

# **Video Games and What Makes Them Sell**

by

Eric Jurman

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Sponsor: Irina Shablinsky  
Second Reader: Athar Abdul-Quader

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## Preface

Video games have grown constantly in popularity since the 1980's. Starting with the Atari 2600 and on through the Nintendo Switch, the video game industry was projected to make \$134.9 billion in 2018<sup>1</sup>. In this paper there will be an analysis of 95% of all video games that have sold more than 10,000 copies between 1980 and 2016, excluding mobile games as they are a new part of gaming that has a very different monetization model.<sup>2</sup> This analysis will determine which variables may be more effective when it comes to game sales in the past and in the future. Video games are a media that allow for a more intense connection to the story at times due to the interactions with the story itself. Over the last 25 years video games have flourished not just in nerd culture but also as a household hobby present in a three out of five of American homes<sup>2</sup>.

A nerd, defined as “A single-minded expert in a particular technical field” has relatively changed recently<sup>3</sup>. Changing from being a technologically savvy individual to someone with extreme interest in one or more specific categories. Nerd culture is the culture of being a nerd. This means there are entire communities of people who pick a specific type of media to indulge in and rarely stray from it. This may be video games, but usually the interest sticks to a specific type of game. The player may take genre, the perspective of the camera, first person vs. third person (see *Figure 1*), gameplay style, and other personal preferences into account when choosing their specific game. There is also a sense of progress in video games not present in other media which drives the players to continue. “Players learn as they make progress in games. Learning is conceptualized not as a function of the game itself or even a simple coupling of the

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<sup>1</sup> "Global Games Market Value Rising to \$134.9bn in 2018." GamesIndustry.biz. Accessed February 22, 2019. <https://www.gamesindustry.biz/articles/2018-12-18-global-games-market-value-rose-to-usd134-9bn-in-2018>.

<sup>2</sup> "Industry Facts." The Entertainment Software Association. Accessed April 03, 2019. <http://www.theesa.com/about-esa/industry-facts/>.

<sup>3</sup> "Nerd." Merriam-Webster. Accessed January 11, 2019. <https://www.merriam-webster.com/dictionary/nerd>.

player and game; rather, learning is seen as transformations that occur through the dynamic relations between subjects, artifacts, and mediating social structures”<sup>4</sup>.



*Figure 1*

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<sup>4</sup> Squire, Kurt. "Cultural Framing of Computer/Video Games." Game Studies 0102: Cultural Framing of Computer/video Games. By Kurt Squire. July 2002. Accessed February 23, 2019. <http://gamestudies.org/0102/squire/>.

## CHAPTER 1: INTRODUCTION

Video games are an increasingly growing market around the world. The top 5 most popular video game consoles of all time have made a total of over \$535 billion dollars<sup>5</sup>. The main audience of gaming tends to be younger people, those ages 18-24 generally, as they are more likely to make gaming purchases compared to the older generation.<sup>6</sup> Despite these numbers, it is the games themselves that make these companies the most money. There are roughly 327 million people in the United States<sup>7</sup> and of that "...42% of Americans play video games regularly, or at least three hours per week"<sup>8</sup>. The average price of a home video game console released after 2004 is \$367.75 (averaged from release prices of the last 8 consoles released).<sup>9</sup> In 2017 video game hardware sales reached \$6.9 billion<sup>10</sup>, while worldwide sales of video games in total reached \$36 billion<sup>11</sup>. What this means is that there is something else accounting for the other 81% of the sales for that year.

What makes a popular video game? Does it matter where it releases first, or what publisher made it? Well, yes, but there are secondary and tertiary factors not accounted for when looking at just those items. For instance, certain games may include a popular voice actor voicing characters and they decide to post about their upcoming game on social media. There may be a game director who is popular enough to rally hundreds of thousands of sales. It is

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<sup>5</sup> Plant, Mike. "Top 10 Best Selling Video Game Consoles." Guinness World Records. December 21, 2018. Accessed March 1, 2019. <http://www.guinnessworldrecords.com/news/2018/12/top-10-best-selling-videogame-consoles-551938>.

<sup>6</sup> Earnest Operations Llc. "The Demographics of Video Gaming | Earnest." Earnest Blog | Money Advice for Young Professionals. February 14, 2019. Accessed April 21, 2019. <https://www.earnest.com/blog/the-demographics-of-video-gaming/>.

<sup>7</sup> "United States Population 2019." United States Population 2019 (Demographics, Maps, Graphs). Accessed April 21, 2019. <http://worldpopulationreview.com/countries/united-states-population/>.

<sup>8</sup> Campbell, Colin. "Here's How Many People Are Playing Games in America." Polygon. April 14, 2015. Accessed April 10, 2019. <https://www.polygon.com/2015/4/14/8415611/gaming-stats-2015>.

<sup>9</sup> Dornbush, Jonathon. "Update: Comparing the Price of Every Game Console, With Inflation." IGN. October 04, 2016. Accessed March 26, 2019. <https://www.ign.com/articles/2016/10/04/comparing-the-price-of-every-game-console-with-inflation>.

<sup>10</sup> "How Many People Own Video Game Consoles?" Marketing Charts. February 14, 2018. Accessed March 26, 2019. <https://www.marketingcharts.com/cross-media-and-traditional/videogames-traditional-and-cross-channel-82362>.

