Gamers and the Games They Play

A Major Qualifying Project Report

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By

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Abstract

Recent video games have been enriched with fascinating game details and multi-player capability. Knowing the players' likes and dislikes is important to game developers in making better games. This study has focused on exploring the players' game preferences and discovering the relations between different types of players by running statistical analyses on the data provided by GamerDNA Inc. The results suggest that different types of gamers have different game tastes which are dictated by the game content.

Acknowledgements

I would like to thank Professor David Finkel from Department of Computer Science, Worcester Polytechnic Institute for his guidance, instruction and help on this project. Also, I wish to express my gratitude to Stephen Sopp at gamerDNA, for his enormous help on transferring the data and explaining the database. I would like to thank Michael Voorhis, of the WPI CS Department, who has setup the database on one of WPI's computers for this project and provided useful technical support during the past seven weeks. This study can never be done without their help. Their time and efforts are greatly respected and appreciated.

Contents

List of Figures

List of Tables

Chapter 1. Background of GamerDNA

Today's video and PC games are very different from the games made a decade ago. They are enriched with advanced graphic and sound effects, composed with fascinating game stories and more importantly, capable of being played by multi-players online. The fast development of games accelerates the advancement of hardware of game consoles and creates huge revenues in many developed countries. The newly appeared characteristics of modern games make today's games more enjoyable and change the way people play video and PC games. Understanding of why people play particular games and how they play the games is important to game developers to design better games.

GamerDNA(www.gamerdna.com) is a social networking website which is especially designed for gamers. The website is aimed to help gamers to discover and better enjoy new games. On the other hand, the massive users' data collected by the company is extremely useful for game developers to study the games from the gamers' perspectives. The website was formerly known as GuildCafe(www.guildcafe.com), launched by entrepreneur Jon Radoff on September 21, 2006. Jon Radoff is an American entrepreneur and game designer. He was also a pioneer in developing one of the first commercial MMORPGs, Legends of Future Past. His current work has focused on online communities, Internet media and computer games [8]. As an enthusiastic MMORPG gamer, Radoff noticed that MMO players often play more than one MMO at a time. When people change their game servers or switch to another MMORPGs, many have not been able to keep in touch with their old friends or guild members. They have to make new friends and build up new social networks in the game. Due to this inconvenience, Jon Radoff started GuildCafe as a place for MMORPG players to keep in touch with friends or guild members they known in different games outside their games [10]. "What you see in the online gaming world today is that it's really the community aspects that are driving those properties," said Jon Karlen, partner at IDG Ventures. "A lot of what keeps people with those games is the fear of losing those people they enjoy playing with every day." The site has especially focused on providing a place for guilds, gaming groups and individual gamers to interact, find friends, discover gaming content and plan gaming sessions. Players can find social networking features like profiles, blogs, pictures, videos and forums on the website. Radoff said: "It started to occur to me that guilds themselves were like social networks, and that…[players] could keep those friendships alive as they change from game to game and server to server."[9] GuildCafe allows its members to "tag" themselves by name, date, game title, server name, guild, and avatar, thus the members can search for former friends within those criteria. In addition, GuildCafe provides tools

which guild members can use to organize themselves. Each member has his/her own blog page on GuildCafe where they can publish their game activities, experience, and in-game victories [2].

MMORPGs became extremely popular in recent years because players can interact with real people rather than the computer-controlled characters. The success of a MMORPG is often decided by the number of its subscribers. How to keep the players with a game is the key to the success of a MMORPG. The computer game industry and the MMORPG industry in particular are in need of more than gameplay and content innovation. Right now, the MMORPG market is nearly winner-takes-all, with only a couple of companies at the top dominating the market for active subscriptions. Radoff claimed "it (GuildCafe) was aimed at enabling new categories of massively multiplayer online games by using disruptive approaches such as social networking." The idea of the GuildCafe.com website was borne out of the realization that expanding the MMOG market would require innovation in terms of business strategies. [13] Radoff says GuildCafe succeeds because "the editorial content of other game sites tends to be focused around reviews and news reporting on the games themselves, not so much they players' perspectives." He believes that giving MMO gamers a place to voice their opinions will ultimately influence the gaming industry, and he envisions GuildCafe as a "see and be seen" place on the Internet.

Based on the success of GuildCafe, the company changed its name from GuildCafe Entertainment Inc. to GamerDNA Inc in April 2008. While GuildCafe was hardly limited to guilds and guild activities and intended to be used by MMORPG gamers, GamerDNA has extended its service to more online gamers and help them to discover, extend and better enjoy games from wherever they play online. Inherited all social networking aspects from GuildCafe, GamerDNA has been improved with new features which attracts more players to communicate on its website when they are outside games. Like other social networking websites, GamerDNA provides each member a single webpage, just like their own blogs where they can share their gaming activities and experience, and even just introduce themselves to others. Moreover, a member's page can be linked to others' pages, such as a friend's page or a guild's page. [2]

One of the company's exclusive features is the game traits system. The website creates separate pages for each game a member has submitted. When a member submits a new game to the system or adds an existing game to his own page, he is able to define or assign up to six different traits to the

game. The traits might be the game's genre, tone, theme, story, or even how the game is played and what kind of role a gamer has played in the game. A member is able to create new traits to a game, as well as assign existing traits which are suggested by others.

In December 2008, GamerDNA has launched the Discovery Engine as the company's core feature. The Discover Engine allows gamers to search games based on their interests, game preference and traits. Jon Radoff says that the goal of the company is to "improve the experience of how people learn about new games." Aggregating each member's gameplay history from popular networks including Xbox Live, Xfire and Steam, the company has collected game data such as the games a player plays, how far a player progresses into each game, and how much time a player spends playing, the achievements and score a player has earned in each game. Based on these comprehensive data, the service can suggest friends who have similar tastes and games which have common settings, genre, etc. Radoff believes the Discovery Engine can deliver more accurate game recommendations using their comprehensive data than other search engines would give, such as Amazon's recommendation feature. [11]

Except the exciting Discovery Engine, GamerDNA also provides its members a large number of quizzes such as the Bartle Test of Gamer Psychology, which classifies the personalities of MMO players.[6] The Bartle Test of Gamer Psychology, a quiz that classifies the personalities of massively multiplayer online game players has quickly become the most popular on GamerDNA.com. Additional quizzes on the site measure the play styles of other gaming genres, such as first-person shooters and real-time strategy games. After completing each quiz, a "facet" system shows participants a set of personality traits that represent their unique "fingerprint" as a gamer. "The quiz system is central to the identity defining capabilities of GamerDNA.com and we are thrilled with the positive response that it has received thus far from the community," said Jon Radoff. "Our goal was to have quizzes on the site that are fun to take and that also help us to define what we, as gamers, find interesting. The quizzes not only enhance our identity platform, but also help us to draw unique insights from the collective intelligence of people involved in the culture of gaming." "We've tossed out the one-size fits all mentality," said Radoff, "The problem for game companies is that they truly haven't known who their customers are."

As of today, GamerDNA has nearly half a million registered members and it keeps a solid pace of adding 1000 new members per day. In addition, the quizzes on the website have been taken more

than 500,000 times. The company is building up the “wisdom of the crowd,” to provide a gamer voice back to publishers that can speak louder than sales figures, and one that becomes a greater part of the conversation of game development. [9] As Radoff has said: “The problem for game companies is that they truly haven’t known who their customers are.” The large number of gamers’ data provided by GamerDNA may be helpful for game developers to better understand their customers in future.

Chapter 2. Bartle Test of Gamer Psychology

2.1 Introduction

Today's massively multiplayer online role-playing games (MMORPGs) have dominated a significant percentage of game market. Millions of gamers have spent countless hours on MMORPGs every week. MMORPGs create huge revenues in recent years worldwide. In MMORPGs, people usually play as fictional characters and behave differently from their real lives. To understand why people play MMORPGs and how they play in virtual worlds, it is important to notice the Bartle's 4-Types players.

Richard. A, Bartle, a British writer and gamer researcher, had been active in developing the MUD (Multi-User Dungeon, see Appendix I) and written an important paper about player personality types in massively-multiplayer online games.[4] Bartle was interested in how the approaches people to play MUDs. His research has also studied what kind of activities players would like to do most based on their playing styles and game settings. He identified players into 4 categories based on their playing styles and game preferences, which are known as Achiever, Explorer, Socializer and Killer. In Bartle's research paper, he assigned each type of players a symbol resembling those in card games.

