Game Development from Nintendo 8-bit to Wii

An analysis of Super Mario Bros. 1985 to 2009

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2009-08-14

This is a report of the game development of Super Mario Bros. from 1985 to 2009. It describes the differences in the games; Story, game flow, hardware, software development and graphics.
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**ABSTRACT**

“The game begins the moment a person touches a console -- everything builds from that.”
(Quote by Shiguru Miyamoto; founder of Super Mario)

This report contains a well-structured analysis of the main four Super Mario games that clearly states a difference in story, hardware, software development and design. The report is structured in sections for each game to better understand the concept of the Super Mario games. The report ends with comparisons of the games for a better view of the paradigm between them.

The pictures and quotations in this report are referenced to the company that has copywrite and Shiguru Miyamoto that is the founder of the character Super Mario.
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INTRODUCTION

“Those who build the future must understand the past.” This is a quote by Shiguru Miyamoto, the founder of Super Mario and it concludes my report. The Super Mario games are classical for anyone that grew up with the games. So how does it come that the next generation plays the new games of Super Mario?

This report will cover that with analyses of the main four games that clearly state a difference to learn the secret of Super Mario’s success. This information is to be used in construction of new games that have not forgotten what made a good game in the past and to use it to develop good games today.

To better understand the Super Mario games, we have to understand the concept of games. Games are products of creativity requiring design, technology, story and music. Only one person cannot do a full professional game containing all of this. A normal videogame takes years to construct and requires specialized people in different areas that develop the different aspects of the game.

In this report a conclusion is made of the differences for the game company Nintendo to create a Super Mario game in 1985 in relation to 2009. There are four Super Mario Bros. games that will be described and the report also cover the requirements for Story, game flow, hardware, software development and graphics. The changes in developing videogames in terms of technology are different techniques. Since the Nintendo Company has released Super Mario games through the time span when this analyze was made, the Super Mario games is good games to discuss.

The report will focus on four main areas, where four different Super Mario games for two different video consoles are represented. There will also be a short summary of some other Super Mario games in these years to see a red thread. There will be analyzing of similarities and differences in Super Mario since it first was released in 1985.

The structure of the report is build up with relevant information for the analysis of the differences of the four games. First is a chapter for each game to conclude their facts. When the facts become clear, the report continues with structured tables to see the differences and similarity of all four games. In the end of this report a section binds together the red thread with own conclusions and thoughts of what the past has given and what the future will bring.
RESEARCH QUESTION/HYPOTHESIS

To explain my hypothesis and questions for this report I recite the quote from the beginning: “Those who build the future must understand the past.” There are few games from the year of 80s that survived until 2009 and are still improving. Super Mario is one of the few and therefor a good way to start understanding why games like Super Mario survived all these years in the unforeseen market.

My hypothesis is:

“We can use the games from before to create new games.”

This leads me to my main research question:

- How have the game design and some development changed during time for the Super Mario games?

QUESTION AT ISSUE

1. How have game development efforts increased from the first Super Mario Bros. for Nintendo 8-bit to the last Super Mario Bros. for “Wii”?
2. How much of the hardware is utilized?
3. How is the game flow shown in the Super Mario games?
4. What changes can be showed between Nintendo 8-bit and Wii in company size and team developers?
5. How has the graphics changed?
6. How are the issues connected to each other?

To meet the expectations for this report it analyzes the relevant information of Super Mario games that is developed to see the differences when the games were released. The requirements have changed from 1985 to 2009 to a Wii console with Super Mario games development. To have the facts for answering the hypothesis, a collection of information is done on what made the first Super Mario game on Nintendo 8-bit so popular and how to remake it with new features in 2009. This is the main purpose in the report. To analyze the games of Super Mario that was developed in 1985 with a comparison of four of the most different games developed since then to the year of 2009 will answer those questions.
GOAL AND PURPOSE

The goal is for people who read the report learn that we cannot forget the past when we are looking into the future, since all the information from the past can be reused to create new games, in this case, in Super Mario style.

TARGET GROUP

This report is directed to those who are interested in Super Mario games and video games but also they who are interested in understanding the past and for implementations for the future. The report is concentrated on the development that have driven the games to where they are today and therefore the history of games are a relevant issue to those who want to learn more about development of videogames.

The focus in the report is only the Super Mario games that are significantly different from one another and have made a difference in the game world of development. There are many Super Mario games and some are too similar to each other. Therefor the report analyzes four main aspects in the Super Mario games. The following areas are covered for the games; Story, game flow, the hardware, software development and graphics. All the pictures are copyrights of Nintendo Co. Ltd and are only for demonstration on what the characters, which is mentioned in this report, look like and should not be used in any other purpose.

METHOD

The literature study to answer the questions concerns research and analyses different articles, books and web sites on Internet on the subject Super Mario games. From these conclusions are drawn that will be presented in the report.

In the discussion is show the facts in the report as diagrams that will show how the games have developed through time.

This is steps that have been taken when writing this report:

- Perform investigation (collect data)
- Arrange the data into tables to make the differences clear.
- Draw conclusions about the changes over time. [2.]
The method starts with researches to sort out useful information on the subject. When the information search is done and read through, the next step is to start writing about the areas that is selected to analyze in this report. After some writing the process goes back to the beginning of the method in a circle to search for new information that is needed, to complete the report.

RESULT

In this section the information presented and analyzed is the following games:

- Super Mario Bros.
- Super Mario Bros. 3
- Super Paper Mario
- Super Mario Galaxy

The chosen games are the most relevant where the differences are clear in the areas chosen to analyze. The first two games of Super Mario Bros. were made for the video console *Nintendo Entertainment System* and they are relevant for this report since it was the beginning of the Super Mario era. The other two games of Super Mario is Super Paper Mario and Super Mario Galaxy and are relevant for this report since they have a difference in the hardware on how the games are implemented by programmers and on how games are developed today. These games was released for the console *Wii*, they show us the more complex way of creating games and also what have changed since 1985, when the first Super Mario game was released.

For each game four aspects will be discussed

1. Game flow

The games' story and a “how to play the game” is described in this section. This will then be concluded in a game flow. The game flow contains of three aspects; interface (controls and display), mechanics (interacting with the game world), and gameplay (problems and challenges). [16.]

2. Hardware

The hardware of the consoles will be discussed.

3. Software development

The third aspect focuses on the people that were involved in creating the games. Finally the section will cover the graphic in the game, like the clothing Mario and the characters in Super Mario wears and how it was developed.
4. Graphics

The forth aspect is about the design of the cloths Mario is wearing. This comparisons can be shown in a picture of the Mario in some of the Super Mario games where big differences been made. Here the discussion will be every stage of cloth changing in the four games that are covered.
SUPER MARIO BROS.

**Title:** SUPER MARIO BROS.

**Console:** Nintendo Entertainment System (NES).

**Release date:** 1985 to Nintendo Entertainment System.

**Game Description**

The first Super Mario Bros came in 1985 to NES (Nintendo Entertainment System) and has sold in more than 1.63 million copies. This game had a story that followed in eight different worlds where every world ends with the same mini boss, (See picture 2) except in world eight where the main boss is.

**Storyline**

The story in Super Mario Bros. follows the main character, Mario, when he saves the Princess Peach of the Mushroom Kingdom from the enemy Bowser.

Mario’s younger brother, Luigi, is helping Mario in this quest. To succeed in the quest they need to conquer eight worlds of the Mushroom Kingdom. In each world there is a castle in the end of that world that the player has to reach before moving on to the next world. In each castle the player has to fight and win over a mini boss that has captured a
false princess. In the last world (the eight) the player got to fight the real boss, Bowser, to free Princess Peach.

This game is one of the funniest of the Nintendo games, according to the company themselves, since it was stages the player had to go through and they all had a boss to defeat in the end. There were hidden stages in some of the worlds that are a challenge to find. The stages in each world differ since none of the worlds was the other like. The Super Mario Bros. game was new to our world; it was a hero story of saving the world and the princess and also about defeating the bad guys. The earlier videogames were not this complex and hadn’t the things Super Mario had, with each stage having its own world and enemy to defeat. [14] Mario can climb up on vine ranks and stand on a cloud to be able to fly in the air. As we can see in a review of the Super Mario Bros. this was a game which grow fast in popularity since of its hero story and the game don’t repeat itself; there are always new ways to solve and challenges to bump into. If there is an interested to have a look at the review from 1988 it can be found in this link: http://www.youtube.com/watch?v=yGFrI_ueq-M

**GAME FLOW**

In Super Mario Bros. the game flow have a story that is concentrated on the hero killing the bad villain and saving the princess; the typical hero story.

