

The Home Video Game Industry: From Pong to X-Box

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This case was prepared by Charles W. L. Hill, the University of Washington.

An Industry Is Born

In 1968, Nolan Bushnell, the twenty-four-year-old son of a Utah cement contractor graduated from the University of Utah with a degree in engineering.¹ Bushnell then moved to California, where he worked briefly in the computer graphics division of Ampex. At home, Bushnell turned his daughter's bedroom into a laboratory. There, he created a simpler version of Space War, a computer game that had been invented in 1962 by an MIT graduate student, Steve Russell. Bushnell's version of Russell's game, which he called Computer Space, was made of integrated circuits connected to a 19-inch black-and-white television screen. Unlike a computer, Bushnell's invention could do nothing but play the game, which meant that, unlike a computer, it could be produced cheaply.

Bushnell envisioned video games like his standing next to pinball machines in arcades. With hopes of having his invention put into production, Bushnell left Ampex to work for a small pinball company that manufactured 1,500 copies of his video game. The game never sold, primarily because the player had to read a

full page of directions before he or she could play the game—way too complex for an arcade game. Bushnell left the pinball company and with a friend, Ted Dabney, put up \$500 to start a company that would develop a simpler video game. They wanted to call the company Syzygy, but the name was already taken, so they settled on Atari, a Japanese word that was the equivalent of “*check in the go.*”

In his home laboratory, Bushnell built the simplest game he could think of. People knew the rules immediately, and it could be played with one hand. The game was modeled on table tennis, and players batted a ball back and forth with paddles that could be moved up and down sides of a court by twisting knobs. He named the game “Pong” after the sonarlike sound that was emitted every time the ball connected with a paddle.

In the fall of 1972, Bushnell installed his prototype for Pong in Andy Capp's tavern in Sunnyvale, California. The only instructions were “avoid missing the ball for a high score.” In the first week, 1,200 quarters were deposited in the casserole dish that served for a coin box in Bushnell's prototype. Bushnell was ecstatic; his simple game had brought in \$300 in a week. The pinball machine that stood next to it averaged \$35 a week.

Lacking the capital to mass-produce the game, Bushnell approached established

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amusement game companies, only to be repeatedly shown the door. Down but hardly out, Bushnell cut his hair, put on a suit, and talked his way into a \$50,000 line of credit from a local bank. He set up a production line in an abandoned roller skating rink and he hired people to assemble machines while Led Zeppelin and the Rolling Stones were played at full volume over the speaker system of the rink. Among his first batch of employees was a skinny seventeen-year-old named Steve Jobs, who would later found a few companies of his own, including Apple Computer, NeXT, and Pixar. Like others, Jobs had been attracted by a classified ad that read "Have Fun and Make Money."

In no time at all, Bushnell was selling all the machines that his small staff could make—about ten per day—but to grow, he needed additional capital. While the ambience at the rink, with its mix of rock music and marijuana fumes, put off most potential investors, Don Valentine, one of the country's most astute and credible venture capitalists, was impressed with the growth story. Armed with Valentine's money, Atari began to increase production and expand their range of games. New games included Tank and Breakout; the latter was designed by Jobs and a friend of his, Steve Wozniak, who had left Hewlett-Packard to work at Atari.

By 1974, 100,000 Ponglike games were sold worldwide. Although Atari manufactured only 10 percent of the games, the company still made \$3.2 million that year. With the Pong clones coming on strong, Bushnell decided to make a Pong system for the home. In fact, Magnavox had been marketing a similar game for the home since 1972, although sales had been modest.² Bushnell's team managed to compress Atari's coin-operated Pong game down to a few inexpensive circuits that were contained in the game console. Atari's Pong had a sharper picture and more sensitive controllers than Magnavox's machine. It also cost less. Bushnell then went on a road show, demonstrating Pong to toy buyers, but he received an indifferent response and no sales. A dejected Bushnell returned to Atari with no idea of what to do next. Then the buyer for the sporting goods department at Sears came to see Bushnell, reviewed the machine, and offered to buy every home Pong game Atari could make. With Sears's backing, Bushnell boosted production. Sears ran a major television ad campaign to sell home Pong, and Atari's sales soared, hitting

\$450 million in 1975. The home video game had arrived.

Boom and Bust

Nothing attracts competitors like success, and by 1976 about twenty different companies were crowding into the home video game market, including National Semiconductor, RCA, Coleco, and Fairchild. Recognizing the limitations of existing home video game designs, Fairchild came out in 1976 with a home video game system capable of playing multiple games. The Fairchild system consisted of three components—a console, controllers, and cartridges. The console was a small computer optimized for graphics processing capabilities. It was designed to receive information from the controllers, process it, and send signals to a television monitor. The controllers were hand-held devices used to direct on-screen action. The cartridges contained chips encoding the instructions for a game. The cartridges were designed to be inserted into the console.

In 1976, Bushnell sold Atari to Warner Communications for \$28 million. Bushnell stayed on to run Atari. Backed by Warner's capital, in 1977 Atari developed and bought out its own cartridge-based system, the Atari 2600. The 2600 system was sold for \$200, and associated cartridges retailed for \$25–\$30. Sales surged during the 1977 Christmas season. However, a lack of manufacturing capacity on the part of market leader Atari and a very cautious approach to inventory by Fairchild led to shortages and kept sales significantly below what they could have been. Fairchild's cautious approach was the result of prior experience in consumer electronics. A year earlier it had increased demand for its digital watches, only to accumulate a buildup of excess inventory that had caused the company to take a \$24.5 million write-off.³

After the 1977 Christmas season, Atari claimed to have sold about 400,000 units of the 2600 VCA, about 50 percent of all cartridge-based systems in American homes. Atari had also earned more than \$100 million in sales of game cartridges. By this point, second-place Fairchild sold around 250,000 units of its system. Cartridge sales for the year totaled about 1.2 million units, with an average selling price of around \$20. Fresh from this success and fortified by market forecasts predicting sales of 33 million cartridges and an

installed base of 16 million machines by 1980, Bushnell committed Atari to manufacturing 1 million units of the 2600 for the 1978 Christmas season. Atari estimated that total demand would reach 2 million units. Bushnell was also encouraged by signals from Fairchild that it would again be limiting production to around 200,000 units. At this point, Atari had a library of nine games. Fairchild had seventeen.⁴

Atari was not the only company to be excited by the growth forecasts. In 1978, a host of other companies, including Coleco, National Semiconductor, Magnavox, General Instrument, and a dozen other companies, entered the market with incompatible cartridge-based home systems. The multitude of choices did not seem to entice consumers, however, and the 1978 Christmas season brought unexpectedly low sales. Only Atari and Coleco survived an industry shakeout. Atari lost Bushnell, who was ousted by Warner executives. (Bushnell went on to start Chuck E. Cheese Pizza Time Theater, a restaurant chain that had 278 outlets by 1981.) Bushnell later stated that part of the problem was a disagreement over strategy. Bushnell wanted Atari to price the 2600 at cost and make money on sales of software; Warner wanted to continue making profits on hardware sales.⁵

Several important developments occurred in 1979. First, several game producers and programmers defected from Atari to set up their own firm, Activision, and to make games compatible with the Atari 2600. Their success encouraged others to follow suit. Second, Coleco developed an expansion module that allowed its machine to play Atari games. Atari and Mattel (which entered the market in 1979) did likewise. Third, the year 1979 saw the introduction of three new games to the home market—Space Invaders, Asteroids, and Pac Man. All three were adapted from popular arcade games and all three helped drive demand for players.