2.2 The Four Categories of Players

Achievers (Diamonds)

In MMORPGs, Bartle characterized achievers as "Diamonds." These players prefer to gain "points," game experience, levels, equipment and other concrete measurements of succeeding in a game. They will spend a great amount of time on achieving rewards that confer them little or no gameplay benefit simply for the prestige of having it. Achievers also like to show off their might progress or elite status. They value or despise the competition from other Achievers, and look to the Socializers to give them praise. These gamers also like seeing their user names at the top of scoreboards. The popular MMORPG World of Warcraft caters to achievers by offering special titles and an exclusive mount to those that place in the top 0.5% of the competitive Arena ladder. Microsoft's Xbox Live utilizes the Gamerscore to reward Achievers, who can get points by completing difficult "Achievements" in the various games.

Explorers (Spades)

Explorers are dubbed "Spades" by Bartle for their tendency to dig around in the game. Explorers prefer discovering new maps, learning about hidden places, knowing tips and tricks about the games. The Explorer benefits much the same way as the Achiever does in the massively multi-player environment, as they are surrounded by people who will benefit from their wisdom. They exchange experiences with other Explorers. Interaction with Killers is usually negative, as hostile Killers would interfere with their exploration. Bartle believed that the population of Explorers is usually smaller than other types of players, by nature.

Socializers (Hearts)

These players are known as "Hearts." They enjoy communicating and interacting with other players in the game. The game is a different place for them to know new people and communicate with friends or relatives other than real life. Socializers take full advantage of the ability to join guilds or kinships in many online games, and form fast friendships and try to help other people out. They are usually friendly with everyone, save maybe the ever-unfriendly Killers. However, Bartle asserted that there is always potential hatred between Socializers and Killers.

Killers (Clubs)

Killers are associated with “Clubs”. In MMORPGs, these players like to fight with other players more than kill computer-controlled opponents. Killers like to cause mayhem among computer-controlled characters and things may be fun to the Killer. Mostly, they enjoy killing an actual player-controlled opponent in the virtual game world. "Ganking," a popular term used in MMORPGs, refers a process that Killers take their strong characters to attack inexperienced or weaker characters without warning. Killers despise Socializers more than any other types of players because they consider Socializers as inert players who do not participate in game play very much.

2.3 Bartle’s Result

Bartle, in his paper, [4] has claimed that each type of players is significantly different from other types in the way they play the games. Certain people act certain ways in a game because of their play style and how the game responds to that play style. He stated that an individual player would only fall into only a single category, but can switch between different categories at another time. Bartle has

asserted that the number of a specific group may affect the population of other types of players and it happens mostly between Killers and Socializers.

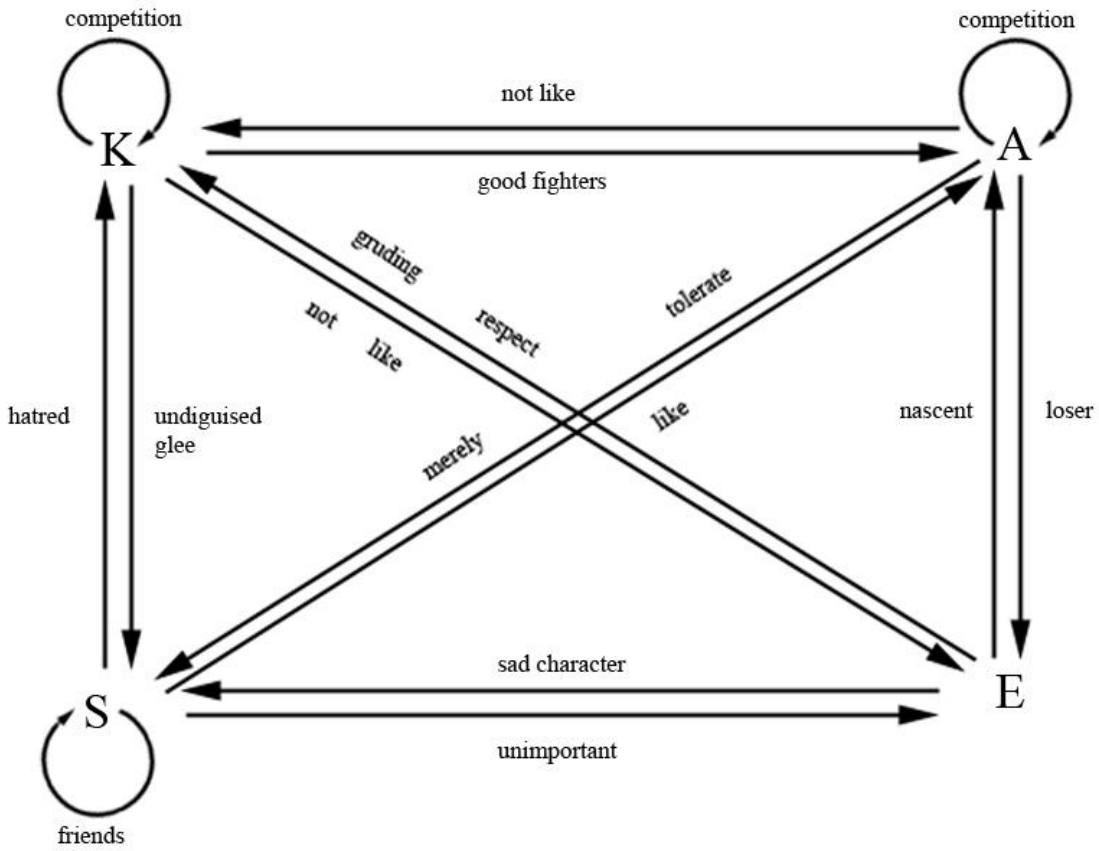

Figure 1. How each type of players reacts with other types of players

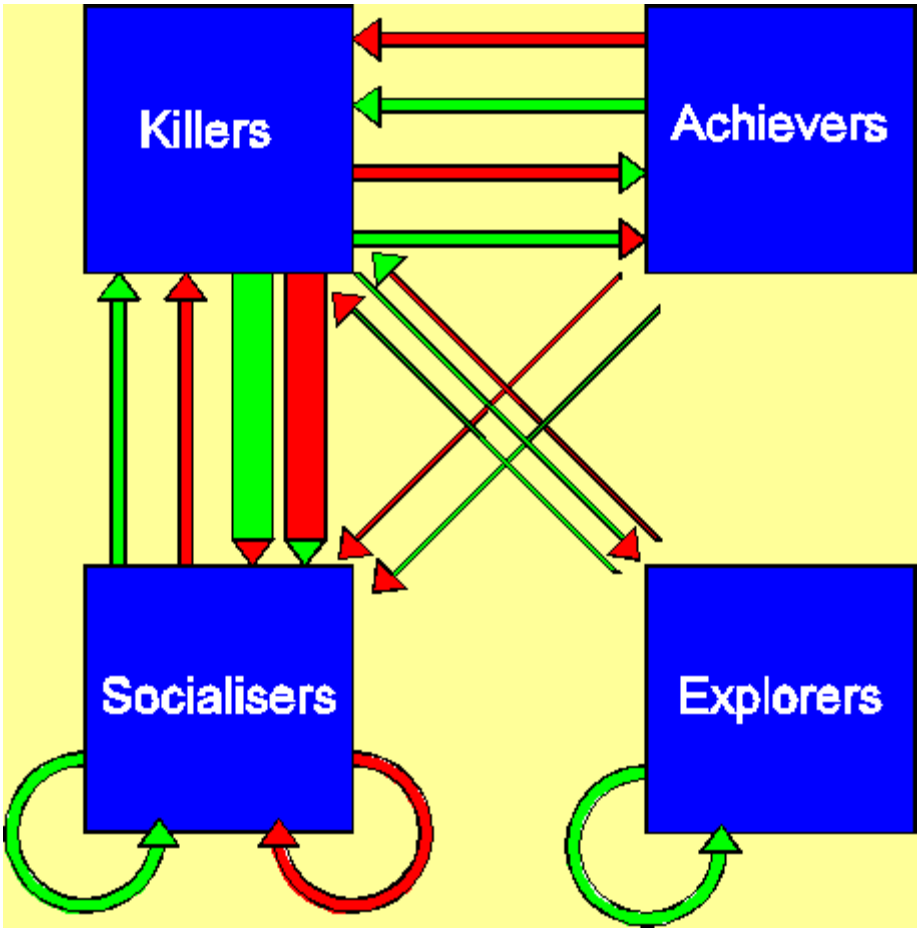

Figure 2. Bartles's graphic representation of players' relationships

Read the graph:

Green indicates increasing numbers and red indicates decreasing numbers. A red line with a green arrowhead means that decreasing numbers of the box pointed from lead to increasing numbers of the box pointed to. A red line with a red arrowhead would mean that a decrease in one leads to a decrease in the other, and so on.

