2005

Video games: Changing the way we think of home entertainment

Eri Shulga

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Video Games: Changing The Way We Think About Home Entertainment

by

Eri Shulga

Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Information Technology

Rochester Institute of Technology

B. Thomas Golisano College
of
Computing and Information Sciences

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Video Games: Changing the Way We Think Of Home Entertainment

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF CONTENTS</td>
<td>2</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>4</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>6</td>
</tr>
<tr>
<td>STATEMENT OF PROBLEMS</td>
<td>6</td>
</tr>
<tr>
<td>ISSUES TO OVERCOME</td>
<td>6</td>
</tr>
<tr>
<td>HISTORY OF VIDEO GAMES</td>
<td>8</td>
</tr>
<tr>
<td>VIDEO GAME MEDIA</td>
<td>8</td>
</tr>
<tr>
<td>VIDEO GAME GENRES</td>
<td>9</td>
</tr>
<tr>
<td>Genre</td>
<td>9</td>
</tr>
<tr>
<td>Definition</td>
<td>9</td>
</tr>
<tr>
<td>Example</td>
<td>9</td>
</tr>
<tr>
<td>INDUSTRY PLAYERS</td>
<td>10</td>
</tr>
<tr>
<td>Atari</td>
<td>10</td>
</tr>
<tr>
<td>Nintendo</td>
<td>10</td>
</tr>
<tr>
<td>Sega</td>
<td>10</td>
</tr>
<tr>
<td>Microsoft</td>
<td>10</td>
</tr>
<tr>
<td>Sony</td>
<td>11</td>
</tr>
<tr>
<td>Timeline</td>
<td>11</td>
</tr>
<tr>
<td>Arcade</td>
<td>11</td>
</tr>
<tr>
<td>Console</td>
<td>12</td>
</tr>
<tr>
<td>Home Computer</td>
<td>13</td>
</tr>
<tr>
<td>Popular Games</td>
<td>13</td>
</tr>
<tr>
<td>CURRENT INNOVATIONS</td>
<td>14</td>
</tr>
<tr>
<td>COUNTRY DEPENDENT ADAPTATION</td>
<td>17</td>
</tr>
<tr>
<td>United States</td>
<td>17</td>
</tr>
<tr>
<td>BREAKDOWN BY GENDER AND AGE</td>
<td>18</td>
</tr>
<tr>
<td>BREAKDOWN BY ANNUAL INCOME</td>
<td>20</td>
</tr>
<tr>
<td>Japan</td>
<td>20</td>
</tr>
<tr>
<td>Europe</td>
<td>22</td>
</tr>
<tr>
<td>SOCIAL ISSUES</td>
<td>24</td>
</tr>
<tr>
<td>PRESENTED ARGUMENTS</td>
<td>24</td>
</tr>
<tr>
<td>LOSS OF PERSONAL RELATIONSHIPS</td>
<td>24</td>
</tr>
<tr>
<td>VIOLENCE</td>
<td>25</td>
</tr>
<tr>
<td>OPPOSING SIDE</td>
<td>26</td>
</tr>
<tr>
<td>THE REAL CAUSE</td>
<td>28</td>
</tr>
<tr>
<td>GENDER DIFFERENCES</td>
<td>29</td>
</tr>
<tr>
<td>NATURE OF VIDEO GAMES</td>
<td>29</td>
</tr>
<tr>
<td>GAME DESIGN</td>
<td>30</td>
</tr>
<tr>
<td>DIFFERENCES IN PERCEPTION (GENDER PREFERENCES)</td>
<td>32</td>
</tr>
<tr>
<td>PROPOSED SOLUTIONS</td>
<td>34</td>
</tr>
<tr>
<td>PC VS. CONSOLE GAMING</td>
<td>37</td>
</tr>
<tr>
<td>DIFFERENT TYPES OF CONTROLLERS</td>
<td>38</td>
</tr>
<tr>
<td>OVERALL INTERFACE DESIGN</td>
<td>39</td>
</tr>
<tr>
<td>CHARACTER MOVEMENT</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# WHAT MAKES VIDEO GAMES PLAYABLE

- Character Development .......................................................... 44
- Game Speed ............................................................................. 44
- Game Music ............................................................................ 45
- Storytelling ............................................................................ 45
- Keys to a Successfully Designed Game
  - Player Empathy ................................................................. 45
  - Feedback ............................................................................. 46
  - Grounding the Player .......................................................... 46
  - Moment to Moment Experience .......................................... 46
  - Immersion ........................................................................... 46
  - Writing ................................................................................ 47
  - Design Within Limits ......................................................... 47
  - Interface Design .................................................................. 47
  - Testing ................................................................................ 47
  - Design Suggestions ........................................................... 48

# FUTURE APPLICATIONS OF VIDEO GAMES

- Education ................................................................................ 49
- Health ..................................................................................... 49
- Exercise .................................................................................. 50
- Communications ..................................................................... 50

# DESIGNING GAMES FOR FAMILIES

- Research ................................................................................ 52
- Usability Testing ...................................................................... 52
- Playability Testing ................................................................ 53

# CONCLUSION

- What Needs to Be Done ........................................................ 55
- Time Estimates ....................................................................... 57

# WORKS CITED

- Appendix A: Console Based Video Gaming Systems ............ 65
- Appendix B: Three Different Types of Controllers ............. 66
- Appendix B: Three Different Types of Controllers ............. 66
- Appendix C: Difference in Graphics Between 1970s and 1990s 67
- Appendix D: Ancestors of Video Games ......................... 68
In this paper the various aspects of video games in modern day households will be discussed. According to marketing trends, video games will be extremely influential in the future of home entertainment, however not all gaming companies are able to understand the importance of this growing trend deep enough to make an effort in producing family-oriented\(^1\) video games [43, par. 2]. The need for more varied video games will be discussed in this paper and examples of successful family games will be used to solidify research conclusions.

There are issues that are clearly holding the video gaming industry back from developing further faster. Among these are the inequalities in game design itself in terms of gender. Even though there are some games targeting females specifically, there are still not enough female-oriented games on the market in order to satisfy the growing demand. In order to determine the right path for video game designers to correctly satisfy the void in the market, materials on gender issues will be reviewed closely in this paper and suggestions on improvements will be provided.

There are other issues that prevent video games from being fully accepted into everyday culture. The biggest one is the belief that violent video games lead to violent behavior in children. This argument will be examined from both sides of the issue and appropriate suggestions for game makers will be provided.

If video games shall become the center of home entertainment, they will achieve better results if they are family-oriented vs. traditional, male oriented, games. The above could be accomplished by developing games that could be enjoyed by the whole family. Examples and suggestions will be given on how to do that, including marketing research and various usability techniques that could aid in better understanding and design of video games.

Among other issues, the one of access (can users get the games?) and availability (are games available to users?) will be discussed. The reasons that prevent people from acquiring certain consoles range between the poor quality of games to the lack of broadband in some areas. These and other roadblocks will be discussed and the appropriate suggestions will be presented in order to fix the situation.

Even though the world of video games is largely divided between computer (PC) games and console games, this paper will primarily focus on consoles. It will also illustrate various

\(^1\) Games that can be played by all members of the family, young and old, with different levels of game mastery, different tastes, and preferences. This would be straying away from traditional male dominated industry.
theories that support the notion of console games being the center of home entertainment as opposed to computer games.

Overall, this paper will supply answers to some questions about video games but will also provide various suggestions on what needs to be implemented in order for video games to become more accepted worldwide.
Every generation has its own mascot, if you will, represented by one of the most influential things that has happened to it. Just like the baby-boomers are the generation of the television set, the new Generation X\(^2\) is the generation of the video game. It seems that the 2000s will be remembered, among other things, for the development and rapid expansion of the video game market [58, p.68].

Over the years, the video game industry, in terms of video game sales, has been on a roller coaster constantly going up and down and multiple times coming close to extinction [36, p. 240]. However, it has picked up after every fall and progressed to be a huge presence in our homes. Whether it be new innovations or growing demand for a new type of entertainment, video games have become very important to many various people within the industry and beyond. From video game designers, to video game manufacturers, to the players that get to utilize these games, new jobs were created and new needs were fulfilled. Even though video games are pretty popular now, they will inevitably become a part of everyday life in the future due to the continuous growth of the industry [36, p.590].

The point that will be emphasized in this paper is that console-based video games will become the primary source of family entertainment in the future. There are, however, problems still at hand that would have to be worked out in order for the statement above to become a reality. These issues need to be correctly identified and appropriate solutions have to be implemented in order for the required predictions to come to life.

Among the main issues is the one of gender and its inequalities in terms of representation in video games. This paper will present evidence showing that avid female gamers require games designed specifically towards them and that currently almost none of the companies are designing these types of games.

### Issues to Overcome

Since this paper will defend the progress of console-based games, it is only natural to discuss their main competition – computer or PC based video games. Besides there being an apparent difference in hardware between the two, the quality of the console games produced leaves a lot of gamers yearning for more [39, par. 6]. Overall, in the past, PC based games were

\(^2\) According to Wikipedia, refers to people who were born between 1960 and 1970. Also considers people who’s teen years were during 1980s <Source: http://en.wikipedia.org/wiki/Generation_X>. 
considered superior to console games based on the superior graphics and controller types, which allowed for more prolonged and engaging game-play. However, with the advancements of technology and constant improvements of the console systems, this hardware and software quality gap might be slowly diminishing after all [23, par. 2].

Since the beginning of the video game industry, the majority of the games have been male oriented. It's easy for male designers\(^3\) to create games for males, because they know that aggression and violence is what boys want and that by following this simple rule, the company will make money from it [30, p.174]. Due to this ongoing cycle, females were often overlooked as design targets and being a big part of the gaming market. Nowadays, this has to change if companies want to make more money because females are, now more than ever, the driving forces behind video game purchases.

A fast emerging market share of the video gaming market seems to belong to females and families. More parents are spending time playing video games with their children, whether the children are young or teenagers [74, par. 4]. It appears that video games have the necessary qualities to bring different family members together as described further in the paper. Therefore, if companies want to get a piece of this growing market, they have to understand that designing games just for adolescent boys won't work for everybody in the family.

Another issue preventing consoles from being popularized even more is availability of some additional services required for a full gaming experience. In terms of hardware restrictions, the new online gaming movement might be decreased or slowed down because not that many people have broadband internet access. This particularly applies to lower income people who cannot afford broadband and many Europeans who cannot get broadband due to old infrastructure limitations [44, par.4] and poor service [46, par. 1].

It is important to understand that these changes to the video gaming market and its users will require the production of a completely new generation of video games. These games will have to be aimed at families, they have to have interfaces that are easy to learn and understand for people of various ages, and they will have to have enough depth to interest people within the whole family. This process will require lots of research, including various usability testing of games on the future target markets.

\(^3\) Historically, there has been a dominance of male designers in the industry. See Game Design section for more information.
The predecessors of modern video games were various novelty games, especially Bagatelle and Pinball (see Appendix D) [36, p.11]. During the 1960s, these types of games became very popular and the general public became interested in non-traditional entertainment. In fact, Pinball became so popular, that the mayor of New York City Fiorello LaGuardia took out a grudge on pinball machines in the late 1930s. He went to court, arguing that coin-operated Pinball machines were an extension of gambling. After six years in court, he won and by using his powers he took out all the Pinball machines and donated the metal parts to the war efforts against Nazi Germany [36, p.5]. This Pinball prohibition lasted for almost 35 years.

This was only the start of resistance that video games have received over the years. In fact, working in a video game industry was not considered as respectable as it is today. Only after the creation of Electronic Arts (EA), a video game company that valued designers, video game designers became more respected as professionals [36, p.203]. After years of innovations and developments, we can see the tremendous improvements in the games from the design and navigation techniques to the graphics and the overall look and feel (see Appendix C). It is also important to understand that video games, as an industry, went through many stages of various mediums, before it became what we know it as now—primarily a personal computer (PC) and console based entertainment.

Video games did not originally start as a console-based entertainment. There are four basic types of media: arcade, hand-held, console, and computer. Arcade video games are usually big in size and have a limited set of controllers. Because they are bulky, they are usually found in various public places from bars to gaming arcades. On the other hand, there are hand-held games that started out to be very primitive and ended up like Nintendo GameBoy and Sega Genesis. Console games were also quite simple when they first came out and gradually became more sophisticated and now even include storage options and networking capabilities. Last, but not least, there are computer games that came about with the invention of personal computers.

There is also a distinction in names of games, based on the medium they are played on. This refers to the difference between video games and computer games. Video games are played on a gaming console that is usually attached to a television set. Computer games, on the other hand, are played on a personal computer. Video games require a purchase of a disk or a cartridge, containing a particular game, which is inserted into a gaming console and used to play the game. While computer games also require a purchase of a disk(s) with a video game on it,
additional installation of the game to your PC is necessary in order to play the game. There are also arcade games that are played on big machines usually in arcades, at fairs, or gaming parlors. Due to the specific topic of this thesis being the infiltration of video games into the household, the main focus will remain on the video and computer games.

**Video Game Genres**

Besides the different media, there are also several general genres of video games. Each of them has its own strengths and weaknesses and is usually preferred by different types of people, based on their age and interests [19, p. 3]. Table 1 lists more detailed definitions and explanation of each genre. These are important to understand in order to follow other sections of this paper.

