History of video games

The origin of video games lies in early cathode ray tube-based missile defense systems in the late 1940s. These programs were later adapted into other simple games during the 1950s. By the late 1950s and through the 1960s, more computer games were developed (mostly on mainframe computers), gradually increasing in sophistication and complexity.[1] Following this period, video games diverged into different platforms: arcade, mainframe, console, personal computer and later handheld games.[2]

The first commercially viable video game was *Computer Space* in 1971, which laid the foundation for a new entertainment industry in the late 1970s within the United States, Japan, and Europe. The first major crash in 1977 occurred when companies were forced to sell their older obsolete systems flooding the market. Six years later a second, greater crash occurred. This crash—brought on largely by a flood of video games coming to the market—resulted in a total collapse of the console gaming industry worldwide, ultimately shifting dominance of the market from North America to Japan. While the crash killed the console gaming market, the computer gaming market was largely unaffected. Subsequent generations of console video games would continue to be dominated by Japanese corporations. Though several attempts would be made by North American and European companies, fourth generation of consoles, their ventures would ultimately fail. Not until the sixth generation of video game consoles would a non-Japanese company release a commercially successful console system. The handheld gaming market has followed a similar path with several unsuccessful attempts made by American companies all of which failed outside some limited successes in the handheld electronic games early on. Currently only Japanese companies have any major successful handheld gaming consoles, although in recent years handheld games have come to devices like cellphones and PDAs as technology continues to converge.

Origins

A device called the *Cathode-Ray Tube Amusement Device* was patented in the United States by Thomas T. Goldsmith, Jr. and Estle Ray Mann.[3] The patent was filed on January 25, 1947, and issued on December 14, 1948. It described using eight vacuum tubes to simulate a missile firing at a target and contains knobs to adjust the curve and speed of the missile. Because computer graphics could not be drawn electronically at the time, small targets were drawn on a simple overlay and placed on the screen.

In 1949-1950, Charley Adama created a "Bouncing Ball" program for MIT's Whirlwind computer.[4] While the program was not yet interactive, it was a precursor to games soon to come.

In February 1951, Christopher Strachey tried to run a draughts program he had written for the NPL Pilot ACE. The program exceeded the memory capacity of the machine and Strachey recoded his program for a machine at Manchester with a larger memory capacity by October.

Also in 1951, while developing television technologies for New York based electronics company Loral, inventor Ralph Baer came up with the idea of using the lights and patterns he used in his work as more

Tennis for Two

than just calibration equipment. He realized that by giving an audience the ability to manipulate what was projected on their television sets, their role changed from passive observing to interactive manipulation. When he took this idea to his supervisor, it was quickly squashed because the company was already behind schedule.[5]

OXO, a graphical version tic-tac-toe, was created by A.S. Douglas in 1952 at the University of Cambridge, in order to demonstrate his thesis on human-computer interaction. It was developed on the EDSAC computer, which uses a cathode ray tube as a visual display to display memory contents. The player competes against the computer.
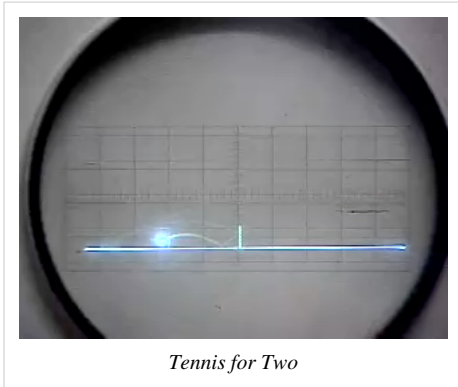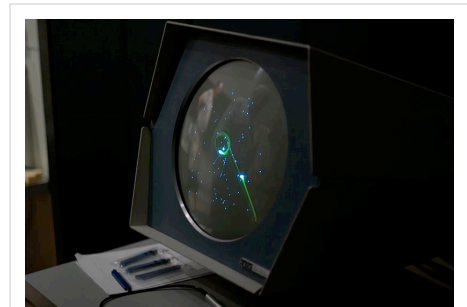
In 1958 William Higinbotham created a game using an oscilloscope and analog computer.[6] Titled *Tennis for Two*, it was used to entertain visitors of the Brookhaven National Laboratory in New York.[7] *Tennis for Two* showed a simplified tennis court from the side, featuring a gravity-controlled ball that needed to be played over the "net," unlike its successor—Pong. The game was played with two box-shaped controllers, both equipped with a knob for trajectory and a button for hitting the ball.[6] *Tennis for Two* was exhibited for two seasons before its dismantlement in 1959.[8]

1950s–1960s

The majority of early computer games ran on university mainframe computers in the United States and were developed by individuals as a hobby. The limited accessibility of early computer hardware meant that these games were small in number and forgotten by posterity.

In 1959-1961, a collection of interactive graphical programs were created on the TX-0 machine at MIT:

Spacewar! is credited as the first widely available and influential computer game.

- Mouse in the Maze : which allowed players to place maze walls, bits of cheese, and (in some versions) glasses of martini by way of a light pen interacting with the screen. One could then release the mouse and watch it traverse the maze to find the goodies.[9]
- HAX: By adjusting two switches on the console, various graphical displays and sounds could be made.
- Tic-Tac-Toe: Using the light pen, the user could play a simple game of noughts and crosses against the computer.

In 1961, a group of students at MIT, including Steve Russell, programmed a game titled *Spacewar!* on the DEC PDP-1, a new computer at the time.[10] The game pitted two human players against each other, each controlling a spacecraft capable of firing missiles, while a star in the center of the screen created a large hazard for the crafts. The game was eventually distributed with new DEC computers and traded throughout the then-primitive Internet. *Spacewar!* is credited as the first influential computer game.

In 1966, while sitting bored at a bus stop, Ralph Baer rekindled his idea for an interactive video 'game' machine. Refining his ideas into a four-page document, Baer engaged co-worker Bill Harrison in the project, where they both worked at military electronics contractor Sanders Associates in New Hampshire. They created a simple video game named *Chase*, the first to display on a standard television set. With the assistance of Baer, Bill Harrison created the light gun and developed several video games with Bill Rusch in 1967. Ralph Baer continued development, and in 1968 a prototype was completed that could run several different games such as table tennis and target shooting. After months of secretive labouring between official projects, Baer was able to bring an example with true promise to Sanders' R & D department. By 1969, Sanders was showing off the world's first home video game console to manufacturers.[5]

In 1969, AT&T computer programmer Jeremy Ben wrote a video game called *Space Travel* for the Multics operating system. This game simulated various bodies of the solar system and their movements and the player could attempt to land a spacecraft on them. AT&T pulled out of the MULTICS project, and Ben ported the game to Fortran code running on the GECOS operating system of the General Electric GE 635 mainframe computer. Runs on this system cost about $75 per hour, and Ben looked for a smaller, less expensive computer to use. He found an underused PDP-7, and he and Dennis Ritchie started porting the game to PDP-7 assembly language. In the process of learning to develop software for the machine, the development process of the Unix operating system began, and *Space Travel* has been called the first UNIX application.[11]

1970s

At this time, computer and video game development split to many areas, such as arcade machines, university computers, handhelds, and home computers.

Golden age of video arcade games

In September 1971, the *Galaxy Game* was installed at a student union at Stanford University. Based on *Spacewar!*, this was the first coin-operated video game. Only one was built, using a DEC PDP-11 and vector display terminals. In 1972 it was expanded to be able to handle four to eight consoles.

Also in 1971, Nolan Bushnell and Ted Dabney created a coin-operated arcade version of *Spacewar!* and called it *Computer Space*. Nutting Associates bought the game and manufactured 1,500 *Computer Space* machines, with the release taking place in November 1971. The game was unsuccessful due to its steep learning curve, but was a landmark as the first mass-produced video game and the first offered for commercial sale.

Bushnell and Dabney felt they did not receive enough earnings by licensing *Computer Space* to Nutting Associates and founded Atari, Inc. in 1972 before releasing their next game: *Pong*. *Pong* was the first arcade video game with widespread success. The game is loosely based on table tennis: a ball is "served" from the center of the court and as the ball moves towards their side of the court each player must maneuver their paddle to hit the ball back to their opponent. Atari sold 19,000 *Pong* machines, creating many imitators.