The thickness of the line shows the strength of the effect: thin lines mean there's only a small effect; medium lines mean there's an effect involving roughly equal numbers of players from both boxes; thick lines means there's a great effect, magnifying the influence of the origin box. [4]

2.4 Bartle Test of Gamer Psychology

The Bartle Test of Gamer Psychology is a series of questions and an accompanying scoring formula that classifies players of multiplayer online games (including MUDs and MMORPGs) into categories based on their gaming preferences. Based on the research of Richard Bartle, Erwin

Andreasen has designed the Bartle Test and organized into electronic form. The test has been taken by a large number of computer game players. As of May 2008, the test had been taken by over 420,000 game players. [7]

The result of the Bartle Test is the "Bartle Quotient," which is calculated based on the answers to a series of 30 random questions in the test, and totals 200% across all categories, with no single category exceeding 100%. For example, a person may score "100% Killer, 50% Socializer, 50% Achiever, 0% Explorer," which indicates a player who prefers fighting other players relative to any other area of interest. Scores are typically abbreviated by the first letter of each category, in order of the quotient. In the previous example, this result would be described as a "KSAE" result.

The results of Bartle test are more important to game developers rather than MMORPG players. In addition to helping players define their game-playing preferences, the Bartle Test has been used by game designers to help define the requirements of games that are intended to appeal to a particular audience. Game developers also use Bartle test to balance their game settings and power of different classes of characters.

2.5 Problems and Criticism of Bartle Test

Although the Bartle Test is important to game developers, it has met with many criticism [15] for the dichotomous nature of its question-asking methodology. Some had argued that the Bartle Test questions were not properly made and choices for each question do not truly represent players' responses to the question.

Moreover, the 4-letter abbreviation result of Bartle Test has also been criticized by many players [15] because a player may score same percentage in different types of players. Therefore, there is not always a unique 4-letter abbreviation for a player. For example, a player may score 60% in both Explorer and Kill, 53% in Achiever and 27% in Socializer. The result of Bartle test for this player is "EAKS"; however, "AEKS" is another result for the player in this case.

Figure 3. Bartle test result of a player from GamerDNA

In addition, many players and game analysts have questioned Richard Bartle's original 4-types player model by observing the result of Bartle Test.[15] According to the data from GamerDNA, most participants who have taken the Bartle Test on GamerDNA are classified as "Explorer" (39.4% of 554,061). On the other hand, "Socializer" was the category with least players. This result has contradicted with Bartle's assumption which he predicted the population of "Explorers" is smaller than other groups by nature and "Socializers" would be the largest category. The Bartle Test was originally designed for MUD participants and based on Bartle's 4-Types model which was proposed more than 10 years ago. Therefore it is somehow out-dated and does not perfectly apply on today's MMORPGs. However, it remains relevant to new virtual worlds and MMORPGs.

2.6 Validation of Bartle Test

Bartle's Player Types are a well-known model of player motivations. Bartle provides important insight into how players may differ from one another and he suggests a categorization of 4 Types based on two underlying axes. However, his model has not been validated by any research.

Nick Yee, a professor at Stanford University, has studied player motivations in MMORPGs by using factor analysis. [14] His study was intended to validate Bartle's 4-Types Player model. However, his result reveals there are too many similar traits between the types which Bartle has proposed. He suggested merging Bartle's 4-Types into fewer categories by classifying players' common motivations and interests. Yee has asked a series of questions regarding to players' in-game motivations to different groups of MMORPG players. Based on the feedbacks from the participants, Yee has divided MMORPG players into three general categories, as illustrated in table 1.1; each category includes multiple detailed sub-categories.

Achievement	Social	Immersion
Advancement Progress, Power, Accumulation, Status	**Socializing** Casual Chat, Helping Others, Making Friends	**Discovery** Exploration, Lore, Finding Hidden Things
Mechanics Numbers, Optimization, Templating, Analysis	**Relationship** Personal, Self-Disclosure, Find and Give Support	**Role-Playing** Story Line, Character History, Roles, Fantasy
Competition Challenging Others, Provocation, Domination	**Teamwrok** Collaboration, Groups, Group Achievements	**Customization** Appearances, Accessories, Style, Color Schemes
		Escapism Relax, Escape from Real Life, Avoid Real Life Problems

Table 1. The subcomponents of gamer types revealed by the factor analysis

Yee has also addressed the three flaws of Bartle's theory in his paper as follows[14]:

1. Proposed components of each Type may not be related. For example, Bartle proposes that role-playing and socialization both fall under the same Type, but they may not be highly-correlated.
2. Proposed Types may overlap with each other. For example, aren't members of raid-oriented guilds both Achievers and Socializers? But in Bartle's types, they are on opposite corners of the model.
3. The purely theoretical model provides no means to assess players as to what Type they are. But more importantly, without resolving the problem in (1), any attempted assessment of players based on this model might be creating player types rather than measuring them.

In addition, Yee questioned that the axial model of Bartle's Player Types presumes that certain motivations are antithetical to or suppress other motivations.

2.7 Conclusion

In essence, it would be hard to use Bartle's model on a practical basis unless it was validated with and grounded in empirical data. For example, Bartle suggested that different Player Types influenced each other in certain ways. But unless we have a way of assessing and identifying players of different Types, theories built on top of Bartle's model are inherently unverifiable. While a "Bartle Test" (not

made by Bartle) does exist, the dichotomous, forced-choice nature of that assessment tool merely perpetuates the assumptions of Bartle's Types rather than validating them.

Although Bartle's 4-Type model and Bartle Test faced a number of criticisms, they still provide a good understanding about players' behaviors and motivations. Further researches could be done on validating on correcting Bartle's model and improving the Bartle Test. The result of a better re-designed Bartle Test would be useful to the game developers in making good MMORPGs.

Chapter 3. Project Goal

The ultimate goal of this project was to use the data from GamerDNA to do some useful statistical analysis to understand what characteristics of game players like and dislike. I am also interested in searching the relation between a particular kind of games and certain type of players by looking up the ESRB ratings of many popular games and the population of each type of players who have played a specific game. For example, do the players who belong to the 'family' zone on Xbox Live system tend to play games rated as for "Everyone" more than the games rated as "Mature". Finally, I also planned to write a Java program which connects to the database and provides the GUI or functions for others to conduct statistic analysis on the data more conveniently.

Chapter 4. Getting the Data and Setting Up

Getting the data from GamerDNA for this project was not quite a pleasant experience. GamerDNA staff spent about 2 weeks to remove the personally identifiable data from the database, specifically, they obfuscated the gamertags and send me two big compressed dump files, combined as 3.6 gigabytes.

The first machine I have used for this project was an Intel Core 2 Duo E8400, 3.0GHz CPU, with 3G RAM and the database engine I chose was MySQL 5.0. The system manager Michael Voorhis helped me creating a MySQL database and importing the data into the database. However, Michael stopped importing the data after the machine had run for more than 24 hours. After discussions with GamerDNA staffs, Michael first uncompressed the dump files before importing the data. The total amount of uncompressed data is about 40 gigabytes. Michael issued the same command to import the uncompressed data into the database on the same machine. Unfortunately, the machine's disk has sat at more than 90% duty cycle for more than two days. Finally, Michael terminated the command and decided to import the data from one of WPI server machines. Luckily, all the data have been successfully imported into the database within a day. The 'Recentgames' table is about 64M rows and the 'Gamerinfo' table is about 90M rows.

While waiting for the system manager importing the data into the database on one of WPI server machine, I can manually import a small amount of data into the database on my own machine which is an AMD Duo Core 4800+, 2.6GHz, with 4G RAM. I have used MySQL database engine on Fedora 10 platform. The 'more' command under the Linux system allows me to partially view the data inside the uncompressed data file. Therefore, I have copied the first one thousand records from each table and paste them into two separate MySQL bulk loader files. In addition, I have created a database called "gamerdna" and two tables inside it. Two tables are named as "gamerinfo" and "recentgames", which contain the exact same column names and data types as the tables from GamerDNA. After setting up the database and importing a small friction of the data, I have been able to test a few queries on my own machine.

I would like to thank staffs from GamerDNA and Michael Voorhis again for their great help.

Xbox Live Zones

The database contains data on over 165,000 gamers and information about their gameplay as recorded in Xbox live.

On Xbox LIVE® system, a player has the ability to choose his/her Xbox Live Gamer Zone. Based on the choice of a Gamer Zone, a player can tell others the kind of player he/she is. The following is taken from the Xbox Live webpage. The author of the article, Ben Barker, has summarized the characteristics of each type of gamers [3].

Xbox Live Gamer Zone: Recreation

This zone is designed for casual gamers who just want to have fun.

You might be a recreation gamer if …

- You only have one Xbox 360™, and it stays in the living room. For the most part.
- You like to meet new people and talk about the latest movies, music, and (of course) video games.
- You only venture into ranked games by accident.
- You treat every day like Casual Friday.
- You think keeping score is only fun when you're winning.
- You *are* physically capable of leaving mid-game if you need A) food, B) a restroom, or C) to go to work.