<sup>11</sup> "US Video Game Industry Revenue Reaches \$36 Billion in 2017." The Entertainment Software Association. Accessed March 26, 2019. <http://www.theesa.com/article/us-video-game-industry-revenue-reaches-36-billion-2017/>.

always important to remember that defining or uncovering extra variables is a constant requirement throughout the entire analysis.

Kaggle.com is a website where users create their own data sets and upload them. This allows for others to analyze them and post their results for the public to see. This is where the data set came from for this piece. The site held sales numbers in the millions, the variables in this data set hold information on what sold when, and where. These sales are divided into four categories: North America, Europe, Japan, and then total global sales. These regions include most of the top 10 countries who purchase video-game related items. These regions, the United States, Japan, Germany, the United Kingdom, France, Spain, and Italy were 7 of the top 10 in January 2019<sup>12</sup>. Throughout the data set there was a decrease in information the closer the data got to the present starting in 2012-2013. This missing information made it harder to look at the overall picture of the data. Despite this lack, the percentages in certain categories help explain what the most important factors in games sales are.

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<sup>12</sup> "Top Countries & Markets by Game Revenues." Newzoo. Accessed December 23, 2018. <https://newzoo.com/insights/rankings/top-100-countries-by-game-revenues/>.

## CHAPTER 2: LIT REVIEW

In the piece “Keys to Successful Interactive Storytelling: A Study of The Booming ‘Choose-Your-Own-Adventure’ Video Game Industry”, by Eric Tyndale and Franklin Ramsomair; the question of what has made a video game popular while being restricted to the “choose your own adventure” genre is explored. A “Choose Your Own Adventure Game,” hereafter referred to as CYOA, drops a player in an environment where they will be given opportunities to make choices, changing their path as the story; usually with some limitations leading to a few branching paths deciding how the game ends. It gives the player choices throughout the entire experience, some changing where the player goes while others change relationships between non-player characters and the player. The system will usually give an indication an effect has occurred displaying “Zach didn’t like that” or “Emily will remember that”. (See *Figure 2*)



*Figure 2*

Tyndale and Ramsomair studied reviews about games within 6 months of their release, as well as checking other CYOA games popular at their times of release. These reviews written by fans, as well as critics, gave information on the characteristics a CYOA game's audience would desire. There were three categories, with smaller sub categories, showing specific characteristics required to get the best player reviews. These include story pacing, character realism with closure, illusion of choice/agency, as well as emotional investment with mental and physical stress. These factors cause this stress, as the choices made will influence the story, even going so far as having a timer at certain intervals to increase intensity. These choices are said to help the player shape their moral compass and makes the experience overall more enthralling.

There are many factors that are needed to create a good story. One such factor is "tangible physical reactions." Being able to make a player cry or have their stomach knot up in tension means the player feels a connection to the story. These are signs of stress, which hold negative connotations, but cause an increase of enjoyment throughout the experience. These factors emphasize the authors' second point - there must be a high level of empathy for the characters in the story. If the player, or in the case of movies or television, the viewer, is not empathetic with the main character or doesn't care for the story, then there is a very low chance for impact. The authors state in chapter 7 of the piece, "Without empathy the events in the story will not generate emotional response from the player."<sup>13</sup> The next case is unpredictability; if a player sees the twists and turns coming the story will get boring and there will be no reason to continue the game. "Having to evaluate a chaotic situation and make a decision in a limited amount of time is a stressful yet thrilling experience for players."<sup>14</sup> Throughout the entire piece it

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<sup>13</sup> Eric, Tyndale, and Ramsomair Franklin. "Keys to Successful Interactive Storytelling: A Study of the Booming "Choose-Your-Own-Adventure" Video Game Industry." *I-manager's Journal of Educational Technology* 13, no. 3 (2016): 28. Accessed October 2, 2018. doi:10.26634/jet.13.3.8318.

<sup>14</sup> Eric, Tyndale, and Ramsomair Franklin.



is emphasized that all the factors stated previously in this chapter must be introduced early, must be ramped up throughout the experience, and come to a head at the conclusion.

Without a proper climax review scores drop dramatically. There are many variables that are needed to make a game succeed, as explained previously for CYOA games they are heavily story based. However, the needs for each game and genre vary drastically. A racing game may need stellar graphics and gameplay, and if these factors are placed in the wrong kind of game it risks potential loss of sales. The final point to be made about choosing your own adventure games is the ending. If the ending is boring and doesn't have a climax or is a choice that persists in the player's head can make all the difference when it comes to player feedback. "Because of this it is crucial that player's receive adequate closure to repay them for the emotional investment they have made in the story and its characters."<sup>15</sup>

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<sup>15</sup> Eric, Tyndale, and Ramsoomair Franklin.

## CHAPTER 3: METHODS

When dealing with data sets from the internet, especially large ones, certain precautions must be taken to have usable data. This data set contained 16,719 games. One must clean the data. This means making sure values all are correct, meaning that there are no empty values in your data as well as no values that are incorrectly entered. This ensures that regressions run on the data will work. If the data is not cleaned there is the possibility of incorrect data which can throw off the analysis. This can cause incorrect results. Not knowing what to search for in a data set leads to misdirected analysis; so, it is always a good idea to know what the final goal is for a data analysis. This gives a clear question of “does x affect y” but on a larger scale, meaning you get the effect of multiple independent variables on one dependent variable. The goal of this project was to note what sold globally, and what factors cause a game to sell better in North America vs. the EU or Japan.