Demand recovered strongly in late 1979 and kept growing for the next three years. In 1981, U.S. sales of home video games and cartridges hit \$1 billion. In 1982, they surged to \$3 billion, with Atari accounting for half of this amount. It seemed as if Atari could do no wrong; the 2600 was everywhere. About 20 million units were sold, and by late 1982, a large number of independent companies, including Activision, Imagic, and Epyx, were now producing hundreds of games for the 2600. Second-place Coleco was also doing well, partly because of a popular arcade game,

Donkey Kong, which it had licensed from a Japanese company called Nintendo.

Atari was also in contact with Nintendo. In 1982, the company very nearly licensed the rights to Nintendo's Famicom, a cartridge-based video game system machine that was a big hit in Japan. Atari's successor to the 2600, the 5200, was not selling well and the Famicom seemed like a good substitute. The negotiations broke down, however, when Atari discovered that Nintendo had extended its Donkey Kong license to Coleco. This allowed Coleco to port a version of the game to its home computer, which was a direct competitor to Atari's 800 home computer.⁶

After a strong 1982 season, the industry hoped for continued growth in 1983. Then the bottom dropped out of the market. Sales of home video games plunged to \$100 million. Atari lost \$500 million in the first nine months of the year, causing the stock of parent company Warner Communications to drop by half. Part of the blame for the collapse was laid at the feet of an enormous inventory overhang of unsold games. About 15 to 20 million surplus game cartridges were left over from the 1982 Christmas season (in 1981, there were none). On top of this, around 500 new games hit the market in 1983. The average price of a cartridge plunged from \$30 in 1979 to \$16 in 1982, and then to \$4 in 1983. As sales slowed, retailers cut back on the shelf space allocated to video games. It proved difficult for new games to make a splash in a crowded market. Atari had to dispose of 6 million ET: The Extraterrestrial games. Meanwhile, big hits from previous years, such as Pac Man, were bundled with game players and given away free to try to encourage system sales.⁷

Surveying the rubble, commentators claimed that the video game industry was dead. The era of dedicated game machines was over, they claimed. Personal computers were taking their place.⁸ It seemed to be true. Mattel sold off its game business, Fairchild moved on to other things, Coleco folded, and Warner decided to break up Atari and sell its constituent pieces—at least, those pieces for which it could find a buyer. No one in America seemed to want to have anything to do with the home video game business; no one, that is, except for Minoru Arakawa, the head of Nintendo's U.S. subsidiary, Nintendo of America (NOA). Picking through the rubble of the industry, Arakawa noticed that there were people who still packed video arcades, bringing in \$7 billion a year,

more money than the entire movie industry. Perhaps it was not a lack of interest in home video games that had killed the industry. Perhaps it was bad business practice.

The Nintendo Monopoly

Nintendo was a century-old Japanese company that had built up a profitable business making playing cards before diversifying into the video game business. Based in Kyoto and still run by the founding Yamauchi family, the company started to diversify into the video game business in the late 1970s. The first step was to license video game technology from Magnavox. In 1977, Nintendo introduced a home video game system in Japan based on this technology that played a variation of Pong. In 1978, the company began to sell coin-operated video games. It had its first hit with *Donkey Kong*, designed by Sigeru Miyamoto.

The Famicom

In the early 1980s, the company's boss, Hiroshi Yamauchi, decided that Nintendo had to develop its own video game machine. He pushed the company's engineers to develop a machine that combined superior graphics-processing capabilities and low cost. Yamauchi wanted a machine that could sell for \$75, less than half the price of competing machines at the time. He dubbed the machine the Family Computer, or Famicom. The machine that his engineers designed was based on the controller, console, and plug in the cartridge format pioneered by Fairchild. It contained two custom chips—an 8-bit central processing unit and a graphics-processing unit. Both chips had been scaled down to perform only essential functions. A 16-bit processor was available at the time, but to keep costs down, Yamauchi refused to use it.

Nintendo approached Ricoh, the electronics giant, which had spare semiconductor capacity. Employees at Ricoh said that the chips had to cost no more than 2,000 yen. Ricoh thought that the 2,000-yen price point was absurd. Yamauchi's response was to guarantee Ricoh a 3-million-chip order within two years. Since the leading companies in Japan were selling, at most, 30,000 video games per year at the time, many within the company viewed this as an outrageous commitment, but Ricoh went for it.⁹

Another feature of the machine was its memory—2,000 bytes of random access memory (RAM), compared to the 256 bytes of RAM in the Atari machine. The result was a machine with superior graphics-processing capabilities and faster action that could handle far more complex games than Atari games. Nintendo's engineers also built a new set of chips into the game cartridges. In addition to chips that held the game program, Nintendo developed memory map controller (MMC) chips that took over some of the graphics-processing work from the chips in the console and enabled the system to handle more complex games. With the addition of the MMC chips, the potential for more-sophisticated and more complex games had arrived. Over time, Nintendo's engineers developed more powerful MMC chips, enabling the basic 8-bit system to do things that originally seemed out of reach. The engineers also figured out a way to include a battery backup system in cartridges that allowed some games to store information independently—to keep track of where a player had left off or to track high scores.

The Games

Yamauchi recognized that great hardware that would not sell itself. The key to the market, he reasoned, was great games. Yamauchi had instructed the engineers, when they were developing the hardware, to make sure that “it was appreciated by software engineers.” Nintendo decided that it would become a haven for game designers. “An ordinary man,” Yamauchi said, “cannot develop good games no matter how hard he tries. A handful of people in this world can develop games that everyone wants. Those are the people we want at Nintendo.”¹⁰

Yamauchi had an advantage in the person of Sigeru Miyamoto. Miyamoto had joined Nintendo at the age of twenty-four. Yamauchi had hired Miyamoto, a graduate of Kanazawa Munci College of Industrial Arts, as a favor to his father and an old friend, although he had little idea what he would do with an artist. For three years, Miyamoto worked as Nintendo's staff artist. Then in 1980, Yamauchi called Miyamoto into his office. Nintendo had started selling coin-operated video games, but one of the new games, *Radarscope*, was a disaster. Could Miyamoto come up with a new game? Miyamoto was delighted. He had always spent a lot of time drawing cartoons, and as a student, he had played video games con-

stantly. Miyamoto believed that video games could be used to bring cartoons to life.¹¹

The game Miyamoto developed was nothing short of a revelation. At a time when most coin-operated video games lacked characters or depth, Miyamoto created a game around a story that had both. Most games involved battles with space invaders or heroes shooting lasers at aliens; Miyamoto's game did neither. Based loosely on *Beauty and the Beast* and *King Kong*, Miyamoto's game involved a pet ape who runs off with his master's beautiful girlfriend. His master is an ordinary carpenter called Mario, who has a bulbous nose, a bushy mustache, a pair of large pathetic eyes, and a red cap (which Miyamoto added because he was not good at hairstyles). He does not carry a laser gun. The ape runs off with the girlfriend to get back at his master, who was not especially nice to the beast. The man, of course, has to get his girlfriend back by running up ramps, climbing ladders, jumping off elevators, and the like, while the ape throws objects at the hapless carpenter. Since the main character is an ape, Miyamoto called him Kong; because the main character is as stubborn as a donkey, he called the game *Donkey Kong*.