Xbox Live Gamer Zone: Family

This zone is where those "kids of all ages" you're always hearing about can gather for family-friendly gaming.

You might be a family gamer if …

- You require a parent and/or guardian to set up your Xbox LIVE account.
- You're playing a game with your Mom/Grandma/rich Aunt and want to maintain a wholesome atmosphere.
- Covenant Brutes give you nightmares, literally.
- You have kids, are a kid, or never stopped being a kid.
- You knitted four matching wireless controller cozies, one for each member of your household. With love, of course.

Xbox Live Gamer Zone: Pro

The Pro gamer is the truly hardcore—gamers who are there to play and to win, improving their gamerscore.

You might be a pro gamer if …

- You automatically mute the "human beat box" gamers and you automatically boot the "trash-talking chucklehead" gamers.
- You've actually won real prize money in videogame competitions.
- You never play anything but ranked games, and your rank has never gone anywhere but up.
- You check leaderboards for games that aren't even playable online.
- You own griefer insurance. Which, if you don't have it, is quite a deal and I would be happy to assist you if it existed.

Xbox Live Gamer Zone: Underground

The Underground is where anything goes—and usually does.

You might be an underground gamer if …

- You *are* the "human beat box" or "trash-talking chucklehead" (and proud of it).
- You rock with extreme vengeance and other totally intense buzzwords.
- People shout "griefer!" and you say "Yeah, whaddaya want?"
- You take out whole teams online. Including your team.
- You'd rather get revenge than win.

In short, Barker has pointed out the difference between each type of gamers. “Recreation” players are casual players. They play games occasionally just for fun. “Family” players usually play with family members and prefer the games which are more enjoyable and easier to play. “Pro” players are the truly hardcore gamers. They tend to play the games with intensive levels. They would stay within a game for a long time and be competitive during the play. “Underground” gamers play hard on the games too. They played a wide range of games.

About the Database

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Chapter 5. Queries

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Chapter 6. Statistical Results

The statistic analysis is important to verify the assumption about players' behaviors and game preferences. Before looking into each type of players' game preferences, there are a number of basic statistics needed to support further studies.

6.1 Basic Numbers – Players and Gamer Zones

The first query counts the number of gamers in each Gamer Zone.

Classification	Total Player
Recreation	85361
Family	6476
Underground	60945
Pro	56700
None	1725
United States	1
(Empty Value)	1
Total	211209

Table 2.Number of gamers in different Gamer Zones

Because many queries will investigate the players by their Gamer Zones, thus the first query is designed to categorize all the members into their own Gamer Zones. From the result table, a bad value and an empty value have been found in two rows. The value "United States" is not one of the Gamer Zones on the Xbox Live system. The gamer that had empty value for his/her zone field later had changed to 'None'. The results table shows four distinct Gamer Zones as used on Xbox Live system. In addition, 211209 is not the number of unique gamers as later study has noticed that many players have switched between different Gamer Zones and the information is saved as new records in the table. The total of unique players in the "gamerinfo" table is 165637.

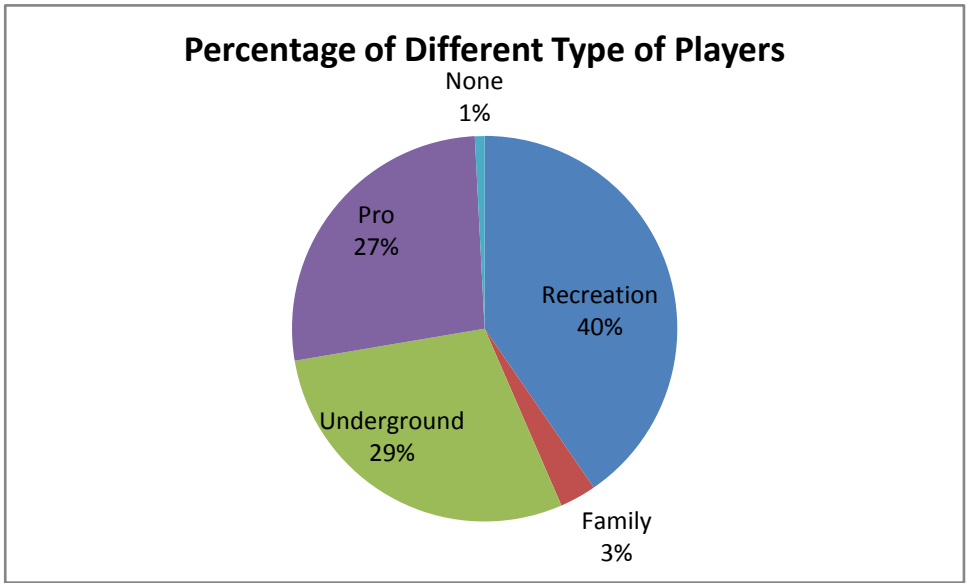

Figure 4. Percentages of Different Gamer Zones

The pie chart in Figure 4 shows the majority of gamers are "recreation" players. Gamers in "Pro" zone and in "Underground" zone are 27% and 29% of total players. Only 3% of gamers selected "Family" zone. Based on the description about "Recreation" zone gamers, most gamers are casual players.

6.2 Top Played Games and Their ESRB Ratings

The query is to ask which games have been played most by different players. The games in the result table will be used as references in further studies.

Name	Number of played by different gamers	ESRB
Halo 3	119701	M
Gears of War	118463	M
Call of Duty 4	102275	M
Hexic HD	99743	E
GTA IV	92072	M
UNO	89238	E
Gears of War 2	76319	M
Oblivion	74834	M
Geometry Wars Evolved	70067	E
Crackdown	69848	M
Assassin's Creed	68895	M
Guitar Hero III	67198	T

Rainbow Six® Vegas	65242	M
Texas Hold'em	64770	T
BioShock	62497	M
Mass Effect	61468	M
DEAD RISING	60582	M
G.R.A.W.	59942	M
Call of Duty 2	58334	T
Guitar Hero II	57095	T
Aegis Wing	55331	E
Fable II	55211	M
The Orange Box	54683	E10+
Rock Band	54655	T
Forza Motorsport 2	53979	E
PGR 3	53732	E10+
Call Of Duty 3	53708	T
Street Fighter II' HF	53384	T
Worms	53004	E10+
Fallout 3	52675	M
Saints Row	50192	M
Undertow	49582	E10
DOOM	48952	M
Marble Blast Ultra	48084	E
TMNT 1989 Arcade	46938	E10+
Perfect Dark Zero	46934	M
CoD: World at War	45222	M
Viva Piñata	44856	E
EA SPORTS FN 3	44754	T
Left 4 Dead	44520	M
Small Arms	44166	E10
Ultimate MK3	44145	M
Boom Boom Rocket	43863	E
Bankshot Billiards 2	43851	E
Frogger	43450	E
Rainbow Six® Vegas 2	42979	M
LUMINES LIVE!	42441	E
Carcassonne	41752	E
Splinter Cell D.A.	41531	M
Assault Heroes	41247	T