<table>
<thead>
<tr>
<th>Genre</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Games</td>
<td>Constant action involving shooting, flying, driving, etc.</td>
<td>Max Payne, Spy Hunter</td>
</tr>
<tr>
<td>Adventure Games</td>
<td>Usually consist of quests with various puzzles along with the journey.</td>
<td>Myst, Schizm</td>
</tr>
<tr>
<td>Casual Games</td>
<td>These include card, board, and game show games</td>
<td>Chessmaster 9000, Reel Deal Poker Challenge</td>
</tr>
<tr>
<td>Educational Games</td>
<td>Used to teach or emphasize the learning of a certain concept.</td>
<td>Blue’s Clues Learning Time, Shrek Gameland Activity Center</td>
</tr>
<tr>
<td>Role-Playing Games (RPGs)</td>
<td>Usually multi-player games, where individuals take on an avatar form to explore the virtual terrain, find treasures, and fight various monsters.</td>
<td>Dark Age of Camelot, EverQuest</td>
</tr>
<tr>
<td>Simulation Games</td>
<td>Let users experience real situations from the comfort of their home. Similar games are used to train soldiers for combat.</td>
<td>Flight Simulator, Rowan’s Battle of Britain</td>
</tr>
<tr>
<td>Sport Games</td>
<td>These games mimic the real-life sports. They let you be the player on the field.</td>
<td>NBA Street, Madden NFL</td>
</tr>
<tr>
<td>Strategy Games</td>
<td>These games require a player to think and plan ahead in order to win.</td>
<td>Black &amp; White, Civilization 3</td>
</tr>
<tr>
<td>Other (Puzzles and Toys)</td>
<td>Puzzle games let you solve a puzzle. Toy games let you build and control various contraptions.</td>
<td>Bejeweled, Ultimate Ride</td>
</tr>
</tbody>
</table>

It also seems that some genres are not only different in their definitions and content but are also more popular than the others. For example, Action genre games have sold more quantities than those of sports or racing. In fact, action games dominate the market as could be seen from Figure 1.

![Figure 1: Popularity of Video Game Genres](source: [80])
Even though there were many companies that produced games and various gaming systems, only a few of them have passed the test of time. These successful companies are described below in detail in order to fully understand the history of video game development.

**Atari**

Atari\(^4\) was started in 1972 by Nolan Bushnell, Ted Dabney, and Larry Bryan [36, p.38]. The company atmosphere was very laid back and due to low start up capital, many of the workers were taken from the streets, without any formal education. Drug abuse was prevalent while management enjoyed themselves during frequent company parties and named various projects after attractive female employees. Nevertheless, through continuous struggle and a couple of sell offs and trades, Atari is known for making the first home gaming console system and games that were very popular at the time and remain important points in history. Atari also produced a game called “Adventure” which was the first game ever to feature an “Easter egg”\(^5\) in it.

**Nintendo**

Nintendo was originally started in Japan, however it wanted to have an American presence, so it strategically placed a representative in California. The first US office was opened in 1980 [36, p.155]. After a while, that idea did not work out and years later Nintendo chose to switch markets from west coast to east and moved to New York City, where it had a lot of success and recognition. Shortly after the move, things began to pickup for the Japanese company and soon it became one of the main players in the industry.

**Sega**

Sega is a concoction from two words – Service Games, which was originally started to serve American Army service men after arcade games were abolished (see History). Even though Sega has a long history, its American presence was started only in the 1980s. The owner of Sega is an American, David Rosen, who for many years worked in Japan, first importing games from the US and then exporting Japanese games to the US. He later moved to the U.S. to run Sega in 1986.

**Microsoft**

Microsoft is a well-known software company that just recently has gotten into video games with its Xbox console. It has advantages over the rest of the consoles due to its highest quality of graphics and more intense games. In 2001 it began marketing the Xbox, which was successful with many gamers purchasing up to three different games in addition to the system.

\(^4\) The word Atari is taken from a Japanese game Go and approximately describes chess term “Check” in Japanese [36, p.35].

Now, with the introduction of online gaming for consoles, Microsoft controls its online gaming domain and requires people to pay for using its services. It is the only company so far that controls its gaming network. Other games, like those for PlayStation2, have their own online network and setup. While the unification of services might provide a standard interface for users, the price factor might stop many from subscribing to the service.

Sony

Sony is an electronics giant that was originally established in Japan in 1946. It has been one of the world leaders in audio and video equipment as well as various electronic components. It finally entered the video gaming market with its PlayStation system in 1994 and quickly became one of the market leaders.6

Contrary to popular belief, Pong was not the first video game ever made. Indeed, it was "Spacewar", created in 1962 by Steve Russell [36, p.19]. In this game, players could control their ships and throw torpedoes at each other. It is important to point out that this was the first game to be commercialized. There was a game created earlier, in 1958, by Willy Higinbotham of Brookhaven National Lab, that claims the rights of the first video game. This particular game was a tennis simulation; however, none of the famous game designers, such as Ralph Baer or Steven Russell, were aware of the game at the time.

Arcade

In June of 1967 Ralph Baer’s partner, Rusch, came up with an idea for a game that would later become Pong [36, p.24]. In the beginning of the arcade machines, the places where the machines were placed used to be referred to as "coin routes". These coin routes replaced old juke boxes that used to be so popular in the 1950s. The arcade machines could be placed anywhere from a bar to a laundromat, as long as the area was frequently visited by interested individuals. The most profitable routes seemed to be near or in different college towns because college students had the time, quarters, and knowledge to learn these types of games. After a while, when the popularity grew, specific gaming arcades opened, that would have many arcade machines with different games in them. This was a pretty profitable business for a while.

In 1983 consumers stopped purchasing video games and the interest for arcade games significantly declined [36, p.239]. This could be partially attributed to the rising popularity of console games. This could also be one of the turbulent times in video game history in general. It seemed that it had spikes in popularity when certain games came out and downfalls when the

market was still. For a while, it seemed that people were only interested in very engaging games, that were worth their time going to the arcades and spending tons of quarters on. Currently, arcade games are still available throughout various venues, however computer and console games seem to be much more dominant due to their accessibility.

**Console**

After the arcade games were popularized, many players wished they could have these games at home. Because of their size and cost, this was impossible for many of the players. A smart solution would be to have something smaller that could attach to something most of the households already had and that played similar games in your house. Alas, the idea of a video game console was born.

There were many companies that released various consoles, however only a few of them have survived the test of time. In 1972 Magnavox released Odyssey, a gaming console system based on Ralph Baer's idea. In 1974 Atari made a home version of Pong that was played on a console attached to a television set [36, p.80]. Odyssey had an advantage over Atari; it could play up to twelve games, while the Atari console only played Pong. In 1976, seventy five companies promised to release home-based tennis games [36, p.94]. It would seem that the video gaming business was on the rise, however Atari was sold later that year to Warner Brothers [36, p.105]. In August of 1976, Fairchild Camera and Instrument released Channel Fin, a new video game console [36, p.98]. In 1977 RCA released Studio II, a game system with interchangeable game cartridges [36, p.107]. It had one flaw — all its cartridges were black and white. Competition to the Atari VCS system were Coleco's Telstar Arcade and Mattel's Intellivision [36, p.195].

In 1982 General Computers released Vectrex, a product that bridged the gap between tabletop electronics and video game consoles [36, p.230] It looked like a small version of an arcade game because it was a box with a built-in monitor that used vector graphics; it had a built-in controller and a slot for various gaming cartridges. It was popular among video game players because of the high-resolution images and with parents because they could still watch TV while their children played video games [36, p.233]. Its downside was the black and white graphics that didn't satisfy those gamers who were used to the colorful graphics of arcade translated games.

Initially, many of the games were played using a joystick, but that method was not very comfortable because the player would have to lie on the floor or lean against something to operate the joystick. This produced many sore elbows. Some of the players decided to improve the whole situation; these players were Bob Sanders and Alan Kotok, who made remote controllers from spare parts that could be attached to a computer [36, p.20]. They both thought
that having the controllers would help players enjoy the whole gaming experience better. They were right; these were the predecessors of modern game pad controllers.

In 1985 Nintendo started distributing NES systems to the public [36, p.298]. In 1986, Sega introduced the Master System console that utilizes a more powerful processor than the Nintendo NES [36, p.303]. The console systems were gradually getting more powerful and cheaper to produce and operate. Currently, there are only three major players on the console market: Microsoft with its Xbox, Nintendo with the GameCube, and Sony with the popular PlayStation2.

**Home Computer**

In 1980, “Space Invaders” was the first game licensed for home use, and became the best-selling game of the year [36, p.190]. Later on, around 1981, companies such as Broderbund and On-Line Systems released consumer versions of games for Atari, Apple, and Commodore home computers [36, p.153]. This started the growing trend of playing games in the privacy of your own home. However, the capabilities of home computers at that time lacked performance and designers were limited in what they could develop. Home computers were also much more expensive than they are now and were more of a luxury than a commodity at that time. This further limited the spread of home gaming. However, as technology improved and home computers became more powerful and cheaper, players have begun to consider PC gaming more seriously than ever.

**Popular Games**

Throughout the whole video game development history, there have been games that have contributed to the overall development of the video gaming industry, be it through their design, options, or overall ideas they have presented to the playing field. Those are still remembered and in some instances are even played in arcades or on various gaming simulators. Some of these will be mentioned in Table 2.

Table 2 shows that certain games brought the groundbreaking technology with them, allowing the rest of the game industry to develop and prosper further.
Table 2: Significant Games Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Game</th>
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<tbody>
<tr>
<td>1978</td>
<td>Taito released “Space Invaders” which instantly became a hit in Japan [36, p.116].</td>
</tr>
<tr>
<td></td>
<td>Atari released “Football” which became as popular as “Space Invaders” [36, p.118].</td>
</tr>
<tr>
<td></td>
<td>Cinematronics released “Space Wars” and it incorporated Vector Graphics. These graphics not only had sharp edges and crisp shapes but also allowed for more artistic expression and more independent objects to be seen on the screen [36, p.129].</td>
</tr>
<tr>
<td>1980</td>
<td>Legendary “Pac Man” came out, created by Toru Iwatari at Namco [36, p.141].</td>
</tr>
<tr>
<td></td>
<td>“Donkey Kong” came out and became a huge hit in both Japan and US [36, p. 160].</td>
</tr>
<tr>
<td></td>
<td>Atari releases “Centipede”, which was one of the first games liked by girls [36, p.162]. This could be attributed to the fact that the game designer was a female, Donna Bailey, and that she chose to use pastel colors for graphics.</td>
</tr>
<tr>
<td></td>
<td>“John Madden Football” became the most enduring game in history and ultimately played a deciding role in the leaders of video game consoles [36, p.266].</td>
</tr>
<tr>
<td></td>
<td>Midway came out with “Journey” during the 80s, this was the first game to utilize digitized graphics [36, p.175].</td>
</tr>
<tr>
<td>1985</td>
<td>“Super Mario Brothers” came out, being the first “never-ending” game. This means that the players could run through the Mario world forward and backward, instead of just being constricted to a certain space on the screen. Arnie Katz, the editor for Electronic Games, later called it a “side-scrolling” game. It also utilized the “easter egg” concept by having various hidden worlds within the game. This added extra interesting features to the game.</td>
</tr>
<tr>
<td>1990</td>
<td>Square Soft’s Hironobu Sakaguchi came out with one of the biggest RPG bestsellers, Final Fantasy [36, p.540]. The game introduced a new way of gameplay in terms of controlling characters and accomplishing different missions. New editions of the Final Fantasy series are being released today.</td>
</tr>
<tr>
<td>2000s</td>
<td>Games such as “Medal of Honor” by EA Games and “Socom: US Navy Seals” by SCEA are further shrinking the gap between quality PC and console online gaming. These games allow players to play online utilizing communication techniques such as headsets and microphones, so the game feels more real than ever.</td>
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</table>

Sony started a growing trend with its Playstation console of technologically matching the capabilities of the video gaming devices to those of a home computer [4, par.42]. Whether it is due to competition or just because they could, this has started a whole new trend between various video game producers. Nowadays, consoles have fast processors, powerful video cards, network adapters, and storage capabilities that can satisfy any gaming fan. There are also various accessories that are available in order to make the experience of game play even more pleasurable. Features such as steering wheels for racing games and keyboards in order to enter user’s information are among some of the popular ones. So, the question is: does this mean that our home computers will eventually get replaced with video gaming consoles for checking e-mail, communicating online, surfing the web, and spending quality time with the family? 

Another big issue about consoles is the quality of games that are available for them. Every console is known to have a couple of games that gamers usually look forward to owning. However, computer games have always had a stronger player following [23, par. 1]. This is due to the fact that PC games historically have been considered more intellectual than console games.
Part of the reason for it is the strategy genre of these games that has been popularized on PCs. These games also differ because of different graphical capabilities of consoles and the controllers that might have different functions as well.

With further advances in technology, game interaction between a player and a video game interface will become much different from what it is today. Instead of just interacting through a game pad, players will use everything from gestures to emotions to contribute to the overall gaming experience [7, par.4]. This will be possible by using cameras to capture player’s movements and facial expressions as well as microphones to capture voice commands. It will then be processed by a central computer and further incorporated into the game. Right now, Sony offers the EyeToy for its PS2, which is a camera that captures player’s movements and uses them to control the game. This makes the player the center of attention or a star of the game, satisfying the inner ego of anyone who participates.