Since the game flow is built on a model of concentration, challenge, skills, control, clear goals, feedback, involvement, and social; [16] the following is describing the elements of the Super Mario Bros.

- **Concentration:** Super Mario Bros. is an addictive game since the game can’t be saved and this forces the player to continue the game till the end or at least to have the game running non-stop.
- **Challenge and skills:** The interest for the game is kept with every level in the game being different and more challenged than the last one. In every world there is always the same way to defeat the boss but with different levels of difficulty, this means that the game could be boring but nevertheless the player know always how to defeat the boss which is a safety.
- **Control:** The player doesn’t have much to say about the development of the story. The things the player can control are to travel to different paths through tunnels hidden in the game.
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- **Clear goals:** In Super Mario Bros. the player have the goal to level through the worlds to the last one and defeat Bowser to save the princess. This goal is as precise and simple as it can be.

- **Feedback:** It is frustrating to always found out that the princess was a false one and the real princess moved to another castle in the next world when the minion to Bowser was defeated. This doesn’t give a direct reward for defeating a boss but the reward is in collecting points for stomping on enemies heads and get a level-up mushroom or gold coins for jumping under a question-mark.

- **Involvement:** The time to play the game is many hours and no option of saving the game, so the player has to play the game till the end or stop playing it. When the game is on, the player is easy to lose the sense of time since it is addictive playing to always get new challenges and levels in every world.

- **Social:** The game can be played by two players; not by the same time but when player 1 is killed, player 2 is taking over on the exact same level and therefore they are helping each other not to die entirely and losing all their lives just to start over from the beginning of the world. When two is playing the game is very social for the involved when they are discussing the best way to the goal or watching out for enemies that could kill the player that is playing.

**Hardware**

The system requirements for Nintendo 8-bit are: [15.]

- CPU: 8-bit 1,66 MHz
- Memory: 2KB RAM (32KB ROM)
- Display: 256 x 240 pixel maximum resolution, 52 colors, 8 x 16 pixel maximum sprite size, 64 sprites on-screen
- Video Processor: 5,37 MHz
- 8KB Memory

The requirements are explained in more detail in the dictionary at the end of the report. Here is an overview of the requirements; the faster the CPU is, the better the system can compute the information. The Memory in Nintendo 8-bit of 2 KB is needed to run the game. The Display explains what requirement the game have on the TV-screen, how much color is shown and how big the sprites are that is the picture of the characters and buildings. The Video Processor is responsible for the production of a TV video signal to the game device.

The memory of 8 Kilo Byte is for the data to be saved and reloaded when the game is starting and when Mario get to a new area.

**Software development**

The specialist developer on the hardware is called console producers. They who are specialized on the software are called game producers. [3.]
There was only one department of game developers. These were divided in software programmers and design programmers, were software designers concentrated on the engine and the design programmers concentrated on the characters and how they should move.

In 1986 the president of Nintendo Hiroshi Yamauchi divided his employees into three groups of developing; Research & Development 1 (R&D 1), Research & Development 2 (R&D 2) and Research & Development 3 (R&D 3). The groups was to make the companies employees specialize in their area and to easier have some area covered when the game of Super Mario became bigger. The first group "Nintendo Research & Development 1(R&D1) is specialized in the design of the games. It was responsible for Super Mario and is the oldest group in Nintendo; it had more than 100 employees. [15.] The second group "Nintendo Research & Development 2(R&D2) was created to focus on both unessential hardware and software; this group had a small group of employee. The third group “Nintendo Research & Development 3 (R&D 3)” was the main group for developing Super Mario Bros. Later on, this was the game that the third group became famous for.

**GRAPHICS**

Mario’s appearance is bound to the 1985’s graphics technology. The technique is in 2D and every pixel in the characters is shown in the performance of the game. Therefore he has a distinct nose and shoes and the arms swings back and forward when he walks; otherwise the performance of Mario couldn’t be seen, only as a clump of red shaped as a person without arms and shapes in the face. He is a plumber dressed in a red hat and overall. The hat was only made because the creator, Miyamoto, had difficulties making the hair move realistically. The moustache and the oversized nose were given Mario to make the nose more noticeable [17.]. To make Mario look like he was running there was the use of *Sprites*, this is two-dimension pictures of Mario in different poses. To see that Mario is running there are one counter that decide how long every frame should stay on a picture before moving on to the next picture. If the frames per second are high, it will look like Mario is running. The first picture is of Mario: Sprite 1, standing still, the second picture is when Mario: Sprite 2 takes a step forward and the third picture is of Mario: Sprite 3’s leg is over the ground in a wide angle.
SUPER MARIO BROS. 3

**Title:** Super Mario Bros. 3

**Console:** NINTENDO ENTERTAINMENT SYSTEM (NES).


**Game Description**

This game was the third Super Mario Bros. game that came out for television. It came to Europe in August 29 1991.

The playing of the Super Mario series became more popular and more advanced. There are more hidden tracks to take in the worlds that will lead the player to new worlds not yet discovered. Here Super Mario can transform into a frog (that the picture shows with Luigi, Mario’s brother) or a bear; each animal transformation with its own ability. For example: the frog swims easily in water, and a bear can turn into stone and therefore be ignored by the enemies. This technique hasn't been shown before in any Super Mario game and today these transformations are usual to use in roll-playing-games.

**Storyline**

In this Super Mario Bros. game, it's the same story it always has been; the greatest enemy to Mario, Bowser, kidnaps Princess Peach and Mario must once more save her from his enemy. Bowser’s ultimate goal is to take over the Mushroom kingdom and to get revenge on the Mario Brothers, Mario and his brother Luigi. The worlds are bigger and more detailed than before and now Mario has to change his appearance if he wants to make the stages in the worlds easier to manage. The princess is never seen until the end of the game but she sends letters when the Mario brothers finish a world, with helping items to be used when needed. Everything in these worlds are more complicated, Mario needs to use some power to help him get some treasures and he needs to hide under some blocks to get away from a cloud that’s chasing him. In the desert the sand is sinking and is dragging Mario down so he needs to jump all the time to stay on the sand at the same time as the sun is chasing him and send out shooting sun globs.
GAME FLOW

- **Concentration**: In Super Mario Bros. 3 the memory allows the players items to be saved in an inventory. This helps the player in difficult stages of the game.
- **Challenge and skills**: The game is more challenging than before since now Mario can transform into different species that develops special abilities.
- **Control**: If the player can find hidden levels in the game, a flute can be found that can make Mario jump to worlds and jump over the past worlds in the story. There are also other objects that can be used to get to different stages or worlds in the game.
- **Clear goals**: The goal is to save the princess and defeat Bowser. The way to get to the last world to do this is optional with the flute and hidden levels.
- **Feedback**: The player gets rewarded for stumping on enemies and jumping on question mark to get money but also when Mario now can use a super feather that makes him, for one level only, fly through the level up in the sky untouchable by any enemy.
- **Involvement**: The game can’t be saved so the player must play through the game at one time or have the game paused when not playing. This game is easy to lose time in with the always new challenges in every level and new items with transformations for Mario.
- **Social**: This is a two-player game where one player plays the game while the other jumps in as Luigi when the first player dies. This shifts between them until either doesn’t have any more lives or finished the game.

HARDWARE

The system requirements for games in 1994: [15.]

- 386DX 33 MHz CPU
- 4 MB RAM
- 25MB hard disc space
- VGA-graphic card

The CPU here is 33 MHz and this means that the game could load faster when a new quest in the game begin or a new world is loading. The Memory of 4 MB RAM is a lot higher compared to the first game, since this game has upgrades in hardware and software. The game have more programming code in the system running at the same time, this takes a lot of memory for the game when generating a new scene. This also goes under 25 MB HDD since the game saves all the data on the console. The graphic card is updated to get a more detailed coloring in the game.
SOFTWARE DEVELOPMENT

The groups in Nintendo Company are Nintendo Research & Development 1 (R&D 1), Research & Development 2 (R&D 2). A new group has come up “Nintendo Integrated Research & Development (IRD)” this group is the former group Research & Development 3 (R&D 3) only with a new name. The groups are more divided now into specialists and every group has its role for the game, like animation, design, hardcore programming, etc.