Table 3. Most popular games and their ESRB ratings

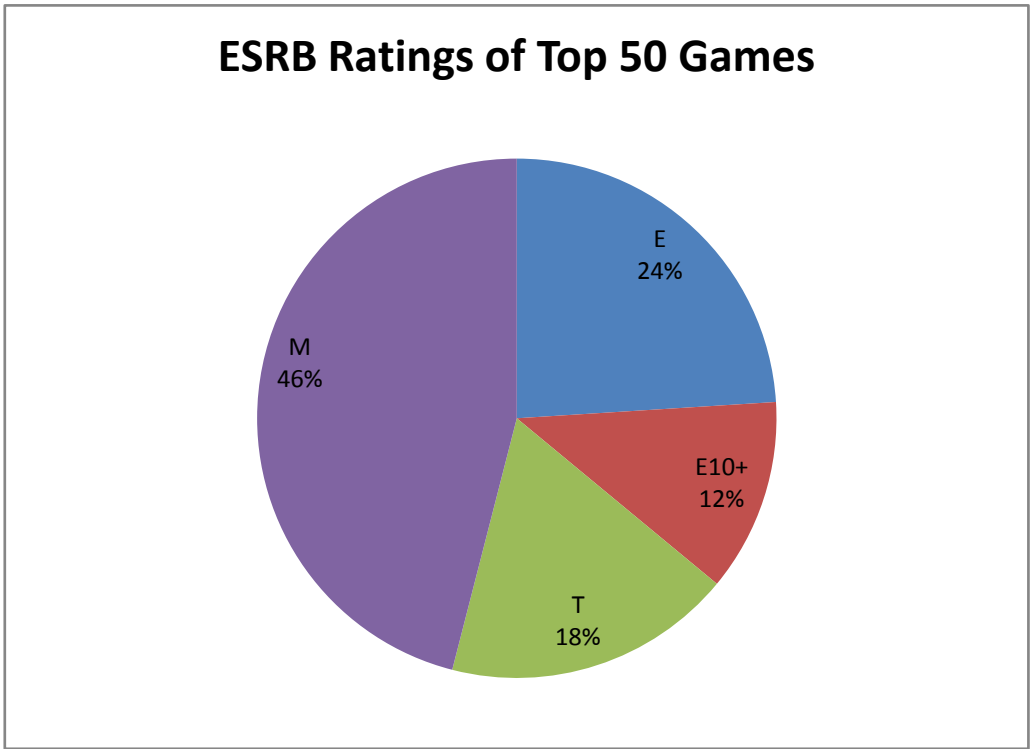

Figure 5. Percentage of ESRB ratings over top 50 games

The result in Figure 5 reveals "M" (Mature) rating games are more popular than games with other ratings. The top three games on the list are all First-Person-Shooting game which is typically rated as "M" because of the genre and bloody scenes. Comparing to Gears of War and Call of Duty 4, Halo 3 is a relatively older game which has been played by most members on GamerDNA. The result also implies the tastes and interests of general gamers, that they may like the games containing mature sexual themes, more intense violence and/or strong language. Interestingly, most "M" rating games on the list are FPS games, games such as GTA IV and Assassin's Creed are Role-Playing Action games. Both games focus on a realistic gaming world and freedom of players. Players play as someone else and usually behave differently from their real lives. They may not rush to finish the game, but kill other characters or make damages to the city for more fun. This type of "M" rating games is more attractive to the "recreation" players as they usually play the game for fun.

6.3 Population of Different Types of Gamers

This query is to investigate the number of players in each Gamer Zone who have played the games in previous list.

Rank	Name	Recreation	Family	Underground	Pro
1	Halo 3	61798	4834	44883	42536
2	Gears of War	62646	4839	45189	42723
3	Call of Duty 4	51123	4108	39907	37432
4	Hexic HD	56097	4349	36584	35035
5	GTA IV	48915	3285	34593	31733
6	UNO	48600	4390	34531	32382
7	Gears of War 2	39757	2888	28690	27226
8	Oblivion	41910	3371	27921	27378
9	Geometry Wars Evolved	40710	3335	24861	25599
10	Crackdown	38864	3211	26963	25652
11	Assassin's Creed	37210	2700	26021	24702
12	Guitar Hero III	35072	2817	25300	24152
13	Rainbow Six® Vegas	34936	2964	26051	24847
14	Texas Hold'em	36974	3375	24630	23947
15	BioShock	36597	2605	22056	21424
16	Mass Effect	35907	2440	21013	20983
17	DEAD RISING	34673	2511	23341	21298
18	G.R.A.W.	33403	2885	22958	23153
19	Call of Duty 2	31517	2919	22758	22956
20	Guitar Hero II	31032	2618	21226	20703
21	Aegis Wing	30294	2951	21338	20548
22	Fable II	31099	2051	19310	17943
23	The Orange Box	31969	2360	18915	18483
24	Rock Band	29849	2415	19236	18620
25	Forza Motorsport 2	30069	2462	19658	19501
26	PGR 3	31979	2734	18867	19595
27	Call Of Duty 3	28803	2671	21805	21236
28	Street Fighter II' HF	30687	2635	20640	19816
29	Worms	31898	2750	19130	18537
30	Fallout 3	29513	1932	18606	17331
31	Saints Row	26064	2210	21819	19153
32	Undertow	29589	2490	17435	17162
33	DOOM	28963	2542	18734	18021
34	Marble Blast Ultra	28031	2705	17501	17909
35	TMNT 1989 Arcade	27000	2446	18108	17016
36	Perfect Dark Zero	26389	2379	17835	17916
37	CoD: World at War	21743	1823	18721	17118
38	Viva Piñata	28212	2722	14875	14729
39	EA SPORTS FN 3	23096	1999	18576	17245
40	Left 4 Dead	23197	1583	17023	15178
41	Small Arms	26347	2530	16679	16504
42	Ultimate MK3	24630	2279	18142	16822

43	Boom Boom Rocket	26438	2466	15798	15389
44	Bankshot Billiards 2	24616	2405	17706	16261
45	Frogger	25997	2655	16285	16039
46	Rainbow Six® Vegas 2	21695	1786	17346	15965
47	LUMINES LIVE!	27112	2385	14818	14631
48	Carcassonne	25733	2349	14220	14115
49	Splinter Cell D.A.	22711	1969	16660	16473
50	Assault Heroes	25472	2442	14915	14743

Table 4. Population of each type of gamers who have played top 50 games

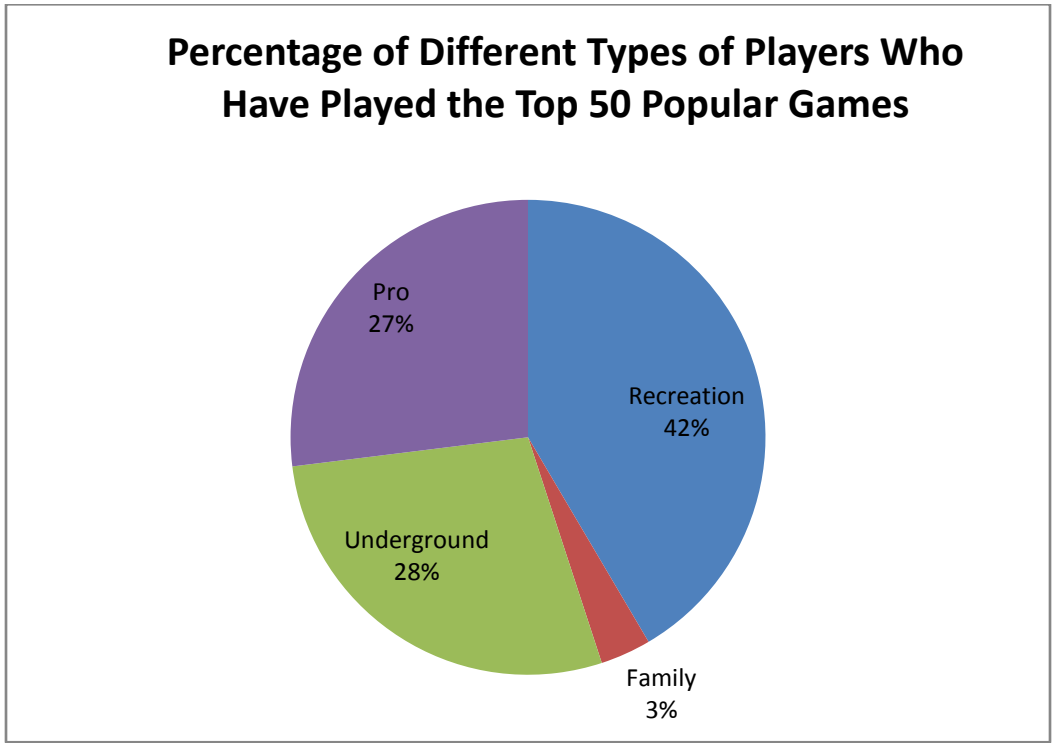

Figure 6. Percentage of each type of gamers who have played top 50 games

The result shown in Figure 6 is almost identical with the pie chart titled "Percentage of Different Types of Players" (Figure 4). Because the population of "recreation" players is significantly larger than any other groups, for each game, the recreation players are out-numbered any other type of players. As the result, the total number of "recreation" gamers is 42% of all players. On the other hand, the small population of "family" players has result a small percentage of "family" players among all the players.

6.3.1 Chi-Square Test

The two-way Chi Square is a convenient technique for determining the significance of the difference between the frequencies of occurrence in two or more categories with two or more groups [12]. The null hypothesis here is different types of players are interested in these popular games in the same proportion.

