System Profile of the Nintendo Entertainment System

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Development and release history
The Famicom (a contraction of "Family Computer") console was released in Japan by Nintendo in 1983. After a slow start due to hardware and programming instabilities, the then-newcomer to the home video game console market ordered a product recall and replaced the device's motherboard. This significantly improved reliability and boosted sales of the Famicom up to over 500,000 consoles sold in the first two months [Kent, 2001: 279]. Nintendo thus set its sight on the rest of the world and prepared its console for export.

The world's second biggest market, the United States, had collapsed in the video game crash of 1983 (sometimes referred to as "the crash of 1984" since its full effects would not be seen until then). This meant that any home video game console would have a hard time gaining acceptance from the consumers and retailers, who were convinced that video games had been a passing fad. On the other side, it also meant that if the system succeeded, it would virtually have the whole market for itself. The Famicom had conquered Japan; this gave Hiroshi Yamauchi, Nintendo's president, good reasons to believe it could work just as well in the U.S.

The Famicom, however, had to change its name and appearance to make a splash in a country allergic to "video games". Nintendo of America's president Minoru Arakawa and senior vice president Howard Lincoln opted for the Advanced Video System name and demonstrated it at the January 1985 Consumer Electronics Show. People who played it liked the games, but retailers were not willing to try selling video games after the crash. Nintendo thus developed the Zapper light gun and a robot named ROB (for Robot Operating Buddy), two peripherals that were to be used with a handful of games, but whose true purpose was to change the perception of the console from a "video game console" to a system that would allow people to play arcade shooting hits like *Wild Gunman* or *Hogan's Alley*, or a technological robot toy. A final name was given to the console: the Nintendo Entertainment System. The NES was test-marketed in New York, the toughest place in the U.S. since the competition for entertainment products was very high. (Yamauchi's reasoning was that if the NES managed to sell there, it would sell anywhere). 50,000 units were sold. [Kent, 2001: 298] [1] The NES caught on and was soon for sale through the whole country and eventually around the globe, thriving until the 16-bit consoles' arrival on the market. Nintendo tried to prolong its life by releasing an updated, stylish version known as the "New NES" or "NES 2" in 1993, but many consumers had moved on to the Super NES or Sega Genesis by then, and it was a commercial failure. Nintendo officially stopped supporting the NES in 1994; today, the company claims to have sold over 60 million units worldwide.

Licensing terms

One of the reasons behind Atari's demise was the flood of poor-quality titles that glutted the market because the company had lost exclusive control of the content developed for its console. Nintendo wanted to make sure this would not happen with the NES, but also realized the importance of having a huge library of games, which could not be large enough with only Nintendo's own games. The company thus approached many successful Japanese publishers – such as Bandai, Taito and Namco – and arranged partnerships to have them develop games for the NES. Nintendo's conditions, however, proved to be draconian.

> Yamauchi protected [the NES] with a security chip that locked out unauthorized cartridges. This meant that the only way to make games for the NES was to allow Nintendo to manufacture them, and Nintendo maintained final authority in deciding which games would be manufactured and in what quantities. [Kent, 2001: 308]

In addition, third-party licensees were restricted to publishing a maximum of five games per year, and every one of them had to be exclusive to the NES for two years. (As a matter of fact, Nintendo circumvented this rule when Konami and Acclaim, two developers that produced hit games, asked for more than five games per year. They were allowed to create subsidiaries, and thus Konami published five additional games under the Ultra Games label, and Acclaim did the same with the LJN subsidiary). Atari – who had the resources to afford legal battles with the Japanese giant – sued Nintendo for monopolizing the home video game market, but lost. Many companies simply agreed to the terms: as Kent puts it,

> Nintendo controlled somewhere between 86 to 93 percent of the market by the end of 1987. By the time Sega [Nintendo's only serious competitor] had sold 100,000 Master Systems, Nintendo had already sold more than 2 million NES units and the gap was widening. [Kent, 2001: 360]

While Nintendo claimed these regulations existed to ensure that games made for the NES were of sufficiently high quality, many developers saw them as strong-arm tactics, often citing Nintendo's censorship policies in particular. Conscious of the importance of keeping a clean image, especially in the United States where the NES' primary target audience consisted of kids, Nintendo had set up a "NES Game Standards Policy" to prevent the appearance and bad publicity of games like *Custer's Revenge* [2]. Every game developed or translated for a North American release had to be sent to Nintendo's censors first, who would review the content and request that the developer make any number of changes to "meet the concerns of the members of [Nintendo's] target age group and their parents" [3]. Some of the things forbidden included illegal drugs, explicit or suggestive sexuality, alcohol, smoking materials, graphic depictions of death, gratuitous or excessive violence, foul language, and ethnic, religious, nationalistic or sexual stereotypes of language or symbols. As a result, many games had to be significantly altered from their original versions, sometimes for things as seemingly unwarranted as removing all crosses from hospitals or tombstones (the cross being recognized as a symbol of Christianity). [4]