With only 7 variables in the data, the analysis process can be simplified. These variables are: release year, genre, publisher, developer, rating, and then the added variables of if the game was a sequel, and if the console the game released on was a handheld. Release year is important when looking for trends in other variables that occur throughout the years. It would have been better to have months, but the process of collecting the months of release for all the games would have been arduous. The genre of the game affects the player base of the game. Someone who would play racing games exclusively would not buy an action game.

The publisher of a game is the company responsible for marketing the game, and at times giving the developers the upfront costs of developing a game. The developer, the company who codes the game and makes sure it works could be important since players know certain

developers for their polish, or lack thereof, and can shift sales in either direction<sup>16</sup>. The rating of the game is the age group that the Entertainment Software Rating Board (ESRB) put in place. The ratings are Early Childhood, Everyone, Everyone 10+, Teen, Mature, and Adults Only. Certain games were only released in Japan, which has their own rating system, and as these sales were usually measured on a global level, most of the analysis excluded the Japanese only games. The rating system in Japan is the Computer Entertainment Rating Organization. It is very similar to the ESRB rating system, but not close enough to make a connection in the data.

Sequels are important because they mark the success of a previous game. They also would have a fan base of players that may be more willing to spend their money on the continuation of a property that they enjoy. The final variable is if games were released on a handheld console or not. Games on handheld consoles were much smaller in comparison, usually on all fronts. Size of the game specially, smaller dev teams being hired, and hardware constraints all hold back sales of handheld consoles. Handhelds had many hits but an even larger number of games that failed.

By using Microsoft Excel, SQL queries, sorting, pivot tables, and the Pandas library of Python to put the data sets into frames for easy manipulation, many different conclusions could be drawn from the data. Excel is an intuitive product that allows for analysis but is not the fastest. Cleaning the data, removing nulls, and adding values when needed is the first step. Roughly 40% of the rating variable was missing from the data set and had to be entered manually.<sup>17</sup> However, Excel is a large, complex tool. With access to over 450 functions, figuring out which situation called for which function came easier with time. That does not make it the

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<sup>16</sup> Trowe, Paul, and Paul Trowe. "The Difference between a Video Game Developer and Publisher." Medium. June 17, 2018. Accessed February 13, 2019. <https://medium.com/@PaulTrowe/the-difference-between-a-video-game-developer-and-publisher-c6038324ee56>.

<sup>17</sup> "Search ESRB Ratings." ESRB Rating Search. Accessed February 03, 2019. <https://www.esrb.org/ratings/search.aspx>.

best to use. If one is trying to figure out a very specific function, the wording may be so specific finding the function takes longer than expected. Throughout the process there were some overarching problems that usually stemmed from either lack of understanding of Excel, or lack of functionality on Excel's end. These problems were corrected with a simple search online, forums usually have the answers required.

Pivot tables are the quickest and most effective way to compare different variables, allowing for brief insight on different relationships. Using pivot tables, graphs can be made using multiple independent variables. When using multiple independent variables on a single dependent variable one can see which one of those variables affects the values more. The order of pivot tables' x values changes entire graphs. This can be seen below. Past pivot tables, regression analysis was used to see which of the variables in the data set platform, release year, genre, publisher, developer, rating, if the game was a sequel, and if the game is on a handheld console caused an increase in sales in different regions as well globally.