The arcade game industry entered its Golden Age in 1978 with the release of *Space Invaders* by Taito, a success that inspired dozens of manufacturers to enter the market. In 1979, Atari released *Asteroids*. Color arcade games became more popular in 1979 and 1980 with the arrival of titles such as Pac-Man. The Golden Age had a prevalence of arcade machines in shopping malls, traditional storefronts, restaurants and convenience stores.

First generation consoles (1972–1977)

The first home 'console' system was developed by Ralph Baer and his associates. Development began in 1966 and a working prototype was completed by 1968 (called the "Brown Box") for demonstration to various potential licensees, including GE, Sylvania, RCA, Philco, and Sears, with Magnavox eventually licensing the technology to produce the world's first home video game console.[12] [13] The system was released in the USA in 1972 by Magnavox, called the Magnavox Odyssey. The Odyssey used cartridges that mainly consisted of jumpers that enabled/disabled various switches inside the unit, altering the circuit logic (as opposed to later video game systems that used programmable cartridges). This provided the ability to play several different games using the same system, along with plastic sheet overlays taped to the television that added color, play-fields, and various graphics to 'interact' with using the electronic images generated by the system.[14] A major marketing push, featuring TV ads starring Frank Sinatra, helped Magnavox sell about 100,000 Odysseys that first year.[5]

Philips bought Magnavox and released a different game in Europe using the Odyssey brand in 1974 and an evolved game that Magnavox had been developing for the US market. Over its production span, the Odyssey system achieved sales of 2 million units.

Mainframe computers

University mainframe game development blossomed in the early 1970s. There is little record of all but the most popular games, as they were not marketed or regarded as a serious endeavor. The people–generally students–writing these games often were doing so illicitly by making questionable use of very expensive computing resources, and thus were not anxious to let very many people know of their endeavors. There were, however, at least two notable distribution paths for student game designers of this time:

- The PLATO system was an educational computing environment designed at the University of Illinois and which ran on mainframes made by Control Data Corporation. Games were often exchanged between different PLATO

systems.

- DECUS was the user group for computers made by Digital Equipment Corporation (DEC). It distributed programs—including games—that would run on the various types of DEC computers.

A number of noteworthy games were also written for Hewlett-Packard minicomputers such as the HP2000.

Highlights of this period, in approximate chronological order, include:

- 1971: Don Daglow wrote the first computer baseball game on a DEC PDP-10 mainframe at Pomona College. Players could manage individual games or simulate an entire season. Daglow went on to team with programmer Eddie Dombrower to design *Earl Weaver Baseball*, published by Electronic Arts in 1987.
- 1971: *Star Trek* was created (probably by Mike Mayfield) on a Sigma 7 minicomputer at University of California. This is the best-known and most widely played of the 1970s *Star Trek* titles, and was played on a series of small "maps" of galactic sectors printed on paper or on the screen. It was the first major game to be ported across hardware platforms by students. Daglow also wrote a popular *Star Trek* game for the PDP-10 during 1970–1972, which presented the action as a script spoken by the TV program's characters. A number of other *Star Trek* themed games were also available via PLATO and DECUS throughout the decade.
- 1972: Gregory Yob wrote the hide-and-seek game *Hunt the Wumpus* for the PDP-10, which could be considered the first text adventure. Yob wrote it in reaction to existing hide-and-seek games such as *Hurkle*, *Mugwump*, and *Snark*.
- 1974: Both *Maze War* (on the Imlac PDS-1 at the NASA Ames Research Center in California) and *Spasim* (on PLATO) appeared, pioneering examples of early multi-player 3D first-person shooters.
- 1974: Brad Fortner and others developed *Airfight* as an educational flight simulator. To make it more interesting, all players shared an airspace flying their choice of military jets, loaded with selected weapons and fuel and to fulfill their desire to shoot down other players' aircraft. Despite mediocre graphics and slow screen refresh, it became a popular game on the PLATO system. *Airfight* was the inspiration for what became the Microsoft Flight Simulator.
- 1975: William Crowther wrote the first modern text adventure game, *Adventure* (originally called *ADVENT*, and later *Colossal Cave*). It was programmed in Fortran for the PDP-10. The player controls the game through simple sentence-like text commands and receives descriptive text as output. The game was later re-created by students on PLATO, so it is one of the few titles that became part of both the PLATO and DEC traditions.
- 1975: By 1975, many universities had discarded these terminals for CRT screens, which could display thirty lines of text in a few seconds instead of the minute or more that printing on paper required. This led to the development of a series of games that drew "graphics" on the screen. The CRTs replaced the typical teletype machines or line printers that output at speeds ranging from 10 to 30 characters per second.
- 1975: Daglow, then a student at Claremont Graduate University, wrote the first Computer role-playing game on PDP-10 mainframes: *Dungeon*. The game was an unlicensed implementation of the new role playing game *Dungeons & Dragons*. Although displayed in text, it was the first game to use *line of sight* graphics, as the top-down dungeon maps showing the areas that the party had seen or could see took into consideration factors such as light or darkness and the differences in vision between species.
- 1975: At about the same time, the RPG *dnd*, also based on *Dungeons and Dragons* first appeared on PLATO system CDC computers. For players in these schools *dnd*, not *Dungeon*, was the first computer role-playing game.
- 1977: Kelton Flinn and John Taylor create the first version of *Air*, a text air combat game that foreshadowed their later work creating the first-ever graphical online multi-player game, *Air Warrior*. They would found the first successful online game company, Kesmai, now part of Electronic Arts. As Flinn has said: "If Air Warrior was a primate swinging in the trees, AIR was the text-based amoeba crawling on the ocean floor. But it was quasi-real time, multi-player, and attempted to render 3-D on the terminal using ASCII graphics. It was an acquired taste."
- 1977: The writing of the original *Zork* was started by Dave Lebling, Marc Blank, Tim Anderson, and Bruce Daniels. Unlike Crowther, Daglow and Yob, the Zork team recognized the potential to move these games to the new personal computers and they founded text adventure publisher Infocom in 1979. The company was later sold

to Activision. In a classic case of "connections", Lebling was a member of the same D&D group as Will Crowther, but not at the same time. Lebling has been quoted as saying "I think I actually replaced him when he dropped out. *Zork* was 'derived' from *Advent* in that we played *Advent* ... and tried to do a 'better' one. There was no code borrowed ... and we didn't meet either Crowther or Woods until much later."

- 1978: *Multi-User Dungeon*, the first MUD, was created by Roy Trubshaw and Richard Bartle, beginning the heritage that culminates with today's MMORPGs.
- 1980: Michael Toy, Glenn Wichman and Ken Arnold released Rogue on BSD Unix after two years of work, inspiring many roguelike games ever since. Like *Dungeon* on the PDP-10 and *dnd* on PLATO, *Rogue* displayed dungeon maps using text characters. Unlike those games, however, the dungeon was randomly generated for each play session, so the path to treasure and the enemies who protected it were different for each game. As the *Zork* team had done, *Rogue* was adapted for home computers and became a commercial product.

Home computers

While the fruit of retail development in early video games appeared mainly in video arcades and home consoles, the rapidly evolving home computers of the 1970s and 80s allowed their owners to program simple games. Hobbyist groups for the new computers soon formed and game software followed.

Soon many of these games—at first clones of mainframe classics such as Star Trek, and then later clones of popular arcade games—were being distributed through a variety of channels, such as printing the game's source code in books (such as David Ahl's *BASIC Computer Games*), magazines (*Creative Computing*), and newsletters, which allowed users to type in the code for themselves. Early game designers like Crowther, Daglow and Yob would find the computer code for their games—which they had never thought to copyright—published in books and magazines, with their names removed from the listings. Early home computers from Apple, Commodore, Tandy and others had many games that people typed in.

The Tandy TRS-80, the first Tandy computer and one of the machines responsible for the personal computer revolution.
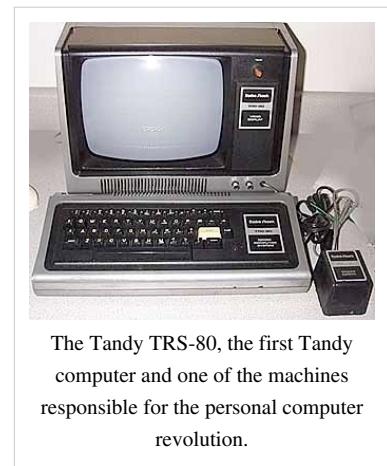
Games were also distributed by the physical mailing and selling of floppy disks, cassette tapes, and ROM cartridges. Soon a small cottage industry was formed, with amateur programmers selling disks in plastic bags put on the shelves of local shops or sent through the mail. Richard Garriott distributed several copies of his 1980 computer role-playing game *Akalabeth: World of Doom* in plastic bags before the game was published.