	Recreation			Family			Underground			Pro		
Games	**O**	**E**	**(O-E)^2/E**	**O**	**E**	**(O-E)^2/E**	**O**	**E**	**(O-E)^2/E**	**O**	**E**	**(O-E)^2/E**
Halo 3	61798	62776	15.24	4834	4760	1.15	44883	44813	0.11	42536	41702	16.68
Gears of War	62646	63324	7.26	4839	4802	0.29	45189	45205	0.01	42723	42066	10.26
Call of Duty 4	51123	54022	155.57	4108	4096	0.04	39907	38565	46.70	37432	35887	66.52
Hexic HD	56097	53816	96.68	4349	4081	17.60	36584	38418	87.55	35035	35750	14.30
GTA IV	48915	48299	7.86	3285	3662	38.81	34593	34479	0.38	31733	32085	3.86
UNO	48600	48860	1.38	4390	3705	126.65	34531	34880	3.49	32382	32458	0.18
Gears of War 2	39757	40164	4.12	2888	3046	8.20	28690	28671	0.01	27226	26680	11.17
Oblivion	41910	40986	20.83	3371	3108	22.26	27921	29259	61.19	27378	27227	0.84
Geometry Wars Evolved	40710	38511	125.56	3335	2920	58.98	24861	27492	251.79	25599	25583	0.01
Crackdown	38864	38586	2.00	3211	2926	27.76	26963	27545	12.30	25652	25633	0.01
Assassin's Creed	37210	36933	2.08	2700	2801	3.64	26021	26365	4.49	24702	24534	1.15
Guitar Hero III	35072	35591	7.57	2817	2699	5.16	25300	25407	0.45	24152	23643	10.96
Rainbow Six® Vegas	34936	36185	43.11	2964	2744	17.64	26051	25831	1.87	24847	24038	27.23
Texas Hold'em	36974	36237	14.99	3375	2748	143.06	24630	25869	59.34	23947	24072	0.65
BioShock	36597	33693	250.30	2605	2555	0.98	22056	24052	165.64	21424	22382	41.00
Mass Effect	35907	32740	306.35	2440	2483	0.74	21013	23372	238.10	20983	21749	26.98
DEAD	34673	33343	53.05	2511	2528	0.11	23341	23802	8.93	21298	22149	32.70

RISING												
G.R.A.W.	33403	33578	0.91	2885	2546	45.14	22958	23970	42.73	23153	22305	32.24
Call of Duty 2	31517	32661	40.07	2919	2477	78.87	22758	23316	13.35	22956	21697	73.06
Guitar Hero II	31032	30798	1.78	2618	2335	34.30	21226	21986	26.27	20703	20459	2.91
Aegis Wing	30294	30616	3.39	2951	2322	170.39	21338	21856	12.28	20548	20338	2.17
Fable II	31099	28689	202.45	2051	2175	7.07	19310	20480	66.84	17943	19058	65.23
The Orange Box	31969	29229	256.85	2360	2216	9.36	18915	20865	182.24	18483	19416	44.83
Rock Band	29849	28574	56.89	2415	2167	28.38	19236	20398	66.19	18620	18981	6.87
Forza Motor sport 2	30069	29214	25.02	2462	2215	27.54	19658	20855	68.70	19501	19406	0.47
PGR 3	31979	29819	156.46	2734	2261	98.95	18867	21287	275.12	19595	19808	2.29
Call Of Duty 3	28803	30365	80.35	2671	2303	58.80	21805	21676	0.77	21236	20171	56.23
Street Fighter II' HF	30687	30065	12.87	2635	2280	55.27	20640	21462	31.48	19816	19972	1.22
Worms	31898	29468	200.38	2750	2235	118.67	19130	21036	172.70	18537	19576	55.15
Fallout 3	29513	27458	153.80	1932	2082	10.81	18606	19601	50.51	17331	18240	45.30
Saints Row	26064	28218	164.42	2210	2140	2.29	21819	20144	139.28	19153	18745	8.88
			2469.6			1218.9			2090.8			661.3

Table 5. Chi-Square calculation

P = 0.05, 95% confidence level

df = (# of rows – 1) x (# of columns – 1) = 30 x 3 = 90.

From the Chi-Square distribution table, the value of $X^2_{.05}$ with 90 degrees of freedom is 137. Apparently, the Chi-Square test result for this case is significantly larger than table value. Therefore, reject null hypothesis, which means the different types of gamers are not interested in same games in the same proposition and they tend to play different kinds of games.

6.4 Which Type of Gamers like E Rating Games

Because different types of gamers play games for different motives, their preferences on games might be different too. What kind of games does each group of gamers like is depended on the games' genre, stories, graphics and sounds. Information such as these details is not contained in the "recentgames" data table. However, these details are often related to the game ESRB ratings. For example, "M" (Mature) rating games have content that may contain intense violence, blood and gore and strong language. (For complete reference, please see Appendix) In addition, it is easier to look up ESRB rating for each game on the Web rather than gathering the game genre and game descriptions.

In order to find out the relations between ESRB rating and the types of gamers, it is better to compare the ratio of the total plays by the games in specific Gamer Zone to the population from that Gamer Zone because the population of "family" players is significantly smaller than any other group. Thus, the result would be more convincing than the one compared with the actual numbers of players from each groups.

The first observation is made on the players who have played twelve "E" rated games from the top 50 games.

E - Games	Players Who Played the Games	Total Player	Ratio
Recreation	391909	85361	4.59
Family	35174	6476	5.43
Underground	248175	60945	4.07
Pro	242138	56700	4.27

Table 6. Ratio of players who have played "E" games to their population

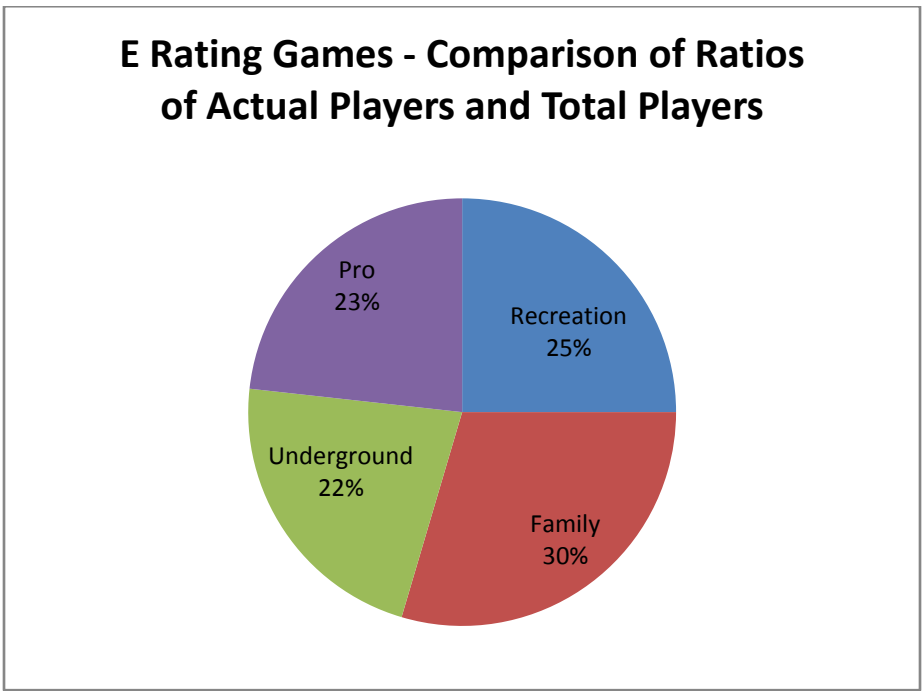

Figure 7. Comparison of ratios of actual gamers to total gamers

Games include: Hexic HD, UNO, Geometry Wars Evolved, Aegis Wing, Forza Motorsport 2, Marble Blast Ultra, Viva Piñata, Boom Boom Rocket, Bankshot Billiards 2, Frogger, LUMINES LIVE!, Carcassonne

The observation implies that "family" players are more interested in "E" rating games than other types of players. The higher ratio owned by "family" players indicates that if the population of each type of players were same, "family" gamers would play more "E" rating games than any other type of players. This result may also reveal the relations between the genres and themes of "E" rating games and the general interests and tastes of "family" gamers. For example, Hexic HD is rated as "E" and is a small puzzle game similar to Tetris. It is easy to get started and more suitable for playing with family members. Therefore, 67% of "family" players (4349 out of 6476) have played this game. The percentage is larger than "recreation" players' 65%, "underground" players' 60% and "pro" gamers' 61%.

6.4.1 Potential problems of the queries

The queries I used to find out each type of players played on a specific rating of games suffer some potential flaws. First, I have refined both gamerinfo and recentgames tables by selecting the gamers' tags from gamerinfo table that the gamers had been in the desired Gamer Zone and selecting the gamers' tags from recentgames table where a game's name matches the searching condition. Then I

simply join two refined table on the condition of a player's gamertag. However, this may result inappropriate records in the new table if a gamer has switched between different zones and he was playing the game when he is in another zone. For example, a gamer maybe switched zone from "family" to "recreation", he was only playing "Call of Duty 4" when he is in the "recreation" zone, not in "family" zone. My query would count this player twice as two different gamers playing "Call of Duty 4"; once he was a "family" player and another time he was a "recreation" gamer. To solve this problem, the query needs to check the time the gamer was playing "Call of Duty 4" and then looking up his Gamer Zone at that time.