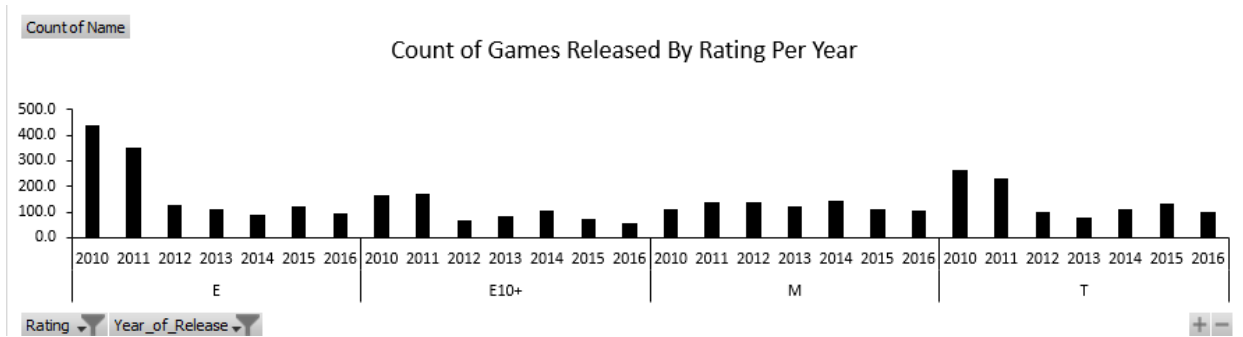


Figure 3

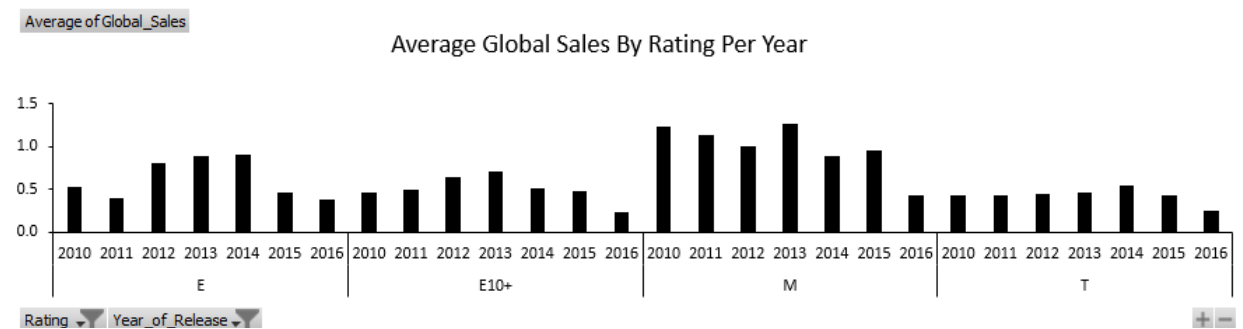


Figure 4

Python and the Pandas library are excellent tools for data manipulation. The Pandas Data Frame allowed for pulling distinct values from the data, as well as copying sets of columns and putting them into their own frames. Data frames make it possible to select any single point in your data set and pull data that relates to it. Operations can be done quickly once one knows what to do. Python easily accessed the comma separated variables files (CSV), one command extracting the file and storing it in a frame. There are also ways to use SQL commands in Python when joining different tables as well as extracting them from data bases. “SQL commands are instructions, coded into SQL statements, which are used to communicate with the database to perform specific tasks, work, functions and queries with data.”<sup>18</sup> SQL can join multiple tables, while adding and dropping variables as required. One of the major benefits of using Python include access to addons which are made for data analysis, as well as any other computer science projects.

The final part of the process was meant to be more of a learning experience than an actual analysis using this tool. Tableau is a data visualization software package. This extremely powerful tool assists in breaking down the results of data analysis for a broader audience. A visualization that allows for interactivity allows for a more engaging experience for an audience. Tableau also makes delivering results easier, as the dashboard function collects specific information from multiple sheets of the file allowing the user to show only the information they want. This information displaying is usually done once the entire analysis is complete, used to accompany results, or display them fully all at once.

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<sup>18</sup> "Beginner SQL Tutorial." SQL Commands. Accessed April 25, 2019. <https://beginner-sql-tutorial.com/sql-commands.htm>.

## CHAPTER 4: TABLEAU

Tableau is data visualization and data analysis software created for interactive flowing visuals. This software is not difficult to learn, but understanding the software takes time. The software allows for different data sheets from many different software formats. It could be a PDF or an Excel file, or a CSV. In the process of working with Excel data in Tableau the software had a specific function that pulls the areas where formulas have been used, and different rows and columns have been added and makes them their own sheets for interacting with in Tableau. The main work in this product is done on sheets, like Excel. These sheets can have graphics of information or have a list of data with different filters on the data with code in the background pulling additional information one would want. For example, if one had a list of video games, and the publisher in the column next to that; one could arrange for every value in the data to contain a link to a certain website which when clicked pulls up the box art for said game on the side. This link would be a separate part of the window on the sheet pulling the link.

Tableau's main draw is its dashboard function. This function allows for multiple sheets to be connected and put into one location. With those sheets being combined, allowing for filters to be applied to all the sheets displayed at once. This combination also allows for filters to be placed for interactive use by the end user. They can shift the genre, year of release, or any variable turned into a filter. When creating the filters for the dashboard it takes two additions to the sheet being used. Each sheet has its own dimensions and measures to choose from. These are all from whatever sheet was chosen from the data set. First a parameter is made to decide what type of value you want to pull into this filter, a Boolean, a string, a float, and so on. Subsequently a dimension, what the program calls these filters, is added to the data set where code is written to

get the exact values wanted. Once this is done then this parameter is added to the sheet, and after that can be added to every dashboard or graph using that sheet. Parameter interaction for the end user is in the form of buttons to click to shift the visualization of the entire data set.