1977

In 1977, manufacturers of older, obsolete consoles and Pong clones sold their systems at a loss to clear stock, creating a glut in the market and causing Fairchild and RCA to abandon their game consoles. Only Atari and Magnavox stayed in the home console market.

Second generation consoles (1977–1983)

In the earliest consoles, the computer code for one or more games was hardcoded into microchips using discrete logic, and no additional games could ever be added. By the mid-1970s video games were found on cartridges, starting in 1976 with the release of the Fairchild 'Video Entertainment System (VES). Programs were burned onto ROM chips that were mounted inside plastic cartridge casings that could be plugged into slots on the console. When the cartridges were plugged in, the general-purpose microprocessors in the consoles read the cartridge memory and executed whatever program was stored there. Rather than being confined to a small selection of games included in the game system, consumers could now amass libraries of game cartridges. However video game production was still a niche skill. Warren Robinett, the famous programmer of the game Adventure, spoke on developing games "in

those old far-off days, each game for the 2600 was done entirely by one person, the programmer, who conceived the game concept, wrote the program, did the graphics—drawn first on graph paper and converted by hand to hexadecimal—and did the sounds." [15]

Three machines dominated the second generation of consoles in North America, far outselling their rivals:

• Video Computer System (VCS)—later renamed Atari 2600— ROM cartridge-based console was released in 1977 by Atari. Nine games were designed and released for the holiday season. The console would quickly become the most popular of all the early consoles.

• Intellivision, introduced by Mattel in 1980. Though chronologically part of what is called the "8-bit era", the Intellivision had a unique processor with instructions that were 10 bits wide (allowing more instruction variety and potential speed), and registers 16 bits wide. The system, which featured graphics superior to the older Atari 2600, rocketed to popularity.

• ColecoVision, an even more powerful machine, appeared in 1982. Its sales also took off, but the presence of three major consoles in the marketplace and a glut of poor quality games began to overcrowd retail shelves and erode consumers' interest in video games. Within a year this overcrowded market would crash.

In 1979, Activision was created by disgruntled former Atari programmers "who realized that the games they had anonymously programmed on their $20K salaries were responsible for 60 percent of the company's $100 million in cartridge sales for one year".[16] It was the first third-party developer of video games.

1980s

The computer gaming industry experienced its first major growing pains in the early 1980s as publishing houses appeared, with many honest businesses—occasionally surviving at least 20 years, such as Electronic Arts—alongside fly-by-night operations that cheated the games' developers. While some early '80s games were simple clones of existing arcade titles, the relatively low publishing costs for personal computer games allowed for bold, unique games—a legacy that has continued to this very day.

Genre innovation

The Golden age of video arcade games reached its zenith in the 1980s. The age brought with it many technically innovative and genre-defining games developed and released in the first few years of the decade, including:

Adventure games

• *Zork* (1980) further popularized text adventure games in home computers and established developer Infocom's dominance in the field. As these early computers often lacked graphical capabilities, text adventures proved successful.

• *Mystery House* (1980), Roberta Williams's game for the Apple II, was the first graphic adventure game on home computers. Graphics consisted entirely of static monochrome drawings, and the interface still used the typed commands of text adventures. It proved very popular at the time, and she and husband Ken went on to found Sierra On-Line, a major producer of adventure games.

• *Portopia Renzoku Satsujin Jiken* (1983), developed by Yuji Horii (of *Dragon Quest* fame), was the first visual novel and one of the earliest graphic adventure games. It is viewed in a first-person perspective, follows a first-person narrative, and was the first adventure game to feature colour graphics. It inspired Hideo Kojima (of *Metal Gear* fame) to enter the video game industry and later produce his own classic graphic adventure, *Snatcher* (1988).

• *King's Quest* (1984) was created by Sierra, laying the groundwork for the modern adventure game. It featured color graphics and a third-person perspective. An on-screen player character could be moved behind and in front of objects on a 2D background drawn in perspective, creating the illusion of pseudo-3D space. Commands were still entered via text.

- *Maniac Mansion* (1987) removed text entry from adventure games. LucasArts built the SCUMM system to allow a point-and-click interface. Sierra and other game companies quickly followed with their own mouse-driven games.

Beat 'em up

- *Kung-Fu Master* (1984), a Hong Kong cinema-inspired action game, laid the foundations for scrolling beat 'em ups with its simple gameplay and multiple enemies.[17]
- *Nekketsu Kōha Kunio-kun* (1986), also released as *Renegade*, deviated from the martial arts themes of earlier game, introducing street brawling to the genre,[18] and set the standard for future beat 'em up games as it introduced the ability to move both horizontally and vertically.[19]

Fighting games

- *Karate Champ* (1984), Data East's action game, is credited with establishing and popularizing the one-on-one fighting game genre, and went on to influence *Yie Ar Kung-Fu*.[20]
- Konami's *Yie Ar Kung Fu* (1985), which expanded on *Karate Champ* by pitting the player against a variety of opponents, each with a unique appearance and fighting style.[20] [21]
- *Street Fighter* (1987), developed by Capcom, introduced the use of special moves that could only be discovered by experimenting with the game controls.[22]

Interactive movie

- *Dragon's Lair* (1983) was the first Laserdisc video game, and introduced full-motion video to video games.

Maze games

- *Pac-Man* (1980) was the first game to achieve widespread popularity in mainstream culture and the first game character to be popular in his own right.
- *3D Monster Maze* (1981) was the first 3D game for a home computer, while *Dungeons of Daggorath* (1982) added various weapons and monsters, sophisticated sound effects, and a "heartbeat" health monitor.

Platform games

- *Space Panic* (1980) is sometimes credited as the first platform game,[23] with gameplay centered on climbing ladders between different floors.
- *Donkey Kong* (1981), an arcade game created by Nintendo's Shigeru Miyamoto, was the first game that allowed players to jump over obstacles and across gaps, making it the first true platformer.[24] This game also introduced Mario, an icon of the genre.
- *Jump Bug* (1981), Alpha Denshi's platform-shooter, was the first platform game to use scrolling graphics.[25]
- Taito's *Jungle King* (1982)[26] featured scrolling jump and run sequences that had players hopping over obstacles.
- Namco took the scrolling platformer a step further with *Pac-Land* (1984),[27] which was the first game to feature multi-layered parallax scrolling and closely resembled later scrolling platformers like *Super Mario Bros.* (1985) and *Wonder Boy* (1986).[28] [29]
- *Mario Bros.* (1983), developed by Shigeru Miyamoto, offered two-player simultaneous cooperative play and laid the groundwork for two-player cooperative platformers.
- *Congo Bongo* (1983), developed by Sega, was the first isometric platformer.
- *Prince of Persia* (1989) was the first cinematic platformer.

Platform-adventure games

- *Metroid* (1986) was the earliest game to fuse platform game fundamentals with elements of action-adventure games, alongside elements of RPGs. These elements include the ability to explore an area freely, with access to new areas controlled by either the gaining of new abilities or through the use of inventory items.[30]
- *Zelda II: The Adventure of Link* (1987) and *Castlevania II: Simon's Quest* (1987) are two other early examples of platform-adventure games.

Racing games

- *Turbo* (1981), by Sega, was the first racing game with a third-person perspective, rear-view format.
- *Pole Position* (1982), by Namco, used sprite-based, pseudo-3D graphics when it refined the "rear-view racer format" where the player's view is behind and above the vehicle, looking forward along the road with the horizon in sight. The style would remain in wide use even after true 3D graphics became standard for racing games.

