. If it is not acceptable, priorities need to be shifted in order to implement the strategy. Unfortunately, many companies do not link the product line plan to the development plan, and do not do the necessary reprioritization.

Figure 4-2 illustrates a hypothetical six-year product development schedule for the Intel 486 product line, starting in 1988.[6] It shows some interesting characteristics. The 486 DX was already under development at the beginning of 1988. Toward the end of its development, but before testing, two additional projects were scheduled. The first was the SX version of the 486. The second was the faster 33-MHz version of the DX.

The number of projects and resources increased during 1990–1991 as the first products began to generate revenue. In total, 14 product development projects were planned, with some taking much more time and resources than others. At the peak of the development effort, there were five projects in process at the same time. By the end of 1991, resource requirements began to decline, and 60 percent less were required by the end of 1993 than were necessary at the beginning of 1988. The freed-up resources were assigned to other product line developments, such as the Pentium.

Estimating the schedule of project start dates enables management to schedule the appropriate event for initiating a new project, such as a Phase 0 review in a phase review process. This review would typically trigger the formal decision to start, cancel, refocus, or delay the specific project.

The time horizon of product line plans is typically two or three times the longest development cycle time.

When development capacity and load are balanced, this scheduling approach is similar to establishing a train schedule. A development project will start and end as scheduled. The estimated time between the start date and complete date is based on known development cycle times for new products of various levels of complexity. If a project is canceled at the Phase 0 review, another product opportunity can enter the process to take its slot in the product line plan.

The time horizon of product line plans is typically two to three times the longest development cycle time. This is long enough to provide visibility into the future and short enough to be realistic. Such a clearly articulated plan of future programs prevents one of the high-technology industry's cardinal sins: overcommitting scarce development resources.

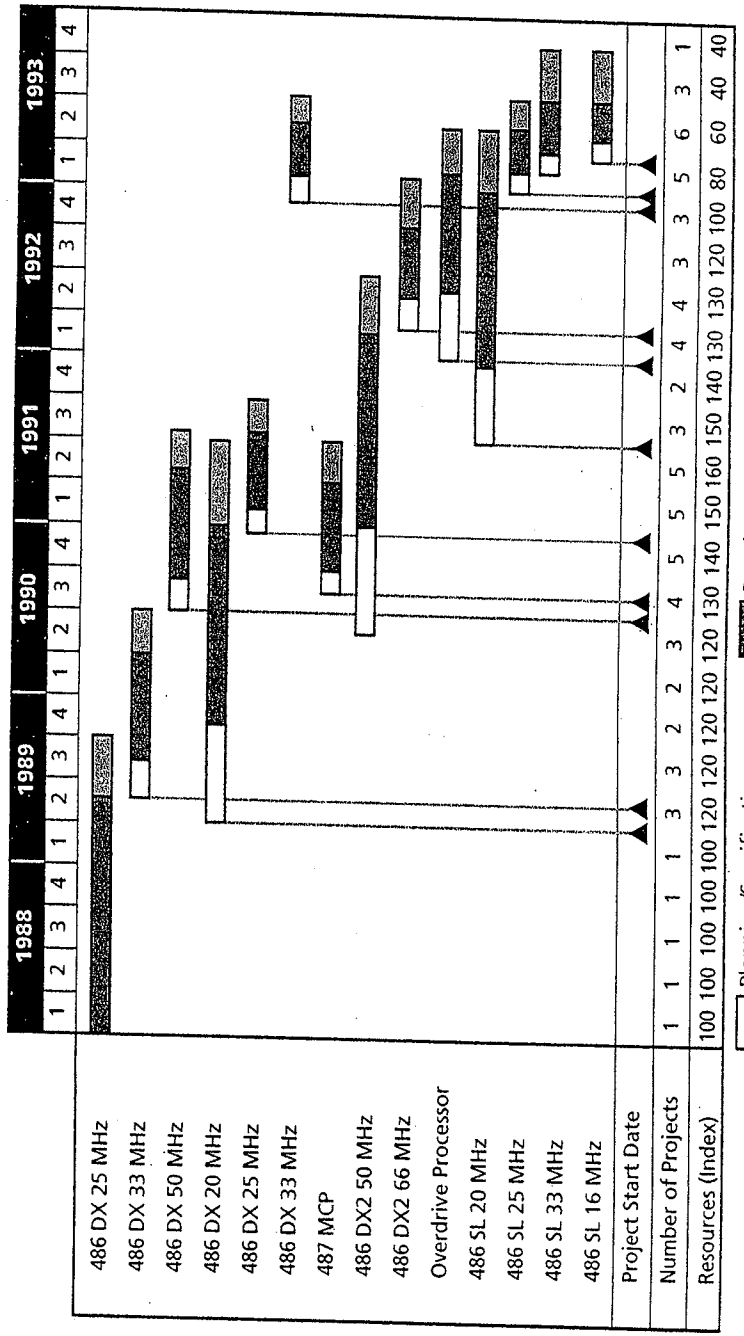

Figure 4-2 A hypothetical product development schedule for the Intel 486 product line shows how resources and timing can be synched for strategic balancing.