The first group “Nintendo Research & Development 1 (R&D1) is specialized in the design of the games. The second group “Nintendo Research & Development 2 (R&D2) was created to focus on both hardware peripherals and software but was very small and spent more time on experiments than to actually release any games. The third group “Nintendo Integrated Research & Development (IRD)” concentrates on hardware and to come up with new hardware and console’s for Nintendo. [17]

GRAPHICS

The cloths on Mario are more developed than in the first Super Mario game. In Super Mario Bros. 3, Mario now has changed the overall color to black and has a red jacket. The red hat is still there as it came to be in all series of Super Mario. The graphic is made with more details than in the games before. The technology has developed since the first game and the pixel on the character is more detailed and therefore it wasn’t relevant to overkill when Mario swung his arms and legs this time. The sprites and the same technique are used here as in the first Super Mario game, but the technique for drawing the pictures has developed and become better. The sprites are mapped in a texture plane with a two dimensional axis. The picture can therefore only be viewed from the same angle. [18.] Here are some pictures of Mario running in the game:

Sprite 1: 🍀 Sprite2: 🍀 Sprite 3:
Super Paper Mario

**Title:** Super Mario: Paper Mario

**Console:** Nintendo Wii Virtual Console

**Release date:** 10 April 2007 [19.]

**Game Description**

In 2008, Super Mario Bros. is the second best-selling video game of all time. It has been sold in 40.24 million copies, not counting to Wii or Game Boy Advanced. The game is on the top spot on EGM's *greatest 200 games of their time* list and was also named in IGN's top 100 games of all-time list twice (2005, 2007). [4.]

This proves that Super Mario Bros. are a classic and will always be. The main leader of Super Mario and the face of the Nintendo Company, Shigeru Miyamoto is very popular all around the world, and are still providing new ideas to create Super Mario games. The original game of Super Mario is still the ground that the following Mario games is based on.

The Virtual Console Wii released in 2008 its own version of Super Mario Bros. Its two most popular games of Super Mario are called: Super Mario Galaxy and Super Mario: Paper Mario. These two games are in 3D, though Paper Mario is also played in 2D at some areas. [17.] The picture in the start of this section (Picture 5) is the front of Super Paper Mario and is a copywriter from: Segers, Andre. [20.]

**Storyline**

The story in this Super Mario game is a lot different from the previous ones. This story starts with a dark voice talking out loud and comes up with an evil plan to conquer the world and turn it to eternal darkness. In the meantime we see a little butterfly fly away after hearing the evil plan. This is the start of a new adventure for the hero Mario. Mario meets up with the butterfly when it saves his life; now Mario must repay the favor or pay the consequences for failing to save the world since Mario is the chosen one. [5.]

This game differs from the once before it; the story is a lot different and also the way the worlds are. The game is in both 3D and 2D and the worlds are doors that are invisibly but Mario can’t get access to them before he has done some quest first or finished another world behind a door. In this game there are a lot of secrets and some side quests that the other games couldn’t contain since there was only in 2D.
GAME FLOW

- **Concentration:** In Super Paper Mario the player can save the game to continue to play at another time. In every door there are often four different levels to play through and this makes the player want to play through a door to return to the city where the good side is living.
- **Challenge and skills:** The game provides a lot of new challenges in every level. Items, persons and secret passages can be found when changing to a 3D view and this opens up a new world with new challenges for the player.
- **Control:** The player can’t change the direction of the story; it follows a path when the player has completed some quest in the game. In the city there is some side-quest for the player to do; the player could for example collect food for recipes or find hidden treasures when collected new abilities through the game play.
- **Clear goals:** The goal is not so clear from the start; the princess is kidnapped again and Mario think that it was Bowser who did it (not surprisingly) but he discovers that a new enemy has appeared that kidnapped the princess. The first goal is to find princess Peach and to find Mario’s brother Luigi that disappeared in the chaos. Later on the player discovers that the new enemy wants to put the worlds in darkness so Mario must now collect hearts of lights in doors to other worlds to defeat this new enemy. Thorough the game the goal is changed many times but the main goal to collect hearts of light remains.
- **Feedback:** The player gets rewarded with money, when he stomps on enemies and jumping on question marks. In some of the world’s Mario collects new friends that have special abilities that Mario can use at any time; these friends is called pixels. With these friends the player can now go to places that were off limit before.
- **Involvement:** With the ability to save the game, the player doesn’t need to play the game nonstop. Nevertheless the game makes the player want to play more and to spend hours to find hidden passageways and treasures while following the main story.
- **Social:** Super Paper Mario is a one player game but nevertheless is it fun for other people to follow the story and help the player to find the secrets in the game.

HARDWARE

The requirements for Wii Virtual Console are: [24]

- Installed RAM: 512 MB
- Gaming Type(s): LAN Gaming
- DD: 6500MB
- Ports: 4 x Game Controller Port

The RAM is the memory needed to have the game up and running and to be able to update the stages when the game starts and save everything on its correct place. The game type is LAN gaming, Local Area Network, and it means that the connection type of the Network is between computers directly. The DD is the Disc Device needed to save all
the data the Wii console is producing. All the games played are saved on the console and also the inbuilt games are saved on the hard disc. In the Wii console there are 4 connections to the game controls, this means that four players at the same time can be connected to Wii and play games together. In this game the player must have the console Wii Virtual Console and a Nun chuck to control the character and controller to steer the character [22]. For this game it was relevant to use the Nun chuck otherwise the player couldn’t use the programmed buttons for example change to a 3D view.

**SOFTWARE DEVELOPMENT**

Now there are six divisions of developer in Nintendo at 1997. The largest division, where Super Mario’s creator is a head lead in, is called “Nintendo Entertainment Analysis and Development” (shortening EAD). This team was formerly called “Research & Development Team4”. These different teams are employees that specialize in different games that Nintendo are creating.

The altogether divisions are called: (after quote from [22.])

- Nintendo Research & Development 1 (R&D1)
- Nintendo Research & Development 2 (R&D2)
- Nintendo Integrated Research & Development (IRD)
- Nintendo Entertainment Analysis & Development (EAD)
- Nintendo Special-Planning & Development (SP&D)
- Nintendo Research & Engineering (R&E)

The third group “Nintendo Integrated Research & Development” (IRD) is renamed after the group was created in 1985 when it was called “Nintendo Research & Development 3” (R&D3). The group was in charge of console hardware development and creating games. After the rename the group have focused entirely on the hardware and left the software design to other groups. [23.] The fourth group “Nintendo Entertainment Analysis & Development” (EAD) had more star designers like Shigeru Miyamoto (founder of Super Mario) and with him as the team leader of this group, the Nintendo Company had increased in popularity and was recognized in Japan and in America at this time. The division became the most dominant group of them all in the Nintendo Company ever since its success with Super Mario Bros. (the first game that ever came out on Super Mario).