Another factor that will contribute to the future of the video games will be advancements in wireless technology, which will ensure that video games can be played outside the house as well as inside [7, par.6]. This will provide greater flexibility in terms of locations of the players within the house. It will also allow for more people to enjoy video games, where they will not be forced to cram into a little room around one television set.

The features of consoles can be improved by purchasing additional add-ons in order to improve performance and overall gaming experience. This is quite different from how it used to be in the beginning of the console existence. It used to be that players had to buy new console versions in order to upgrade the capabilities of their consoles. Now with improved designs and multiple expansion slots, upgrades are possible to achieve in addition to the existing console instead of replacing the console with a newer version. This will prolong the life of a single console version by many years and postpone the necessity of an overall system upgrade. So, the approximate timeline for the wireless technology capability on a gaming console could be as early as the next platform release.

Computers have higher capabilities for upgrades due to their modular component design and own technological innovations over the years. Internal improvements include more efficient components such as memory, video cards, audio cards, processors, and more. External components include enhanced keyboards, controller attachments, steering wheels, tactical boards, and joysticks among others [53]. Some companies make keyboard sets game specific, so the player has more control over the game and its capabilities [54]. The range of prices for
upgrades depends on the quality and amount of features, however it is possible to convert your ordinary machine into a gaming solution for a reasonable amount of money [9].
COUNTRY DEPENDENT ADAPTATION

The popularity of video games is constantly rising throughout the globe. It depends on the player's resources, ability to play, access to the necessary equipment, and preference for video games. All of these factors differ based on the country, gender, and age of the players. Even though these figures are constantly changing, it is still important to know who buys the most video games and where they live\(^7\). Besides being available in more developed countries, the trend is slowly spreading through new emerging markets. It is predicted that sales of game consoles and software in the US and Europe are supposed to yield over seventeen billion dollars a year [52, p.11]. Some of this possibly due to piracy, while other possibilities arise due to newly formed partnerships between gaming companies and various countries. Three of the main video game markets will be examined below.

UNITED STATES

Figure 2: USA: Breakdown of the video game market by segment (billion €)

<table>
<thead>
<tr>
<th>Year</th>
<th>PC Software Sales</th>
<th>Hardware Market Value</th>
<th>Console Software Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
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</tbody>
</table>

Source: [1, p.64]

The US has been a pioneer of video games from the days of Pong. However, shortly after, the craze became contagious and moved to Japan. That was a huge stepping stone for video gaming culture, because it is so popular in Japan that presently it is one of the most favorable spending choices. Currently, in the US, one out of four households already owns a PlayStation [52, p.7]. That is approximately thirty five million homes in the US owning a video game console, another ten to twenty million renting or sharing with neighbors. Twenty to forty percent of American homes own a video game console [12, p.7]. In terms of gender preferences, in 1999 about forty three percent of gamers were female and about half of online gamers were female. This tells us that video games as a social aspect are appealing to women [52, p.45].

\(^7\) Due to the lack of sufficient data for both Japan and Europe, only stats for US will be used and analyzed.
In the United States, video games are becoming a major part of entertainment spending. More adults are choosing to play video games over watching TV or going to the movies [52, p.6]. It is also interesting to see the different demographics of people who play both computer and video games. For example, from Figure 3 we can see that the majority of game owners, either computer or console, are males. It is interesting to see that there are more female computer gamers (41.9%) than there are female console gamers (28.5%). This could be attributed to the facts stated in Gender Differences section, pertaining to the differences in tastes and preferences between genders. It is also obvious from the chart that a higher number of older people prefer playing computer games to console games. This could be explained by the fact that many older people tend to own computers at home, so it is more convenient for them to purchase PC games. Another reason could be the quality of games that would be suitable for an older generation.

**Figure 3: US 2003 Game Demographics**

![Graph showing game demographics by age and gender.](source)

**Breakdown by Gender and Age**

Video games were attractive to adolescent males since the beginning of their existence. The popularity then moved to females and older males after the games were starting to become more complex. Now, any family member can find a game that they would be interested in. The challenge is to keep their interest for a prolonged period of time and make the game enjoyable for different types of players. Table 5 shows the periods in children’s lives when they start playing video games. Video games are favored by elementary school children the most, while computer and online games are more popular with junior high and high school students [24]. This could be explained by the availability of computers later in life for aiding with homework and so forth.
Table 3: Breakdown by when children start playing video games [24]

<table>
<thead>
<tr>
<th></th>
<th>College</th>
<th>Jr. High/High School</th>
<th>Elementary School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Games</td>
<td>2%</td>
<td>15%</td>
<td>69%</td>
</tr>
<tr>
<td>Computer Games</td>
<td>9%</td>
<td>49%</td>
<td>28%</td>
</tr>
<tr>
<td>Online Games</td>
<td>22%</td>
<td>43%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Below are some of the statistics that reflect people’s general interest on video game play.

- Thirty five percent of children between the ages of 7 and 18 have a video game console in their bedroom [4].
- Forty one percent of all people who visit gaming sites are women.
- Forty three percent of people who visit gaming sites are ages 25 to 49.
- On average, 8.9% of people visiting gaming sites are African American, 4.2% are Asian, and 79.3% are white. 35% of those people earn $50,000 to $100,000 annually, while 16.2% gross more than $100,000 [20, par. 2].

Nearly half of all students, forty six percent, who play video games played on systems such as Nintendo or Sega, say they play multi-player games with their friends. And one in five goes so far as to say that play time actually helps them make new buddies or improve their existing relationships. Sixty percent of women versus forty percent of men play computer games like solitaire, etc. and online games against other remote players [24]. This further confirms findings in Gender Differences section.

There seems to be a growing trend of video games becoming more of a family entertainment, as opposed to being just for children [40, par.5]. This became more apparent when the prices for various consoles dropped to more reasonable levels. PlayStation2 can be obtained for anywhere from $100 to $199 and Xbox is retailing for $149. In addition to that price, some of the consoles now come with a DVD player, which would be much cheaper than purchasing a home theater system [40, par.4].

In terms of popularity, currently it seems that Microsoft’s Xbox is the best pick for those who care how technologically advanced their video game system is. It is also the only system that has parental controls on it, making it attractive for parents to buy for their children. However, it ultimately comes down to the quality of the games that are made for any specific console since they are the driving force behind the sales. Many children will rent video games to try them out first and buy them later only if they liked the initial game play [40, par.16].

Another interesting fact is that the popularity of video games is on the rise with middle aged adults [61, par.3]. Those who are possibly married but have no children to take up their time tend to spend up to three hours a day playing video games. This helps them release stress and makes them spend their time on something they like. This could also be attributed to the fact that this generation grew up on Atari and arcade game craze.
BREAKDOWN BY ANNUAL INCOME

The popularity of video games is higher within the lower-income families. About sixty-three percent of children that live in families whose annual income is under $50,000 (gross) have a video gaming console in their bedroom as opposed to the fifty seven percent of children from families whose annual income exceeds $50,000 (gross) [79, p.1]. One of the explanations of this could be that video games are relatively a low cost form of entertainment. Even though when a console initially comes out, it costs around $300, after a while due to various market factors and price competition between console manufacturers the price drops to around $100. You purchase a console and a couple of games and you can play them for as long as you want. On the other hand, to see a movie or to go somewhere with your friends will require you to pay for every visit.

The ever-increasing popularity of video games is forcing advertising agencies, such as Bloc Media, to employ ingenious methods of marketing. In a given example, they have created a website, www.skivesuite.com which promotes "anti-productivity solutions for serious slackers", i.e. a fictitious software suite that will help one to get out of work in order to spend more time playing PlayStation2 games at home [62, p.11]. The website can be viewed in eleven different European languages. Not only does this prove the popularity of console video games, but also adds to the notion of a media-aware new generation.

Adding to the already popular video game phenomena, many musicians have decided to release their music on video game titles before their albums even hit the stores [47, par.9]. Many games include voiceovers done by celebrity actors and some of the new titles even feature actors as characters in the game. This will only further blend the art of film and video games together.

People seem to turn to video games when signs of trouble arise in their environment. For example in Taiwan, video game console sales were on the rise since the SARS epidemic [57, par.1]. More and more people were staying home, due to a scare of contracting the illness, and were seeking entertainment they could use at home. Many retailers were promoting the sales by decreasing the prices on many items that were in demand. This is good news for consoles, because it demonstrates that this form of entertainment does not heavily rely on the outside factors, making its effectiveness higher than other forms of entertainment.

Japanese people are extremely interested in video games as a form of entertainment. The reason for this is that a lot of Japanese people have a large disposable income but spend little because of the small living space. So, all the money they have left over they choose to spend on video games. In fact, there is so much demand and supply in the video gaming
industry, that currently it is considered saturated and Japanese suppliers have to look at export options in order to keep making money [34, p.1]. From Figure 4, a clear difference can be seen in gaming device purchasing patterns between Japan, the United States and/or Europe. In Japan, console software sales are higher compared to PC software sales. This indicates that PC games are not as popular in Japan as they are in the US and Europe. It could also indicate that Japanese gamers play games on a console rather than a PC.

The type of video games Japanese gamers are interested in also differs slightly from those games that are popular in the West. For example, first shooter games have never really caught up in Japan, even though they are among the top games in the US [37, par.3]. Japanese players also like more linear games with hints or appropriate instructions in them, instead of games that have various goals to choose from [37, par.14]. There are also different standards for violence in Japan, compared to the US. For example, a popular game Grand Theft Auto III would be considered antisocial by Japanese standards. Japanese players usually prefer games that are based on fantasy, role-playing, and strategy, while American players like sport, crime, and shooting games [37, par.17].

![Figure 4: Japan: Breakdown of the video game market by segment (billion €)](image)

Source: [1, p.64]

Because the Japanese video game market is more mature than the one in the US, the next move for gaming in Japan seems to lean towards mobile devices. Japanese consumers love different gadgets, from cellular phones to electronic pals, so it's no wonder that they would be interested in mobile gaming. Besides, the industry has had the chance to develop various technologies that are not yet available in the United States, which gives Japan the advantage to move forward.
There seems to be a problem with gaming console adaptation in Europe due to various factors. At first, it was thought to be the lack of broadband in Europe [16, par.8]. However, after further research, it came out to be more than that. According to the research that was conducted by both Microsoft and Sony, only a third of an estimated twenty million households in Europe that have broadband also have video gaming consoles [16, par.15]. The question then arises: why are people not purchasing more gaming consoles? The answer is partially dependent on the quality of the video games supplied to the market. Historically, video games are designed and written by American and Japanese designers and programmers. There are currently no popular games that are developed by Europeans [16, par.18]. Therefore, there is a lack in the market that would interest specifically European gamers, which results in lower overall game sales.

Figure 5: Europe: Breakdown of the video game market by segment (billion €)

Source: [1, p.64]

There might be a potential problem in the future in terms of Europe adapting the whole online gaming theme. Because Europe’s infrastructure in cities is much older than that of the US, it is much harder for homes in Europe to get broadband. This will slow the rate of online gaming adaptation for both PS2 and Xbox as it already has. According to the facts, Microsoft has been having problems with attracting online gamers in Europe [76, par.3]. Even though Microsoft is giving away coupons for two free months of service, people who want to join are currently physically restricted due to lack of broadband infrastructure.

Nevertheless, the video game market in Europe is thriving. For example, in Great Britain, more adults are choosing to play video games over going to the movies, which is shown by the market data: sixty percent more money than total movie tickets sold and eighty percent more than video rentals [52, p. 6]. So, even though the rate of console adaptation might not be as rapid as it is in the US and Japan, it is still on the rise.
According to Forrester Research analyst, Paul Jackson, Europe's console game market development will occur in three different phases. First phase will focus on selling base consoles with game bundles. Second phase will focus on connecting these base consoles to broadband networks. The third and final phase will consist of twenty four percent of households having broadband and forty one percent of these connected homes will have console systems. Jackson continues to predict that by 2005, 12.7 million households will have everything necessary to play online games [50]. This means that Europe will possibly be the second largest video game market in the world after the United States.
Video games act as new channels of entertainment for both children and adults. Especially for children, they often substitute for other traditional forms of entertainment such as books, cartoons, and movies. So, one of the major responsibilities that video games have is storytelling [52, p.98]. One of the differences from the movies is that instead of the world being projected at a participant, the player is projected into the world [52, p.86]. In this way, the interaction involving video games is much deeper than the interaction involving any other forms of entertainment. The better the game is designed, the deeper the involvement that occurs. However, due to this deep involvement, lots of criticism blames video games for the problems that children and teenagers have in their lives.

Video games have historically been the scapegoat of violence for the media. They have been blamed for outbursts of violence within youth, school shootings, and murders of family and friends, and other horrible happenings. The public outrage began in 1976, when for the first time in history, violence in video games was brought up as a major problem [36, p.90]. The trigger was the creation of “Death Race” by Exidy Games. Ever since then it has been a growing issue not only within video games but also comic books, TV shows, and movies. However, no matter how much we, as a society, want to assign blame to something, video games might end up not being the cause of all this violence after all.

Below is an overview of the major arguments that are brought up during the discussion about how video games influence children in negative ways. These arguments are different and valid in their own ways so it is only appropriate to cover them in this paper.