Role-playing games

- The earliest role-playing games to use elements from Dungeons and Dragons are Telengard, written in 1976, and Zork (later renamed Dungeon), written in 1977.[31] [32]
- Akalabeth (1980) was created in the same year as Rogue (1980); Akalabeth led to the creation of its spiritual sequel Ultima (1981). Its sequels were the direct inspiration for many of the first Japanese console role-playing games.
- *Dragon Slayer II: Xanadu* (1985) is considered the first full-fledged action role-playing game, with character stats and a large quest, with its action-based combat setting it apart from other RPGs. *The Legend of Zelda* (1986) and its sequel *Zelda II: The Adventure of Link* (1987), both developed by Shigeru Miyamoto, further defined and popularized the emerging action RPG genre.
- *The Bard's Tale* (1985) by Interplay Entertainment is considered the first computer role-playing game to appeal to a wide audience that was not matched until Blizzard Entertainment's *Diablo*.[33]
- *Dragon Quest* (1986), developed by Yuji Horii, was one of the earliest console role-playing games. With its anime-style graphics by Akira Toriyama (of *Dragon Ball* fame), *Dragon Quest* set itself apart from computer role-playing games. It spawned the *Dragon Quest* franchise and served as the blueprint for the emerging console RPG genre,[34] inspiring the likes of Sega's *Phantasy Star* (1987) and Squaresoft's *Final Fantasy* (1987), which spawned its own successful *Final Fantasy* franchise and introduced the side-view turn-based battle system, with the player characters on the right and the enemies on the left, imitated by numerous later RPGs.[35]
- *Megami Tensei* (1987) and *Phantasy Star* (1987) broke with tradition, abandoning the medieval setting and sword and sorcery themes common in most RPGs, in favour of modern/futuristic settings and science fiction themes.

Rhythm game

- *Dance Aerobics* was released in 1987, and allowed players to create music by stepping on Nintendo's Power Pad peripheral. It has been called the first rhythm-action game in retrospect.[36]

Scrolling shooters

- *Defender* (1980) established the scrolling shooter and was the first to have events (e.g., enemy movement) taking place outside the player's view. A radar was displayed showing a map of the whole playfield.
- *Moon Patrol* (1982) introduced the parallax scrolling technique in computer graphics.[37]

Stealth games

- *005* (1981), an arcade game by Sega, was the earliest example of a stealth-based game.[38] [39] [40]
- *Metal Gear* (1987), developed by Hideo Kojima, was the first stealth game in an action-adventure framework, and became the first commercially successful stealth game, spawning the *Metal Gear* series.

Survival horror

- *Haunted House* (1981) was the first to intentionally introduce elements of horror fiction into video games.
- *Sweet Home* (1989) introduced many of the modern staples of the survival horror genre. Gameplay involved battling horrifying creatures and solving puzzles. Developed by Capcom, the game would become an influence upon their later release *Resident Evil* (1996), making use of its mansion setting and its "opening door" load screen.[41]
- *Alone in the Dark* (1992) took the action-adventure style and retooled it to de-emphasize combat and focus on investigation. An early attempt to simulate 3D scenarios by mixing polygons with 2D background images. This style became the inspiration for *Resident Evil* (1996).

Vehicle simulation games

- *Battlezone* (1980) used wireframe vector graphics to create the first true three-dimensional game world.
- *Elite* (1984), designed by David Braben and Ian Bell, ushered in the age of modern style 3D graphics. The game contains convincing vector worlds, full 6 degree freedom of movement, and thousands of visitable planetary systems. It is considered a pioneer of the space flight simulator game genre.

Gaming computers

The primary gaming computers of the 1980s emerged in 1981 & 1982: the Commodore Vic20, Commodore 64, Apple II (although the Apple II started in 1977) and Sinclair ZX81 and ZX Spectrum, and two years later, Amstrad CPC. The ZX Spectrum and Amstrad CPC were mostly used and known only in Europe, whilst the USA market was more familiar with the Apple II, Commodore 64, and Atari 800.

In 1984, the computer gaming market took over from the console market following the crash of that year; computers offered equal gaming ability and since their simple design allowed games to take complete command of the hardware after power-on, they were nearly as simple to start playing with as consoles.

The Commodore 64 system

The Commodore 64 was released to the public in August 1982. It found initial success because it was marketed and priced aggressively. It had a BASIC programming environment and advanced graphic and sound capabilities for its time, similar to the ColecoVision console. It also utilized the same game controller ports popularized by the Atari 2600, allowing gamers to use their old joysticks with the system. It would become the most popular home computer of its day in the USA and many other countries and the best-selling single computer model of all time internationally.

At around the same time, the Sinclair ZX Spectrum was released in the United Kingdom and quickly became the most popular home computer in many areas of Western Europe—and later the Eastern Bloc—due to the ease with which clones could be produced.

The IBM PC compatible computer became a technically competitive gaming platform with IBM's PC/AT in 1984. The primitive 4-color CGA graphics of previous models had limited the PC's appeal to the business segment, as its graphics failed to compete with the C64 or Apple II. The new 16-color EGA display standard allowed its graphics to approach the quality seen in popular home computers like the Commodore 64. The sound capabilities of the AT, however, were still limited to the PC speaker, which was substandard compared to the built-in sound chips used in many home computers. Also, the relatively high cost of the PC compatible systems severely limited their popularity in gaming.

The Apple Macintosh also arrived at this time. It lacked the color capabilities of the earlier Apple II, instead preferring a much higher pixel resolution, but the operating system support for the GUI attracted developers of some interesting games (e.g. *Lode Runner*) even before color returned in 1987 with the Mac II.

The arrival of the Atari ST and Commodore Amiga in 1985 was the beginning of a new era of 16-bit machines. For many users they were too expensive until later on in the decade, at which point advances in the IBM PC's open platform had caused the IBM PC compatibles to become comparably powerful at a lower cost than their competitors. The VGA standard developed for IBM's new PS/2 line in 1987 gave the PC the potential for 256-color graphics. This was a big jump ahead of most 8-bit home computers but still lagging behind platforms with built-in sound and graphics hardware like the Amiga. This caused an odd trend around '89-91 towards developing to a seemingly inferior machine. Thus while both the ST and Amiga were host to many technically excellent games, their time of prominence proved to be shorter than that of the 8-bit machines, which saw new ports well into the 80s and even the 90s.

Dedicated sound cards started to address the issue of poor sound capabilities in IBM PC compatibles in the late 1980s. Ad Lib set an early de facto standard for sound cards in 1987, with its card based on the Yamaha YM3812 sound chip. This would last until the introduction of Creative Labs' Sound Blaster in 1989, which took the chip and added new features while remaining compatible with Ad Lib cards, and creating a new de facto standard. However, many games would still support these and rarer things like the Roland MT-32 and Disney Sound Source into the early 90s. The initial high cost of sound cards meant they would not find widespread use until the 1990s.

The Yamaha YM3812 sound chip.
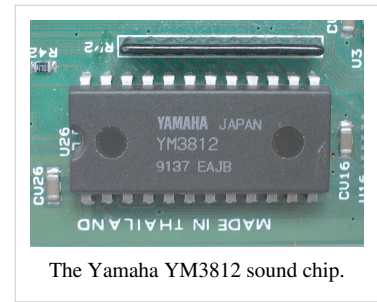
The UK was in prime position to rise to prominence in the gaming computers market in the late 1980s for various reasons. Personal computer users in the UK were offered a smooth scale of power versus price, from the ZX Spectrum up to the Amiga. Developers and publishers were also in close enough proximity to offer each other support. Moreoever the NES—though outselling all the other home consoles—made much less of an impact than it did in the United States due to the enormous popularity of personal computers there.

Shareware gaming first appeared in the mid 1980s, but its big successes came in the 1990s.

Early online gaming

Dial-up bulletin board systems were popular in the 1980s, and sometimes used for online game playing. The earliest such systems were in the late 1970s and early 1980s and had a crude plain-text interface. Later systems made use of terminal-control codes (the so-called ANSI art, which included the use of IBM-PC-specific characters not part of an ANSI standard) to get a pseudo-graphical interface. Some BBSs offered access to various games which were playable through such an interface, ranging from text adventures to gambling games like blackjack (generally played for "points" rather than real money). On some multiuser BBSs (where more than one person could be online at once), there were games allowing users to interact with one another.

SuperSet Software created *Snipes*, a text-mode networked computer game in 1983 to test a new IBM Personal Computer based computer network and demonstrate its capabilities. *Snipes* is officially credited as being the original inspiration for Novell NetWare. It is believed to be the first network game ever written for a commercial personal computer and is recognized alongside 1974's *Maze War* (a networked multiplayer maze game for several research machines) and *Spasim* (a 3D multiplayer space simulation for time shared mainframes) as the precursor to multiplayer games such as 1987's *MIDI Maze*, and *Doom* in 1993. Commercial online services also arose during this decade. The first user interfaces were plain-text—similar to BBSs— but they operated on large mainframe computers, permitting larger numbers of users to be online at once. By the end of the decade, inline services had fully-graphical environments using software specific to each personal computer platform. Popular text-based services included CompuServe, The Source, and GEnie, while platform-specific graphical services included PlayNET and Quantum Link for the Commodore 64, AppleLink for the Apple II and Macintosh, and PC Link for the IBM PC—all of which were run by the company which eventually became America Online—and a competing service, Prodigy. Interactive games were a feature of these services, though until 1987 they used text-based displays, not graphics.