Nintendo Special-Planning & Development (SP&D) was a very small group of team leaders and the former designers of the groups R&D1 and EAD. This group’s focus was to create very unique software, like handheld game. Nintendo Research & Engineering (R&E) was ones an engineering team in the first group R&D1, this division created the design of some of Nintendo’s console, like the Game Boy. [24.]
In 1997, there were twenty to thirty employees working in each EAD. There was also a programming group in each division called SRD; it was a group of about 200 employees with expertise in hardware development. [6]

From 2005 and till now the divisions of development teams have looked like this:

- Nintendo Integrated Research & Development (IRD)
- Nintendo Technology & Development (T&D)
- Nintendo Software Planning Development (SPD)
- Nintendo Entertainment Analysis & Development (EAD)
- Nintendo Licensing Business (LB)

Almost every software designers are extracted from the tree divisions that do not longer exist; these are the former Nintendo R&D1, Nintendo R&D2, and Nintendo-Special Planning & Development. These are now blended with the Nintendo Entertainment Analysis & Development group and the EAD is also divided into several different sectors. The Nintendo Company decided to merge all its software designers in the EAD group behind the manager Shigeru Miyamoto. Nintendo Technology & Development is mixed of the hardware developers of the former Nintendo Research & Development 2 and Nintendo Research & Engineering. Nintendo Software Planning Development is a new division that has its main focus on the production of the first-party software. [23]

**GRAPHICS**

The graphic in this game has returned to its former style. Mario’s appearance is now more like a cartoon hero than the turning to the realistic side since the drawing lines of him and the characters in this game are more indistinct to get the feeling of a cartoon movie rather than a videogame. Even the game play in Paper Mario is more a game for children. The new style of Mario’s color on his overall is becoming to be standard. He has his blue overall and the red jacket and hat. Princess Peach and Mario’s brother Luigi have their own personal colors and clothes as always, only Mario changes color to a more notable style. This way of creating the characters in Super Mario is a consequence of where the game industries are going. There are more pixels to the animation of the game world and the characters in it. This is possible because the technique have brought us to use “Sprites”. The technique before this was a two dimension pixels sprites that is integrated on a larger scene. It was pictures that were decided how fast Mario could move with help of a counter to count the frames on every picture. In this game the characters is drawn with help on an animation cell that is wrapped around a polygon, this means a hand-drawn Mario image by an animator and is later manipulated by the game to make the character more detailed. The picture can be seen from different angles to get a picture of the whole figure from a 3D perspective and this haven’t been done
before since it only was in the second dimension before. The two dimensional picture is more a partially transparent picture that is now mapped onto a special plane in a three dimensional scene. This means that the character is transformed in the same world that the rest of the game. Before the sprites were mapped to a texture map, which means that it was only one picture in 2D. The different here is that the sprites in now on the sprite plane and is always at a 90 degree angle to the axis that is viewed from the camera so the picture will always be seen when he’s moving, the camera will follow him wherever he’s going. The picture can be rotated in two dimensional and overlap other objects and be occluded. [20.] With these changes to the graphic it requires more of the hardware; a processor with higher response for the data packages send between the game and the control, television and so on.
SUPER MARIO GALAXY

**Title:** Super Mario Galaxy  
**Console:** Nintendo Wii, Nunchuck  
**RELEASE DATE:** NOVEMBER 12TH 2007

**GAME DESCRIPTION**

Super Mario Galaxy was released in November 12 2007 and was sold in 766 000 copies [7.]. The TV resolution is in 50Hz or 60Hz and the game can be played in both EDTV and HDTV.

This Super Mario game takes it serious when talking about the different “worlds” that Mario has to travel to; since each world is a whole planet that Mario is running around on. Some of the planets Mario can enter and others he can't so it's still the same running around. For Mario to get around to other planets he can be dragged by using his magnetic weapon that, when pointed to a star some distance away, he'll be dragged to the star. Mario must then use the weapon on the next star closest to be dragged in space to a new planet. The second way to get to a new planet is to complete the challenge on the planet and defeat the boss, and then a big star appears that pushes Mario into a spin to the next planet in the story.

**STORYLINE**

When Mario’s never ending enemy: Bowser, capture Princess Peach and the whole Palace in space, Mario once again must save her and the world from Bowser’s evil plans. This time Mario has to follow them into space and other worlds to fight some new enemies. He discovers some new abilities, like transform to a bee and flies for a short period of time. Mario meets some new friends that help him to new planets.

The game play increases with help from the nunchuk that comes with the Wii console. It let the player shake, tilt and points the control to let Mario take advantage of the unique aspects of the Wii Remote. Mario's new abilities let him perform mind-bending, low gravity jumps across the globe of a planet.

**GAME FLOW**

- **Concentration:** In Super Mario galaxy, the player must have focus on the game when on a planet, since he can at all-time be attacked by enemies or crushed under rolling boulders. Some challenges are hard to finish without full concentration and must be replayed until the challenge is completed.
• **Challenge and skills:** The challenge is high in this game since Mario gets new abilities and some of them are hard to manage a control over. The skill required of the player is higher if the player wants to finish the game to 100%; to collect all the stars but this isn’t necessary for the story mode.

• **Control:** The player follows the main story but can use for himself the path to follow. The player has the choice to go to the planets he wants when he has enough stars demanding to unlock a planet. The player can unlock some planets when feeding a pink figure with “star bits” (artifact in the game) that will then be transformed into a new planet, but this is optional and isn’t a part of the story mode.

• **Clear goals:** The goal is clear from the beginning; Princess Peach is once again kidnapped by Bowser and Mario has to save her but this time in outer space and he also has to defeat Bowsers son that turns up in Super Mario for the first time.

• **Feedback:** There is still money to collect in Super Mario Galaxy while jumping on enemies and jumping on question mark-boxes. The new thing here is that Mario also can collect “star bits” that is precious stones falling of the sky or coming from killing enemies on other ways than jumping on them.

• **Involvement:** Since all the new design in the game and many new abilities, the player can forget about time when playing. It is fun and stimulating for the intellect to try to solve the problems Mario is encountering on the different worlds.

• **Social:** The Super Mario Galaxy can be played by 1-2 players, were one player plays Mario and do all the hard work while the other player can collect star bits and kill enemies by shooting star bits on them. It is a good teamwork were the player is soon to realize how much easier the game is when the player has one more player to help with the collecting while the player one concentrate on the tasks in the game.

**Hardware**

The requirements for Wii Virtual Console are: [24]

- Installed RAM: 512 MB
- Gaming Type(s): LAN Gaming
- HDD: 10000MB
- Ports: 4 x Game Controller Port

The RAM is higher here since the Wii console is demanding higher requirements to run the games. The DD is the Disc Device and is needed to save all the data the Wii console is producing. This game demands more of the DD to draw the scenes in the game.

**Software development**

In 2004 Nintendo had to corporate a restructuring, in which Nintendo Research & Development 1 and Nintendo Research & Development 2 were merged under the
Game Development from Nintendo 8-bit to Wii
A report of Super Mario Bros. 1985 to 2009

“Nintendo Entertainment Analysis Development” (EAD) banner. Nintendo EAD is itself split into five separate teams who work concurrently on different projects.

In 2005, the Nintendo’s worldwide companies have more than 3000 employees, which more than 850 are directly involved in game development.

In 2009 when Super Mario Galaxy was released, the Nintendo Entertainment System version of Mario Bros. has sold more than 1.63 million copies [7]. The number of employees is 3768 that is working at the company with every games made by Nintendo.

[26.]

GRAPHICS

Super Mario Galaxy came out 2007. The appearance of Mario’s character is reflecting the time of game makings of today. He is much more realistic than before, but still like a cartoon character. The cloths are the blue overall and red jacket and hat. The boots have become a more dark brown and Mario is even bigger this time. The planets are like globes, which Mario can run the whole way around without falling off due to the gravity of every planet. With this gravity it takes a higher requirement on the game programmers to have implemented a good physic engine to handle the forces that makes Mario stay, walk and jump on a planet and the enemies to do so as well. When Mario is being dragged some distance from the planet, he needs to be able to fly weightless in space and is getting forward only by the power of the magnetic weapon or other pushing objects.

The figure Mario is a model made in an animation program like Maya or 3DStudiomax. This means that a modeler do the characters in a program for management of 3D-graphic and animation. To do this figure the developer used meshes to model Mario from a 3D perspective. When a developer uses this kind of technique to make a character, he or she has more control over the details of the characters and can rotate the character in 360 degrades. A model of Mario can be seen from this link from YouTube: http://www.youtube.com/watch?v=06mbaUtV8p8
COMPARISON

In this section, the discussion will be of the similarities and differences between the Super Mario games. The section will have the same structure as the previous sections; beginning with the story, hardware, software development and finish with the graphic. In the end of this headline there is a summary that will bind together the parts that is discussed here.

STORY

The story gets more complex the newer the game is. The first game only has one goal; to hunt Bowser down to save the princess. To do this he thinks the princess is at the castle on every end of the world but she is a fake and is transforming into a bat. The second game “Super Mario Bros. 3”, the player has to save the princess that Bowser kidnapped. Mario doesn’t meet Bowser until the end of the game as the final boss, before this he has to defeat his underlings in every worlds end.