Released in 1981, *Donkey Kong* was a sensation in the world of coin-operated video arcades and a smash hit for Nintendo. In 1984, Yamauchi again summoned Miyamoto to his office. He needed more games, this time for Famicom. Miyamoto was made the head of a new research and development (R&D) group and told to come up with the most imaginative video games ever.

Miyamoto began with Mario from *Donkey Kong*. A colleague had told him that Mario looked more like a plumber than a carpenter, so a plumber he became. Miyamoto gave Mario a brother, Luigi, who was as tall and thin as Mario was short and fat. They became the Super Mario Brothers. Since plumbers spend their time working on pipes, large green sewer pipes became obstacles and doorways into secret worlds. Mario and Luigi's task was to search for the captive Princess Toadstool. Mario and Luigi are endearing bumbling, unequal to their tasks yet surviving. They shoot, squash, or evade their enemies—a potpourri of inventions that include flying turtles and stinging fish, man-eating flowers and fire-breathing dragons—while they collect gold coins, blow air bubbles, and climb vines into smiling clouds.¹²

Super Mario Brothers was introduced in 1985. For Miyamoto, this was just the beginning. Between 1985 and 1991, Miyamoto produced eight Mario games. About 60 to 70 million were sold worldwide, making Miyamoto the most successful game designer in the world. After adapting *Donkey Kong* for Famicom, he also went on to create other top-selling games, including another classic, *The Legend of Zelda*. While Miyamoto drew freely from folklore, literature, and pop culture, the main source for his ideas was his own experience. The memory of being lost among a maze of sliding doors in his family's home was re-created in the labyrinths of the *Zelda* games. The dog that attacked him when he was a child attacks Mario in *Super Mario*. As a child, Miyamoto had once climbed a tree to catch a view of far-off mountains and had become stuck. Mario gets himself in a similar fix. Once Miyamoto went hiking without a map and was surprised to stumble across a lake. In the *Legend of Zelda*, part of the adventure is in walking into new places without a map and being confronted by surprises.

Nintendo in Japan

Nintendo introduced Famicom into the Japanese market in May 1983. Famicom was priced at \$100, more than Yamauchi wanted, but significantly less than the products of competitors. When he introduced the machine, Yamauchi urged retailers to forgo profits on the hardware because it was just a tool to sell software, and that is where they would make their money. Backed by an extensive advertising campaign, 500,000 units of Famicom were sold in the first two months. Within a year, the figure stood at 1 million, and sales were still expanding rapidly. With the hardware quickly finding its way into Japanese homes, Nintendo was besieged with calls from desperate retailers frantically demanding more games.

At this point Yamauchi told Miyamoto to come up with the most imaginative games ever. However, Yamauchi also realized that Nintendo alone could not satisfy the growing thirst for new games, so he initiated a licensing program. To become a Nintendo licensee, companies had to agree to an unprecedented series of restrictions. Licensees could issue only five Nintendo games per year, and they could not write those titles for other platforms. The licensing fee was set at 20 percent of the wholesale price of each cartridge sold (game cartridges wholesaled for around

\$30). It typically cost \$500,000 to develop a game and took around six months. Nintendo insisted that games not contain any excessively violent or sexually suggestive material and that they review every game before allowing it to be produced.¹³

Despite these restrictions, six companies (Bandai, Capcom, Konami, Namco, Taito, and Hudson) agreed to become Nintendo licensees, not least because millions of customers were now clamoring for games. Bandai was Japan's largest toy company. The others already made either coin-operated video games or computer software games. Because of these licensing agreements, they saw their sales and earnings surge. For example, Konami's earnings went from \$10 million in 1987 to \$300 million in 1991.

After the six licensees began selling games, reports of defective games began to reach Yamauchi. The original six licensees were allowed to manufacture their own game cartridges. Realizing that he had given away the ability to control the quality of the cartridges, Yamauchi decided to change the contract for future licensees. Future licensees were required to submit all manufacturing orders for cartridges to Nintendo. Nintendo charged licensees \$14 per cartridge, required that they place a minimum order for 10,000 units, (later the minimum order was raised to 30,000), and insisted on cash payment in full when the order was placed. Nintendo outsourced all manufacturing to other companies, using the volume of its orders to get rock bottom prices. The cartridges were estimated to cost Nintendo between \$6 and \$8 each. The licensees then picked up the cartridges from Nintendo's loading dock and were responsible for distribution. In 1985, there were seventeen licensees. By 1987, there were fifty. By this point, 90 percent of the home video game systems sold in Japan were Nintendo systems.

Nintendo in America

In 1980, Nintendo established a subsidiary in America to sell its coin-operated video games. Yamauchi's American-educated son-in-law, Minoru Arakawa, headed the subsidiary. All of the other essential employees were Americans, including Ron Judy and Al Stone. For its first two years, Nintendo of America (NOA), based originally in Seattle, struggled to sell second-rate games such as Radarscope. The subsidiary seemed on the brink of closing. NOA could not even make the rent payment on the warehouse. Then they received a large shipment from Japan:

2,000 units of a new coin-operated video game. Opening the box, they discovered Donkey Kong. After playing the game briefly, Judy proclaimed it a disaster. Stone walked out of the building, declaring that "it's over."¹⁴ The managers were appalled. They could not imagine a game less likely to sell in video arcades. The only promising sign was that a twenty-year employee, Howard Philips, rapidly became enthralled with the machine.

Arakawa, however, knew he had little choice but to try to sell the machine. Judy persuaded the owner of the Spot Tavern near Nintendo's office to take one of the machines on a trial basis. After one night, Judy discovered \$30 in the coin box, a phenomenal amount. The next night there was \$35, and \$36 the night after that. NOA had a hit on its hands.

By the end of 1982, NOA had sold over 60,000 copies of Donkey Kong and had booked sales in excess of \$100 million. The subsidiary had outgrown its Seattle location. They moved to a new site in Redmond, a Seattle suburb, where they located next to a small but fast-growing software company run by an old school acquaintance of Howard Philips, Bill Gates.

By 1984, NOA was riding a wave of success in the coin-operated video game market. Arakawa, however, was interested in the possibilities of selling Nintendo's new Famicom system in the United States. Throughout 1984, Arakawa, Judy, and Stone met with numerous toy and department store representatives to discuss the possibilities, only to be repeatedly rebuffed. Still smarting from the 1983 debacle, the representatives wanted nothing to do with the home video game business. They also met with former managers from Atari and Caloco to gain their insights. The most common response they received was that the market collapsed because the last generation of games were awful.