6.5 Who Likes "E10+" Games

E10+ - Games	Players Who Played the Games	Total Player	Ratio
Recreation	178782	85361	2.09
Family	15310	6476	2.36
Underground	109134	60945	1.79
Pro	107297	56700	1.89

Table 7. Ratio of gamers who have played "E10+" games to their population

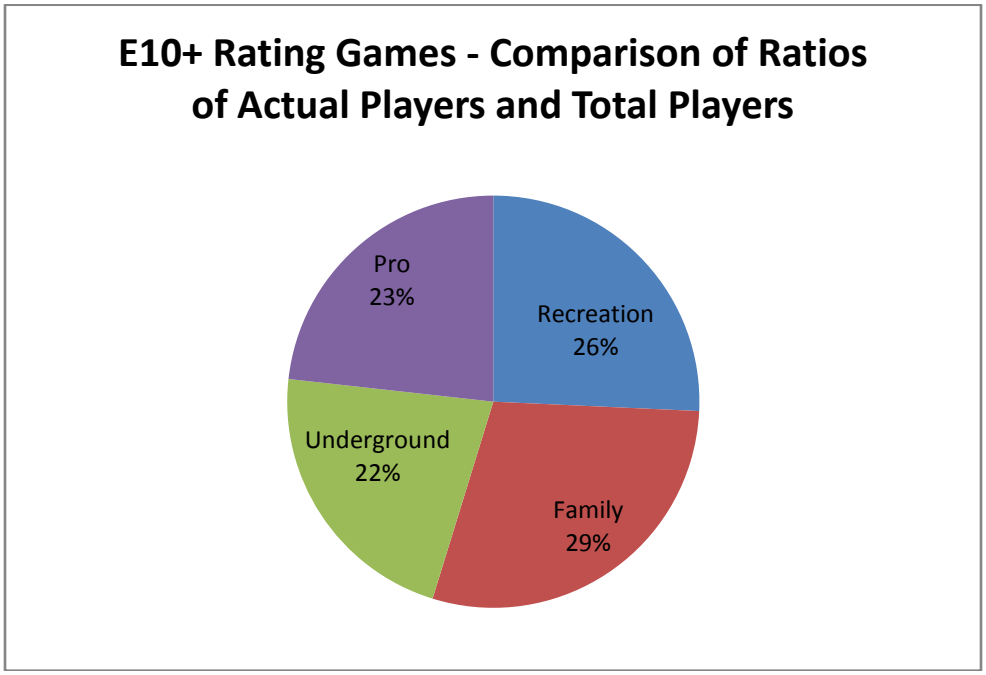

Figure 8. Comparison of ratios of actual players to total players

Games include: The Orange Box, PGR 3, Worms, Undertow, TMNT 1989 Arcade, Small Arms

Similar to the result of last query, “family” gamers have higher percentage than other types of gamers, which means they are more interested in playing “E10+” rating games too. “Underground” gamers and “pro” gamers have the same percentage as they had before for playing “E” rating games. As describe by Ben Barker on Xbox Live web page, [3] “’underground’ players are everywhere”. They play a wide range of games. Moreover, sometimes they play the games just for fun and other times they are more like “pro” gamers digging into a game. Therefore, it is difficult to predict the behaviors of “underground” gamers because they do not behave consistently in same games nor follow fixed patterns when they play a game.

However, “pro” players often follow their principles during the play. Their goals are often set to make better score, earn more achievements, and collect unusual items in the games. Their favorite games are often “M” rating games because these games offer many achievements. “Pro” gamers feel more competitive as they are playing for better game scores. The reason of “Pro” gamers playing “E” or “E10+” rating games might be 1) increase their total game score or expand their achievement collection; 2) play for fun. If a “pro” gamer is more willing to get the achievements from the game rather than enjoy the gameplay, he/she might be considered as “Achievement Chaser”. Compared to other types of gamers, “pro” gamers are more likely to become the “Achievement Chasers”. Considering Bartle’s 4-type MMORPG players, “achievement chasers” are somehow similar to those “Achievers” in the MMORPGs.

6.6 Mature Games – Anyone’s Favorite?

M - Games	Players Who Played the Games	Total Player	Ratio
Recreation	813743	85361	9.53
Family	63195	6476	9.76
Underground	573782	60945	9.41
Pro	543007	56700	9.58

Table 8. Ratio of actual gamers to their population

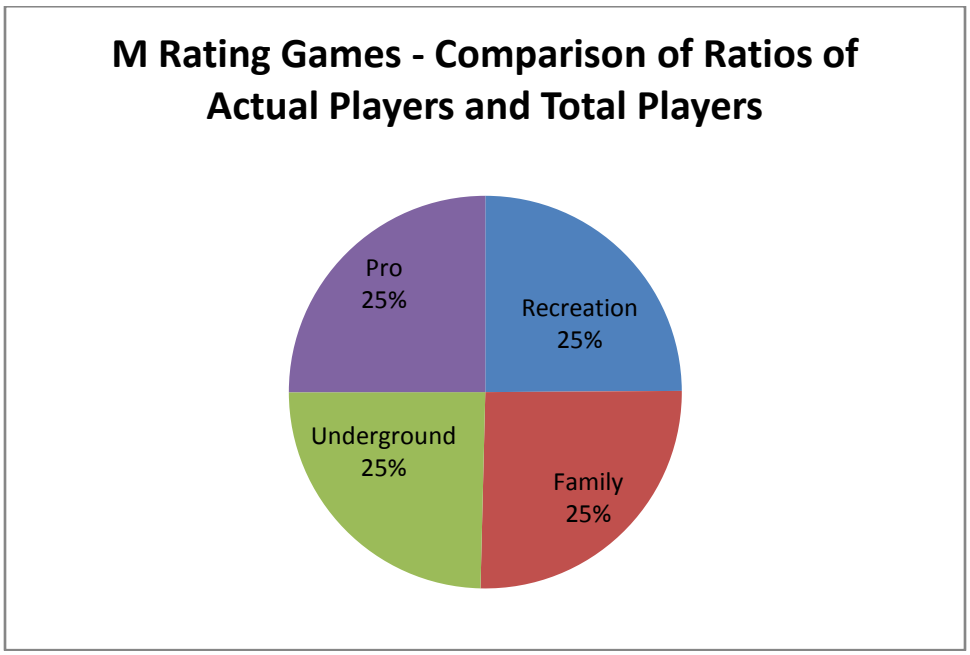

Figure 9. Comparison of ratio of actual players to the population

The result of "M" rating games is interesting. The number of different types of gamers is equally distributed. However, looking at the ratios "pro" players played on the three top games, which are Halo 3, Gears of War, and Call of Duty 4, their ratios are higher than other types of players. In addition, the ratio of "pro" gamers and their population is also higher than gamers in other zones. These games not only offer many achievements, but also support online multi-player play. With amazing graphic and sound effects, as well as fantastic game stories, many young gamers have been addicted to these games. "Pro" gamers would play these games frequently to gain every available achievements and special titles.

Games\Types	Recreation (85361)		Family (6476)		Underground (60945)		Pro (56700)	
	Players	% of Total	Players	% of Total	Players	% of Total	Players	% of Total
Halo 3	61798	72.40%	4834	74.64%	44883	73.65%	42536	**75.02%**
Gears of War	62646	73.39%	4839	74.72%	45189	74.15%	42723	**75.35%**
Call of Duty 4	51123	59.89%	4108	63.43%	39907	65.48%	37432	**66.02%**
Total	175567		13781		129979		122691	
Ratio	2.056		2.128		2.132		**2.164**	

Table 9. Ratio of different zone of gamers who have played Halo 3, Gears of War and Call of Duty 4

6.7 Achievement Chasers

"Pro" gamers are also known as hardcore gamers as they are always willing to improve their game score and collect special achievements. In order to assert the assumption that "pro" gamers are more likely to be "achievement chasers", it is worth to look at the achievements "pro" gamers collect on a specific game and compare the number with other groups of players. The game chosen for the test is "Assassin's Creed" because the game contains 44 achievements and offers a maximum game score of 1000 on Xbox Live system. In addition, it is an offline game which means players have to achieve all the rewards individually, without cooperation with others by playing online.

I was not able to design a simple query to accomplish this complex task. Therefore, I have run a query to find out all "pro" gamers who have played "Assassin's Creed". Because the result set is very large, I have to manage the data in Microsoft Excel. I have filtered out the gamers who have already acquired all 44 achievements and remove the duplicate gamer records (some players continue to play the game even though they have completed all the quests).

The final result contains 295 rows, which means 295 "pro" gamers have collected all the achievements in "Assassin's Creed". Running the same procedures for "recreation" players, the result shows 354 "recreation" gamers have collected all the achievements in "Assassin's Creed". However, because 62 gamers have switched between "recreation" and "pro" Gamer Zones and played "Assassin's Creed", it is hard to say which Gamer Zones they were in while pursuing the game achievements without further investigation. Nonetheless, the ratio of "pro" gamers who have gained all the achievements to the population of "pro" gamers is larger than the ratio of "recreation" gamers to their population. Therefore, "pro" gamers are more active in chasing the achievements.