The changes from the beginning in 1985 are more advanced implementation like new paths, music, enemies and a more deepening story [27]. In this third game of Super Mario it is a change in the 2D graphic; the developers have some beginnings for a 3D graphic with the different level of the background. Mario can walk behind some objects now and the enemies can’t reach him. On some stages Mario has to use a hammer to get access to a hidden tunnel that takes him to the end of that world, or to get a secret “level up”. This hammer Mario could get access to by finish some stages in a world or by other special occasions.

The third Super Mario game, “Super Paper Mario”, has a lot different story than the ones before it. In this game Bowser is one of the good guys and is helping Mario to defeat an ever bigger enemy that is planning to conquer the world and put it to eternal darkness. To defeat this enemy the player have to defeat his underlings that he sends in Mario’s way when opening a door and collects a heart of light to vanquish the darkness. The fourth game “Super Mario Galaxy” is different from all the former games even though the goal is the same; to defeat Bowser that kidnapped the princess and her castle. But even though the goal is the same as the first two games the story is taking place on a different dimension; outer space. Mario gets help from new characters, like the stars to get him to new planets to help Mario forward in search for the princess.
The comparison is summarized in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Task</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Mario Bros.</td>
<td>Go through every world and defeat Bowser in every world.</td>
<td>Save Princess Peach and defeat the final Bowser.</td>
</tr>
<tr>
<td>Super Mario Bros 3</td>
<td>Travel through each world or jump 3 worlds forward with a flute to get to the last world.</td>
<td>Save Princess Peach on the last world and defeat Bowser.</td>
</tr>
<tr>
<td>Super Paper Mario</td>
<td>Collect hearts to open new doors and bring light to every world behind the doors.</td>
<td>Defeat the dark enemy and his underlings so the world isn't filled with darkness.</td>
</tr>
<tr>
<td>Super Mario Galaxy</td>
<td>Travel through space to collect star.</td>
<td>Defeat Bowser on a gigantic space ship.</td>
</tr>
</tbody>
</table>

Table 1: Summary of storyline comparison.

GAME FLOW

The game flow is built on different aspects of elements that builds up a game, these are: Concentration, challenge, skills, control, clear goals, feedback, involvement and social interaction.

The game flow consists of eight elements; [16]

1. A task that can be completed.
2. The ability to concentrate on the task.
3. That concentration is possible because the task has clear goals.
4. That concentration is possible because the task provides immediate feedback.
5. The ability to exercise a sense of control over actions.
6. A deep but effortless involvement that removes awareness of the frustrations of everyday life.
7. Concern for self disappears, but sense of self emerges stronger afterwards.
8. The sense of the duration of time is altered.

In consideration of these elements analyze is made of the games of Super Mario to examine the game flow and their similarity. The game flow follows a guideline of what the game should contain;
<table>
<thead>
<tr>
<th>Element</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concentration</strong></td>
<td>Games should require concentration and the player should be able to concentrate on the game.</td>
</tr>
<tr>
<td></td>
<td>- games should provide a lot of stimuli from different sources</td>
</tr>
<tr>
<td></td>
<td>- games must provide stimuli that are worth attending to</td>
</tr>
<tr>
<td></td>
<td>- games should quickly grab the players’ attention and maintain their focus throughout the game</td>
</tr>
<tr>
<td></td>
<td>- players shouldn’t be burdened with tasks that don’t feel important</td>
</tr>
<tr>
<td></td>
<td>- games should have a high workload, while still being appropriate for the players’ perceptual, cognitive, and memory limits</td>
</tr>
<tr>
<td></td>
<td>- players should not be distracted from tasks that they want or need to concentrate on</td>
</tr>
<tr>
<td><strong>Challenge</strong></td>
<td>Games should be sufficiently challenging and match the player’s skill level.</td>
</tr>
<tr>
<td></td>
<td>- challenges in games must match the players’ skill levels</td>
</tr>
<tr>
<td></td>
<td>- games should provide different levels of challenge for different players</td>
</tr>
<tr>
<td></td>
<td>- the level of challenge should increase as the player progresses through the game and increases their skill level</td>
</tr>
<tr>
<td></td>
<td>- games should provide new challenges at an appropriate pace</td>
</tr>
<tr>
<td><strong>Player Skills</strong></td>
<td>Games must support player skill development and mastery.</td>
</tr>
<tr>
<td></td>
<td>- players should be able to start playing the game without reading the manual</td>
</tr>
<tr>
<td></td>
<td>- learning the game should not be boring, but be part of the fun</td>
</tr>
<tr>
<td></td>
<td>- games should include online help so players don’t need to</td>
</tr>
</tbody>
</table>
exit the game
- players should be taught to play the game through tutorials or initial levels that feel like playing the game
- games should increase the players’ skills at an appropriate pace as they progress through the game
- players should be rewarded appropriately for their effort and skill development
- game interfaces and mechanics should be easy to learn and Use

<table>
<thead>
<tr>
<th>Control</th>
<th>- players should feel a sense of control over their characters or units and their movements and interactions in the game world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Players should feel a sense of control over their actions in the game</td>
<td>- players should feel a sense of control over the game interface and input devices</td>
</tr>
<tr>
<td></td>
<td>- players should feel a sense of control over the game shell (Starting, stopping, saving, etc.)</td>
</tr>
<tr>
<td></td>
<td>- players should not be able to make errors that are harmful to the game and should be supported in recovering from errors</td>
</tr>
<tr>
<td></td>
<td>- players should feel a sense of control and impact onto the game world (like their actions matter and they are shaping the game world)</td>
</tr>
<tr>
<td></td>
<td>- players should feel a sense of control over the actions that they take and the strategies that they use and that they are free to play the game the way that they want (not simply</td>
</tr>
</tbody>
</table>
| **Clear Goals** | - overriding goals should be clear and presented early  
- intermediate goals should be clear and presented at appropriate times |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Games should provide the player with clear goals at appropriate times</td>
<td></td>
</tr>
</tbody>
</table>
| **Feedback** | - players should receive feedback on progress toward their goals  
- players should receive immediate feedback on their actions  
- players should always know their status or score |
| Players must receive appropriate feedback at appropriate times |  |
| **Involvement** | - players should become less aware of their surroundings  
- players should become less self-aware and less worried about everyday life or self  
- players should experience an altered sense of time  
- players should feel emotionally involved in the game  
- players should feel viscerally involved in the game |
| Players should experience deep but effortless involvement in the game |  |
| **Social Interaction** | - games should support competition and cooperation between players  
- games should support social interaction between players (Chat, voice-chat, etc.)  
- games should support social communities inside and outside the game |
| Games should support and create opportunities for social interaction |  |
Super Mario Bros.
Ability for the player to concentrate on the task is in this game addictive. The game can't be saved and this forces the player to continue the game till the end or at least to have the game running non-stop.
When talking about the challenge of the game; these elements are combined because the challenges in the game must match the skills of the player. This must provide the player a reasonable level of problem solving.

The game consists of a clear goal to follow; Mario must pass through every world until he gets to the last world where the real Bowser is with the princess. The minor goals are to clear the level until Mario can move on to the next level. The feedback is basically the same in every Super Mario; Mario has to jump on question marks to get money and stomp on enemies or shoot them with fireballs to kill them. The money and score of enemy jumping is shown in the top of the screen so the player always gets feedback.

Super Mario Bros. 3
The inventory in this game helps the player to save items that can help him get through some hard played stages. Mario can transform into an animal with the help of items collected through the game. The goal is the same as before, with Mario saving princess Peach from Bowser at the end of world eight. Every world has its theme that the stages are built after, like the desert in world 2. The player can be involved in the game by choosing different paths in the worlds. There are more two- or three ways to choose from to reach the end boss of that world.

Super Paper Mario
The first stages of the game have a clear goal and the player always know where to head next. The stages are simple to clear and are played in 2D. When the player comes to the next stage in the game; the second door is opened, Mario gets a new friend with the ability to change the screen to 3D. When Mario is back on the main stage where there is a city and the doors to other worlds are located, he can now discover other mini-quest in the city when going to 3D. The things to discover grow larger with every friend with special ability that Mario gets.
The main goal is often clear but the challenge is that the player doesn’t always know where to go next. With the more friends Mario gets, the more challenge is it to discover new things in the city with the special abilities to move forward in the story. The game is only played by one player but it is a fun game to watch for other people.