Arakawa and his team decided that if they were going to sell Famicom in the United States, they would have to find a new distribution channel. The obvious choice was consumer electronics stores. Thus, Arakawa asked the R&D team in Kyoto to redesign Famicom for the U.S. market so that it looked less like a toy (Famicom was encased in red and white plastic), and more like a consumer electronics device. The redesigned machine was renamed the Nintendo Entertainment System (NES).

Arakawa's big fear was that illegal, low-quality Taiwanese games would flood the U.S. market if NES

was successful. To stop counterfeit games being played on NES, Arakawa asked Nintendo's Japanese engineers to design a security system into the U.S. version of Famicom so that only Nintendo-approved games could be played on NES. The Japanese engineers responded by designing a security chip to be embedded in the game cartridges. NES would not work unless the security chips in the cartridges unlocked, or shook hands with, a chip in NES. Since the code embedded in the security chip was proprietary, the implication of this system was that no one could manufacture games for NES without Nintendo's specific approval.

To overcome the skepticism and reluctance of retailers to stock a home video game system, Arakawa decided in late 1985 to make an extraordinary commitment. Nintendo would stock stores and set up displays and windows. Retailers would not have to pay for anything they stocked for ninety days. After that, retailers could pay Nintendo for what they sold and return the rest. NES was bundled with Nintendo's best-selling game in Japan, Super Mario Brothers. It was essentially a risk-free proposition for retailers, but even with this, most were skeptical. Ultimately, thirty Nintendo personnel descended on the New York area. Referred to as the Nintendo SWAT team, they persuaded some stores to stock NES after an extraordinary blitz that involved eighteen-hour days. To support the New York product launch, Nintendo also committed itself to a \$5 million advertising campaign aimed at the seven- to fourteen-year-old boys who seemed to be Nintendo's likely core audience.

By December 1985, between 500 and 600 stores in the New York area were stocking Nintendo systems. Sales were moderate, about half of the 100,000 NES machines shipped from Japan were sold, but it was enough to justify going forward. The SWAT team then moved first to Los Angeles, then to Chicago, then to Dallas. As in New York, sales started at a moderate pace, but by late 1986 they started to accelerate rapidly, and Nintendo went national with NES.

In 1986, around 1 million NES units were sold in the United States. In 1987, the figure increased to 3 million. In 1988, it jumped to over 7 million. In the same year, 33 million game cartridges were sold. Nintendo mania had arrived in the United States. To expand the supply of games, Nintendo licensed the rights to produce up to five games per year to thirty-one American software companies. Nintendo contin-

ued to use a restrictive licensing agreement that gave it exclusive rights to any games, required licensees to place their orders through Nintendo, and insisted on a 30,000-unit minimum order.¹⁵

By 1990, the home video game market was worth \$5 billion worldwide. Nintendo dominated the industry, with a 90 percent share of the market for game equipment. The parent company was, by some measures, now the most profitable company in Japan. By 1992, it was netting over \$1 billion in gross profit annually, or more than \$1.5 million for each employee in Japan. The company's stock market value exceeded that of Sony, Japan's premier consumer electronics firm. Indeed, the company's net profit exceeded that of all the American movie studios combined. Nintendo games, it seemed, were bigger than the movies.

As of 1991, there were over 100 licensees for Nintendo, and over 450 titles were available for NES. In the United States, Nintendo products were distributed through toy stores (30 percent of volume), mass merchandisers (40 percent of volume), and department stores (10 percent of volume). Nintendo tightly controlled the number of game titles and games that could be sold, quickly withdrawing titles as soon as interest appeared to decline. In 1988, retailers requested 110 million cartridges from Nintendo. Market surveys suggested that perhaps 45 million could have been sold, but Nintendo allowed only 33 million to be shipped.¹⁶ Nintendo claimed that the shortage of games was in part due to a worldwide shortage of semiconductor chips.

Several companies had tried to reverse-engineer the code embedded in Nintendo's security chip, which competitors characterized as a lockout chip. Nintendo successfully sued them. The most notable was Atari Games, one of the successors of the original Atari, which in 1987 sued Nintendo of America for anticompetitive behavior. Atari claimed that the purpose of the security chip was to monopolize the market. At the same time, Atari announced that it had found a way around Nintendo's security chip and would begin to sell unlicensed games.¹⁷ NOA responded with a countersuit. In a March 1991 ruling, Atari was found to have obtained Nintendo's security code illegally and was ordered to stop selling NES-compatible games. However, Nintendo did not always have it all its own way. In 1990, under pressure from Congress, the Department of Justice, and several lawsuits, Nintendo rescinded its exclusivity

requirements, freeing up developers to write games for other platforms. However, developers faced a real problem: what platform could they write for?

Sega's Sonic Boom

Back in 1954, David Rosen, a twenty-year-old American, left the U.S. Air Force after a tour of duty in Tokyo.¹⁸ Rosen had noticed that Japanese people needed lots of photographs for ID cards, but that local photo studios were slow and expensive. He formed a company, Rosen Enterprises, and went into the photo-booth business, which was a big success. By 1957, Rosen had established a successful nationwide chain. At this point, the Japanese economy was booming, so Rosen decided it was time to get into another business—entertainment. As his vehicle, he chose arcade games, which were unknown in Japan at the time. He picked up used games on the cheap from America and set up arcades in the same Japanese department stores and theaters that typically housed his photo booths. Within a few years, Rosen had 200 arcades nationwide. His only competition came from another American-owned firm, Service Games (SeGa), whose original business was jukeboxes and fruit machines.

By the early 1960s, the Japanese arcade market had caught up with the U.S. market. The problem was that game makers had run out of exciting new games to offer. Rosen decided that he would have to get into the business of designing and manufacturing games, but to do that he needed manufacturing facilities. SeGa manufactured its own games, so in 1965 Rosen approached the company and suggested a merger. The result was Sega Enterprise, a Japanese company with Rosen as its CEO.

Rosen himself designed Sega's first game, *Periscope*, in which the objective was to sink chain-mounted cardboard ships by firing torpedoes, represented by lines of colored lights. *Periscope* was a big success not only in Japan, but also in the United States and Europe, and it allowed Sega to build up a respectable export business. Over the years, the company continued to invest heavily in game development, always using the latest electronic technology.

Gulf and Western, a U.S. conglomerate, acquired Sega in 1969, with Rosen running the subsidiary. In 1975, Gulf and Western (G&W) took Sega public in the United States, but left Sega Japan as a G&W subsidiary. Hayao Nakayama, a former Sega distributor,

was drafted as president. In the early 1980s, Nakayama pushed G&W to invest more in Sega Japan so that the company could enter the then-booming home video game market. When G&W refused, Nakayama suggested a management buyout. G&W agreed, and in 1984, for the price of just \$38 million, Sega became a Japanese company once more. (Sega's Japanese revenues were around \$700 million, but by now the company was barely profitable.)

Sega was caught off guard by the huge success of Nintendo's Famicom. Although it released its own 8-bit system in 1986, the machine never commanded more than 5 percent of the Japanese market. Nakayama, however, was not about to give up. From years in the arcade business, he understood that great games drove sales. Nevertheless, he also understood that more powerful technology gave game developers the tools to develop more appealing games. This philosophy underlay Nakayama's decision to develop a 16-bit game system, Genesis.