6.8 Conclusion

The analyses discussed above have suggested some game preferences for different types of gamers. The comparisons have shown that "family" players are more interested in playing "E" or "E10+" rating games. These games are often easy to get started and good for casual amusement, which are also suitable for many "recreation" players. On the other hand, the analyses found that "pro" gamers are more likely to play "M" rating games because the games often contain intense levels and more achievements. "Pro" players like the competitions inside and outside the games. Sometimes, they

play “E” and “E10+” games to increase their game score and expand their achievement collections. When others play games for fun, “pro” gamers may play hard to chase the achievements. Unlike any other type of gamers, “underground” gamers are not easy to predict. As describe on Xbox Live website, they would play any kind of game. Depends on the game they play; they may just play for fun like “recreation” gamers or play seriously as “pro” gamers.

In this study, the data have not shown significant distinctions between “underground” gamers and “pro” gamers in terms of their population and number of players who played a particular game. This study does not reveal strong evidence about their common grounds either. However, these two types of gamers have very close numeric results in many tests. Moreover, there is a tendency that players in these two gamer zones are more likely to switch to the other (the query and result are shown in Appendix Experimental Queries and Results in the full report). Thus, a question has been raised for further researchers to study the differences between “underground” and “pro” gamers in the way they play the same game. Indeed, many other factors, such as player's ages, sex, cultures and education levels, all have effects on their game tastes and their playing styles.

GamerDNA provides the game developers a place to understand the gamers and also a place for gamers to discover interest games based on their tendencies and their likes in other gameplay. With the support of a huge amount of users’ data, GamerDNA’s Discovery Engine is able to provide more accurate and useful game recommendations to its users. In addition, the data collected by GamerDNA is helpful for users to explore interesting facts about games. For example, the numbers of a game being played and being added to members’ lists are a solid evidence to present the popularity of the games. The number accumulated from every member is more helpful than a 5-star scale rating given by an individual.

Thanks to GamerDNA, I have been able to run many interesting tests on their data. The tests were designed to reveal the difference each type of players has played in a variety of games. The website has more than 350,000 members and its members have continuously contributed positive data, the website captures more accurate profiles of gamers' gaming habits than any single online game service. In addition, the social aspects of the website keep the gamers gathering together outside the games. GamerDNA is growing fast to be an ultimate resource for gamers looking for new games.

During a seven-week study, I have practiced to write efficient SQL queries for large database by understanding the database schemas and conducted statistic tests on real problems. The queries were designed to discover the gamers' different gaming habits. Although all the queries have been validated on a small database with the same schemas, some of them (see Appendix. Experimental Queries) are not efficient enough to retrieve the results from GamerDNA's giant database. If the queries cannot be further optimized, they need to be executed on a faster computer. I believe some queries would produce useful results to support my conclusions. Moreover, because many statistic analyses cannot be done by a single query, it is often helpful to save the results as external files and work on them with statistic software. Lastly, it is a great opportunity to work on real data to understand today's gamers from many perspectives. This study would be more helpful to game developers in order to design better games with good understanding of different type of gamers.

Chapter 7. Java Program

One goal of this project is to develop a small Java program with easy to use graphic interface, which connects to the GamerDNA database and helps others to use the data in the database. The programming language I have chosen to write the program is Java because it is much easier for me to make a graphic interface in Java.

In the first phase of writing this program, I have created a graphic interface which allows the users to run several pre-defined queries. In addition to select the check boxes or the radio buttons to run specified queries, the users are also allowed to modify the query in the text area and check the result of a user-defined query.

I have also created the "Gamer" and "Game" classes to hold all the records in the database. Each class contains a number of variables which matches fields in the corresponding table in terms of the data types. When the program is launched, it establishes the connection with the MySQL database through JDBC connector and each gamer and game record will be loaded from database into "Gamer" and "Game" objects. In addition, each gamer object also maintains a list of games that user has played. A gamer object also has a variable to remember the number of different gamer zone this gamer had been. The program could run many tests by manipulating the gamer and game objects. Unfortunately, because the database is too large that contains too many player and game information, it is not possible to populate all the gamers and games objects on my working computer which only has 4G RAM.

However, this Java program has been tested to work correctly on a small database which contains 1000 gamer records and 1000 game records. After every record is appropriately loaded into objects, it is faster to run many tests by calling the function rather than running the queries.

7.1 UML Diagram

This section removed at the request of GamerDNA.

7.2 Screenshot

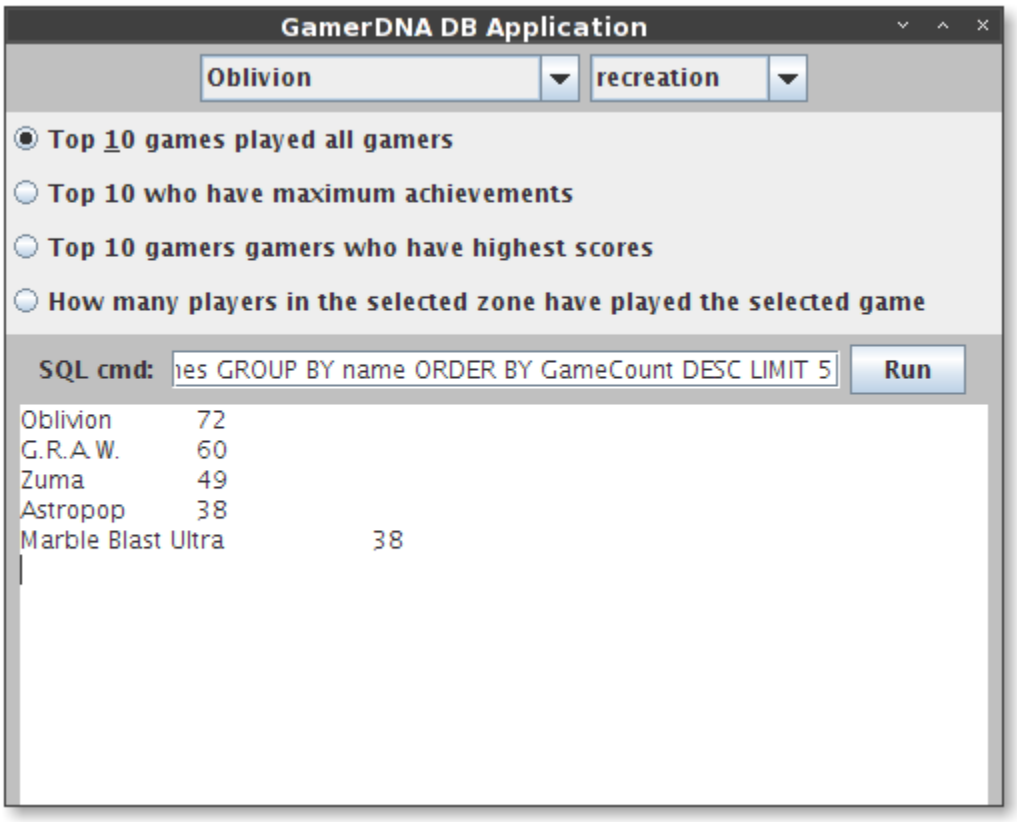

Figure 10. Screenshot of the program

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Reference II

ESRB Rating Symbols

EARLY CHILDHOOD
Titles rated **EC (Early Childhood)** have content that may be suitable for ages 3 and older. Contains no material that parents would find inappropriate.

EVERYONE
Titles rated **E (Everyone)** have content that may be suitable for ages 6 and older. Titles in this category may contain minimal cartoon, fantasy or mild violence and/or infrequent use of mild language.

EVERYONE 10+
Titles rated **E10+ (Everyone 10 and older)** have content that may be suitable for ages 10 and older. Titles in this category may contain more cartoon, fantasy or mild violence, mild language and/or minimal suggestive themes.

TEEN
Titles rated **T (Teen)** have content that may be suitable for ages 13 and older. Titles in this category may contain violence, suggestive themes, crude humor, minimal blood, simulated gambling, and/or infrequent use of strong language.

MATURE
Titles rated **M (Mature)** have content that may be suitable for persons ages 17 and older. Titles in this category may contain intense violence, blood and gore, sexual content and/or strong language.

ADULTS ONLY
Titles rated **AO (Adults Only)** have content that should only be played by persons 18 years and older. Titles in this category may include prolonged scenes of intense violence and/or graphic sexual content and nudity.

RATING PENDING
Titles listed as **RP (Rating Pending)** have been submitted to the ESRB and are awaiting final rating. (This symbol appears only in advertising prior to a game's release.)

Appendix

List of Queries

This section removed at the request of GamerDNA.

Experimental Queries

This section removed at the request of GamerDNA.