Handheld LCD games

In 1979. Milton Bradley Company released the first interchangelable catridge-based handheld system, Microvision. While the handheld received modest success in the first year of production, the lack of games, screen size and video game crash of 1983 brought about the system's quick demise.[42]

In 1980, Nintendo released its Game & Watch line, handheld electronic game which spurred dozens of other game and toy companies to make their own portable games, many of which were copies of Game & Watch titles or adaptations of popular arcade games. Improving LCD technology meant the new handhelds could be more reliable and consume fewer batteries than LED or VFD games, most only needing watch batteries. They could also be made much smaller than most LED handhelds, even small enough to wear on one's wrist like a watch. Tiger Electronics borrowed this concept of videogaming with cheap, affordable handhelds and still produces games in this model to the present day.

Video game crash of 1983

At the end of 1983, the industry experienced losses more severe than the 1977 crash. This was the "crash" of the video game industry, as well as the bankruptcy of several companies that produced North American home computers and video game consoles from late 1983 to early 1984. It brought an end to what is considered to be the second generation of console video gaming. Causes of the crash include the production of poorly designed games such as *E.T. the Extra-Terrestrial* and *Pac-Man* for the Atari 2600 that suffered due to extremely tight deadlines. It was discovered that more Pac-Man cartridges were manufactured than there were systems sold. In addition, so many *E.T. the Extra-Terrestrial* cartridges were left unsold that Atari allegedly buried thousands of cartridges in a landfill in New Mexico.

Third generation consoles (1983–1995)
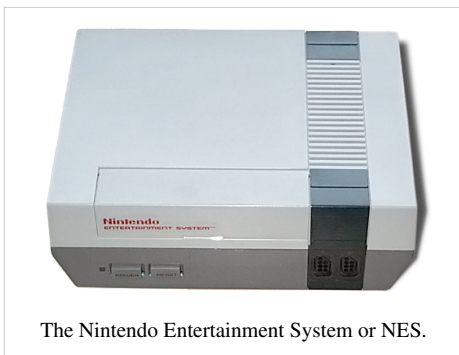
The Nintendo Entertainment System or NES.

In 1985, the North American video game console market was revived with Nintendo's release of its 8-bit console, the Famicom, known outside Asia as Nintendo Entertainment System (NES). It was bundled with *Super Mario Bros.* and instantly became a success. The NES dominated the North American and the Japanese market until the rise of the next generation of consoles in the early 1990s. Other markets were not as heavily dominated, allowing other consoles to find an audience like the Sega Master System in Europe, Australia and Brazil (though it was sold in North America as well).

In the new consoles, the gamepad or joypad, took over joysticks, paddles, and keypads as the default game controller included with the system. The gamepad design of an 8 direction Directional-pad (or D-pad for short) with 2 or more action buttons became the standard.

The *Legend of Zelda* series made its debut in 1986 with *The Legend of Zelda*. In the same year, the *Dragon Quest* series debuted with *Dragon Quest*, and has created a phenomenon in Japanese culture ever since. The next year, the Japanese company Square was struggling and Hironobu Sakaguchi decided to make his final game—a role-playing game (RPG) modeled after *Dragon Quest* and titled *Final Fantasy*—resulting in *Final Fantasy* series, which would later go on to become the most successful RPG franchise. 1987 also saw the birth of the stealth game genre with Hideo Kojima's *Metal Gear* series' first game *Metal Gear* on the MSX2 computer—and ported to the NES shortly after. In 1989, Capcom released *Sweet Home* on the NES, which served as a precursor to the survival horror genre.

In 1988, Nintendo published their first issue of *Nintendo Power* magazine.[43]

This generation ended with the discontinuation of the NES in 1995.

1990s

The 1990s were a decade of marked innovation in video gaming. It was a decade of transition from raster graphics to 3D graphics and gave rise to several genres of video games including first-person shooter, real-time strategy, and MMO. Handheld gaming began to become more popular throughout the decade, thanks in part to the release of the Game Boy. Arcade games, although still relatively popular in the early 1990s, begin a decline as home consoles become more common.

The video game industry matured into a mainstream form of entertainment in the 1990s. Major developments of the 1990s included the beginning of a larger consolidation of publishers, higher budget games, increased size of production teams and collaborations with both the music and motion picture industries. Examples of this would be Mark Hamill's involvement with Wing Commander III or Quincy Jones' introduction of QSound.

The increasing computing power and decreasing cost of processors as the Intel 80386, Intel 80486, and the Motorola 68030, caused the rise of 3D graphics, as well as "multimedia" capabilities through sound cards and CD-ROMs. Early 3D games began with flat-shaded graphics (Elite, Starglider 2 or Alpha Waves[44]), and then simple forms of texture mapping (Wolfenstein 3D).

1989 and the early 1990s saw the release and spread of the MUD codebases DikuMUD and LPMud, leading to a tremendous increase in the proliferation and popularity of MUDs. Before the end of the decade, the evolution of the genre continued through "graphical MUDs" into the first MMORPGs (Massively multiplayer online role-playing games), such as *Ultima Online* and *EverQuest*, which freed users from the limited number of simultaneous players in other games and brought persistent worlds to the mass market.

In the early 1990s, shareware distribution was a popular method of publishing games for smaller developers, including then-fledgling companies such as Apogee (now 3D Realms), Epic Megagames (now Epic Games), and id Software. It gave consumers the chance to try a trial portion of the game, usually restricted to the game's complete first section or "episode", before purchasing the rest of the adventure. Racks of games on single 5 1/4" and later 3.5" floppy disks were common in many stores, often only costing a few dollars each. Since the shareware versions were essentially free, the cost only needed to cover the disk and minimal packaging. As the increasing size of games in the mid-90s made them impractical to fit on floppies, and retail publishers and developers began to earnestly mimic the practice, shareware games were replaced by shorter game demos (often only one or two levels), distributed free on CDs with gaming magazines and over the Internet.

In 1991, Sonic the Hedgehog was introduced. The game gave Sega's Mega Drive console mainstream popularity, and rivaled Nintendo's Mario franchise. Its namesake character became the mascot of Sega and one of the most recognizable video game characters.

In 1992 the game *Dune II* was released. It was by no means the first in the genre (several other games can be called the very first real-time strategy game, see the History of RTS), but it set the standard game mechanics for later blockbuster RTS games such as *Warcraft: Orcs & Humans*, *Command & Conquer*, and *StarCraft*. The RTS is characterized by an overhead view, a "mini-map", and the control of both the economic and military aspects of an army. The rivalry between the two styles of RTS play—*Warcraft* style, which used GUIs accessed once a building was selected, and *C&C* style, which allowed construction of any unit from within a permanently visible menu—continued into the start of the next millennium.

Alone in the Dark (1992), while not the first survival horror game, planted the seeds of what would become known as the survival horror genre today. It established the formula that would later flourish on CD-ROM based consoles, with games such as *Resident Evil* and *Silent Hill*.

Adventure games continued to evolve, with Sierra Entertainment's *King's Quest* series, and LucasFilms'/LucasArts' *Monkey Island* series bringing graphical interaction and the creation of the concept of "point-and-click" gaming. *Myst* and its sequels inspired a new style of puzzle-based adventure games. Published in 1993, *Myst* itself was one of the first computer games to make full use of the new high-capacity CD-ROM storage format. Despite *Myst*'s

mainstream success, the increased popularity of action-based and real-time games led adventure games and simulation video games, both mainstays of computer games in earlier decades, to begin to fade into obscurity.

It was in the 1990s that Maxis began publishing its successful line of "Sim" games, beginning with *SimCity*, and continuing with a variety of titles, such as *SimEarth*, *SimCity 2000*, *SimAnt*, *SimTower*, and the best-selling PC game in history, *The Sims*, in early 2000.