**Loss Of Personal Relationships**

Another negative effect of video games, as stated by the media, is the loss of personal relationships that children might have during the time they spend playing video games. Some people argue that this time is wasted and could be spent socializing with other children instead of sitting in front of a television set, playing on a console. What they do not realize, however, is that video games also form relationships of a different kind. This is because friendships form during “experiencing enjoyable activities together”, in this case video games [11, p. 4]. Besides having a new topic to talk about, by playing video games online, people can meet others just like them purely through game play. Even though this would not be classified as a classically defined friendship, it does add to the overall social development of a person.
One could argue that television takes up too much free time from children who could be playing outside and that video games are just the same. However, they are not. While watching television is static and non-participatory activity, video games are interactive [12, p.270]. By having this sort of interaction, video games actually promote brain activity and keep children actively occupied as opposed to just simply staring at a television screen. In fact, during this interaction, children learn various ways of dealing with different problems and circumstances as they may occur in the video game [35, p.11]. Therefore, not only is playing video games not harmful to a child’s development but it is actually beneficial in many ways.

**Violence**

There is a divide in opinion about video game violence. One side states that video games are the direct cause of violence, while the other blames poor parenting and emotional disturbance as the cause of problems. So far both sides have supporting evidence; however neither is strong enough to cause the industry to dramatically change its standards and practices.

Ronnie Lamb has launched a war against video games [36, p.119]. Her campaign resulted in a changing view of video games and changed the public’s perception of video games. She went on a speaking tour to try and convince the public of the real dangers of video games. Many people became convinced of this notion and this, in turn, forced various studies to be performed in order to determine whether these allegations were true. Numerous studies have been done to prove this theory, however there is little to no evidence which would clearly state that playing video games directly results in violence [80, ch. 4].

Some of the facts that add to the whole controversy are the statements that were made by those who acted violently. For example, in the Columbine school shooting, the boys that were involved talked about possibly killing their schoolmates and compared the experience to the one they had when they played Doom [72, par. 13]. This automatically puts such video games at risk for being blamed for whatever happened. We tend to notice and focus on negative things more often than the positive things. This might be because negative things make for better news reporting and they are easy to blame because they are “evil” to begin with [2].

Many books that were written on the subject of violence in the media and video games refer to countless studies that prove the correlation between children playing violent games and acting violently afterwards. Some of these studies mention that crime rates have significantly increased throughout the world, after the introduction of television [28, p.11]. There has also been a correlation found between the increase of violence in television and the increase of violence in the classroom [28, p.26]. Furthermore, a bold statement has been made by David Grossman, the author of Stop Teaching Our Kids to Kill, that mentioned that if “television technology had never
been developed, there would today be 10,000 fewer murders each year in the United States, 70,000 fewer rapes, and 700,000 fewer injurious assaults” [28, p.32]. After reading these reports and listening to these statements, it seems that media has turned the people within our societies into evil, violence eager monsters.

The Entertainment Software Association has compiled a document, which reviews in detail various facts of the correlation between video games and violence. Among other statements, the one that stands out is the fact that youth violence has decreased over the years during which video game sales and involvement has gone up [18, p. 2]. There is also an interesting statement that illustrates how the violent video games that are sold in United States are also sold in other countries, however they do not elicit the same amount of violence from players [18, p.2]. This further suggests that the cause of violent behavior lays elsewhere and not in video games. Furthermore, a literature review conducted by Washington State Department of Health came up with the following: “In conclusion, current research evidence is not supportive of a major public concern that violent video games lead to real-life violence” [18, p.2]. Overall, there is not enough scientific evidence to conclude that video games are the main reason for youth violence.

Those who accuse the media and video games of promoting violence in children keep forgetting one important fact. The fact is that before the 19th century, historically, people’s everyday lives were much more violent [12, p.272]. Everybody had to struggle to survive. People went through many wars over territories and possessions. Everybody had to fight for their lives in one way or another. Now the times seem to be much more civilized and so these outlets of violence have to be satisfied in other ways. One of these ways is playing violent video games. Instead of actually being violent, a person could satisfy that urge virtually. Another way to put this would be to say that “computer games have inherited the content of violence from a cultural tradition within fiction...the act of playing violent computer games can be seen as a parallel to the violent and ‘rough’ play traditionally found among boys.” [25, par.31]. This seems to be a much safer and civilized way to deal with one’s emotions [30, p.188].

Although violence in video games has been an issue for a number of years, the real cause of this violence has never been discussed in detail. The key to the problem is not in the media or video games themselves but in the actual cause of the violence in the people. This statement can be backed up by numerous research that simply states that there is little to no correlation between video games and youth violence [18, p.2]. It is much easier to blame something or somebody for our problems than to spend time and effort to find the real cause
behind it. The same seems to stand true with violence in video games. From our everyday exposure to the media, it seems that video games have a causal effect on those who use them. However, it appears that people revert to using video games in order to deal with much deeper issues [35, p.9].

According to Gerard Jones, the author of "Killing Monsters", violence as it is displayed in children is not only not bad, but it is a healthy and normal way for children to deal with their emotional problems. After speaking to a little girl at a comic book convention, the author came to the conclusion that "the violence had helped a timid adolescent tap into her own bottled-up emotionality and discover a feeling of personal power" [35, p.4]. What Jones is trying to point out is that children choose to use violence to express their emotions in cases where other options are not working for them. So, in this sense, violence can actually act as a channel for communications between children. They feel like they can relate to the characters in the media, whether it be a TV show, a comic book hero, or a video game character in a way that would help them understand themselves. The children can immerse themselves into the fantasy world to the point where they can feel what the character is feeling and relate to what is going on in the story. This way, they can relate their own life experiences to the ones they read about or play out in video games.

Another important distinction that has to be made is the perception of violence from an adult and child point of view. While adults view violence in a literal way, comparing it to their life experience, children view it completely different. As the author refers to it "they need to play with it until it feels safer" [35, p.12]. The reason that adults do not want their children exposed to violence is because they are afraid of the effects that violence will have on their children. They are afraid because they are applying their own notions and feelings about violence to their children. This is wrong because children’s psychology does not work in the same way as adult's psychology does. Children utilize violence in order to deal with their inner emotions, they use “fantasies of combat in order to feel stronger, to access their emotions, to take control of their anxieties, to calm themselves down in the face of real violence, to fight their way through emotional challenges and lift themselves to new developmental levels” [35, p.6].

Contrary to popular beliefs, many children find comfort in virtual violence. Children who have depression and other emotional problems tend to look for other people who may experience similar emotions and feelings [35, p.5]. This starts a breeding ground for various "clicks" and cults within the community. Groups such as Punks, Goth, and death-metal lovers have all sprung up due to this psychological phenomenon. A less destructive way to express one’s emotions would be to play a video game, where one could be violent without doing any actual damage to anybody.
Some people go as far as to state that without video games, we would be missing a crucial part of our lives that deals with fantasy and imagination. According to Douglas Rushkoff, people have to allow themselves to have healthy dreams about various things, otherwise they will experience “cultural hallucination” that will express itself in different conspiracies dealing with UFO and related outlandish stuff. He goes on further, suggesting that “we should look to our dreams for answers about why we do what we do in real life” [56, p.178]. What he means by this is that video games provide us with healthy outlets of dream and fantasy instead of forcing us to think of these ideas ourselves, which sometimes could be outrageous and even unhealthy.

The main issue here is that it is not the video games themselves that cause violence in people, it is other psychological factors [75, par.6]. However, the media has focused so much on blaming various sources, that it’s almost embedded in our heads that they are the true causes. Every time we witness an act of violence, we automatically try to blame either a violent movie, TV show, or a video game. We gradually have conditioned our minds to find a scapegoat in order to find answers to our questions. In fact, “we’re so afraid of aggression in this society that we haven’t been able to talk intelligently about it” [35, p.8].

Besides playing video games, teenagers who have committed acts of violence have had a history of mental problems or issues, pleaded insanity during the trials, and were either on medication or saw a psychiatrist on a regular basis [75, par.24]. They were also said to be “outcasts” in their schools and often felt angry with their peers for failing to accept them. Why did they need to see a doctor? What were the issues that were bothering them? Why weren’t these facts addressed more closely instead of blaming the media? These are the real questions that should be asked in order to understand the true causes of these violent outbursts. Concluding from the facts presented, in all the cases, the roots of violence were much more deeply set to be triggered simply by playing a violent video game.

It is known that people are scared of things they do not know about. Most of the time people have a fear of something because they do not know what will happen once they encounter a particular thing. So they imagine the worst instead of getting over their fear and facing it [26, par. 12]. Technology, specifically video games, is not much different in that a lot of people have not had experience with it and so they tend to blame it for many of their problems that might not even be related.

# # #
In video games, there seems to be a stereotype that women either do not perform as well as men or they do not enjoy video games as much as men do. A more accurate statement would be that many women feel bored by the video games that are currently available on the market, which are designed for men by men [5, p.145]. In fact, women prefer games that involve more "brain-taxing" versus the straight ahead games such as fighting and racing that are largely preferred by men [5, p.144]. So, in short, the demand for more intellectual video games that are created by women is not satisfied at all.

In order to understand the reasons why women might be put off by video games, we must examine the nature of games themselves. There are different genres of games and depending on the genre, there are different demographics as well. Some games are liked more by males, while others by females. According to a study done by surveying over nine hundred of female and male gamers, notions of gender preferences were confirmed. The questions asked covered the following topics:

- Ownership, location, and types of machines and games
  - Do you have a video game/ computer at home?
  - What games do you have for your system?
  - Do you rent video games?
  - Who owns the computer/ computer game console?
  - Who uses it the most?
  - Where is the computer/ computer game system located? Who decided that it would be in this location?
  - Are there any conditions attached to the use of the computer/ game system in your house? If yes who set the conditions?

- Theme and genre of the games
  - What is the story/ aim of the games that you have?
  - Favorite and least favorite types of games and why?
  - Which game is your favorite? Why?

- Playing styles
  - How many times do you play video/ computer games each week and for how long? (table provided for completion of this item)
  - Do you prefer to play computer/ video games/ arcade games alone or with friends?
  - Do you like to talk about computer games with your friends when you are not playing with them? [4, p.52]

For example, action games are preferred by males due to their inherent "hero" side of the ego [4, p.52]. On the other side of the spectrum, females prefer strategy and life simulation games. Many action video games are either too violent for females or they have female characters in them that are depicted as objects rather than equals. This, additionally, puts women off.
Since originally games have always attracted more males than females, games were always designed for males. Most of the games, ninety two percent, do not even have female roles at all [12, p.8]. The ones that do, present females as either helpless “damsels in distress” or as some sort of reward for accomplishing a mission. Even the video game cover art follows the trend in misrepresentation. In fact, after looking at over forty video games, the representation of men in video games outnumbered the representation of women by a ratio of 13 to 1 [12, p.7]. Male oriented games usually have beautiful women playing a part in them. There seems to be a reason for it as well. It seems that “men like to control women through video games and fantasize about them, therefore they like when women look attractive so the fantasy is easier to fulfill” [8, p.89]. Only when female designers were put on the task, did the games come out somewhat female oriented, such as Centipede with its pastel colors, which was one of the few games liked by girls [36, p. 160]. It seems that the problem lies not only in game design itself but also the overlooking of possible market capabilities. By avoiding female oriented games, companies are not satisfying the whole market, but only a part of it. Especially now that technology in general is a lot more advanced and popular than years ago, more and more females want to participate in video gaming, however they are currently not adequately supplied by the industry.

As one of the solutions to the design problem a new type of a game design movement has been proposed, referred to as a feminist approach to design. Not only does it provide for a better design of girl games, but also an overall better design of games for the player. Some of the principles that this approach adheres to are:

- Transfer design authority to the user
- Value subjective and experiential knowledge in the context of computer use
- Allow use by many different kinds of users in different context
- Give the user a tool to express her voice and the truth of her existence
- Encourage collaboration among users [12, p.305]

This approach emphasizes the fact that the player should have more control of the game itself. It also focuses on collaboration of gamers during game design, which would offer more creative solutions to the existing problems of game design.

There is often a misconception about current game design flaws. Many tend to think that females do not like the games that are currently on the market because they do not enjoy the action that is prevalent in male-oriented games. This does not seem to be the case. In fact, females like action a lot and avid female gamers would laugh at a “Barbie Designer” video game title [12, p.56]. The problem is in the action itself. Many games have pointless fighting or shooting which might attract male’s attention, but seems quite boring to the females. They would
rather have action that adds to the overall story of the game and action that emphasizes the point of the game, instead of action that is there only for pushing buttons. These conclusions are based on studies performed, but not limited to, surveying over 900 children, ages 10-13 [78, p.1]; observing a study of two groups of forth-grade students working on video game designing projects [12, p.93]; another study was done by assigning a group of children (females and males separately) to design the same game that came out quite different for both groups [27, p.7]; and more. So, in short, girls prefer intelligent action that contributes to the overall experience of the gameplay.