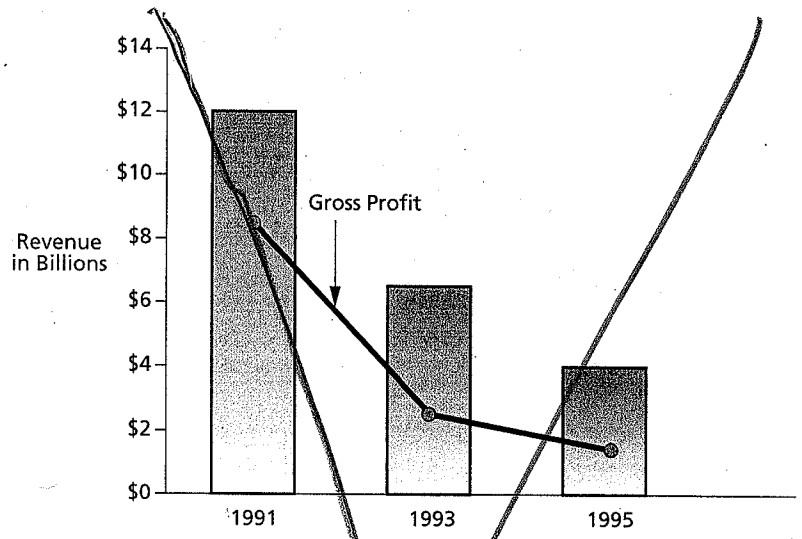

Figure 3-7 IBM's large-scale systems business fell 50 percent from 1991 to 1993. (Source: Ira Sager, "Lou Gerstner Unveils His Battle Plans," *Business Week*, April 4, 1994.)

gross profit margins, which declined from 70 percent to 40 percent at the same time that revenues were declining. The combined impact was an estimated drop in IBM's mainframe computer gross profit from $8.5 billion to $2.5 billion.

The loss of $6 billion in gross profit in two years can cause problems for any company, even an IBM. As a result, it needed to refocus its strategies and substantially cut overhead. The drop in mainframe revenue also shifted the thrust of its business. By 1993, IBM's personal computer revenue (almost $10 billion) exceeded its mainframe revenue, and by 1995 mainframe revenue was expected to become relatively small, compared with personal computer revenue. The PC business is very different from the mainframe business. It has different economics and a different competitive model, and it requires different product strategies to be successful.

In some cases, a market declines because it becomes saturated. When a new technology creates a market, there is rapidly growing demand for the resulting products. However, the market eventually becomes saturated as potential customers buy the product and have no need to buy another. The automobile radar detector market suffered this fate. Created by technology, it grew to more than $200 million (retail) during the 1980s. Eventually, the market became saturated and began to contract in the 1990s, as manufacturers ran out of ideas for improving their

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INTEL'S PLATFORM STRATEGY

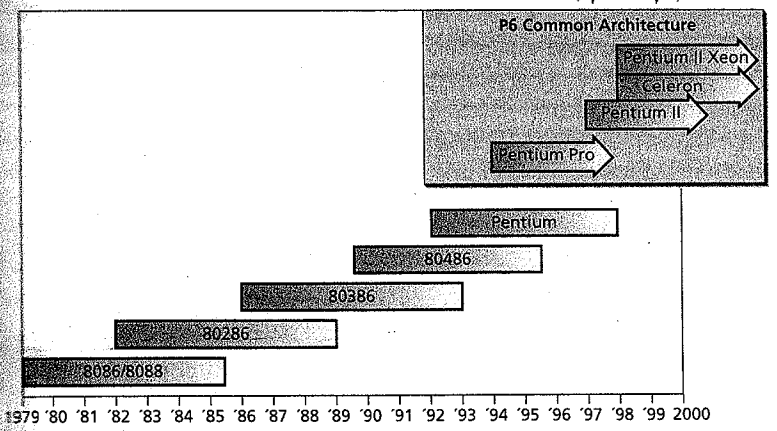

Figure 3-8 Intel's product strategy is based on introducing new product platforms in regular cycles. (compare with Apple, Figure 3.2)

~~products enough to get customers to replace the detectors they~~ already ~~owned.~~

5. *Regularly replace platforms with short life cycles.* Product platform life cycles for most high-technology products are notoriously short—and in some cases, are getting even shorter. The life cycle of microprocessors, for example, is approximately 3.5 years. Short cycles can be a competitive advantage for the company that establishes a cadence to replace its product platforms regularly. The need to replace a platform is never a surprise; it becomes a normal part of life.

Figure 3-8 illustrates product life cycles for microprocessors, using the Intel microprocessor product platforms as an example. Each of these is a distinctly different product platform; within each platform there are a number of product variations (devices with differing speeds or power consumption) and product line extensions. Sometimes short, but regular, platform life cycles are an advantage. For example, Intel can plan strategically to replace its microprocessor platforms with new ones approximately every 3.5 years.

Companies that successfully manage short platform life cycles can achieve a competitive advantage. IBM, for example, introduced the IBM PC in August 1981 and then replaced it with the XT in early 1983, only 18 months later. IBM began working on the XT even before it introduced the PC. It then replaced the XT with the AT in August 1984, again only 18 months later. By 1984, IBM's PC revenue was $4 billion, and it dominated the market for personal computers.

Short platform life cycles require a company to make product strategy decisions more frequently. If the decisions are right, then it wins—but