Super Mario Galaxy
The player must be concentrated in the game when on planets other than the home planet. The game moves fast and if the player is standing still too long Mario could get hit by a passing enemy. The challenge of the game is to get to new planets. To do so the player must collect stars and move forward in the story to unlock more planets. The feedback is both rewards immediately and over time. The immediately rewards is coins and stars when stomping on an enemy or jumping on a question mark. The long term rewards is new friends with helping tips in the game or a new planet when feeding a pink star-figure. The game can be played by two but not as individual characters. One player is the main character and the other is helping out with collecting stars.
HARDWARE

The first game of Super Mario only needed 8KB memory to save all the data in the game when it started up. All the characters, story, design must already be up and running as a new game starts. This is the same as in the second game that is analyzed since it is a console with no Networking connections. In Super Paper Mario and Super Mario Galaxy the differences in the memory is considerable since there are different way of implementing the objects and worlds in the different games. There was only required 64 MB in Paper Mario since it is the memory needed to save the game at that point and to be able to start the game from the exact same point in the game story. In Super Mario Galaxy there are different worlds all the time with everything to be drawn to the scene, when Mario is on a planet he can see other planets in the horizon, this takes more memory to always have to draw the scene when Mario saves the game on a saving spot in the game; therefore there is required 128 MB memory from the hardware in this last game.

The memory in the console is the ordinary type of memory that the data is saved on. In Nintendo 8-bit the games couldn’t be saved therefore there isn’t so much memory required. The first game has 2KB memory for the uploading of the game at start. The second game, Super Mario Bros. 3 have 4 MB and the changes is that the second game is required more memory for all the hardware and sprites uploading. The games on the console Wii have its own memory card for the games to be saved on and are the size of 512MB.

The CPU on each game is different since it is the connection to the TV monitor that the console sends signals to. When the games have more information and data package to send between the game data and the TV to view the game there are needed more CPU to send this data fast. Therefore there are differences between the earlier games that only have 1,66MHz and 33MHz CPU, and the games in 2009 that have more data in their games and also to connect the console Wii and all its components to work properly on the TV screen. Super Paper Mario has 2000 MHz CPU and is dividing the memory for saving the game, the handheld nunchuck and all the features in the game. The last game Super Mario Galaxy has 2800MHz since the game is using models for the game world and the characters.

The Disc Device saves for every console, the games implemented objects and design. When a game starts, the saved components must be sent to be drawn on the scene. The first Super Mario Bros. only had one screen to be seen when starting up, and it was always the same scene since the game couldn’t be saved. This only demanded a little bit of memory (32KB) taken to write the scene. In the second game the player still can’t save the game but the first scene to be drawn have characters moving in the background and this takes more memory (25MB) to draw. The third game, Super Paper Mario can be
start up as a new game with one still scene or at the saving spot where all the character data must be loaded. The saving spot was the same world Mario always starts in that takes him to different worlds behind some doors. After a world behind a door is done, Mario is taken back to the original world and the game continues with new things to do. This system for saving and loading the game takes 6500MB memory from the game. In the last game, Super Mario Galaxy requires more memory (10 000MB) on the Disc device since the game starts with a saving point from the main planet after finishing the last planet that was played. This takes a lot of memory in this game since not only must the story played so far be loaded, but also the worlds around Mario and the components where he is needs to be drawn on the scene at start-up of the game. The camera in this game is in third person view and therefore there are more to be written in the game.

The Network for the first two games didn’t exist since at that time (1980-1990) the technique wasn’t that developed. The last two games is using a so called “LAN – Local Area Network” for the connection to internet. This could be used for loading saved data from another Wii console or to download new games through Wii on Internet.

Table 2, summary of the hardware comparison: [15.]

<table>
<thead>
<tr>
<th></th>
<th>VRAM</th>
<th>RAM</th>
<th>CPU</th>
<th>DD</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Mario Bros.</td>
<td>8KB</td>
<td>2KB</td>
<td>1,66 MHz</td>
<td>32 KB</td>
<td>None</td>
</tr>
<tr>
<td>Super Mario Bros 3</td>
<td>8KB</td>
<td>4MB</td>
<td>33 MHz</td>
<td>25MB</td>
<td>None</td>
</tr>
<tr>
<td>Super Paper Mario</td>
<td>64MB</td>
<td>512MB</td>
<td>2000MHz</td>
<td>6500MB</td>
<td>LAN (Local Analog Network)</td>
</tr>
<tr>
<td>Super Mario Galaxy</td>
<td>128MB</td>
<td>512MB</td>
<td>2800MHz</td>
<td>10000MB</td>
<td>LAN (Local Analog Network)</td>
</tr>
</tbody>
</table>

SOFTWARE DEVELOPMENT

The group diversions in every game have increased and decreased in the number of employees over time, in the first game of Super Mario Bros. there were only three groups called Nintendo Research & Development 1, 2, 3. These groups have their specific area to cover. The first group concentrated on the software design, the second group had
its focus on the hardware and also some of the software design but was a very small group and the third group was focused on technology with the console hardware design. These together created the first Super Mario Bros.

In the second game of Super Mario Bros. 3 that is analyzed, the groups have increased and the third group of Research & Development have renamed to "Nintendo Integrated Research & Development" (IRD). This group was now entirely focused on the hardware.

In the third game, Super Paper Mario, the groups became more divided in different sections. The former groups: Nintendo R&D1, Nintendo R&D2, and Nintendo-Special Planning & Development are now blended with the Nintendo Entertainment Analysis & Development group. These groups have their employers specialized on researches, software and hardware. The Nintendo Entertainment Analysis & Development (EAD) group now handles all the software developers under the lead of Shigeru Miyamoto the group became the most popular of all groups even today. This group developed the first Super Mario Bros. and is now the leading group in Nintendo Company. In Super Mario Galaxy, the groups aren’t changed from when the Super Paper Mario game was made and are still today divide up in these groups. The changes that are made are the number of employees that works in every group. Today the Nintendo Company have 3768 employees of which 850 is working in the game developing department. These numbers of persons is not working only on the Super Mario games, but of all the games the Nintendo Company has under development.

Table 3: Summary of software development comparison.

<table>
<thead>
<tr>
<th></th>
<th>Nr of persons</th>
<th>Departments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Mario Bros.</td>
<td>100</td>
<td>Research &amp; Development 1, 2, 3, (R&amp;D 1), (R&amp;D2), (R&amp;D3).</td>
</tr>
<tr>
<td>Super Mario Bros 3</td>
<td>200</td>
<td>Research &amp; Development 1, Research &amp; Development 2, Integrated Research &amp; Development (IRD),</td>
</tr>
<tr>
<td>Super Paper Mario</td>
<td>3000, 850 persons of them was working in game development.</td>
<td>Integrated Research &amp; Development (IRD), Technology &amp; Development (T&amp;D), Software Planning Development (SPD),</td>
</tr>
<tr>
<td>Nr of persons</td>
<td>Departments</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entertainment Analysis &amp; Development(EAD), Licensing Business(LB)</td>
<td></td>
</tr>
<tr>
<td>Super Mario Galaxy</td>
<td>3768 total and 850 persons of them in game development in the Nintendo Company.</td>
<td>Integrated Research &amp; Development (IRD), Technology &amp; Development(T&amp;D), Software Planning Development(SPD), Entertainment Analysis &amp; Development(EAD), Licensing Business(LB)</td>
</tr>
</tbody>
</table>

**GRAPHICS**

The differences in the design of the characters in Super Mario Bros. games are the use of Sprites but mapped in different planes. The first two games are mapped in a texture plane and can therefore only be viewed in the same angle all the time. The only differences here are the use of sprites, in the first game there are only three pictures in use to make Mario running but in the game Super Mario Bros. 3 there are more sprites to make it more detail in Mario’s running style. The third game Super Paper Mario is also using sprites to make the characters appearance look more of textures. The sprites are mapped in the sprite plane with is a difference to the other two beforehand, this makes the possibilities to make the objects overlap each other and makes the scene more realistic and a better transition between the pictures. In the last game Super Mario Galaxy the sprite is all gone and instead the use of models is taking their place. The models make it possible to rotate Mario in all angles and to scale him; Mario still have the same proportions for his body. This is totally different from the three former games of Super Mario, because the scenes in Super Mario Galaxy are shown all the time in the background. When Mario is on a planet, he is shown in every angle wherever he is turning to face from the camera and in the background there are models of the galaxies in the horizon that Mario get has to get to.
Table 4: Summary of graphic comparison.