The problem with the lack of games for females starts with the types of games that are available for girls in the early stages of their development. After reviewing some of the research material, it is apparent that there is a strong belief by the public that the only type of games that girls like are pre-teen oriented games such as Barbie Designer and such that have to do with girls doing traditional female tasks such as decorating, cooking, or cleaning [12, p.335]. One of the reasons that girls like these games might be that girls tend to prefer video games that act as tools rather than the ends to the mean. What this means is that if a video game helps a girl accomplish something in real life, then it would be considered useful or fun [12, p.58]. Even though some girls might like such stereotypical games, it is wrong to assume and to force all girls to enjoy these games. In fact, it is very stereotypical and should not be ignored. In this day and age, when women more and more hold higher positions within various corporations and take on even more responsibilities than before, it might be unwise for parents to force their children to adhere to old world grown stereotypes such as girl and boy oriented toys and games [12, p.331]. When buying toys for children, parents should acquire those toys that would bring the most satisfaction to the child as well as help them develop as a complete adult. This should not only be dolls for girls and soldiers for boys, but anything that would spark a child’s desire to want to learn more from chess to a video game [12, p.335].

In the past, a lot of game design companies seemed to follow what they have heard from the media, which was that video games are violent and should be used with caution. For a long time, it was thought that video games viewed violence to women as appropriate, based on the type of games they have designed [12, p.10]. This notion has not only influenced parents but video game companies as well. Some companies have started to associate video game violence with video game action [12, p.52]. This, in turn, resulted in game design for girls that had no violence and consequently no action as well. These types of games turned out to be quite boring because they had nothing to excite the player. A clear distinction has to be made between violence and action in order to design interesting games.
Another reason that games are boring is the fact that they are usually designed around the same characters. In the East, it is giggling girls in school uniforms and in the West its women who have abnormally voluptuous bodies [12, p.8]. While this formula works for many boys and male gamers, it doesn’t work for others. This sort of stereotypical approach to game design has disappointed many video game enthusiasts over the years and has conditioned them, in a way, to not like any games that are out on the market.

It is known that males and females are different in many ways, based on studies performed on young children and young adults [45, p.52]. This also applies to the way they perceive and play video games. In fact, the differences are so apparent that games that are designed with guys in mind will not satisfy women’s gaming needs completely. Starting with overall attitudes toward technology and ending with how different genders deal with conflict resolution, females differ from males in many ways and need to be accounted for accordingly [27, p.6]. That is exactly why games need to be designed specifically for women, with women’s needs and wants in mind.

The video game market has been pretty stable for the last few years. It has always been focused on boys ages 18 to 35 [27, p.148]. Some consider this a threat to the industry because if the target market does not change with the times, it will soon get saturated to the point that it will not be able to advance any further [27, p.148]. By including females in the game design fundamentals, video game industry will create an opportunity for its market to grow in a new direction.

One way that females tend to avoid violence and misrepresentation is by choice of platform. They tend to pick either computer games or online games versus console [24]. This may be because a lot of video game characters are not very realistic and could be quite violent. Computer games tend to be more laid back and strategic, while online games tend to disclose your identity or even not require you to pick a character at all [24].

Not all game designers have the flaw of not knowing how to design for women. For example, it seems that in Japan, the developers create more games than anywhere else that women seem to like [52, p.143]. This might be explained by a much larger demand of Japanese women for video game products. This, in turn, pushes the industry to be more innovative in order to please the specific market segment. Even though the types of games that Japanese women like differ from those that US women will play, the fact that female oriented games can be quite popular and work for the business should be examined closely by US designers.
Table 4: Gender Differences in Video Game Preference

<table>
<thead>
<tr>
<th>Category</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game environment</td>
<td>Prefer more realistic environments that they can relate to in real world [12, p.50]. Like games that require emotional response [27, p.182].</td>
<td>Prefer fantasy based environments that would provide super human abilities [10, p.75]. Like games that require physical response [27, p.182].</td>
</tr>
<tr>
<td>Communication</td>
<td>Like to use it as much as possible whether it be communicating with another player or with characters in the game [2, p. 5].</td>
<td>Do not rely heavily on it, usually prefer to play by themselves in seclusion.</td>
</tr>
<tr>
<td>Cooperation</td>
<td>Show big preference for cooperation during game play [14, p.1].</td>
<td>Don't mind playing by themselves in order to gain superiority.</td>
</tr>
<tr>
<td>Main Character</td>
<td>Like to identify with or be the main character of the game [12, p.61].</td>
<td>Do not particularly care about the relationship.</td>
</tr>
<tr>
<td>Game Pace</td>
<td>Like to set their own pace, chose the developments to come when needed, instead of unexpectedly [12, p.63].</td>
<td>Like to play fast paced, non-stop action games.</td>
</tr>
<tr>
<td>Instructions</td>
<td>Games that lay out the rules and patterns at the start and that are more predictable might be more appealing [12, p.61]</td>
<td>Like to figure things out by trying different things in the game.</td>
</tr>
<tr>
<td>Relationships</td>
<td>Girls prefer positive relationships, friendships and family oriented situations [12, p.54].</td>
<td>Do not care as much about relationships as long as the game is exciting [2, p.5].</td>
</tr>
<tr>
<td>Themes</td>
<td>Tend to be less enthusiastic about the embedding of good versus evil themes in games. Also, do not like the violent feedback that often follows this type of storytelling [12, p.53].</td>
<td>Very interested in good vs. evil themes, where they can play a part of a main character or a hero.</td>
</tr>
<tr>
<td>Values</td>
<td>Tend to value diplomatic skills, such as persuasion for solving conflicts [7, p.83]. Value forgiveness for mistakes made in the game [27, p.182].</td>
<td>Value conquest and battle as methods for solving problems. Value punishment for mistakes made in the game [27, p.182].</td>
</tr>
<tr>
<td>Risks</td>
<td>Deal with defying convention and doing something new that’s never been done before [12, p.84].</td>
<td>Most of the time deal with gaining power or authority over others.</td>
</tr>
<tr>
<td>Puzzles</td>
<td>Like when they add to the storytelling value of the game [12, p.84].</td>
<td>Like anything that could give them extra points in the game.</td>
</tr>
<tr>
<td>Winning</td>
<td>Care about what exactly they win. Want to find ways to solve a certain problem or issue [27, p.182].</td>
<td>Care only whether they win or not [12, p.82]. Mostly care only about winning or getting to the last level of the game [27, p.182].</td>
</tr>
</tbody>
</table>

Overall, girls prefer to have games that are more related to the real world that they are used to. Compared to boys, who will mostly choose fantasy situations, girls seem to feel more comfortable when they can relate to their surroundings [12, p.50]. There is a need for specific games that focus on encouraging assertiveness, competition and take advantage of female’s natural hand-eye coordination [12, p.335]. The reason for this is that there are a greater number of boys who play various sports and activities than there are girls. So, while for boys these traits are almost inherent, for girls they usually have to be developed. Not only is there a lack of games that are designed for girls, but the public’s perception of how women should act and what they should look like is preset based on past history. In fact, it’s been said that the “image of a woman with a gun is too shocking, disruptive, and threatening to the male dominant order of things” [12, p.335].
Some of the best games that were popular for both males and females were Final Fantasy and The Sims. In Final Fantasy, the main storyline is centered around the main female character, Yuna, while excitement and action are still present. This balance works for female gamers and keeps them interested enough to keep playing [29, par. 8]. In Sims, on the other hand, the game centers around the main character, which the player directly controls. The main point is to maintain your Sim happy and prosperous, while doing regular everyday activities [10, par. 11]. Another reason for the game’s success could be that the companies that make these games employ more females than regular game development companies [10, par. 12]. The combination of female game designers and a game that contains all the elements of an exciting game, plus advanced character control, provides the necessary ground for a successful female video game.

In summary, it is obvious that girls need games that would be specifically designed for them. It is apparent from the research reflected in Table 3 that the preferences in video games differ significantly enough for girls not to be satisfied by the games that are made for boys. On the other hand, it is also important to understand that while this might sum up preferences for most of the women gamers out there, there are still some that say that they like boy-oriented games and get very offended when you tell them otherwise. Many women state that they like shoot’em-up games, however they just wish that they would also have a good plot to go with the action [42]. This only shows us that there has to be a balance in the games that are designed for females. This balance should cover female preferences as well as the right amount of action and aggression to excite female players and not make them bored. Overall, females tend to prefer "A game that’s well-designed with a real story to it, a real plot, and good characters", which sounds like an improvement to the games currently on the market [42].

So, if we know what types of games are favored by females, what should we do to design more of them? One of the first things is to try and attract more female designers. In order to do that, more colleges and universities will have to offer game programming majors. Also, maybe have different scholarships for female game designers in order to get more female, applicants. In the future this should be easier and easier because more girls are playing computer games and so they will be interested in pursuing it as a possible career choice. In fact, one of the schools is already looking into creating the first video game scholarship for females which is supposed to provide up to $18,500 or half the cost of a certification [60, par. 10]. After more colleges and universities follow this example, it will be easier for females to get a degree and pursue a career in what traditionally has been thought of as a male dominated industry.
Within the video game industry, there is a low percentage of female employees in comparison to males. For example, only about ten to fifteen percent of all International Game Developers Association members are women. The number of executives within the industry is even lower. Most of the females are usually in such areas as graphics design and not the crucial areas of game creation itself [38, par. 4]. Some say that this is due to the stereotypical male-oriented organization of the gaming companies that subconsciously keeps women away from applying for work [27, p.149]. If the company produces only male oriented game titles, this might tell women that they are not welcome there. Also, if women are portrayed in demeaning ways within the company games, some might think that this is the overall attitude of the company towards women [27, p.150]. It would not be hard for women to imagine these things, given that for the past twenty years, the industry had been primarily focused on male oriented products only. Another indicator for possible women applicants would be whether there are women on the executive level of the company. If there are, then the company is open to women and new ideas, therefore looking more attractive to females applying for jobs [27, p.150].

Next, certain standards will have to be set for games designed specifically for women. Things such as types of music, environments, character features, storylines, and amount of cognitive work that most women prefer to have in a game. This could be figured out from current game sales figures, focus groups, and specifically usability testing. Usability testing at early levels of the game can ensure the success of final game completely. Besides testing for bugs and errors in the game play itself, usability testing could be used to find out what is missing in the game in terms of the attraction factor. By gathering feedback from a controlled group of women, game designers could gather valuable insight into the future success of the game. On the other hand, by failing to test the game, many important factors favored by females may be omitted.

Another proposed suggestion on how to make console games more appealing to females and families in general came from Xbox. It wants to introduce a new game called Xbox Music Mixer which will feature Karaoke capabilities, music mixing, and 2-D and 3-D visualizations [65, par.4]. In addition, it will allow downloads of movies, photos, and music from PCs to the Xbox. By doing this, Xbox representatives hope to appeal to "fun-seekers" and "casual gamers". This type of game will appeal to a female’s creative side while letting her personalize the experience with her own details, which appeals to the females that like to utilize their life skills in games [27, p.182]. As well as let them control their own environment and/or be the main character [12, p. 5].

It is important to understand that women drive a large percentage of sales in any country and forgetting about them is losing significant market share. This fact is exciting to hear for any
type of business. So, in the end, not only are you satisfying a big part of the consumer market, but you are also making more money as a company at the same time. The benefits extend both ways.
There have been many things said about the differences of PC and Console gaming, some of them coming from gamers and others from designers. Besides having differences in interfaces, these gaming devices are also different in ways that they are controlled and accessed by the user. A gaming console has a controller that is attached to it, while a PC has a keyboard and a mouse to navigate through the game. Historically, PC games have been prevalent due to the following factors:

- Higher quality of games
- Hardware availability
- Multiplayer capability
- Ease of game design

However, with the advances in technology, it is now possible to create consoles that rival in quality and performance and cost less to produce [45, par.4]. Even though this paper acknowledges the rivalry that is present within the video game industry, it will heavily support consoles over PCs as centers of family entertainment in the future due to the following facts:

- Lower cost than PCs
- Multiplayer capability in one room (multiple controllers) and online (network adapters)
- Multifunctional features that are comparable to those of a computer
  - DVD Player
  - E-mail
  - CD Player

The console has an advantage over the computer in cost. It is much cheaper to buy, especially if there are several games bundled with it. It is also very cheap to setup and start playing. There is a certain comfort in sitting on the couch while playing video games by yourself or with your friends [64] as opposed to sitting by yourself in front of the monitor. So, in terms of design, the console is better equipped to handle multiple players at a time.

The computer has an advantage in terms of different types of games that can be played on it. This includes online, e-mail, and browser games [73]. Another huge advantage is that a computer could be used for a lot more tasks other than video game playing, like word processing, imaging software, e-mail, internet, etc. Graphics on computer monitors, combined with high end video cards, tend to look a lot better than television sets. There are also more updates and upgrades for computers compared to consoles, which come out once every couple of years [64]. Computers are also relatively easy to set up for online gaming if you already have an internet connection.

Some of the disadvantages of computers come with a higher cost compared to consoles. Also, the bugs that are so common in computers might turn average users away because they
will not want to deal with the problems associated with bugs. There is also the issue of actually installing the game on the computer. It's unknown whether the game will work correctly or not, depending on the components of your system, as well as other programs installed that might conflict with the game installation. Computer games can also get pretty complicated, which would make them more interesting to play. However the player would have to learn many keyboard commands and shortcuts in order to master the game [64].