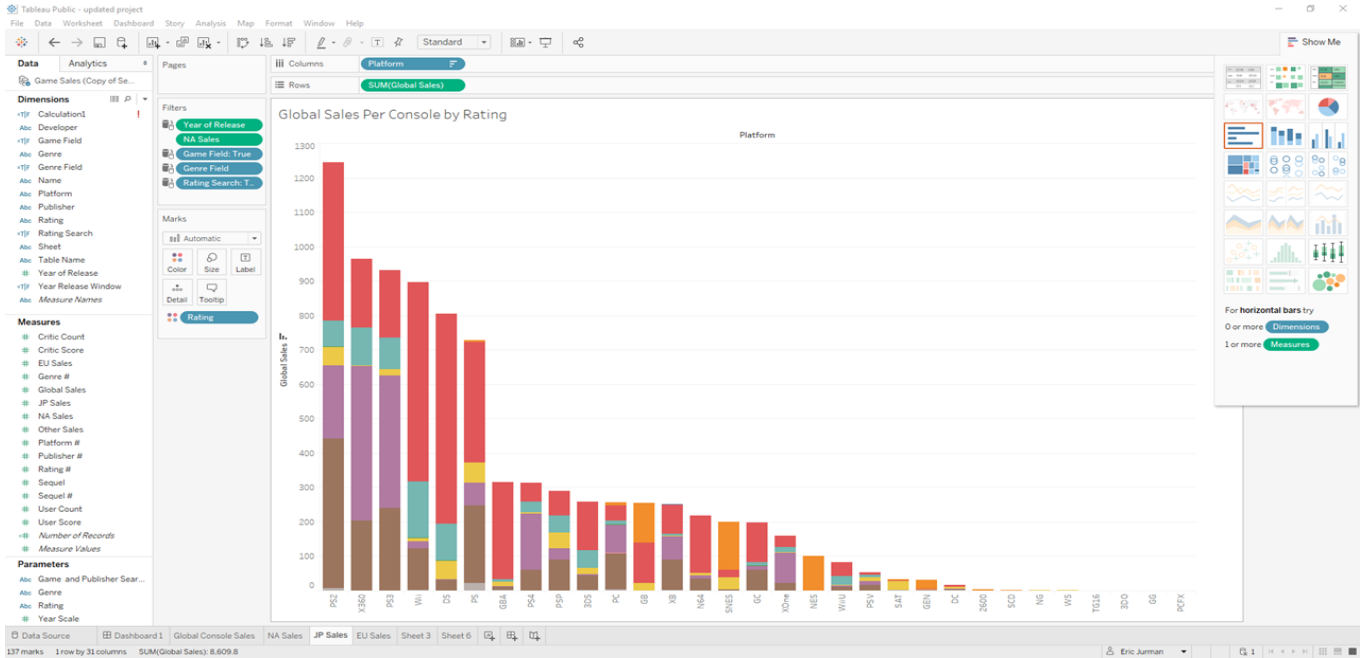


Figure 5

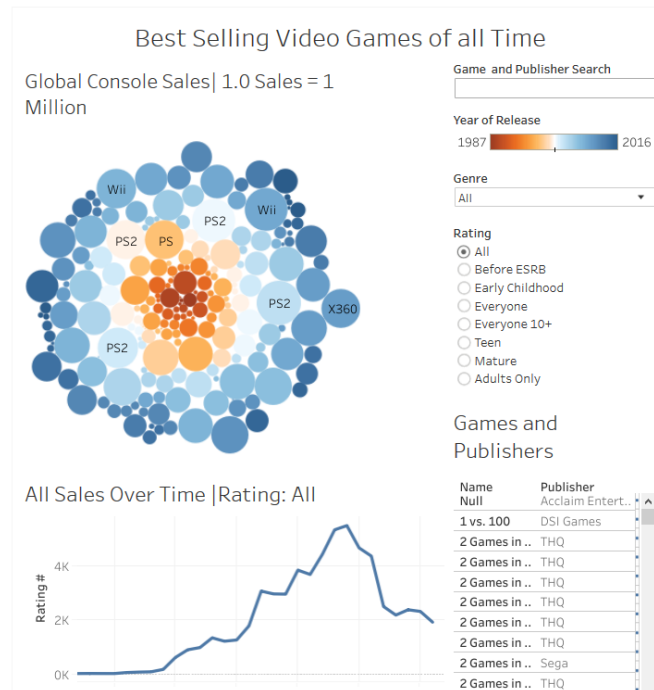


Figure 6

## CHAPTER 5: RESULTS

Regression Analysis is critical in determining what caused certain games to sell while also getting real results. The real numbers come in the form of how the variable shifts the line of your dependent variable via a function. Regression makes a general formula using all the variables to determine if these variables impact the result. This isn't always perfect, but it is a good start. In a regression done on all variables, it showed the most important characteristic of a game is whether it is a sequel or not. This, globally, accounts for ~30% of sales. Certain games are extremely popular, even if, when they were under development, they had an extremely tight budget, or time constraints, or other issues. Tight budget and tight time constraints can cause certain aspects of the game to be overlooked to focus on more important ones. These games would then get a fully funded sequel to take the prior "experimental" game and improve it in any way using reviews as a guide point. An example of a tight budgeted game is Minecraft. Coded by one man in 2009, it had sold over 850,000 copies by December 2010<sup>19</sup>. Sequels are the reason that certain publishers make a substantial profit. While the varying categories seem like they don't make a difference in a regression, certain ones make more differences than others.

A game listed as a sequel is a selling point. This is due to players recognizing the property and increasing their chances of buying the game. The average sales of games that belong to the sequel category in this data are 564,241 copies, while the average of games that are not sequels is 276,620, a 102% increase. A sequel game has a direct impact on sales no matter what other factors are in play. This effect is seen exceptionally in the mature rating. 308,518

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<sup>19</sup> Schreier, Jason. "Indie Sensation Minecraft Enters Beta, Costs More Money." *Wired*. December 22, 2017. Accessed April 25, 2019. <https://www.wired.com/2010/12/minecraft-beta/>.



sales if not a sequel, 911,123 if it is a sequel. M-rated games are usually games that have sequels released if the first game does relatively well, as the market for these video games is 18-24. This is the age range for mature games, and these have been some of the best-selling game franchises of all time: Call of Duty, Battlefield, Grand Theft Auto, these are all M rated games.