In 1996, 3dfx Interactive released the Voodoo chipset, leading to the first affordable 3D accelerator cards for personal computers. These devoted 3D rendering daughter cards performed a portion of the computations required for more-detailed three-dimensional graphics (mainly texture filtering), allowing for more-detailed graphics than would be possible if the CPU were required to handle both game logic and all the graphical tasks. First-person shooter games (notably *Quake*) were among the first to take advantage of this new technology. While other games would also make use of it, the FPS would become the chief driving force behind the development of new 3D hardware, as well as the yardstick by which its performance would be measured, usually quantified as the number of frames per second rendered for a particular scene in a particular game.

Several other, less-mainstream, genres were created in this decade. Looking Glass Studios' *Thief: The Dark Project* and its sequel were the first to coin the term "first person sneaker", although it is questionable whether they are the first "first person stealth" games. Turn-based strategy progressed further, with the *Heroes of Might and Magic* (*HOMM*) series (from The 3DO Company) luring many mainstream gamers into this complex genre.

Id Software's 1996 game *Quake* pioneered play over the Internet in first-person shooters. Internet multiplayer capability became a de facto requirement in almost all FPS games. Other genres also began to offer online play, including RTS games like Microsoft Game Studios' *Age of Empires*, Blizzard's *Warcraft* and *StarCraft* series, and turn-based games such as *Heroes of Might and Magic*. Developments in web browser plug-ins like Java and Adobe Flash allowed for simple browser-based games. These are small single player or multiplayer games that can be quickly downloaded and played from within a web browser without installation. Their most popular use is for puzzle games, side-scrollers, classic arcade games, and multiplayer card and board games.

Few new genres have been created since the advent of the FPS and RTS, with the possible exception of the third-person shooter. Games such as *Grand Theft Auto III*, *Tom Clancy's Splinter Cell*, *Enter the Matrix*, and *Hitman* all use a third-person camera perspective, but are otherwise very similar to their first-person counterparts.

Decline of arcades

With the advent of 16-bit and 32-bit consoles, home video games began to approach the level of graphics seen in arcade games. An increasing number of players would wait for popular arcade games to be ported to consoles rather than going out. Arcades experienced a resurgence in the early to mid 1990s with games such as Street Fighter II and Mortal Kombat and other games in the one-on-one fighting game genre, and *NBA Jam*. As patronage of arcades declined, many were forced to close down. Classic coin-operated games have largely become the province of dedicated hobbyists and as a tertiary attraction for some businesses, such as movie theaters, batting cages, miniature golf, and arcades attached to game stores such as F.Y.E..

The gap left by the old corner arcades was partly filled by large amusement centers dedicated to providing clean, safe environments and expensive game control systems not available to home users. These are usually based on sports like skiing or cycling, as well as rhythm games like *Dance Dance Revolution*, which have carved out a large slice of the market. Dave & Buster's and GameWorks are two large chains in the United States with this type of environment. Aimed at adults and older kids, they feature full service restaurants with full liquor bars and have a wide variety of video game and hands on electronic gaming options. Chuck E. Cheese's is a similar type of establishment focused towards small children.

Handhelds come of age

In 1989, Nintendo released the Game Boy, the first handheld console since the ill-fated Microvision ten years before. The design team headed by Gunpei Yokoi had also been responsible for the Game & Watch systems. Included with the system was *Tetris*, a popular puzzle game. Several rival handhelds also made their debut around that time, including the Sega Game Gear and Atari Lynx (the first handheld with color LCD display). Although most other systems were more technologically advanced, they were hampered by higher battery consumption and less third-party developer support. While some of the other systems remained in production until the mid-90s, the Game Boy remained at the top spot in sales throughout its lifespan.

Mobile phone gaming

Mobile phones became videogaming platforms when Nokia installed Snake onto its line of mobile phones in 1998. Soon every major phone brand offered "time killer games" that could be played in very short moments such as waiting for a bus. Mobile phone games early on were limited by the modest size of the phone screens that were all monochrome and the very limited amount of memory and processing power on phones, as well as the drain on the battery.

Fourth generation consoles (1989–1999) (16-bit)

The Mega Drive\Sega Mega Drive\Genesis proved its worth early on after its debut in 1989. Nintendo responded with its own next generation system known as the Super NES in 1991. The TurboGrafx-16 debuted early on alongside the Genesis, but did not achieve a large following in the U.S. due to a limited library of games and excessive distribution restrictions imposed by Hudson.
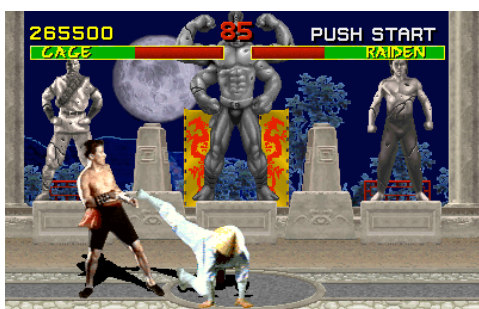
Mortal Kombat, released in both SNES and Genesis consoles, was one of the most popular game franchises of its time.

The intense competition of this time was also a period of not entirely truthful marketing. The TurboGrafx-16 was billed as the first 16-bit system but its central processor was an 8-bit HuC6280, with only its HuC6260 graphics processor being a true 16-bit chip. Additionally, the much earlier Mattel Intellivision contained a 16-bit processor. Sega, too, was known to stretch the truth in its marketing approach; they used the term "Blast Processing" to describe the simple fact that their console's CPU ran at a higher clock speed than that of the SNES (7.67 MHz vs 3.58 MHz).

In Japan, the 1987 success of the PC Engine (as the TurboGrafx-16 was known there) against the Famicom and CD drive peripheral allowed it to fend off the Mega Drive (Genesis) in 1988, which never really caught on to the same degree as outside Japan. The PC Engine eventually lost out to the Super Famicom, but, due to its popular CD add-ons, retained enough of a user base to support new games well into the late 1990s.

CD-ROM drives were first seen in this generation, as add-ons for the PC Engine in 1988 and the Mega Drive in 1991. Basic 3D graphics entered the mainstream with flat-shaded polygons enabled by additional processors in game cartridges like *Virtua Racing* and *Star Fox*.

SNK's Neo-Geo was the most expensive console by a wide margin when it was released in 1990, and would remain so for years. It was also capable of 2D graphics in a quality level years ahead of other consoles. The reason for this was that it contained the same hardware that was found in SNK's arcade games. This was the first time since the home Pong machines that a true-to-the-arcade experience could be had at home.

This generation ended with the SNES's discontinuation in 1999.

Fifth generation consoles (1993–2001) (32 and 64-bit)

In 1993, Atari re-entered the home console market with the introduction of the Atari Jaguar. Also in 1993, The 3DO Company released the 3DO Interactive Multiplayer, which, though highly advertised and promoted, failed to catch up to the sales of the Jaguar, due its high pricetag. Both consoles had very low sales and few quality games, eventually leading to their demise. In 1994, three new consoles were released in Japan: the Sega Saturn, the PlayStation, and the PC-FX, the Saturn and the PlayStation later seeing release in North America in 1995. The PlayStation quickly outsold all of its competitors, with the exception of the aging Super Nintendo Entertainment System, which still had the support of many major game companies.

Metal Gear Solid, notable for its innovative use of in-game generated cinemas, detailed integration of haptic technology, and theatrical story delivery. The *Metal Gear* series primarily defined the stealth game genre.

The Virtual Boy from Nintendo was released in 1995 but did not achieve high sales. In 1996 the Virtual Boy was taken off the market.

After many delays, Nintendo released its 64-bit console, the Nintendo 64 in 1996. The consoles flagship title, *Super Mario 64*, became a defining title for 3D platformer games.

PaRappa the Rapper popularized rhythm, or music video games in Japan with its 1996 debut on the PlayStation. Subsequent music and dance games like *beatmania* and *Dance Dance Revolution* became ubiquitous attractions in Japanese arcades. While *Parappa*, *DDR*, and other games found a cult following when brought to North America, music games would not gain a wide audience in the market until the next decade. Also in 1996 a capcom game resident evil was released, the first actual survival horror game. It was a huge success selling over 2 million copies and is considered one of the best games on the playstaion.

Other milestone games of the era include Rare's Nintendo 64 title *GoldenEye 007* (1997), which was critically acclaimed for bringing innovation as being the first major first-person shooter that was exclusive to a console, and for pioneering certain features that became staples of the genre, such as scopes, headshots, and objective-based missions. *The Legend of Zelda: Ocarina of Time* (1998) for the Nintendo 64 is widely considered the highest critically acclaimed game of all time.[45] The title also featured many innovations such as Z-targeting which is commonly used in many games today.