In terms of different games that are made for consoles and computers, the industry makes it is easier to design computer games than console games. This is due to the complicated programming tools that are required for console game programming. Also, the extensive process of licensing and approvals that is involved in any console game design might turn some designers off [6, par.5]. It consequently appears that designing computer games also allows much more room for innovation because there are not as many restrictions along the way [6, par.6]. This might add to the notion that PC games are much more involved than console games are. This leads us to believe that consoles are good for certain types of games, while PCs are good for others. For example, while consoles are good for action games, PC games tend to do better with slower, strategy based games. Refer to Table 4 for more advantages and disadvantages of the two mediums.

### Table 5: Medium Differences

<table>
<thead>
<tr>
<th>Medium</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| PCs    | - Constantly evolving  
         | - Can be used for more than just playing games  
         | - Graphics on monitors look better than graphics on TV  
         | - Online multiplayer capabilities | - Software piracy issues [13]  
         |                       | - High prices compared to consoles  
         |                       | - Complicated setup and upkeep compared to consoles  
         |                       | - More game titles than for a console  
         |                       | - Controllers are too complex, resulting in complex games that take too much effort to learn [55]  
| Consoles | - Very easy to use, just put a CD in and go  
          | - Can be played in the living room, sitting or lying on the couch  
          | - There is no need to upgrade the system or patch it  
          | - Great international market penetration | - Last only for four years compared to ever improving PCs  
          |                       | - Games require complicated programming skills to create  
          |                       | - The functions of a mouse are not easily replicated  
          |                       | - Strategy games are hard to play due to lack of controls compared to a PC |

Computers have different input devices from those of a gaming console. For a computer, it is a keyboard and a mouse or a trackball, while for a gaming console it is a gaming pad. The way these controllers operate in a game is also different. For a PC game, you can use certain keyboard shortcuts to perform common functions. You can also use your mouse to pick up and drag items around the screen. For a console game, on the other hand, one controller has to
perform all these functions. There are certain combinations of buttons that do certain tricks within the game. Otherwise you have to be skillful to operate the directional buttons, analog sticks, and main buttons.

While PC games utilize the skills that players might already have from using their computer on an everyday basis, in order to play a video game, one has to learn a whole new set of skills. Sometimes, it takes a while for a novice to understand what each of the buttons on a game controller does. In turn, this might take away from the fun of the gameplay itself.

There is a new generation of controllers that is currently out on the market [69, p.4]. These are wireless controllers that allow the player to walk around the room freely while playing the game. This gives the player more mobility compared to old, wired controllers and even more compared to that of a PC game.

Because of the input device difference, the interface design of the game is different as well [5, p. 33]. While the design menu for a computer game can be quite flat because the mouse can click wherever on the screen; the design for a console system is forced to be hierarchical because the access device is different. This can be specifically seen in those games that are made both for computers and console systems. For example, in a game like SIMS, each character in the game can be selected by a click of a mouse on a computer, while on a console, a player would have to scroll through each character until reaching the desired one. Another example would be a game like Tom Clancy’s Splinter Cell or any other similar shooting game. While going through the weapons inventory on a computer, players can use shortcut keys to pick a weapon they want in one move. In performing this function on a console, players are forced to scroll through the entire inventory until they see the weapon they want to pick. These limitations exist due to the large difference in the amount of buttons on a console controller and a computer keyboard and mouse. Ultimately, it is advisable to design the controllers so the players can customize them as they please [5, p. 34]. This will make the player enjoy the gameplay, instead of trying to figure out how to play in the first place.

Because console games and computer games have different types of controllers, are played in different surroundings, and appeal to different types of players, the interfaces of the game produced for these mediums differ along various factors.

---

8 Can pick an item right from the screen with a mouse.
9 Have to perform certain tasks first before picking an item, so in order to perform one task, a series of previous tasks has to be performed.
CHARACTER MOVEMENT

One of the first differences that comes to mind is the way that controllers are used in the games in order to move around the space. While a mouse could be used to move the player or the cursor around in a computer game, in a video game a player would have to use one of the analog sticks to do the same thing. Also, in computer games, the player is usually allowed to move ahead in the game in order to look around the surroundings just by clicking the mouse. In a similar situation in a video game, the player would have to move the character in the game into wherever he/she wants to go. Some of the video games allow players to control the camera view so it is possible to see more than in the default view, however that is still not as much as one can do in a computer game.

HAND INVOLVEMENT

In most computer games, it is possible to play the game just by using the mouse and its two buttons. In some cases, the keyboard’s directional keys could be used instead of the mouse for character movement. Often Spacebar or Enter keys are used for shooting weapons or other action items. However, most of the time, the mouse is used for most of these tasks, unless specific shortcuts have been assigned by the player. The function keys usually contain shortcuts for specific actions, however, a good game interface would duplicate these actions for the mouse. This makes computer games easy to play because only one hand has to be actively involved the whole time.

On the other hand, in order to play video games, the player has to use two hands to hold the game controller. The buttons on the controller are designed in a way for a user to utilize both hands. Main movement throughout the game could be done through the directionals or the analog sticks and the main action buttons are on the opposite side, including additional buttons at the top of the controller (see Appendix B). Not only does this force the player to be more involved at all times, but it also forces game designers to think through the user interface design process, since it is harder to navigate than with a computer.

VISUAL AIDS

There are often graphical representations of various things in the game in order to help the player associate certain things with certain icons. There could also be some text captions if the characters in the game are talking. While these are normal for computer games, designers have to be careful when implementing them into the video games. The first reason would be the quality of graphics. On a PC the graphics are usually clear and vivid. The player also sits very close to the monitor during game play so it is not hard to see what’s going on on the screen. The text caption might help in the case that the player does not have speakers attached to a computer, which is not that common nowadays, however, it could still happen. With video
games, on the other hand, since they are played on television sets, there will always be speakers and so there is no real need for captions, unless the player has hearing problems or the character has a thick foreign accent and is hard to understand. The amount of screen text should be appropriately spaced and timed so as not to overwhelm the player with continuous reading [5, p. 26]. The writing of the text itself should also be complementary to the storyline and add to the overall quality of the game [5, p. 27].

HARDWARE - CONSOLE

The main difference between computer games and console games is the ease of use of console games. Since these systems are made purely for playing games, one can do so just by inserting a disk into the console. With a PC, one constantly has to worry about updating drivers, having the right patches and making sure that the game is compatible with the operating system [63, par.4]. Because of all this hassle, many gamers chose to purchase consoles so they do not have to worry about anything but playing games. There are, however, differences that make each of the systems unique in their own way and preferred by different types of gamers (see Appendix A for technical details).

CONSOLE

Until recently, hardware would not have been an issue for consoles because they did not have any that would even closely compare to that of a PC. However, newer consoles come equipped with more memory, hard drives, and network cards that could rival those of a PC. While PCs come with all the hardware, they have to share it with the operating system and other programs that might be installed on the machine. On the contrary, all the hardware that comes on a console is solely dedicated to whatever game is inserted in the disk drive at that time. This dedicated service contributes to great game playing and is what wins many gamers over.

An average life expectancy of a console is about four to five years [66]. This means that game designers can release a game and then work on improving the game engine throughout the lifespan. Because consoles are similar in design, game programmers can focus on writing optimized code instead of trying to figure out how to accommodate various systems. This gives the designers more opportunity to focus on game details and features instead of technical factors.

COMPUTER

There are computer retailers that market specific models of their computers as "gaming systems". These come equipped with huge hard drives, quality video cards, great sound cards, and lots of memory. What they also come with is an expensive price tag. While buying such a system is acceptable for a solitary gamer, this setup will not work when the whole family wants to play. Not only is there not enough space for everybody in the room, but there is only one
controller, so only one person can play the game at a time. So even though the PC might have much more power than the console, it is unsuitable for family entertainment.

This aspect is quite important in deciding what type of gaming medium to buy. Let us look at the fundamental reasons for why people would purchase either a PC or a video game console. A computer is usually purchased to do tasks other than gaming. It could be used for anything from simple word processing to chatting to keeping track of a family budget. It is usually set up in a home office or a separate room so that whoever uses it has lots of privacy away from the rest of the house. A user typically sits in a chair, about a foot or two away from the monitor. This allows the user to be comfortable but alert at the same time in order to be as productive as possible [55, p.3].

A video gaming console, on the other hand, is usually placed wherever there is a television in the house. Most of the times it’s in the family room or a den, where most of the family spends their time together. So, instead of bringing the family into the office, we’re bringing the entertainment where the family is already [55, p.3].

Quality of Games

The majority of people seem to think that PCs overall have better games than the consoles [71, p.2]. This could be explained by a variety of different factors. One of them is the cost that is associated with developing these games. It is much cheaper to develop a PC game, about $3,000 in total for a compiler and a reasonably fast computer [55, p.4]. On the other hand, in order to develop a console game, game designers have to go through many steps to even obtain licenses in order to develop for a specific console. First, designers have to get a developer’s kit for the console that they want to write the game for, which is about $20,000. Second, game publishing companies usually lend these development kits to game designers, so in case the publisher does not like how the game is coming out, they can pull out of the deal whenever they want to. Because console games require these development kits, there is a very small chance that a team of novices would start developing a game, meaning that usually developers that have developed for consoles in the past have higher chances of getting the gig. This, in turn, means that independent developers who might have better ideas than those who are in the market already have no chance to develop console games [55, p.4]. This might be another reason why many PC games tend to be unique in nature compared to console games.

Because PCs tend to have much more power than consoles, the games tend to be much more graphical and involved compared to console games. Many computer games tend to be
either strategy or "god games" – simulations, where the player has control over the entire civilization. These large scale games are possible because of the "point and click" capabilities of a mouse and the ability of the monitor to display in detail various aspects of the game board [77, p.2].

Overall, the process that new game ideas go through follows a similar path. Usually, if a game is successful, designers will make sequels because it would guarantee success. In fact, it is suggested that game designers stick with what they know and not take risks if they want to make money [5, p.1]. This is attributed to the notion that the consumers want to see something new, however, they need the reassurance of the old title’s success [5, p.2]. Because so many different parties are involved in a video game development, often designers have to follow whatever they are being told by management. This tremendously limits creative thinking. Other times, games have to suit a particular market, meaning that they have to reflect the habits and customs of their target market. For example, Tomb Raider had to be "dumbed down" for the American audience because of the short attention span and lack of patience that is needed to solve complicated puzzles [8, p.87].

Another huge limitation for console games seems to be the bureaucracy that exists in the world of gaming companies. Besides the required developing kit, all the games that are developed for consoles have to be approved at the central location in the company. Even though many of the games do get the approval, it still slows down the overall process [5, p. 222].

The big difference in games between consoles and PCs is the quality of characters. Historically, many of the main characters in console games have been quite cartoonish (think Mario, Sonic the Hedgehog), while the characters on PC games have been more serious or adult oriented. While this is rapidly changing with the tremendous improvement of technology, the stigma of the early games may still be in the minds of the consumers. It is very important to develop console game characters that appeal to every family member in a way that would make it interesting for them to play the game [74].

# # #
Video games have to be designed cleverly in order to keep their players interested for a prolonged period of time. Due to various technological developments and the competition that exists in the video gaming market, companies cannot afford to release mediocre games anymore, and the players definitely want more out of the gaming experience than Super Mario Brothers used to deliver [3, p.6]. There are some important factors that have to be considered when designing successful video games. First, one needs to understand that video games are not just simple toys but rather complex gaming systems [5, p.183]. Therefore, the game play itself has to be complex and sophisticated. This pertains to everything from the concept of a hero to the background music that is used during gameplay.

One of the most important facts to realize would be that the main character of the video game has to be cleverly designed. However, the game itself should also be designed well. Otherwise, if the character is not interesting, the player will perceive the game uninteresting as well [52, p.150]. If the character is designed in a way that a player can relate to it, then the game will be more exciting. If a player follows the storyline and feels that he/she needs to help the game character to succeed in their mission, they will feel like they have to help them win the game [52, p.152]. The closer the relationship between the player and the main character, the more intense the game playing experience will be and the more enjoyable the game.

Some designers do not spend much time developing a main character because they want the player to be the center of attention [5, p.82]. This requires the game to be more responsive to the player in order for the player to feel like he/she is in control. The game will also need to reward and punish the player’s choices, based on how these choices affect the overall gameplay.

For example, the tempo or speed of a video game is important [52, p.189] in order to either keep a player in suspense or provide constant action depending on the script of the game itself. If the timing is off, the game will seem awkward and will only frustrate the player instead of being interesting. Game speed adds to the playability of the game, by either working with or against the player. It is a skill to design a game that varies speed as the storyline develops.
Another important aspect of video game playing is the music [52, p.193]. This is important not only because it makes the game more exciting but also because it mentally suggests the mood of the game itself. In the future, an interesting thing to implement would be to utilize programming in order to make the game environment react organically to whatever music theme the player chooses [52, p.194]. The main element to realize when designing games is that the pleasure a player will yield from the game is directly correlated with the relationship of the game demands and a player's skill level [52, p.169].

This part of game design is extremely important and directly affects the success of the game. Video games are competing with books and movies in terms of storytelling techniques, so they have to be much more advanced in their ways, due to the increased interactivity of the medium. There are a few guidelines that all game stories should follow:

- Every story should have a beginning, middle and an end [5, p.76].
- The beginning of the game has to entice the player to play the rest of the game [5, p.76].
- Main character has to deal with internal and external problems throughout the plot [5, p.79].
- In the conclusion your hero solves his problem and fights the ultimate bad guy [5, p.80].