Sega took the design of its 16-bit arcade machine and adapted it for Genesis. Compared to Nintendo's 8-bit machine, the 16-bit machine featured an array of superior technological features, including high-definition graphics and animation, a full spectrum of colors, two independent scrolling backgrounds that created an impressive depth of field, and near CD quality sound. The design strategy also made it easy to port Sega's catalog of arcade hits to Genesis.

Genesis was launched in Japan in 1989 and in the United States in 1990. In the United States, the machine was priced at \$199. The company hoped that sales would be boosted by the popularity of its arcade games, such as the graphically violent *Altered Beast*. Sega also licensed other companies to develop games for the Genesis platform. In an effort to recruit licensees, Sega asked for lower royalty rates than Nintendo, and it gave licensees the right to manufacture their own cartridges. Independent game developers were slow to climb on board, however, and the \$200 price tag for the player held back sales.

One of the first independent game developers to sign up with Sega was Electronic Arts. Established by Trip Hawkins, Electronic Arts had focused on designing games for personal computers and consequently had missed the Nintendo 8-bit era. Now Hawkins was determined to get a presence in the home video game market, and aligning his company's wagon with Sega seemed to be the best option. The Nintendo playing field was already crowded, and Sega offered a

far less restrictive licensing deal than Nintendo. Electronic Arts subsequently wrote several popular games for Genesis, including John Madden football and several gory combat games.¹⁹

Nintendo had not been ignoring the potential of the 16-bit system. Nintendo's own 16-bit system, Super NES, was ready for market introduction in 1989—at the same time as Sega's Genesis. Nintendo introduced Super NES in Japan in 1990, where it quickly established a strong market presence and beat Sega's Genesis. In the United States, however, the company decided to hold back longer to reap the full benefits of the dominance it enjoyed with the 8-bit NES system. Yamauchi was also worried about the lack of backward compatibility between Nintendo's 8-bit and 16-bit systems. (The company had tried to make the 16-bit system so that it could play 8-bit games but concluded that the cost of doing so was prohibitive.) These concerns may have led the company to delay market introduction until the 8-bit market was saturated.

Meanwhile, in the United States, the Sega bandwagon was beginning to gain momentum. One development that gave Genesis a push was the introduction of a new Sega game, *Sonic the Hedgehog*. Developed by an independent team that was contracted to Sega, the game featured a cute hedgehog that impatiently tapped his paw when the player took too long to act. Impatience was Sonic's central feature—he had places to go, and quickly. He zipped along, collecting brass rings when he could find them, before rolling into a ball and flying down slides with loops and underground tunnels. Sonic was Sega's Mario.

In mid 1991, in an attempt to jump-start slow sales, Tom Kalinske, head of Sega's American subsidiary, decided to bundle *Sonic the Hedgehog* with the game player. He also reduced the price for the bundled unit to \$150, and he relaunched the system with an aggressive advertising campaign aimed at teenagers. The campaign was built around the slogan "Genesis does what Nintendon't." The shift in strategy worked, and sales accelerated sharply.

Sega's success prompted Nintendo to launch its own 16-bit system. Nintendo's Super NES was introduced at \$200. However, Sega now had a two-year head start in games. By the end of 1991, about 125 game titles were available for Genesis, compared to twenty-five for Super NES. In May 1992, Nintendo reduced the price of Super NES to \$150. At this time

Sega was claiming a 63 percent share of the 16-bit market in the United States, and Nintendo claimed a 60 percent share. By now, Sega was cool. It began to take more chances with mass media-defined morality. When Acclaim Entertainment released its bloody *Mortal Kombat* game in September 1992, the Sega version let players rip off heads and tear out hearts. Reflecting Nintendo's image of their core market, its version was sanitized. The Sega version outsold Nintendo's two to one.²⁰ Therefore, the momentum continued to run in Sega's favor. By January 1993, there were 320 titles available for Sega Genesis, and 130 for Super NES. In early 1994, independent estimates suggested that Sega had 60 percent of the U.S. market and Nintendo had 40 percent, figures Nintendo disputed.

3DO

Trip Hawkins, whose first big success was Electronic Arts, founded 3DO in 1991.²¹ Hawkins's vision for 3DO was to shift the home video game business away from the existing cartridge-based format and toward a CD-ROM-based platform. The original partners in 3DO were Electronic Arts, Matsushita, Time Warner, AT&T, and the venture capital firm Kleiner Perkins. Collectively they invested over \$17 million in 3DO, making it the richest start-up in the history of the home video game industry. 3DO went public in May 1993 at \$15 per share. By October of that year, the stock had risen to \$48 per share, making 3DO worth \$1 billion—not bad for a company that had yet to generate a single dollar in revenues.

The basis for 3DO's \$1 billion market cap was patented computer system architecture and a copyrighted operating system that allowed for much richer graphics and audio capabilities. The system was built around a 32-bit RISC microprocessor and proprietary graphics processor chips. Instead of a cartridge, the 3DO system stored games on a CD-ROM that was capable of holding up to 600 megabytes of content, sharply up from the 10 megabytes of content found in the typical game cartridge of the time. The slower access time of a CD-ROM compared to a cartridge was alleviated somewhat by the use of a double-speed CD-ROM drive.²²

The belief at 3DO—a belief apparently shared by many investors—was that the superior storage and graphics-processing capabilities of the 3DO system

would prove very attractive to game developers, allowing them to be far more creative. In turn, better games would attract customers away from Nintendo and Sega. Developing games that used the capabilities of a CD-ROM system altered the economics of game development. Estimates suggested that it would cost approximately \$2 million to produce a game for the 3DO system and could take as long as twenty-four months to develop. However, at \$2 per disc, a CD-ROM cost substantially less to produce than a cartridge.

The centerpiece of 3DO's strategy was to license its hardware technology for free. Game developers paid a royalty of \$3 per disc for access to the 3DO operating code. Discs typically retailed for \$40 each.

Matsushita introduced the first 3DO machine into the U.S. market in October 1993. Priced at \$700, the machine was sold through electronic retailers that carried Panasonic high-end electronics products. Sega's Tom Kalinsky noted, "It's a noble effort. Some people will buy 3DO, and they'll have a wonderful experience. It's impressive, but it's a niche. We've done the research. It does not become a large market until you go below \$500. At \$300, it starts to get interesting. We make no money on hardware. It's a cut-throat business. I hope Matsushita understands that."²³ CD-ROM discs for the 3DO machine retailed for around \$75. The machine came bundled with *Crash n Burn*, a high-speed combat racing game. However, only eighteen 3DO titles were available by the crucial Christmas period, although reports suggested that 150 titles were under development.²⁴

Sales of the hardware were slow, reaching only 30,000 by January 1994.²⁵ In the same month, AT&T and Sanyo both announced that they would begin to manufacture the 3DO machine. In March, faced with continuing sluggish sales, 3DO announced that it would give hardware manufacturers two shares of 3DO stock for every unit sold at or below a certain retail price. Matsushita dropped the price of its machine to \$500. About the same time, Toshiba, LG, and Samsung all announced that they would start to produce 3DO machines.