<table>
<thead>
<tr>
<th></th>
<th>Expression</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Mario Bros.</td>
<td>Red overall and hat, orange skin color and green hair and shirt.</td>
<td>Sprites mapping in a texture plane</td>
</tr>
<tr>
<td>Super Mario Bros 3</td>
<td>Black shirt, red overall, hat and shoes and beige skin color.</td>
<td>Sprites mapping in a texture plane</td>
</tr>
<tr>
<td>Super Paper Mario</td>
<td>Blue overall, brown hair, mustache, eyebrows and shoes, white gloves, the mark “M” on the hat and beige skin color.</td>
<td>Sprites mapping in a sprite plane</td>
</tr>
<tr>
<td>Super Mario Galaxy</td>
<td>Blue overall, brown hair, mustache, eyebrows and shoes, white gloves, the mark “M” on the hat, blue eyes and beige skin color.</td>
<td>3D modeling on 3DStudiomax</td>
</tr>
</tbody>
</table>

**SUMMARY**

In the diagrams below I have made a summary of the hardware and the employees of the four games. To better see the differences I have separated the summary of the first two games Super Mario Bros. and Super Mario Bros. 3 from Super Paper Mario and Super Mario Galaxy. The reason that I chose this separation is because the games for the Nintendo 8-bit is so small values in the hardware that in comparison to the games for the Wii console, these values is hardly noticeable.
Diagram 1: Summary of RAM and VRAM of Super Mario Bros. and Super Mario Bros. 3

In the hardware there are some differences between the first Super Mario Bros. and Super Mario Bros. 3. It is the same device they are using, Nintendo 8-bit, so the VRAM is the same for both games but the other aspects in the hardware are in some cases the double in Super Mario Bros. 3 than the first game since of the higher techniques that are used to draw everything on the scene and the memory is double in RAM because the game Super Mario Bros. 3 contains more objects and scenes than the game before it.
Between those first two games and the two next games, there are big differences. RAM, Random Access Memory, make some huge changes as game developing became more popular and the public required more of the game developers.

The VRAM and RAM are higher in both Super Paper Mario and Super Mario Galaxy since these are games played on the Wii console. This requires more memory not only for the games Super Mario but also to save the data for every game played in the console Wii. The changes however for the games Super Paper Mario and Super Mario Galaxy is different in memory since the way of implementing objects and the model of the characters in Super Mario Galaxy instead of Sprites is taking more memory to render and be saved on the hard disc.
Diagram 3: Summary of CPU and Disc Device for Super Mario Bros. and Super Mario Bros. 3

The differences between these games are high here since in the Super Mario Bros. 3 there are more objects and scenes to be rendered in every new stage in the worlds. The story is more complex with mini-games to collect items that are saved in an inventory.

The memory in the games is used to render the scenes in an acceptable CPU speed for the game not to be too slow, as could be the case with so much information to be read by the console with the higher requirements on the hardware for Super Mario Bros. 3.
Diagram 4: Information about the CPU and Disc Device for Super Paper Mario and Super Mario Galaxy.

CPU, Central Process Unit, must escalate with everything else for the system to work properly without any deletion or package loss since that could cause the system to crash. CPU has the need for a higher frequency to have the connection to the Network online and to play the games with more implementations programmed in the game devices.

DD, Disc Device, is the memory on the disc that the game is demanding. This changes as the games became more crowded with algorithms for the physics, weather changes, Level-of-detail and more detail in the design. The more implementations of new stuffs, the higher were the requirement of the DD to handle the increasing memory.

Some of the games are saved on the hard disc device and others have their saved data in the DD that is an extended disc device for Wii, called "Memory card".
The persons needed for every game is the number of people in a project to develop a game in progress. In the software development the persons working on a game company has expanded between 1985 and 2009 since the games became more detailed and that required more experts in the subject from different departments. The more in-level details the game contained, the more people and departments was included in the game. At the first games of Super Mario there was only need of a group of people under 200.

The Game Flow in the games has changed depending on what time the game was developed. The original of Super Mario is the same of the characters participating in the games. The story changes for the game but not the main purposes for the Super Mario Games; hero story – a hero saves a princess that’s been kidnapped.
In the graphics there aren’t big changes to the clothes Mario are wearing. The enemies are changing and get more detailed since the pixel is used for every frame. In Super Paper Mario and Super Mario Galaxy there are more algorithms and methods to make the characters in Super Mario more realistic than in the first two games that is analyzed.
DISCUSSION

In the Super Mario Bros. series it is easy to detect the changes made in each game. They all have the main purpose goal “Hero-story” to save the Princess Peach and the magic Mushroom Kingdom from Bowser except Super Paper Mario, where Bowser is on Mario’s side but with a new enemy to defeat. Every game also has the same character like the first Super Mario Bros. for Nintendo 8-bit had; Mario, Luigi, Princess Peach and Bowser.

The Super Mario team-developers always keep constant track of time and development of new features of requirements.

We see the first Super Mario Bros. as 2D game with a simple storyline and small requirements in the hardware and for that time it was a good game. The first Super Mario bros. game is still a game to be played today. It is still the most popular game in all times. The old games are played for their simplicity and a sense of recognition in the characters. The games today could have too many high requirements and too many high tech details that it makes us want to go back a few years to old style. The Nintendo Co. Company continues to develop games in the Super Mario Bros. series, the games Super Paper Mario and Super Mario Galaxy is a good example of that. It has the new features of super power and more complicated storyline but still is too focused on the younger generation when it could have more adult public too. Super Mario fans have grown up with the games and therefore the games of Super Mario today should develop in a more adult way. Otherwise the risk is to lose that audience, and to the younger generation Super Mario is just a game like everybody else of the many different games that exist today.

When the first Super Mario Bros. was released to Nintendo 8-bit it was a success and a revolution to the game industry. The graphic for that time was well made and there was an exciting story. By time when the game industry grow bigger and the requirements for new game console grew higher, so did also the graphic and story for Super Mario. It came out new games with the character Mario and his brother in the year of 1991; Nintendo released a new Mario game to the Nintendo Entertainment System, Super Mario 3 to the console Nintendo 8-bit, which came to be the bestselling videogame in all time. [9.]. More companies started to put more time and money in the making of games; they all realized that this was the next generation of making money. On Wii the player can download old Nintendo 8-bit games, like Super Mario Bros. and play it with the new graphic the console supply.

In the years of 1990 till 2007 there were a lot of new games of Super Mario that was released to different console of Nintendo Company. Some of them became very popular and sold more copies than others; like Super Mario Sunshine that was released 2001 to
the Game Cube console or Super Mario Kart where up to four players can ride around in cars to pop other players' balloons.

Many Super Mario games has been released between Super Mario Bros. 3 1990 till Super Paper Mario 2007. These have been released to other consoles than Nintendo 8-bit and Wii; these are Nintendo Gameboy, Nintendo Ds, Nintendo 64-bit, and more.

Here is a list of some of the games that was released by Nintendo in the years of 1990 to 2007:

<table>
<thead>
<tr>
<th>Game Name</th>
<th>Year</th>
<th>Console</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Mario World</td>
<td>1990</td>
<td>Super Nintendo</td>
</tr>
<tr>
<td>Super Mario Allstars</td>
<td>1994</td>
<td>Super Nintendo</td>
</tr>
<tr>
<td>Super Mario 64</td>
<td>1996</td>
<td>Nintendo 64</td>
</tr>
<tr>
<td>Super Mario Kart</td>
<td>1992</td>
<td>Nintendo 64</td>
</tr>
<tr>
<td>Super Mario Sunshine</td>
<td>2001</td>
<td>Game Cube</td>
</tr>
<tr>
<td>Super Smash Bros. Melee</td>
<td>2001</td>
<td>Game Cube</td>
</tr>
<tr>
<td>New Super Mario Bros</td>
<td>2006</td>
<td>Ds</td>
</tr>
</tbody>
</table>

The console Super Nintendo was released in 1990 after Nintendo 8-bit. There were many Super Mario games that were released to this console. Super Mario World and Super Mario All-stars were two games that became popular and sold in many copies. Super Mario World was sold for 20.60 million copies when counting from 1990 till 2001. Super Mario 64 was sold for 11.62 million copies. [38] These games became popular in the times they were made but no one of them could compare to the classics. The games were of different levels of new features and new story or no story at all, such as Super Mario Kart. This game could be played by four players at the same time and the characters of Super Mario where riding around in cars with three balloons on their backs. The point in this game where to pop the other players’ balloons with help of different weapons the car could pick up.