In stark contrast to the saturation of the sequel market, the number of handheld games released was 4,935 while the number of home console games was 11,783. With that the average sales of a home console games+ were 584,429 and the average handheld sales was 412,474 sales. That is a 171,955 sales difference globally. The only region to have a higher handheld average rating was Japan. This was due to having a higher mobile game consumption, as Nintendo and Sony both are from Japan and have very popular handheld consoles. A large portion of games on handheld are Role Playing Games (RPGs), and Japan has the highest average RPG sales. The United States has the highest average sales for all genres except RPG's.

Looking over genres on each console there are usually two or three that sell the best. For example, the Game Boy, a handheld console made by Nintendo, sold primarily action games with 34.5% of sales in role-playing games, 21.5% in platform games, and 18.6% in puzzle games. This means that for each console developers and publishers may trend towards specific types of games. If possible, they would port those games to other consoles with similar demographics.

Each genre also has its ratings demographic. Ratings are put in place by the ESRB which is a system that rates games based on their content and determines what age group the game is appropriate for. These ratings were explained previously in the methods chapter. The top publishers usually had their demographic known when it came to rating age groups. This knowledge can be seen below in figure 5 (a 0 means it is not a sequel, a one means it is a sequel). In the graphics below there is the average sale per year of each rating. In addition, as how many games were released that year with that rating. Publishers that make games continuously are

more likely to make sequels if they see one of their properties sell well. They know it will have a fan base waiting for a sequel. Publishers do have an impact on sales, but the impact varies per publisher.

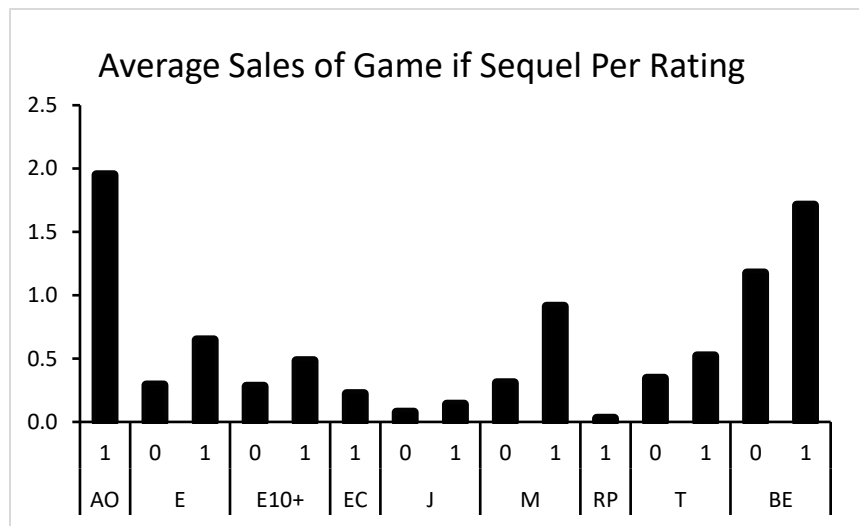


Figure 7

Most publishers don't do much for selling their games. They are the marketers, and are meant to help sell the game, but the data shows that isn't as much the case. When publishers matter it comes from the top 20 or so publishers that sell games. Nintendo is the biggest publisher overall with a total of 1.275 billion sales, followed by Electronic

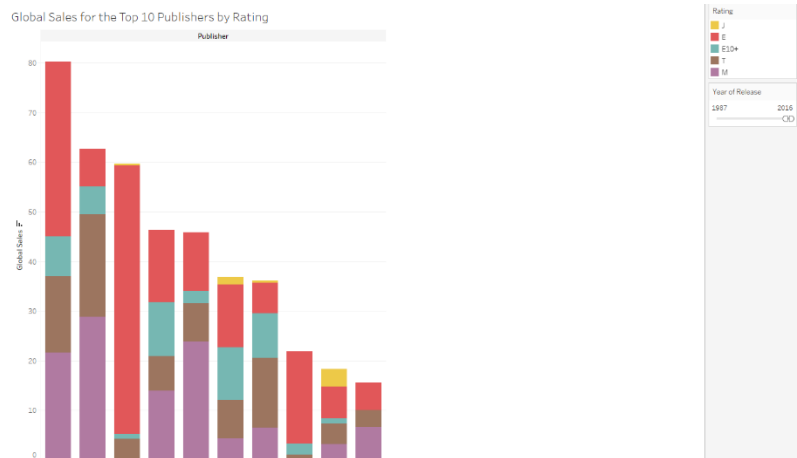


Figure 8 (Seen larger at end of Paper)

arts with 1.179 billion sales. These are numbers of items sold, not dollars. It is over the span of the entire data set, but these numbers then are multiplied by the cost of each game. There was very little impact found on average sales when it came to publishers. Usually the publishers would make decisions about the games that might cause them to sell. Displayed in this graphic are the ratings for each of the top 10 publishers globally.