Nintendo's choice to use cartridges instead of CD-ROMs for the Nintendo 64, unique among the consoles of this period, proved to have negative consequences. While cartridges were faster and combated piracy, CDs could hold far more data and were much cheaper to produce, causing many game companies to turn to Nintendo's CD-based competitors. In particular, SquareSoft, which had released all previous games in its *Final Fantasy* series for Nintendo consoles, now turned to the PlayStation; *Final Fantasy VII* (1997) was a huge success, establishing the popularity of role-playing games in the west and making the PlayStation the primary console for the genre.

By the end of this period, Sony had become the leader in the video game market. The Saturn was moderately successful in Japan but a failure in North America and Europe, leaving Sega outside of the main competition. The N64 achieved huge success in North America and Europe, though it never surpassed PlayStation's sales or was as popular in Japan.

This generation ended with the PlayStation discontinuation in March 2006.

Transition to 3D and CDs

The fifth generation is most noted for the rise of fully 3D games. While there were games prior that had used three dimensional environments, such as *Virtua Racing* and *Star Fox*, it was in this era that many game designers began to move traditionally 2D and pseudo-3D genres into full 3D. *Super Mario 64* on the N64, *Crash Bandicoot* on the PlayStation, *Sonic Adventure* on the Dreamcast and *Tomb Raider* on the Saturn (later released on the PlayStation as well), are prime examples of this trend. Their 3D environments were widely marketed and they steered the industry's focus away from side-scrolling and rail-style titles, as well as opening doors to more complex games and genres. Games like GoldenEye 007, The Legend Of Zelda: Ocarina of Time or Soul Calibur were nothing like shoot-em-ups, RPG's or fighting games before them. 3D became the main focus in this era as well as a slow decline of cartridges in favor of CDs. Also, most 3D games used realistic graphics and large, interactive environments like Shenmue.

2000s

The first decade of the 2000s showed innovation on both consoles and PCs, and an increasingly competitive market for portable game systems.

The phenomena of user-created modifications (or "mods") for games was one trend that began around the turn of the millennium. The most famous example is that of *Counter-Strike*; released in 1999, it is still the most popular online first-person shooter, even though it was created as a mod for *Half-Life* by two independent programmers. Eventually, game designers realized the potential of mods and custom content in general to enhance the value of their games, and so began to encourage its creation. Some examples of this include *Unreal Tournament*, which allowed players to import 3dsmax scenes to use as character models, and Maxis' *The Sims*, for which players could create custom objects.

Mobile games

Mobile gaming interest was raised when Nokia launched its N-Gage phone and handheld gaming platform in 2003. While about two million handsets were sold, the product line was seen as not a success and withdrawn from Nokia's lineup. Meanwhile many game developers had noticed that more advanced phones had color screens and reasonable memory and processing power to do reasonable gaming. Mobile phone gaming revenues passed 1 billion dollars in 2003, and passed 5 billion dollars in 2007, accounting for a quarter of all videogaming software revenues. More advanced phones came to the market such as the N-Series smartphone by Nokia in 2005 and the iPhone by Apple in 2007 which strongly added to the appeal of mobile phone gaming. In 2008 Nokia revised the N-Gage brand but now as a software library of games to its top-end phones. At Apple's App Store in 2008, more than half of all applications sold were games for the iPhone.

Sixth generation consoles (1998-present)

In the sixth generation of video game consoles, Sega exited the hardware market, Nintendo fell behind, Sony solidified its lead in the industry, and Microsoft developed a gaming console.

The generation opened with the launch of the Dreamcast in 1998. It was the first console to have a built-in modem for Internet support and online play. While it was initially successful, sales and popularity would soon begin to decline with contributing factors being Sega's damaged reputation from previous commercial failures, software pirating, and the overwhelming anticipation for the upcoming Playstation 2 at the time. Production would discontinue in most markets by 2002.

The second release of the generation was Sony's Playstation 2, which would go on to be the best selling console at the time. Nintendo followed a year later with the Nintendo GameCube, their first disc-based console. Though more or less equal with Sony's system in technical specifications, the Nintendo GameCube suffered from a lack of third-party games compared to Sony's system, and was hindered by a reputation for being a "kid's console" and

lacking the mature games the current market appeared to want.

Before the end of 2001, Microsoft Corporation, best known for its Windows operating system and its professional productivity software, entered the console market with the Xbox. Based on Intel's Pentium III CPU, the console used much PC technology to leverage its internal development. In order to maintain its hold in the market, Microsoft reportedly sold the Xbox at a significant loss[46] and concentrated on drawing profit from game development and publishing. Shortly after its release in November 2001 Bungie Studio's *Halo: Combat Evolved* instantly became the driving point of the Xbox's success, and the Halo series would later go on to become one of the most successful console shooters of all time. By the end of the generation, the Xbox had drawn even with the Nintendo GameCube in sales globally, but since nearly

The Xbox, Microsoft's entry into the video game console industry.

all of its sales were in North America, it pushed Nintendo into third place in the American market. In 2001 *Grand Theft Auto III* was released, popularizing open world games by using a non-linear style of gameplay. It was very successful both critically and commercially and is considered a huge milestone in gaming.

Nintendo still dominated the handheld gaming market in this generation. The Game Boy Advance in 2001, maintained Nintendo's market position. Finnish cellphone maker Nokia entered the handheld scene with the N-Gage, but it failed to win a significant following.

Console gaming largely continued the trend established by the PlayStation toward increasingly complex, sophisticated, and adult-oriented gameplay. Most of the successful sixth-generation console games were games rated T and M by the ESRB, including many now-classic gaming franchises such as Halo and Resident Evil, the latter of which was notable for both its success and its notoriety. Even Nintendo, widely known for its aversion to adult content (with very few exceptions most notably *Conker's Bad Fur Day* for the Nintendo 64), began publishing more M-rated games, with Silicon Knights's *Eternal Darkness: Sanity's Requiem* and Capcom's *Resident Evil 4* being prime examples. This trend in hardcore console gaming would partially be reversed with the seventh generation release of the Wii.

Return of alternate controllers

One significant feature of this generation was various manufacturers' renewed fondness for add-on peripheral controllers. While novel controllers weren't new, as Nintendo featured several with the original NES and PC gaming has previously featured driving wheels and aircraft joysticks, for the first time console games using them became some of the biggest hits of the decade. Konami introduced a soft plastic mat versions of its foot controls for its *Dance Dance Revolution* franchise in 1998. Sega's alternate peripherals included Samba De Amigo's maraca controllers. Nintendo introduced a bongo controller for a few titles in its *Donkey Kong* franchise. Publisher RedOctane introduced *Guitar Hero* and its distinctive guitar-shaped controllers for the PlayStation 2.

Online gaming rises to prominence

As affordable broadband Internet connectivity spread, many publishers turned to online gaming as a way of innovating. Massively multiplayer online role-playing game (MMORPGs) featured significant titles for the PC market like *RuneScape*, *World of Warcraft*, and *Ultima Online*. Historically, console based MMORPGs have been few in number due to the lack of bundled Internet connectivity options for the platforms. This made it hard to establish a large enough subscription community to justify the development costs. The first significant console MMORPGs were *Phantasy Star Online* on the Sega Dreamcast (which had a built in modem and after market Ethernet adapter), followed by *Final Fantasy XI* for the Sony PlayStation 2 (an aftermarket Ethernet adapter was shipped to support this game). Every major platform released since the Dreamcast has either been bundled with the

ability to support an Internet connection or has had the option available as an aftermarket add-on. Microsoft's Xbox also had its own online gaming service called Xbox Live. Xbox Live was a huge success and proved to be a driving force for the Xbox with games like *Halo 2* that were overwhelmingly popular.

Rise of casual PC games

Beginning with PCs, a new trend in casual gaming, games with limited complexity that were designed for shortened or impromptu play sessions, began to draw attention from the industry. Many were puzzle games, such as Popcap's *Bejeweled* and *Diner Dash*, while others were games with a more relaxed pace and open-ended play. The biggest hit was *The Sims* by Maxis, which went on to become the best selling computer game of all time, surpassing *Myst*.[47]

Other casual games include Zynga Games like *Mafia Wars*, *Cafe World*, among many others, which are tied into social networking sites such as Myspace and Facebook. These games are offered freely with the option buy in game items, and stats for money and/or reward offers.