By June 1994, cumulative sales of 3DO machines in the United States stood at 40,000 units. Matsushita announced plans to expand distribution beyond the current 3,500 outlets to include the toy and mass merchandise channels. Hawkins and his partners announced that they would invest another \$37 million in 3DO. By July, there were 750 3DO software

licensees, but only forty titles were available for the format. Despite these moves, sales continued at a very sluggish pace and the supply of new software titles started to dry up.²⁶

In September 1996, 3DO announced that it would either sell its hardware system business or move it into a joint venture.²⁷ The company announced that about 150 people, one-third of the work force, would probably lose their jobs in the restructuring. According to Trip Hawkins, 3DO would now focus on developing software for online gaming. Hawkins stated that the Internet and Internet entertainment constituted a huge opportunity for 3DO. The stock dropped \$1.375 to \$6.75.

Sega's Saturn

3DO was not alone in moving to a CD-ROM-based format. Both Sega and Sony also introduced CD-ROM-based systems in the mid 1990s. Sega had in fact beaten 3DO to the market with its November 1992 introduction of the Sega CD, a \$300 CD-ROM add-on for the 16-bit Genesis. Sega sold 100,000 units in its first month alone. Sales then slowed down, however, and by December 1993 were standing at just 250,000 units. One reason for the slowdown, according to critics, was a lack of strong games. Sega was also working on a 32-bit CD-ROM system, Saturn, which was targeted for a mid-1995 introduction in the United States. In January 1994, Sega announced that Microsoft would supply the operating system for Saturn.²⁸

In March 1994, Sega announced the Genesis Super 32X, a \$150 add-on cartridge designed to increase the performance of Genesis cartridge and CD-ROM games. The 32X contained the 32-bit Hitachi microprocessor that was to be used in Saturn. Sega called the 32X "the poor man's 32-bit machine" because it sold for a mere \$149. Introduced in the fall of 1994, the 32X never lived up to its expectations. Most users appeared willing to wait for the real thing, Sega Saturn, promised for release the following year.

In early 1995, Sega informed the press and retailers that it would release Saturn on "Sega Saturn Saturday, Sept 2nd," but Sega released the 32-bit Saturn in May 1995. It was priced at \$400 per unit and accompanied by the introduction of just ten games. Sega apparently believed that the world would be delighted by the May release of the Saturn. However, Saturn was released without the industry fanfare that

normally greets a new game machine. Only four retail chains received the Saturn in May, while the rest were told they would have to wait until September. This move alienated retailers, who responded by dropping Sega products from their stores.²⁹ Sega appeared to have made a marketing blunder.³⁰

Sony's PlayStation

In the fall of 1995, Sony entered the fray with the introduction of the Sony PlayStation.³¹ PlayStation used a 32-bit RISC microprocessor running at 33 MHz and using a double-speed CD-ROM drive. PlayStation cost an estimated \$500 million to develop. The machine had actually been under development since 1991, when Sony decided that the home video game industry was getting too big to ignore. Initially, Sony was in an alliance with Nintendo to develop the machine. Nintendo walked away from the alliance in 1992, however, after a disagreement over who owned the rights to any future CD-ROM games. Sony went alone.³²

From the start, Sony felt that it could leverage its presence in the film and music business to build a strong position in the home video game industry. A consumer electronics giant with a position in the Hollywood movie business and the music industry (Sony owned Columbia Pictures and the Columbia record label), Sony believed that it had access to significant intellectual property that could form the basis of many popular games.

In 1991, Sony established a division in New York: Sony Electronic Publishing. The division was to serve as an umbrella organization for Sony's multimedia offerings. Headed by Iceland native Olaf Olafsson, then just twenty-eight years old, this organization ultimately took the lead role in both the market launch of PlayStation and in developing game titles.³³ In 1993, as part of this effort, Sony purchased a well-respected British game developer, Psygnosis. By the fall of 1995, this unit had twenty games ready to complement PlayStation: *The Haldeman Diaries*, *Mickey Mania* (developed in collaboration with Disney), and *Johnny Mnemonic*, based on the William Gibson short story. To entice independent game developers such as Electronic Arts, Namco, and Acclaim Entertainment, Olafsson used the promise of low royalty rates. The standard royalty rate was set at \$9 per disc, although developers that signed on early enough were given a lower royalty rate. Sony also

provided approximately 4,000 game development tools to licensees in an effort to help them speed games to market.³⁴

To distribute PlayStation, Sony set up a retail channel separate from Sony's consumer electronics sales force. It marketed the PlayStation as a hip and powerful alternative to the outdated Nintendo and Sega cartridge-based systems. Sony worked closely with retailers before the launch to find out how it could help them sell the PlayStation. To jump-start demand, Sony set up in-store displays to allow potential consumers to try the equipment. Just before the launch, Sony had lined up an impressive 12,000 retail outlets in the United States.³⁵

Sony targeted its advertising for PlayStation at males in the eighteen- to thirty-five-year age range. The targeting was evident in the content of many of the games. One of the big hits for PlayStation was *Tomb Raider*, whose central character, Lara Croft, combined sex appeal with savviness and helped to recruit an older generation to PlayStation.³⁶ PlayStation was initially priced at \$299, and games retailed for as much as \$60. Sony's Tokyo-based executives had reportedly been insisting on a \$350–\$400 price for PlayStation, but Olafsson pushed hard for the lower price. Because of the fallout from this internal battle, in January 1996, Olafsson resigned from Sony. By then, however, Sony was following Olafsson's script.³⁷

Sony's prelaunch work was rewarded with strong early sales. By January 1996, more than 800,000 PlayStations had been sold in the United States, plus another 4 million games. In May 1996, with 1.2 million PlayStations shipped, Sony reduced the price of PlayStation to \$199. Sega responded with a similar price cut for its Saturn. The prices on some of Sony's initial games were also reduced to \$29.99. The weekend after the price cuts, retailers reported that PlayStation sales were up by between 350 percent and 1,000 percent over the prior week.³⁸ The sales surge continued through 1996. By the end of the year, sales of PlayStation and associated software amounted to \$1.3 billion, out of a total for U.S. sales at \$2.2 billion for all video game hardware and software. In March 1997, Sony cut the price of PlayStation again, this time to \$149. It also reduced its suggested retail price for games by \$10 to \$49.99. By this point, Sony had sold 3.4 million units of PlayStation in the United States, compared to Saturn's 1.6 million units.³⁹ Worldwide, PlayStation had outsold Saturn by

13 million to 7.8 million units, and Saturn sales were slowing.⁴⁰ The momentum was clearly running in Sony's favor, but the company now had a new challenge to deal with: Nintendo's latest generation game machine, the N64.