These guidelines provide a standard frame for the game storytelling technique. It uses the methods that have worked in the past in order to guide what should work in the future.

There are several guidelines that contribute to making a well designed game. According to Bob Bates, the author of Game Design: The Art and Business of Creating Games, they are as follows.

**Player Empathy**

One of the most important things to do before designing the game is to have empathy for the player. This means being able to foresee his/her reaction to specific actions in the game. It is very important for a game designer to predict what will be going through a player's head when he/she will be playing the game [5, p. 22]. Testing the game for playability will allow the designer to see what choices potential players will make, consequently allowing them to have a further insight into making the game better. Besides working towards creating an interesting game play, it also allows the designers to identify and fix the problems during the design phase. This eliminates the problem fixing that is usually done during production phase, when it's a lot harder because all the details, including code and graphics, have been completed [5, p.23].
**Feedback**

It is very frustrating when playing a game and making some sort of action, not to receive any type of feedback to let you know whether the action went through or not. It is imperative that every input that a player makes in the game is accompanied by a suitable response. This means that no input whatsoever should go unanswered. Even if it is the wrong input, the game should let the player know that that particular input is not allowed. These feedbacks could be expressed in visual, audio, or physical manner, but they do need to be expressed in order for a player to understand how the game functions and be able to enjoy it to the fullest [5, p.23].

**Grounding the Player**

Grounding means letting the player know exactly where he is in the game and why he/she is performing a specific action at any given time. While playing the game, the player should tackle different problems that arise, knowingly realizing why these problems are arising and what should he/she do in order to overcome them. Every little step that a player makes has to make sense and fit into an overall scheme of winning the game [5, p.24]

**Moment to Moment Experience**

This deals with keeping the player excited during the whole process of playing the game. One of the worst things a game designer can do is make a game that bores the player. The game has to provide a player with a constant chain of interesting choices that will result in significant outcomes. On the other hand, the game should not burden the player with repetitive tasks either. The following is a list of design suggestions to help make a game that is interesting without being boring:

- Don’t make the player perform the same action twice (if they figured out how to open a safe, do not make them figure out the combination every time. Just give them an Open Safe command).
- In an action game, try not to make the player travel back and forth for no reason. Create some sort of portals that will do that for him/her faster than it would take for him/her to travel manually.
- If there are transitions between levels in the game, allow a player to bypass them instead of watching them every time.
- Have the game perform simple setup tasks for the player so that he/she could play right away with default settings.
- Give a player a lot to do but also make sure that these tasks are fun to do [5, p.25].

**Immersion**

This step is very important in a game in order to make the whole interactive experience flawless. Immersion happens when the moment to moment experience in the game is so believable that it draws the player into the game completely, making the real world disappear. This is when people play for hours at a time without realizing how much time has passed by. A successful game is supposed to bring a player in and not let him/her go [5, p. 26].
WRITING

Games should be written by professional writers. Just like a good book, which engages the reader and makes reading a pleasure, the writing in the video game should coexist with the gameplay. It is said that good game writing is invisible, while bad writing only draws attention to itself and consequently destroys the player’s feeling of immersion [5, p.27].

DESIGN WITHIN LIMITS

Every designer needs to know the limitations of the hardware that he/she is designing for. Even if a game requires extra features, they have to be implemented in a way that will not interfere with smooth gameplay. A designer has to make sure that his/her game will run without problems on any platform with none of the game components taking up more resources than they actually need [5, p.27].

INTERFACE DESIGN

This is one of the most important factors in game design. Even if the game itself is exceptional, a bad interface can ruin the overall experience for a player. The following is a list of guidelines one should follow in order to design a successful interface:

- The screen layout has to be aesthetically pleasing because the player will stare at it for hours.
- Vital information should always be accessible.
- The controls must be clear. The number of inputs for a player should be reduced to a minimum of clicks, key presses, or button pushes.
- Pay attention to conventions in your genre and use them.
- If including a non-vital feature comes at the cost of messing up the interface, not including it might be a better solution.
- Prototype the layout and design of the interface early and keep updating it.
- After a while, the player’s fingers should move unconsciously on the controller so that he/she is thinking only about performing an action rather than how to perform it [5, p.32].

TESTING

Testing is a very important part in any game design. It makes sure that the game is doing what the designers have intended it to do [5, p.175]. The tester has a lot of responsibilities in his job including staying current with bugs and fixes, weeding out multiple reports of the same problems, and letting coders know that their attempt to fix bugs did not succeed. If the design is for a console game, incremental builds will have to be sent to the console company and testing will have to be coordinated with their testers as well. If the game is multi-player, outside test sites might have to be setup with hundreds of volunteers in order to check whether everything is functioning properly [5, p.176]. Some of the things to look for when testing a game are:

- Is it fun?
- Is it easy to use?
- Does it make sense?
- Does it work?
It is a tester's responsibility to make sure that the game not only works but is fun to play as well. So all the testers have to not only be able to seek out problems but know what good games should do and look like [5, p.41].

Another factor that is very important to understand is that video games are not a static, but rather a dynamic art form. What that means is that their benefits often can only be realized after prolonged usage [52, p.148]. In order to achieve this, video game designers have to design games that will keep the player interested long enough to get him/her hooked on the game and like it. If this process takes too long, the player's opinion about the game will be negative.

One of the biggest things that will make games either playable or not is their design. This is an important part of the game and should always be designed with consumers in mind. However, many times there are games that are not interesting or that do not work as a player would expect them to or are simply boring for people to keep playing. These failures could be attributed to poor game design and decisions that were made by the design team.

The reason that there are so many similar games out on the market could be the beliefs that people have about what makes games popular. Players not only want the latest and the greatest in terms of their games, but they also want to make sure that their money was well spent on the new game [5, p.5]. This is accomplished by producing sequels of well known games or games that are similar to the most popular games on the market. However, because of this amount of creativity in terms of game story and game design is limited and many people complain that many games are too similar to one another.

There are certain guidelines that game designers need to follow in order to create a successful game. For example, in order to sell your game idea to a publishing house, a person has to put the whole idea into two sentences in order to respond to a question "What is your game about?" If they fail to do this, it is considered that their game has no chance for success [5, p.5]. However, there are also certain limitations in the gaming industry that force designers to abandon many creative ideas and practices. Nevertheless, it is considered that a good designer should be able to taken the limitations that are presented to him and use them to his/her own advantage in order to create new and interesting games [5, p.17].
Besides being one of the major sources of entertainment, video games have also proven to have other qualities and benefits over the years. Some of them might be quite obvious, while others are fully understood only after further research. Nevertheless, not only do video games bring us daily entertainment, but they also enrich our everyday lives whether we know it or not.

**Education**

Video games can be used in various ways but some of the most important ones are for learning. Since video games are interactive, they are not perceived as boring as traditional ways of learning. This might play a big factor in demand for educational applications. Also, because video games require a lot of interaction, the learning process itself will be primarily hands on and therefore might work better for some children who have learning disabilities.

Current research has shown that video games affect three different parts of psychology: cognitive, affective, and connate [3, p.8]. It has been noted that in terms of the connate part, people have tried to prove that the improvement of reflexes, manual skills, and motor coordination could be attributed to the time spent playing platform, arcade, and role-play video games. In terms of affective development, studies suggest that there is a correlation between time spent on video games and stress relief.

Even though different researchers may disagree on the specific benefits of video games, most of them agree on one thing: video games "promote intellectual development, and suggest that players can benefit from developing knowledge strategies, practicing problem-solving, and developing spatial skills, and related aspects such as increased precision and reaction rates" [3, p.8]. Critical thinking is also mentioned as one of the skills that could potentially benefit from video games. It is also mentioned that according to research, children who play video games seem to have higher intellectual levels than those that don't [3, p.9].

**Health**

Besides providing the traditional values of entertainment, video games also provide therapeutic benefits. According to a Wired News article, video games are used to help people deal with certain fears [70]. By deliberately exposing people to their fears, it is possible to gradually reduce the level of fear and eventually get rid of it altogether. This is done by performing various simulations, using video games and sometimes virtual reality in order to make people feel like they are really being exposed to the objects of their fear.
Video games are also used to aid in physical therapy. For example, in New York University Medical Center, therapists use video games to improve hand-eye coordination in recovering stroke victims [56, p.182]. This not only makes the therapy more exciting but also opens up new possibilities for interactive therapy where the patient can control their own pace of development.

Other disorders that can be treated using video games include Attention Deficit Disorder (ADD). The treatment is performed by attaching wires to a patient’s head and reading the signals that are sent by the brain when the patient is thinking of something [41, par.4]. These signals are then converted into signals that are understood by the computer. This allows the patient to control a game or even watch a movie on a DVD by only using their mind. This could be implemented in the future to play more complex games or even perform various tasks utilizing different applications.

There are a few games on the market that force the player to get off the couch and jump or dance around. They are able to do that through utilizing a dance mat that plugs into the video gaming console and records the players movements. By switching the controls from hands to feet, this forces players to move around more than during a usual game. These games are: Dance Dance Revolution (DDR), American Idol, and Dancing Stage MegaMix.

Various attachments could be made that would add to or enhance the existing video game play. For example, a company named Cateye Fitness (www.cateyefitness.com) has created a fitness bike, Cateye Interactive Game Bike, with a controller that attaches to any PS2 and allows the player to control his/her movements on the screen with his/her own body while pedaling [59]. Not only does this make a game more interactive, but it also forces the person who is playing the game to exercise while playing. This could evolve into other equipment being incorporated into game play or even into a virtual workout room with a virtual personal trainer that will give certain people the extra motivation that they might lack on their own.

Besides being the medium that gathers the whole family to entertain them, video gaming consoles could serve as communications devices. This could be achieved through having broadband access that is used for online gaming, being used for online communications as well. A separate keyboard could be purchased in order to send e-mails. Also, possibly a web camera and a microphone could serve as tools for communication when voice over IP quality improves.
For people who own home computers just for the communication part of it, it could mean getting rid of their bulky PC and switching over to a slick looking gaming console that could perform all the functions that a family would need to use. From watching movies on DVDs to playing music to talking to their family and friends, all of this could be done by one device that costs a lot less than a PC. This could mean the phase out of low end PCs.
From the reviewed research it is clear that specific video games need to be designed for females and families in order to attract them to the growing market. This will require the development of a whole new design process, since it does not exist right now, and games are simply designed based on old male stereotypes and what happens to be successful. Some of the aspects that need to be considered are research, usability testing, and personal preferences of the gamers.

The first step to making sure that the games that are designed are suited for families would definitely require the collection of market data. This should include demographics, household console saturation, percentage of time spent on games, computer literacy, etc. Besides just gathering data, some hands-on experiments would need to be performed in order to determine which types of games are preferred by most families. This would definitely include usability testing in order to determine exactly what needs to be included and worked on for the future games. This would provide game designers with loads of data that would guide them in the game designing process. Many game designers make the assumptions that they will anticipate the needs and wants of gamers instead of actually doing user testing before completing the design. This might hurt the game success in the end if the designer’s anticipations are not backed up by the user’s factual wants and needs [21, par.5].

It is also important to share the findings of research within the industry, so that everybody could benefit from it equally. This way the whole discipline of game designing will have a knowledge base to work from. This will save time and money that could otherwise be utilized in order to improve games.

Usability testing for video games is quite different than usability testing for regular applications [21, par.3]. The difference is in the audience: in video games it is individuals who are the target, not businesses. This forces the designers to make the games more personal and engaging for the player and make it a fun experience, versus selling a tool to accomplish a specific goal as it is usually done with office software and such [21, par.3]. This means that each game is competing to be the favorite of many individuals with many different tastes and preferences. The video game itself is more than software, it’s an interactive experience. Users should be able to play the game the way it was designed to be played but also have fun at the same time.
The measures of usability are effectiveness and efficiency but also the overall satisfaction that the player gets from the whole gaming experience [21, par.4]. It is also important to understand the difference between quality assurance and usability testing. Usually when the game is tested for quality it is by professional gamers, who have played many games in the past and who are looking for specific things in the game [21, par.7]. Usability testing, on the other hand, should be performed using a sample of people who would be targeted for purchasing the game. This way, game designers would have a small sample of their target market to work with. Instead of experienced game players who earn their living looking for bugs and ways to cheat the games, ordinary people who own gaming consoles should be picked as test subjects.

It is also important to start testing in the early stages of the game design so that if any suggestions are presented, they could be acted upon in a timely manner. Otherwise, it would either be impossible to change the game or it would take too long and would not be worth the effort.

Another measure of game quality would be game playability. While for business software, usability is important because clients have to be able to use the package efficiently, for games the main reason is entertainment. Games have to be “easy to learn but difficult to master” [15, p.1509], while business applications should be easy to learn and easy to master. The challenging aspect of the game is what makes it exciting to play. However, it has to be challenging enough to keep the player interested but not too hard so they easily give up. These qualities are measured and make up what is called playability of the game.

Traditionally, various user studies have been performed to test the game’s playability. However, there is a new technique for playability testing. It is called Heuristic Evaluation for Playability (HEP) [15, p.1509]. It is based on productivity and playtesting heuristics which are comprised of computer, video, and board games. In combination with traditional user studies, HEP creates a new way for the gaming community to evaluate games. This can result in games that are more usable and playable for the target audience.