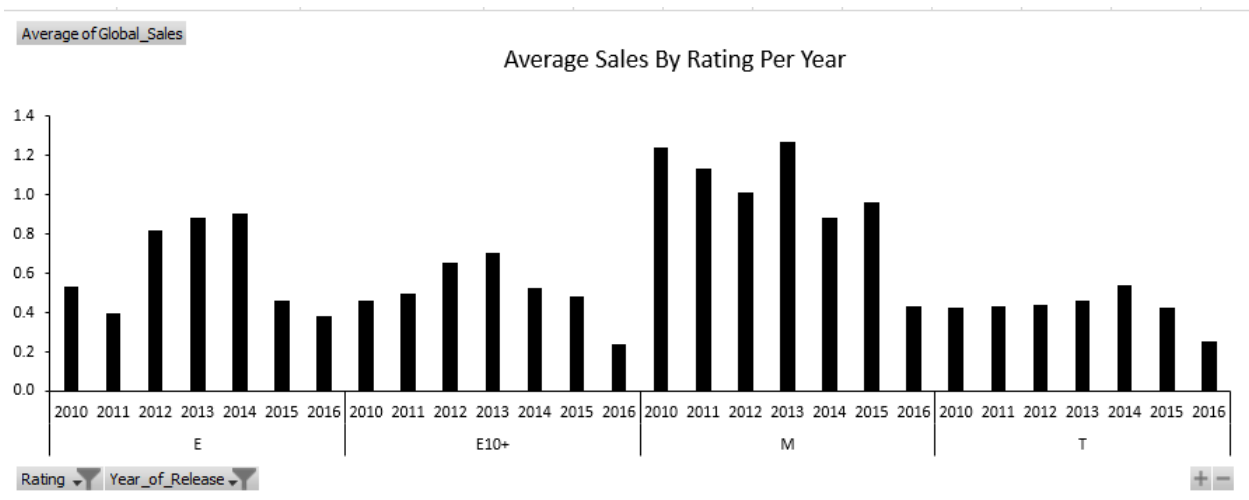


Figure 9

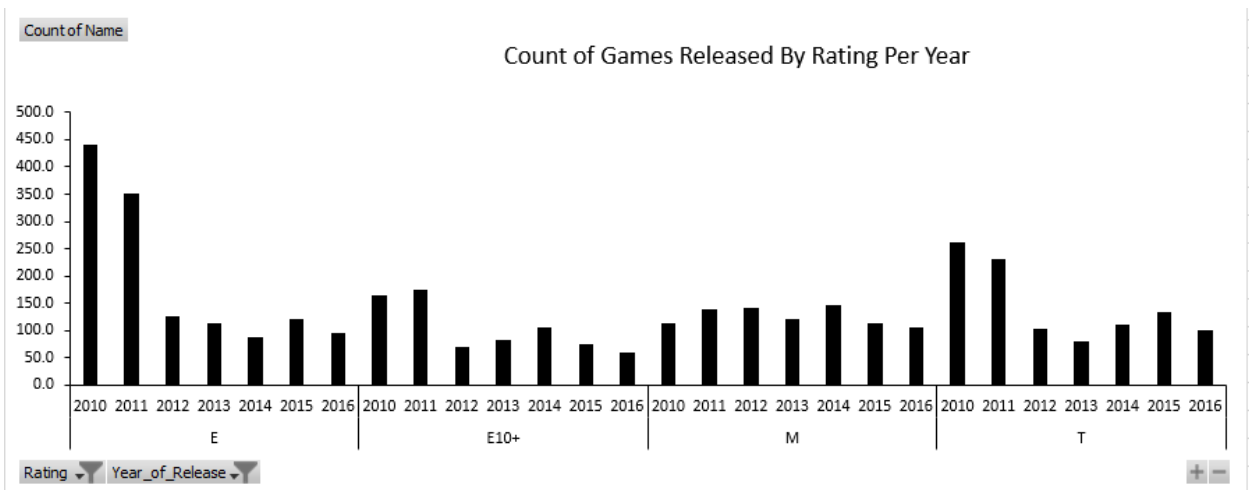


Figure 10

Consoles make up a large portion of sales in the video game market. If someone buys a console, they must buy games for that console. Each region has their top consoles, but certain

consoles were extremely popular all over the world. The top console in both NA and EU was the Xbox 360 taking up 14.4% in NA and 18.1% in the EU. Japan didn't have the 360 in its top 5 consoles, as Sony, the creator of the PlayStation, is stationed in Japan and has a large presence there. A "Console Cycle" is the process that occurs after a generation of consoles get old and their hardware is not fast enough to run the current games coming out. Large companies who make these consoles then start to end production on one and begin production on another shifting their resources accordingly.

The first time there wasn't just one big console on the market was 1987-1993 with the Super Nintendo Entertainment System, referred to as SNES from this point forward, and the Sega Genesis. Before this there was one clear preference when it came to consoles. During this period there is a visible "Console War" "an intense period of competition for market share between video game console manufacturers."<sup>20</sup> Not all consoles that won the cycle, selling the most units, had the highest average sales globally for that cycle. The SNES had a global sales average of 837,702 26.6% lower than the average sales of the Sega Genesis with 1,061,379. Of the 5 generations where there were enough consoles popular enough to consider sales split, 3 of 5 had lower average sales, leaving 2/5 higher. The two higher percentages were the Sony PlayStation 2 and PlayStation 4. The Wii was the only console to win its generation and have the

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<sup>20</sup> Codex Gamicus. "Console Wars." Codex Gamicus. April 10, 2018. Accessed April 22, 2019. [https://gamicus.gamepedia.com/Console\\_wars](https://gamicus.gamepedia.com/Console_wars).

lowest average sales of the 3. The Wii had 687,977, the PlayStation 3 had 705,807, and the Xbox 360 had 769,912.