![Figure 4: Super Mario Kart](image-url)
In today time, the new video games is developed faster from different game companies that they sometimes have "bugs", programming misses, in the game. When we see all the new games and higher requirements, people may want to go back to the first games for Nintendo 8-bit which was simpler developed than of the games in 2009. Super Paper Mario was an answer to that protest. In the game we could go back to 2D design and also have 3D graphic. The console Wii has the requirements necessary to make such a mix-up with two types of graphics. This is one of the biggest changes in the Super Mario history. Even if Super Paper Mario was a new story and a new evil boss, it was still related to the old fashion 2D graphic. This became popular and guides how to progress in developing games in a new way.

After the big release of Super Paper Mario on Wii; Super Mario Galaxy made its entry on Wii in 2007. This game got even higher publicity than the first Super Mario did on Wii. This game has a new different story, same background story as always with Super Mario saving the Mushroom Kingdom and the Princess Peach from Bowser, only this time Super Mario gets some new friends that help him into space to chase after Bowser.

The appearance of Mario’s has turned from red to blue of his overall. The connections between the first Super Mario game and Super Mario Galaxy the same powers is presented; Mario still jumps on enemies to collect coins or when collecting powers, Mario get access to a flower in the first game to shoot flames at enemies and in the Galaxy-game he can collect a bee costume to be able to fly for an short amount of time.

As the development of the games change as do the game flow. The changes of game flow is of a more complex significance, since the first Super Mario game was developed in 1985, the game flow wasn’t at that rate considerate important in the same level as of today. Over time the games of Super Mario is following a model of game flow to have a red thread for the player to want to play more of games. It is a way for the Nintendo Company to sell more of their games. The game flow of the Super Mario games never change from the main story of the hero Mario saving the princess peach and in the later games even has to save the whole planet/world with Peach as a playing character. It is the game flow that has made the Super Mario games classical and more popular after every game that has been released.

Everyone that has once played a videogame knows that games are interactive. Because of that they must challenge and reward when the player rise to the challenge, in all the Super Mario games the player can always get money from stomping on enemies or blocks with a question mark, ?, on it. This is a way to keep the standards of what makes the games to Super Mario games. Maybe the game companies can do even better with the old story of Super Mario but with the new graphics and new features to connect the past classics with the future hardware.
CONCLUSION

“Programmers want you to experience the world and Game Designers wants you to be there.” (Erik Bethke, page 7 [1.]).

The Super Mario series is one of the most popular and enduring series of all time. Every generation of new console has its own Super Mario game connected to it, like the already successful games: *Super Mario Bros.*, *Super Mario Bros. 3*, *Super Paper Mario* and *Super Mario Galaxy*; these are well known games for all game enthusiasts. *Super Mario Bros.* is still played on the NES or at least on the new console like Wii that have the ability to download old NES games. The style in Super Mario Bros. is still used, and continues to be very popular around the world. These game series never gets old and the first Super Mario game that came to Nintendo 8-bit will always be one of the founder for video game for all time.

The game development for the first Super Mario Bros on the console Nintendo 8-bit 1985 became a success and therefore Super Mario became a classic game to be reconstructed years after it first came out. With the first game Super Mario Bros. it was all about the hardware that made the game so play-friendly. It was easy to control the Mario-character and it was new that a character could jump, run and fly in videogames. The design of the game wasn’t any complex implementation. It was in rough pixel display in 2D and couldn’t be played over the Network since internet weren’t used for games then. In 2009 the Super Mario games to the console Wii uses internet for downloading new games. The game designers for the Mario games to Wii make the world in the game more detailed.

The games biggest change for Super Mario is when the arcade games started to be developed in 3D graphic and no longer in 2D. In the following Super Mario games we see a slightly difference in the chances that the games made, it became more obvious what the audience wanted; With the games *Super Paper Mario* and *Super Mario Galaxy* it has a very detailed design and more different colors to the game world. This started to make higher expectations for future development. This made the disc storage increase since there was no room for the growing change that developing game involves. The games was played on consoles that was ten times faster than before and this made some changes in the development and also the number of people that made the games. In overall the series of Super Mario Bros. has always been the same as the first basic game to Nintendo. We see the same characters with the color of the cloths change; it’s the same things Mario must do to grow bigger by eating a mushroom that runs by. To kill enemies, Mario or Luigi does the same jumping on them or shooting them by fireballs.
that they collected from a fire flower or be invincible for an amount of time by a jumping star.

The changes in number of developers to make the Super Mario games in 1985 and 2009 are the growing size of the Nintendo Company and the different sections to develop games in Nintendo. The changes to make games today in the Nintendo Company is that the sections have increased and is more detailed specialized in every area of creating games, it results in more people working for the company.

Overall the first game to Nintendo 8-bit had the inside as priority, but over time the inside of the game seem to fade to second place in priority. It was when the graphic changed from 2D to 3D that the videogames changes to a more outside perspective, the gameplay and the graphic became more detailed. Today the games aren't considered improved if they don't have a good design on the character and the game world but never the less it is also important to have cool features in the software; the player want to shoot a flaming flower and see it wander across the screen to its goal and kill that enemy that stands in the Mario's way to victory.

The game flow of the games follows the “hero story” where Mario saves princess Peach against an enemy. In the four games in this report the game flow is of this story and how to make the player want to play more even if it is the same story. Some of the other games of Super Mario have different purposes, like popping balloons of other players’ cars. The instant rewards is to collect money or items that transform Mario or make him big to help the player with different enemies or to just make the game more fun to play. Some games have a two player feature but overall Super Mario is a social game for people other than the player to watch the game is played.

What we learned in this report is that everything must change so that the new things can have a place in history and so must the Super Mario games, to keep up with the demands from the players. The first Super Mario games are classical but if they were developed today as new games, they wouldn’t stand a chance against the more complex games of today. We can only learn what made the games so good and how to use the information to make new games that will sell in millions and be new classics.
AFTERWORD

After the report was finished, a new game from Nintendo Company was released. This game is named "New Super Mario Bros." and was released to the game console Wii. The interesting part of this game is that it concludes everything this report is built on, with the view of the old games to create new games. In New Super Mario Bros. we return to the first Super Mario Bros. to the console Nintendo 8-bit, and have a nostalgic trip to the classical game. The stages and worlds in this new game reminds of the old games but with some changes; it has the new designing technology and the stages is a bit different from the old game but with the same theme as Super Mario Bros. 3 in every world. This makes the game new and creative and still has the old classical Mario in it to be more attractive to the older audience that grew up with Nintendo 8-bit. For the newer audience, the game is creative with the features of game development today. The game also makes it possible to play up to four players at the same time. First we have Mario as main character, Luigi as second player and then there is two toadstool in blue and yellow for the rest of the players.

The conclusion to this new game: New Super Mario bros., confirm that all the things discussed in the report can be relevant to game companies which was with the purpose of this report.
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The Technique for Arcade Games in Time


Books

The Technique for Arcade Games in Time

DICTIONARY

**RAM – RANDOM ACCESS MEMORY**
The RAM is needed for the game to be updated when new images comes in the screen of the camera. This makes sure that the data get the entire package that is being transferred.

**VRAM – VIRTUAL RAM**
The VRAM is the memory in the device that games can be saved, to be able to play from the last saved point in the game.

**CPU – CENTRAL PROCESS UNIT**
The CPU must escalate with everything else for the system to work properly without any deletion or package loss since that could cause the system to crash.

**DD – DISC DEVICE**
The DD is the memory on the disc the games are saved on and it changes as the games became more crowded with algorithms for the physics, weather changes, level-of-detail and more details in the design. The more implementations of new stuffs, the higher the requirements of the DD are.