Seventh generation consoles (2004-present)

The generation opened early for handheld consoles, as Nintendo introduced their Nintendo DS and Sony premiered the PlayStation Portable (PSP) within a month of each other in 2004. While the PSP boasted superior graphics and power, following a trend established since the mid 1980s, Nintendo gambled on a lower-power design but featuring a novel control interface. The DS's two screens, one of which was touch-sensitive, proved extremely popular with consumers, especially young children and middle-aged gamers, who were drawn to the device by Nintendo's *Nintendogs* and *Brain Age* series, respectively. While the PSP attracted a significant portion of veteran gamers, the DS allowed Nintendo to continue its dominance in handheld gaming. Nintendo updated their line with the Nintendo DS Lite in 2006, the Nintendo DSi in 2008 (Japan) and 2009 (Americas and Europe), and the Nintendo DSi XL while Sony updated the PSP in 2007 and again with the smaller PSP Go in 2009. Nokia withdrew their N-Gage platform in 2005 but reintroduced the brand as a game-oriented service for high-end smartphones on April 3, 2008.[48]

Apple Inc. entered the realm of mobile gaming hardware with the release the App Store for the iPhone and iPod Touch in the summer of 2008. The greatest shift brought by Apple's entry was to abandon the traditional reliance on "brick and mortar" retail sales for software purchases; instead, the iPhone platform relies entirely on digitally-distributed content.

In console gaming, Microsoft stepped forward first in November 2005 with the Xbox 360, and Sony followed in 2006 with the PlayStation 3, released in Europe in March 2007. Setting the technology standard for the generation, both featured high-definition graphics, large hard disk-based secondary storage, integrated networking, and a companion on-line gameplay and sales platform, with Xbox Live and the PlayStation Network, respectively. Both were formidable systems that were the first to challenge personal computers in power (at launch) while offering a relatively modest price compared to them. While both were more expensive than most past consoles, the Xbox 360 enjoyed a substantial price edge, selling for either $300 or $400 depending on model, while the PS3 launched with models priced at $500 and $600. The PlayStation 3 was the most expensive game console on the market since Panasonic's version of the 3DO, which retailed for little under 700USD.[49]

Nintendo was not expected to compete credibly at all, with most industry analysts predicting a distant third place finish for its new Revolution console, later renamed Wii, introduced a couple days after the PS3, and one even going so far as to predict a market exit similar to Sega. Instead, Nintendo pulled off an industry turnaround in business. The Wii had lower technical specifications (and a lower price) than both the Xbox 360 and PlayStation 3.[50] Nintendo refused to publish or confirm technical specifications, instead touting the console's new control scheme, featuring motion-based control and infrared-based pointing. Many gamers, publishers, and analysts dismissed the Wii as an underpowered curiosity, but were surprised as the console sold out through the 2006 Christmas season, and remained so through the next 18 months, becoming the fastest selling game console in most of the world's gaming markets.[51]

In June 2009, Sony announced that it would release its PSP Go for 249.99USD on October 1 in Europe and North America, and Japan on November 1. The PSP Go was a newer, slimmer version of the PSP, which had the control pad slide from the base, where its screen covers most of the front side.[52]

Increases in development budgets

With high definition video an undeniable hit with veteran gamers seeking immersive experiences, expectations for visuals in games along with the increasing complexity of productions resulted in a spike in the development budgets of gaming companies. While many game studios saw their Xbox 360 projects pay off, the unexpected weakness of PS3 sales resulted in heavy losses for some developers, and many publishers broke previously arranged PS3 exclusivity arrangements or cancelled PS3 game projects entirely in order to cut losses.

Nintendo capitalizes on casual gaming

Meanwhile, Nintendo took cues from PC gaming and their own success with the Nintendo Wii, and crafted games that capitalized on the intuitive nature of motion control. Emphasis on gameplay turned comparatively simple games into unlikely runaway hits, including the bundled game, *Wii Sports*, and *Wii Fit*. As the Wii sales spiked, many publishers were caught unprepared and responded by assembling hastily-created titles to fill the void. Although some hardcore games continued to be produced by Nintendo, many of their classic franchises were reworked into "bridge games", meant to provide new gamers crossover experiences from casual gaming to deeper experiences, including their flagship Wii title, *Super Mario Galaxy*, which in spite of its standard-resolution graphics dominated critics' "best-of" lists for 2007. Many others, however, strongly criticized Nintendo for its apparent spurning of its core gamer base in favor of a demographic many warned would be fickle and difficult to keep engaged.

Motion control revolutionizes game play

The way gamers interact with games changed dramatically, especially with Nintendo's wholesale embrace of motion control as a standard method of interaction. The Wii Remote implemented the principles to be a worldwide success. To a lesser extent, Sony experimented with motion in its Sixaxis and subsequent DualShock 3 controller for the PS3, while Microsoft continually mentioned interest in developing the technology for the Xbox 360, such as Project Natal. While the Wii's infrared-based pointing system has been widely praised, and cited as a primary reason for the success of games such as Nintendo's *Metroid Prime 3: Corruption* and EA's *Medal of Honor: Heroes 2*. Despite the success of these titles, reliable motion controls have been more elusive, with even the most refined motion controls failing to achieve true 1-to-1 reproduction of player motion on-screen. Some players have even found that they must move slower than they would like or the Wii will not register their movements, but this is rare. Nintendo's 2008 announcement of its Wii MotionPlus module intends to address these concerns.

Alternate controllers also continue to be important in gaming, as the increasingly involved controllers associated with Red Octane's *Guitar Hero* series and Harmonix's *Rock Band* demonstrate. In addition to this, Nintendo has produced various add-on attachments meant to adapt the Wii Remote to specific games, such as the Wii Zapper for shooting games and the Wii Wheel for driving games.[53] With the introduction of the Balance Board in Nintendo's *Wii Fit* package, motion controls have been extended to players feet. Third party efforts from THQ, EA, and other publishers that integrate Nintendo's Balance Board are expected in 2009.

At Electronic Entertainment Expo 2009, Microsoft and Sony each presented their own new motion controllers: Project Natal (later renamed *Kinect*) and PlayStation Move, respectively.[54]

Cloud Computing comes to games

In 2009, a few cloud computing services were announced targeted at video games. These services allow the graphics rendering of the video games to be done away from the end user, and a video stream of the game to be passed to the user. OnLive allows the user to communicate with their servers where the video game rendering is taking place.[55] [56] Gaikai is used entirely in the user's browser, and communicates with servers ideally close to the user.[57]

2010s

The new decade has seen rising interest in the possibility of next generation consoles being developed in keeping with the traditional industry model of a five-year development cycle. However, in the industry there is believed to be a lack of appetite for another race to produce such a console.[58] Reasons for this include the challenge and massive expense of creating consoles that are graphically superior to the current generation, with Sony and Microsoft still looking to recoup development costs on its current consoles. The focus for new technologies is likely to shift onto motion-based peripherals, such as Microsoft's Kinect and Sony's PlayStation Move.

One new console is Nintendo's new handheld: the successor to the Nintendo DS known as the Nintendo 3DS[59] . The system is due for release by the end of the fiscal year (March 2011).[60] The system will incorporate 3D graphics and effects without the need for using 3D glasses. Other features include three cameras (one internal and a dual 3D external set), a motion sensor, a gyro sensor and a Slide Pad that allows 360-degree analog input.[61]

On June 14 2010, during E3, Microsoft revealed their new Xbox 360 console referred to as the Xbox 360 S or Slim. Microsoft's intent was to make the unit smaller and quieter, while also installing a 250GB hard drive and built-in 802.11n WiFi. It starting shipping to US stores the same day, not reaching Europe until July 13th.

Eighth generation

A few years after the Wii was released, speculations were raised over the Internet, and continue to be, about Nintendo's eighth-generation home console. Initial beliefs were that the new console would be an enhanced version of the Wii, named the "Wii HD" and would have a HD output along with a Blu-ray drive built in with a release in 2011[62] , but they waned when Reggie Fils-Aime, "confident the Wii home entertainment console has a very long life in front of it," declared that a successor would not be launched in the near future.[63]

See also

- Chronology of console role-playing games
- Chronology of real-time strategy video games
- Chronology of real-time tactics video games
- List of years in video games
- Timeline of video arcade game history
- Game On (exhibition), a touring exhibition detailing the history of video games.
- Home computer
- Personal computer game
- Video game console
- Golden age of video arcade games
- History of online games

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