Nintendo Strikes Back

In July 1996, Nintendo launched Nintendo 64 (N64) in the Japanese market. This release was followed by a late fall introduction in the United States. N64 is a 64-bit machine developed in conjunction with Silicon Graphics. Originally targeted for introduction a year earlier, N64 had been under development since 1993. The machine used a plug-in cartridge format rather than a CD-ROM drive. According to Nintendo, cartridges allow for faster access time and are far more durable than CD-ROMs (an important consideration with children).⁴¹

The most-striking feature of the N64 machine, however, was its 3D graphics capability. N64 provides fully rounded figures that can turn on their heels and rotate through 180 degrees. Advanced ray tracing techniques borrowed from military simulators and engineering workstations added to the sense of realism by providing proper highlighting, reflections, and shadows.

N64 was targeted at children and young teenagers. It was priced at \$200 and launched with just four games. Despite the lack of games, initial sales were very strong. Indeed, 1997 turned out to be a banner year for both Sony and Nintendo. The overall U.S. market was strong, with sales of hardware and software combined reaching a record \$5.5 billion. Estimates suggest that PlayStation accounted for 49 percent of machines and games by value. N64 captured a 41 percent share, leaving Sega trailing badly with less than 10 percent of the market. During the year, the average price for game machines had fallen to \$150. By year-end there were 300 titles available for PlayStation, compared to forty for N64. Games for PlayStation retailed for \$40, on average, compared to over \$60 for N64.⁴²

By late 1998, PlayStation was widening its lead over N64. In the crucial North American market, PlayStation was reported to be outselling N64 by a two-to-one margin, although Nintendo retained a lead in the under-twelve category. At this point, there were 115 games available for N64 versus 431 for PlayStation.⁴³ Worldwide, Sony had now sold close to

55 million PlayStations. The success of PlayStation had a major impact on Sony's bottom line. In fiscal 1998, PlayStation business generated revenues of \$5.5 billion for Sony, 10 percent of its worldwide revenues, but accounted for \$886 million, or 22.5 percent, of the company's operating income.⁴⁴

The Next Generation

After almost vanishing from the marketplace in 1998, Sega made a bold attempt to retake a leadership position with the late 1998 introduction in Japan of its Dreamcast home video game machine. The Dreamcast is the most powerful home video game machine yet, with the capability to display advanced 3D graphics. The Dreamcast runs on a 128-bit microprocessor at 200 MHz and uses a Microsoft Windows CE operating system. The games are stored on a CD-ROM, and the machine comes equipped with a 56K modem to facilitate multiplayer online game playing. Priced at \$240 and launched with only a handful of games, the Dreamcast still sold over 1 million units in its first few months on the Japanese market.

Sega has scheduled a September 1999 date for the U.S. launch of the Dreamcast. The machine is priced at \$199. Up to twelve games will be available at launch, including a new version of Sonic the Hedgehog that cost an estimated \$30 million to produce. By Christmas 1999, there should be thirty games, and 100 by mid 2000. Sega has licensed approximately 100 independent developers to work on Dreamcast games. The company has plans to spend some \$100 million on advertising to launch the system in the United States. Sega has already struck distribution agreements with some of the largest chains in the United States, including Toys "R" Us, Wal-Mart, and Sears. About 20,000 stores should be carrying the Dreamcast. As of spring 1999, advanced orders for the Dreamcast stood at 300,000.⁴⁵

Sony also has plans to launch a 128-bit machine, dubbed PlayStation 2, in 2000. Sony is reportedly investing \$1 billion in development of PlayStation 2. The machine is expected to have graphics capabilities 200 times faster than the original PlayStation and will utilize a DVD disk for storage. In an attempt to leverage its huge global base, Sony plans to make its new machine backward compatible with the original PlayStation.⁴⁶ Nintendo is also reportedly working on a 128-bit machine, although details are sketchy.

The great unknown is the threat that the personal computer poses to the video game industry. The threat has been discussed for years, but until recently general-purpose PCs have lacked the capabilities of specialized game machines. This may now be changing. Microsoft has provided a direct interface between Windows applications and three-dimensional graphics technology with a variation on its Active X technology, Direct X. According to game developers, the combination of Direct X, fast Pentium microprocessors, faster CD-ROM drives, and graphics accelerator chips has made the PC a much more appealing platform for which to write games. Another attraction of writing for the PC is that game developers do not have to pay royalties to PC manufacturers for the privilege of supplying compatible games.

Since early 1997, most new PCs have been sold with 3D graphics capability. With prices dropping to under \$1,000 for high-powered "entry level" PCs, industry estimates suggest that over 100 million PCs may be sold in 1998, all of them with a high enough specification to run advanced games. Indeed, many believe that game software is the only application that really stretches the modern PC.⁴⁷

The New Millennium

In the history of the video game industry, each new chapter has been associated with a launch of a new generation of more powerful machines that can support faster processing, better graphics, and more compelling game play. In each era, a different company has risen to market dominance. The original video game consoles were produced by Atari and were based on 4-bit technology. Nintendo dominated the 8-bit era; Sega, the 16-bit era; and Sony, the 32-bit era. Nintendo launched a 64-bit machine in 1996, but its competitors didn't follow, preferring instead to focus on the development of 128-bit machines. Sega was the first to market a 128-bit video game console, which it launched in Japan in late 1998 and in the United States in late 1999. Sony launched its own 128-bit machine, Sony PlayStation 2, in 2000. Industry newcomer Microsoft and Nintendo are currently developing their own 128-bit machines.

With the possible exception of Nintendo's offering, all these machines will have web-browsing capabilities to facilitate multiplayer gaming over the Internet. Users will also be able to download games, movies, and music onto their consoles and use their consoles

to browse the web, send email, execute ecommerce transactions, and so on. These capabilities have led some to speculate that video game consoles might ultimately hit personal computer sales.⁴⁸

The prize that these competitors are going after is a \$20-billion-a-year worldwide market that industry analysts say is growing more rapidly than the film or music industries. United States video game sales now rival Hollywood box-office revenues. More people than ever are playing video games and spending more time doing it. More than 40 percent of U.S. households now have at least one game console, according to estimates from International Data Corp.⁴⁹

Sega Dreamcast

Sega introduced its 128-bit console, Sega Dreamcast, in the United States in September 1999 (the Japanese market launch was late 1998). The Dreamcast came equipped with a 56-kilobit modem to allow for online gaming over the Internet. By late 2000, Sega had sold around 6 million Dreamcasts worldwide, accounting for about 15 percent of console sales since its launch. The company has a goal of shipping 10 million units by March 2001.⁵⁰ Sega has nurtured Dreamcast sales by courting outside software developers who help keep the pipeline full of new games, including *Crazy Taxi*, *Resident Evil*, and *Quake III Arena*. Another 170 games are scheduled for the 2002 holiday season.

In April 2000, Sega announced that it would provide its Dreamcast video game console at no charge to customers who subscribe to a new Sega web service for two years at \$21.95 a month. Customers who have already bought the Dreamcast console, which lists for \$199, will get a free keyboard and a \$200 check if they subscribe.⁵¹ This represents something of a gamble by Sega. No one really knows whether there's a critical number of game players who want to hook their machines to their television sets and cruise the Web. The business potential of online games has received a lot of attention, but the usual game medium is still the personal computer. Still, by April 2000 company data showed that about 20 percent of Sega Dreamcast owners were already using the console's built-in modem. They were going online to cruise the Internet or send email. In March 2000, the company launched the first Internet game played from a video game console. In the simple game, *Chu Chu Rocket*, players help lead mice through mazes and escape from pursuing cats.