Average of Global\_Sales

### Average Global Sales of Consoles in Generation 4

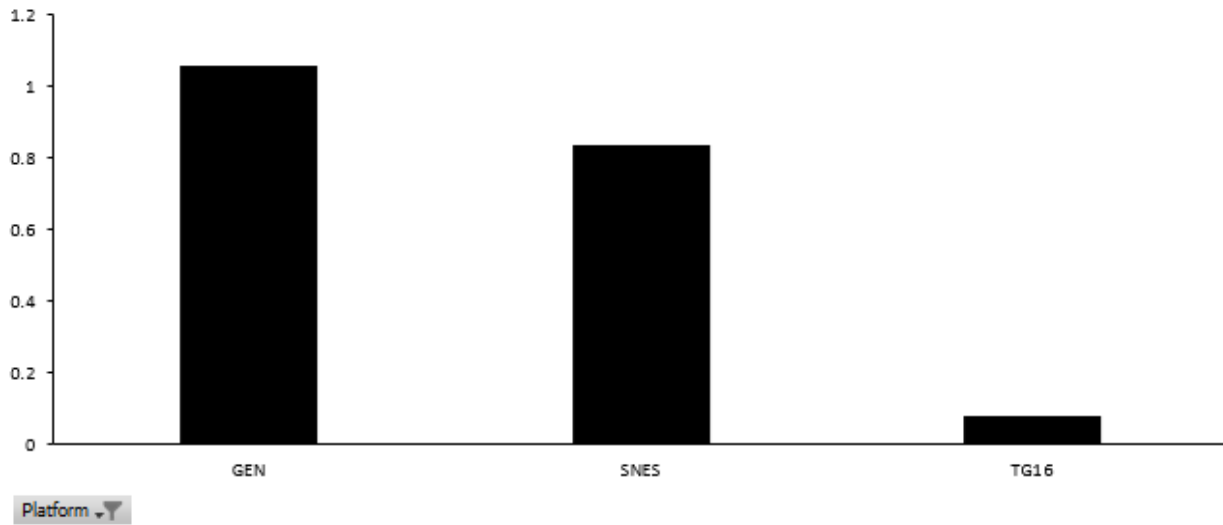


Figure 11

## CHAPTER 6: CONCLUSION

A data analysis is not always perfect. There are many steps taken before even analyzing the data to ensure that everything goes as planned. Video games are an interesting topic, and are great for analysis, but in the future more variables would make the process go differently. More variables are cause for more analysis, which can account for a larger portion of the sales. This is the situation for any analysis. Even if a factor does not effect your outcome intensely, being able to say a variable doesn't do anything lets one focus more on the variables that do effect the results<sup>21</sup>. This entire analysis was meant to be a learning experience in both analyzing data through different products and learning how to visualize it. Video games are an extremely large market and the data set analyzed only used games that had at least minor success, at least . 10,000 sales. It is important to note, there are many more factors which would account of major portions of sales. This paper worked to illustrate what tools would be necessary for a data analysis, along with showing the process of an analysis. Using what was learned from this paper it may be possible in the future to predict the sales of a game based on a few of its characteristics.

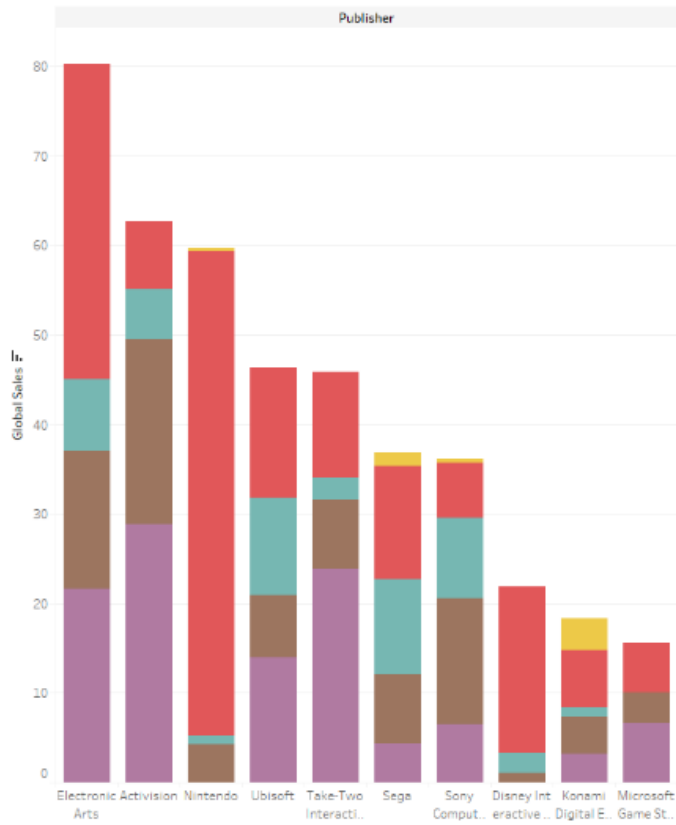
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<sup>21</sup> Jurman, Steven(Director of Data Architecture, Atlas Air Inc.) April 12, 2019

TABLEAU DASHBOARD:

<https://public.tableau.com/profile/eric.jurman#!/vizhome/BestSellingVideoGames/Dashboard1>

Global Sales for the Top 10 Publishers by Rating



Rating

- J
- E
- E10+
- T
- M

Year of Release

1987 2016

○ □

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