There are several heuristic categories by which the games are being judged which are shown in detail in Table 6. It covers everything from the type of challenges that a player is forced to face in the game, to how well the interface is designed to help the player overcome these challenges.
Table 6: Game Heuristic Categories and Definitions [15, p.1509]

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game play</td>
<td>Set of problems and challenges a user must face to win a game.</td>
</tr>
<tr>
<td>Game story</td>
<td>Covers all plot and character development.</td>
</tr>
<tr>
<td>Game mechanics</td>
<td>Programming that provides the structure by which units interact with the environment.</td>
</tr>
<tr>
<td>Game usability</td>
<td>Involves the interface and encompasses the elements the user utilizes to interact with the game (e.g. mouse, keyboard, controller, game shell, heals-up display).</td>
</tr>
</tbody>
</table>

Source: [15, p.1509]

There have been numerous attempts at making game design uniform and follow a certain set of rules. However, they have all been individual and have not been officially recognized by the industry. With HEP, it could be possible to implement some sort of standards for playability testing in order to improve the overall quality of games.

In order to validate HEP, a comparison test set was set up with people testing various aspects of the game in two-hour sessions. Players were asked to think aloud and voice their negative and positive thoughts. This was recorded in addition to the collection of data from traditional user studies. The results were compared to see what exactly HEP contributed to the field. Even though there were some overlapping issues covered by the user studies and HEP, it was concluded that "the total number of issues identified from HEP was greater than the number of issues found from the user study" [15, p.1510].

Overall, it was concluded that HEP is most useful during preliminary design phase which comes before prototyping stage. It helps to see the user's (player's) point of view, which allows designers to avoid expensive design flaws. However, because this is just one study, it is possible that HEP will be useful during other phases of game design, based on who uses it (playability experts or game designers) and on types of issues that will be covered during the tests [15, p.1512].
Based on the publications analyzed in this paper, it seems obvious that video games are here to stay. More so, their target market is constantly expanding to include all ages, genders, and races. In fact, it is expanding so quickly that the industry has not been able to accommodate all tastes and preferences. For example, female gamers are still a minority in terms of game ideas and designs that are geared towards them. Also, families are now choosing to stay home and play video games instead of other forms of entertainment like going to movies. There seems to be a void that needs to be filled in the video gaming market that hasn’t been really addressed seriously. Not only are there more moneymaking opportunities but also new ideas and possibly innovations in game design relating to the development of these games.

There are many social issues that arise when the subject is video games. These include everything from violence in children to loss of personal relationships to rising obesity. However, the opposing side argues that video games are just used as scapegoats for people’s problems and laziness. From various research sources, facts seem to state more of a positive influence of video games rather than the negative due to some of the negative statements being unsubstantiated. This fact only strengthens the notion that video games are a popular form of entertainment and are here to stay and change our society forever.

Besides having to deal with various social issues, video game reputation also has to deal with multiple gender-differences related matters. Given the research for this paper, it is clear that there is a significant lack of supply of female-oriented video games to the market, making it primarily a male-oriented and operated industry. This is not because females are not interested in video games completely, but because they are interested in completely different types of games than males are. Through researching games that have been successful in the past, female social habits, female way of thinking and interpreting data, and more research geared towards female oriented entertainment, it could be possible to satisfy the current growing demand for video games designed specifically for women in the near future.

There seems to be many arguments about the positives and negatives of various gaming media. The main contenders are personal computers and consoles, due to the nature of their design (stationary) and the quality of games they offer (high speed, quality graphics). Some of the main points that occur deal with the controller differences, spatial positioning of actual machines, quality of games, upgrade capability, ease of use, and problems that arise during utilization. All in all, game consoles seem to come up on top on most, if not all, of the issues. It just seems to be more versatile, allowing for much interesting and relaxing gameplay.
Overall, the United States seems to be on top of the game, in terms of the video gaming market share. Video game sales and popularity have been steadily rising over the years. Recently, video games started to rise to the level of movies on the entertainment ladder. More celebrities are doing voices for various game characters as well as acting as characters themselves. Musicians put songs from their new albums into video games, knowing they will reach a wide and diverse audience. It is considered "cool" to be a part of anything that deals with video games in general. With the quality and complexity of games being constantly on the rise, it is only evident that the popularity of video games will keep rising and eventually might replace movies and music entertainment as one conglomerate of interactive way of spending free time.

In order to make video games interesting enough for a person to spend hours playing it, certain rules and guidelines need to be followed. Some of them simply state the obvious – if the technique used in the last game worked, use the same one on this one. Others are more elaborate on what exactly needs to be done before, during, and after game design phase in order to produce a successful game. Any successful game needs lots of thought put into it during the entire design process, as well as a lot of hours of testing and fixing in order to eliminate any possible hurdles that could annoy the player. Usability testing is also important in order so as to make the game easy but interesting to play and engage the player into the game completely. Based on past success, knowledge of the target players, and thorough understanding of game design principles, it is possible to make a hit game and have fun while doing so.

Because video games are an interactive form of entertainment, they have the potential to be used for things other than gaming. Some of these things include educational applications, health related applications, interactive exercising, and various forms of communication. Due to the flexibility of a console in terms of positioning and with future add-ons, it might be possible for some processes to completely switch to this interactive way of presentation. For example, exercise could become completely interactive even for one person, by having a camera monitoring one’s moves, with instructions on the screen and a heart rate monitor. One could have a very own personal trainer without having to pay the high price of a real person. This only strengthens the notion that video games are here to stay and will be used by a very diverse group of people in the future.

Besides being used for various non-gaming applications, one of the biggest challenges for video game designers is to make games that could be played by the whole family. Everybody from small children to grown adults should be able to enjoy these types of games as well as find them challenging in one way or another. This could be done through continuous research, focus groups, usability and playability testing. In addition to the abovementioned techniques, Heuristic
Evaluation for Playability is a new way of evaluating games that seems to be very accurate in determining which games will be positively accepted within the target market. This could provide the needed industry wide standard for testing, which would increase the overall quality and playability of games.

It is clear that specific games have to be made that are geared towards female players. However, what type of games do they need to be? From the analysis, a few things seemed pretty obvious in terms of what female gamers liked:

- Games that are related to the real world [27, p.182]
- Games that stimulate the brain rather than being completely action-based [27, p.182]
- Utilize their communication skills [2, p.5]
- Identify with the main character [12, p.61]
- Set their own pace, choose the developments [12, p.63]
- Positive relationships, friendships and family oriented situations [12, p.54]
- Good versus evil themes [12, p.53]
- Value diplomatic skills [27, p.182]
- Defy convention and doing something new [12, p.84]
- Puzzles that add to the storytelling value of the game [12, p.84]
- Games that help characters achieve their goals through cooperation rather than fighting [27, p.182]

These values showed to be almost opposite to those preferred by males. This fact only strengthens the urgency for female-oriented games.

Most of these values were used in the design of a widely popular game – The Sims. First of all, the whole game is based on life simulation, which in its nature resembles the real world. The game has tasks that force the player to communicate with characters in the game, thereby utilizing both their communication and diplomatic skills. If the player acts the right way and says the right things, then the characters will react in a positive way and vice versa. This illustrates positive relationships and friendships. One of the main aspects of the game is that it lets you set your own pace. For example, if your character is hard working and keeps developing, eventually it will be promoted at work or get a raise. On the other hand, if the character is being lazy all the time and not doing much, then it might face all the negative consequences of his/her actions. This game is a perfect example of a successfully designed and received game by females and family type players.

It is important to remember when designing games for females that just putting a game in a pretty package won't sell any games. Even though there are females that play games occasionally there are also avid gamers who need more than just a basic game with pretty graphics. It has to be more than just basing it on general stereotypes; it has to be thoroughly
researched and done with a passion involving female designers who would have an insight into a woman’s mind.

Another target market on the rise is the family. Right now, many of the games are either board games written into software or mild games that parents will allow their children and themselves to play. In order to make games that will interest the whole family, there have to be various plot points and game developments that would entice every family member from a mother to the smallest child in the family. These games would have to be multiplayer and possibly have characters that will evolve differently according to who is playing at that time. This means different artificial intelligence (AI) strategies for every player. This would allow the game to develop while catering to each player individually. The game has to be able to bring the whole family together for a night of a family entertainment. This means that the game could be played by every family member, no matter what gaming level they are on.

**Time Estimates**

An average game currently takes about twenty months to develop [49, par.5]. An average life of a console system is about five years [31], at least it was in the past, even though Sony now claims that its consoles have a ten year lifecycle, backing the statement by the fact that sales for PlayStation are still going strong [68, p.32]. Suppose it will take a year for various design companies to finally decide that they want to make female gamers happy and develop game ideas. This means that the minimum amount of time required to create a new game would be around three years, that’s if everything goes smoothly.

Some of the issues that could stand in the way of a successful game development could be innovations in technology. For example, if a company started to design a game and then something came out that changed the gaming world completely, the game project would either have to be abandoned or completely reworked in order to properly function using the new technology. Another problem could be the release of a new generation of console systems. For example, PS2 was released back in 2000, so theoretically PS3 should be coming out sometime in 2005 – 2006. Sony president Kaz Hirai has been quoted to say that Sony will not release PS3 unless it would have "quantum leap" capabilities compared to PS2 [68, p.33]. However, what if a rival company releases the next generation system? Would Sony feel compelled to answer the call by releasing its own version? So, if a game is developed for PS2, will enough people still buy it, knowing that PS3 will have much higher capabilities?

Carefully considering all the topics that were covered in this thesis, a valid conclusion can be drawn. The gaming industry is ever growing and the demand for quality games is on the rise.
It is up to the industry players to realize all the potential of the market and cash in on it. Currently, only part of the market is satisfied. Because the users are changing from traditional adolescent boys to include a more diverse base, it is crucial to recognize this change and adapt to it accordingly. It is also important to make the games and gaming systems readily and easily available to a variety of users throughout the globe. Overall, it is no doubt that the video game demand will keep growing in the future, however the long term success of the market will be determined by how fast and accurately the industry can respond back with quality products.


   <http://doi.acm.org/10.1145/950566.950583>


   <http://www.msnbc.msn.com/id/4609150/>


   <http://www.pcmag.com/article2/0,1759,1430072,00.asp>


   <http://www.techtv.com/screensavers/interact/story/0,24330,3002134,00.html>


   <http://doi.acm.org/10.1145/985921.986102>


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### APPENDIX A: CONSOLE BASED VIDEO GAMING SYSTEMS

<table>
<thead>
<tr>
<th>RAM</th>
<th>Nintendo GameCube</th>
<th>Sony PlayStation2</th>
<th>Microsoft Xbox</th>
</tr>
</thead>
<tbody>
<tr>
<td>40MB</td>
<td></td>
<td>32MB Direct RDRAM</td>
<td>64MB DDR SDRAM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cache Memory</th>
<th>L1: 32 instruction/data</th>
<th>Instruction: 16KB, Data: 8KB+16K (ScrP)</th>
<th>128 KB Advanced Transfer Cache</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2: 256KB</td>
<td></td>
<td></td>
<td>8GB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hard drive Ports</th>
<th>1.5GB</th>
<th>2</th>
<th>4</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Processor</th>
<th>IBM Power PC “Gekko” 485 MHz</th>
<th>128-bit CPU 294.912 MHz</th>
<th>Intel Pentium III 733 MHz processor 100Mbps integrated modem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking</td>
<td>N/A</td>
<td>Optional Network Adaptor</td>
<td>5x – 8GB NVIDIA GPU 256bit 2D/3D graphics acceleration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DVD Graphics</th>
<th>24-bit color, 24-bit Z buffer</th>
<th>4X RGB:Alpha:Z Buffer (24:8:32)</th>
<th>8MB Flash</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Memory Card Approximate price</th>
<th>N/A</th>
<th>8MB</th>
<th>$149.99</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Fill Rate</th>
<th>6 to 12 million polygons per second (peak)</th>
<th>75 million polygons per Second Graphics Synthesizer</th>
<th>4000 million pixels/sec</th>
</tr>
</thead>
</table>

| Graphic Effects | 162 MHz custom ATI/Nintendo Flipper | Bilinear filtering, trilinear filtering, Vertex Shaders, Pixel Shaders, fog effects, shadows, texture lighting. | |

Sources: [www.xbox.com](http://www.xbox.com); [www.techdepot.com](http://www.techdepot.com); [www.us.playstation.com](http://www.us.playstation.com)
APPENDIX B: THREE DIFFERENT TYPES OF CONTROLLERS

Microsoft Xbox

Nintendo Game Cube

Sony PlayStation2

Sources: www.amazon.com,
APPENDIX C: DIFFERENCE IN GRAPHICS BETWEEN 1970s AND 1990s.

Then

[Image of 1970s graphic]

Now

[Image of 1990s graphic]

Source: [http://www.pong-story.com](http://www.pong-story.com)

APPENDIX D: ANCESTORS OF VIDEO GAMES

Bagatelle Board

![Bagatelle Board Image](http://www.tradgames.org.uk/images/Bagatelle.jpg)

Pinball Machine

![Pinball Machine Image](http://www.tradgames.org.uk/images/Bagatelle.jpg)

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15 Source: [http://www.tradgames.org.uk/images/Bagatelle.jpg](http://www.tradgames.org.uk/images/Bagatelle.jpg)