Many licensees thought Nintendo of America's inflexible enforcing of these regulations was disproportionate and stymied their creativity and freedom in making games. Douglas Crockford may speak for many in "The Untold Story of *Maniac Mansion*", an account of his relationship with Nintendo's censors when he converted *Maniac Mansion* for the NES: "They insist that their standards are not intended to make their products bland, but that is the inevitable result." Nintendo kept enforcing these policies rigorously until the *Mortal Kombat* flop in 1994 [5], at which point it released its grip a little. But it was too late: by then, many developers were disgruntled with the company. When rival Sony offered in 1995 a viable alternative with its PlayStation console and liberal licensing policies, these developers flocked out. Nintendo's dominance over the home video game market had ended.

Games library
It should first be noted that while the hardware of the NES and Famicom were essentially the same, one important difference makes their games library very distinct. The NES was fitted with the 10NES lockout chip, which acted as a software "lock" that would scan a game cartridge's code for a "key". Upon recognizing the specified code needed (which was inputted into the cartridge directly by Nintendo when it manufactured the cartridges), the NES would proceed to launch the game. If the code was not found, the game would not start. This made it difficult to create games without becoming an official Nintendo licensee. Some developers worked around the chip itself, selling their game cartridges with special adapters that would bypass the 10NES chip, and others managed to reverse-engineer the system to figure out the needed authentication code. Nintendo actively prosecuted any known offender to further discourage such enterprises. Thus unlicensed games for the NES were probably fewer in number when compared to the Famicom, which was not equipped with a lockout chip; in Japan and the Far East, Famicom piracy proved to be rampant, significantly increasing the number of games available for the system.

Another factor that further divides the Famicom and the NES' libraries is the Nintendo of America licensee regulations. Since the video gaming culture in Japan was well-established among all layers of society, the Famicom had as much success with adults as with kids, and its market could accommodate a very large offering of games without fear of collapse. Therefore, there was no need for Nintendo to monitor the games made by third-party developers. The censorship reviews, limit on the number of published titles per year, and centralized manufacturing and pricing of cartridges by Nintendo were all absent from the Japanese licensing agreements. Most developers released many titles for the Famicom, and translated five of their best for a North American release.

According to a Nintendo of America representative contacted by e-mail, the amount of published NES games is difficult to establish with certainty: 650+ North American titles are confirmed, but if unlicensed games are to be included, that number would probably reach 900+. This indicates that even with the 10NES chip and legal actions by Nintendo, piracy was still a serious issue. Nintendo of America estimates that internationally, the total number of games released for NES and Famicom numbers well over 1000. [6] This number, however, seems rather conservative, considering the NES was victim to an

estimated 250 unlicensed games; since the Famicom had no lockout chip, it is reasonable to expect that it saw many more unauthorized games, in addition to various "adult" and pornographic games which were systematically refused entry into the North American market. A closer estimate of the total number of NES and Famicom games would probably be higher than that, though how high exactly is difficult to tell. [7]

Identifying the most successful games of the library proves to be much easier. The *Everything and Nothing* website hosts a chart of video games whose worldwide sales have surpassed one million copies. Of the 52 NES games listed in there, Nintendo has published 41, with Capcom, Enix and Square sharing the responsibility behind the other platinum hits. Nintendo's *Super Mario Bros.* series, *Donkey Kong*, *Metroid*, *The Legend of Zelda* series, *Mike Tyson's Punch-Out!!*, *Kirby's Adventure* and *Kid Icarus* all became franchises that churned lucrative sequels in the following years. Other Nintendo games such as *Tetris*, *Duck Hunt*, *F1 Race*, *Gyromite*, and the sports games (*World Class Track Meet*, *Ice Hockey*, *Pro Wrestling*, *Golf*, *Tennis* and *Baseball*) sold extremely well, but did not develop into sequels. Capcom was one of the major third-party developers for the NES, with its *Duck Tales*, *Ghosts 'n Goblins* and *Chip'n Dale Rescue Rangers* all selling over a million copies; but Capcom's greatest contribution to the NES library undoubtedly lies in the *Megaman* series, which has spawned over fifty games to this day. Other games and series of note include Square's *Rad Racer* and *Final Fantasy* series, Konami's *Teenage Mutant Ninja Turtles*, *Contra* and *Castlevania* series, Capcom's *Bionic Commando*, Enix's *Dragon Warrior* series, and Tecmo's *Ninja Gaiden* series. While this list is far from exhaustive, it showcases the biggest advantage the NES had over its competitors: a huge library of high-quality games.