To run its online operation, Sega set up Sega.com, an independent company headed by Brad Huang, a thirty-five-year-old former hedge-fund manager who pitched the strategy to Sega chairman Isao Okawa a year ago. Sega's online gaming web site, SegaNet, made its debut in August 2000. The web site is Sega's portal to the Internet, providing a gathering place for Sega fans. During 2000, Sega planned to launch 12 online games, including versions of hits like *Quake III Arena* and *Half-Life*. In addition, Sega will offer multiplayer online console games like football and basketball. Gamers could play basketball over the Internet, for example, with as many as eight human players on two teams. Eventually, Sega hopes to provide games for which it will be able to charge a premium monthly fee.

Despite its position as first mover with a 128-bit machine, and despite a bold Internet strategy, as of late 2000 the company appeared to be struggling. Sega was handicapped first by product shortages due to constraints on the supply of component parts and then by a lack of demand as consumers waited to see whether PlayStation 2 would be a more attractive machine. In September 2000, Sega responded to the impending launch of Sony's PlayStation 2 by cutting the price for its console from \$199 to \$149. Then in late October, Sega announced that, due to this price cut, it would probably lose over \$200 million for the fiscal year ending March 2001.⁵²

Sony PlayStation 2

Sony's first video game console, the original PlayStation, has been a phenomenal success worldwide. Since its release in 1995, more than 27 million units have been sold in the United States and about 80 million worldwide. In 1999, Sony held a 53 percent share in the market for consoles. PlayStation 2 was launched in Japan in mid 2000, and in the United States at the end of October 2000. Initially priced at \$299, PlayStation 2 is undoubtedly a powerful machine. At its core is a 300-megahertz graphics processing chip that was jointly developed with Toshiba and consumed about \$1.3 billion in R&D. Referred to as the Emotion Engine processor, the chip allows the machine to display stunning graphic images previously found only on supercomputers. The chip makes the PlayStation 2 the most powerful video game machine yet.

The machine is set up to play different CD and DVD formats, as well as proprietary game titles. As is

true with the original PlayStation, PlayStation 2 can play audio CDs. The system is also compatible with the original PlayStation: any PlayStation title can be played on the PlayStation 2. To help justify the price tag, the unit doubles as a DVD player with picture quality as good as current players. The PlayStation 2 does not come equipped with a modem, but it does have networking capabilities and a modem can be attached using one of two USB ports.⁵³

Despite the raw power of PlayStation 2, a couple of things have blemished the market launch. First, Sony made far-reaching performance claims for PlayStation 2, but it is receiving some criticism from game experts who have suggested that the first games available for the new system have not matched the talk. Although Sony has sold 3 million PlayStation 2 consoles in Japan since the launch in March 2000, the devices have clearly fallen short of expectations. Programmers grumble that the machine is very hard to write games for. Game players in Japan have complained about blurry and "jagged" images. Designers still don't have a blockbuster PlayStation 2 software title after eighteen months on the job. Sony counters that most game developers have not had sufficient time to write games for the new system, and that the second generation of games written for PlayStation 2 should take better advantage of PlayStation's capabilities. Another problem arose in late October 2000, when Sony announced that it expects to ship just 500,000 machines—half the number previously announced—to the United States for the product's launch. Sony blamed the shortfall on a chip shortage. It plans to ship about 100,000 more PlayStations each week until Christmas. Sony's marketers had long anticipated that demand for the "PS 2," as the company calls PlayStation 2, would outstrip supply at first—but not by this much.⁵⁴

Nintendo GameCube

Nintendo has garnered a solid position in the industry with its N64 machine by focusing on its core demographic, seven- to twelve-year-olds. In 1999, Nintendo took 33 percent of the hardware market and 28 percent of the game market. Nintendo's next generation video game machine, code named Dolphin and named GameCube, packs a modem and a powerful 400-megahertz, 128-bit processor made by IBM into a compact cube. GameCube marks a shift away from Nintendo's traditional approach of using proprietary cartridges to hold game software.

Instead, software for the new player will come on 8-centimeter compact disks, which are smaller than music compact disks. The new disks hold 1.5 gigabytes of data each, far greater storage capacity than the old game cartridges. Players will be able to control GameCube using wireless controllers.⁵⁵

Nintendo has tried to make the GameCube easy for developers to work with rather than focusing on raw peak performance. While developers no doubt appreciate this, by the time GameCube hits store shelves, PlayStation 2 will have been on the market for eighteen months and may have a solid library of games. On the other hand, Nintendo's greatest asset is its intellectual property, which is instantly recognizable by its core demographic and includes Donkey Kong, Super Mario Brothers, and the Pokemon characters. Currently, Nintendo expects to introduce the GameCube in Japan in July 2001, and in the United States in October 2001.

Microsoft X-Box

Microsoft was first rumored to be developing a video game console in late 1999. In March 2000, Bill Gates made it official when he announced that Microsoft would enter the home video game market in fall 2001 with a console code named X-Box. In terms of sheer computing power, the 128-bit X-Box towers above its competitors. X-Box will have a 733-megahertz Pentium III processor, a high-powered graphics chip from Nvidia Corp, a built-in broadband cable modem to allow for online game playing and high-speed Internet browsing, 64 megabytes of memory, CD and DVD drives, and an internal hard disk drive, all features no other console has to date. The operating system will be a stripped-down version of its popular Windows system optimized for graphics-processing capabilities. Microsoft claims that because the X-Box will be based on familiar PC technology, it will be much easier for software developers to write games for. It should be relatively easy to convert games from the PC to run on the X-Box, and vice versa.⁵⁶

Although Microsoft will be a new entrant to the video game industry, it is no stranger to games. Microsoft has long participated in the PC gaming industry and is one of the largest publishers of PC games, with hits such as Microsoft Flight Simulator and Age of Empires I and II to its credit. Sales of Microsoft's PC games have increased 50 percent annually over the past four years, and the company now controls about 10 percent of the PC game mar-

ket. The company has also offered online gaming for some time, including its popular MSN Gaming Zone site. Started in 1996, the web site is the largest online PC gaming hub on the Internet. Nearly 12 million subscribers pay \$9.95 a month to play premium games such as Asheron's Call or Fighter Ace. Or they can play traditional card and board games for free. Nor is Microsoft new to hardware; its joysticks and game pads outsell all other brands and it has an important mouse business.

Microsoft's entry into the home video game market was in part a response to the potential threat from companies like Sony and Sega. Microsoft worried that Internet-ready consoles like PlayStation 2 and Dreamcast might take over many web-browsing functions from the personal computer. Some in the company described Internet-enabled video game terminals as Trojan horses in the living room. In Microsoft's calculation, it made sense to get in the market to try and keep Sony and others in check. With annual revenues in excess of \$20 billion worldwide, the home video game market is huge and an important source of potential growth for Microsoft. Still, by moving away from its core market, Microsoft is taking a huge risk, particularly given the scale of investments required to develop the X-Box, which could run as high as \$1.5 billion.

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