Technical specifications [8]
The NES is known as an 8-bit console, which means it can access 8 bits of data in a single operation. It runs on two processors, a modified MOS Technology 6502 microprocessor – dubbed the 2A03 for NTSC consoles and 2A07 for PAL consoles – clocked at 1.79 MHz and acting as the Central Processing Unit (CPU), and a separate Picture Processing Unit (PPU) running at 5.37 MHz tasked with handling all graphic operations.

The CPU has access to 2KB of RAM (Random Access Memory) and 48KB of ROM (Read-Only Memory), though various Multi-Memory Controllers (MMCs) can increase those numbers. MMCs were chips designed by game developers and included in their cartridges to expand the features of the NES. For instance, Nintendo's MMC1 chip allowed the player to save his progress in *The Legend of Zelda*, and the MMC2 chip was used in *Myke Tyson's Punch-Out!!* to portray the boxers using bigger sprites than normally allowed by the console hardware. The CPU is also responsible for the console's audio playback. The NES supports five sound channels: two square pulses, one triangle pulse, one noise channel, and a DPCM channel. The square pulses can be set to different levels of saturation in an attempt to simulate different instruments such as a piano or guitars; the triangle pulse's main function is as a bass line, but it can also serve as a flute with higher notes; and the noise channel's primary use is simulating percussions. Each of these channels can be assigned different values of reverberation, vibrato, delay and

sustain to increase their expressiveness. The DPCM channel can play heavily compressed samples, such as digitized speech in JVC Musical Industries' *Star Wars: The Empire Strikes Back*, or sampled drum sounds (one notable example is the bass drum sound in *Super Mario Bros. 3*).

A dedicated graphics processor relieves the CPU of its most demanding operations, allowing the NES to process complex graphics (for the time at which it was released). At a resolution of 256x240 pixels, up to 64 sprites (moving characters or objects) can be displayed simultaneously, at a maximum of 8 per line. These sprites can be 8x8 or 8x16 pixels in size, and comprise up to 4 colors. The NES' palette has 52 colors, and up to 16 of them can be displayed on-screen at a time. The PPU also has 2kb of Video RAM available for processing tile maps stored on cartridges. It outputs a composite signal which can be transformed into an RF signal (for increased compatibility with the TV standards of the late 80s) using the RF modulator included in the console package.

Notes

[1] For more details on the New York NES launch, consult David Sheff's 1994 book *Game Over: How Nintendo Conquered the World*.

[2] *Custer's Revenge* was an infamous game developed and published by Mystique in 1982 for the Atari 2600 console. The player controlled a naked man running from a fort and through a plain, who had to dodge obstacles in order to reach a Native American woman tied to a pole and rape her. Predictably, the game caused controversy from all kinds of social groups and tarnished Atari's reputation, even though the latter had no involvement in this game.

[3] Steven A. Schwartz and Janet Schwartz made an enquiry to NOA regarding their content policies and reproduced the letter they received in their 1994 book *Parent's Guide to Video Games*. The words quoted are taken directly from Nintendo of America's response.

[4] To see some examples of game altering and read the official "Nintendo of America's Video Game Content Guidelines", visit J.J. McCullough's *Nintendo's Era of Censorship* web page @ http://www.filibustercartoons.com/Nintendo.php.

[5] *Mortal Kombat* by Midway was a smash hit fighting game in the arcades in 1992. Much of the game's appeal came from the characters bleeding through the fight, and eventually dying in gory finishing moves dubbed "fatalities". The game was ported to the Sega Genesis and Super NES home consoles in 1993, but to comply with Nintendo's policies, blood was recolored gray and passed off as "sweat", and many fatalities were replaced by less graphically violent moves. For instance, in the arcade and Genesis versions, the character Sub-Zero would execute an uppercut to rip his opponent's head and spine out of his body, holding it all up as a trophy; in the SNES version, he simply froze his opponent (a standard move he could do at any time in any fight), jumped in and

landed an uppercut, shattering the frozen victim. The SNES version, stripped from its core appeal, sold poorly.

[6] These estimates were given personally to this author in response to an inquiry regarding the exact scope of the NES' games library.

[7] *The Nintendo Repository* has compiled an "International NES/Famicom Cartridge List" from various online sources and published it @ http://www.gamersgraveyard.com/repository/nes/nesgames.html. While in no way official, it can be consulted to get a general idea of the amount of games involved.

[8] Readers looking for more extensive information on the NES hardware should visit the NesDev website @ http://nesdev.parodius.com/, which hosts a considerable amount of resources and documentation on the subject.

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