A study into “the effect of platform lifecycles on game performance”

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ABSTRACT

The study investigates how game performance is affected by the launch time of games on videogame platforms. In this study, game performance is operationalized as: "the aggregated scores of individual games, over several platforms, as rated by critics and users of the games" and platform lifecycles: "the period that a platform exists, from the release date of the platform itself, until the last game is launched on this platform". In order to study this phenomenon, we assume that there is a relationship between the variables 'game performance' and 'platform lifecycles'. Thereby, research examines the strength of this relationship, and if the relation between these two variables is positive or negative. The main goal of this research is to expose the performance of games throughout the lifecycle of different platforms to the publishers, so they are able to make conscious decisions regarding the launch time of games. Thereby, the publishers are able to use game performance as a selection indicator in selecting developers to achieve higher game performance. Since today, there has not been any research conducted about the degree, to which game performance is affected by the launch time of games on particular game platforms. In this research, the aforementioned phenomenon is addressed by the use of a linear regression analysis. The research question and two sub questions put the topic straight. Two hypotheses are derived from the theory. The findings state a weak, but significant negative correlation between 'game performance' and 'platform lifecycles'. The determination coefficient, explains a 6.4% variation in game performance, by the time that games are launched on a platform. The overall game performance is negatively affected by the launch time of games on videogame platforms. To further elaborate on this 'launch time', games that are released later during the lifecycle will have a significant lower performance compared to games released earlier during the lifecycle. Thereby, if games are launched after the introduction of a new generation platform, on an already existing platform, the perceived game performance is also lower. The empirical findings suggest that it does indeed matter on which platform the games are released.

KEYWORDS

Game performance, platform lifecycle, video games, release year, simple regression analysis, PlayStation, Nintendo, Xbox

1 INTRODUCTION

Nowadays, the gaming industry is a big player in the global entertainment economy (Marchand and Hennig-Thurau, 2013). There are a lot of studies concerning the successes of the three big players in the video gaming industry: Nintendo, PlayStation and Xbox. These three big players have multiple video game platforms, on which multiple games are released during a platform lifecycle. A platform is the era of a console which is used in households (Arreola, Habbari and Petrova, 2010). In other words, games (software) are released for different consoles (hardware), these consoles are developed and renewed every seven years.

According to Clements and Ohashi (2005), high-tech products have a relatively short lifecycle. As soon as "a console becomes obsolete, both the installed base and software variety decrease" (Clements & Ohashi, 2005, p. 3). The lifecycles nowadays become shorter, because of the fast-changing technological environment and customer demands (Hofman, 2010). Thus, through these findings, the longer a platform exists – becomes mature – the game sales and variety decreases. This phenomenon can be explained by the introduction of new platforms and platform maturity. The three biggest game platform owners – Sony, Microsoft and Nintendo – invest highly in designing technologically superior platforms in order to release these to the market every seven years (Tatikonda, 1999 ; Rietveld, Schilling and Bellavitis, 2016). Since most developers take actions on producing games for a new platform, the number of games released on the current platform decreases at the end of the platform's lifecycle (Gretz & Basuroy, 2013 as referred by Marchand, 2016). New games that are released on the next generation platform, are likely not compatible with the previous – already existing – platforms (Marchand, 2016).

Nowadays, research is executed into platform performance and how the lifecycle of a platform develops and expires. Rietveld, Schilling and Bellavitis (2016) for example, measure the platform performance, and did not conduct any research into game performance. The conclusions in these researches are based on different measures, compared to this paper. Furthermore, these researches apply measures of 'game sales' and 'platform performance'. Literature repetitively stated that the game sales are likely to decrease after the saturation point of the lifecycle, or when a new platform is launched. Thereby, Rietveld and Eggers (2016) found a negative and significant effect of platform maturity and next generation platform on game sales ($p < 0.01$). Currently, the effect of platform lifecycles on game performance has not been researched. The operationalization of game performance can be stated as follows: "the aggregated scores given to individual games, over several platforms, as rated by critics and users of the games". The remaining question, is whether the aforementioned developments do

have an effect on the game performance as experienced by the users of the games. For example, do games that are released later in the lifecycle have a lower game performance, than games released earlier in the lifecycle. A platform lifecycle is the period that a platform exists, from the release date of the platform itself, until the last game is launched on this platform. Because in previous researches the game sales are lower at the end of the lifecycle, we expect that the game performance will also decrease as soon as the platform matures or when a new generation platform is introduced.

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Besides the research question and two sub questions, two hypotheses are stated according the theory. In these hypotheses, two themes are central, namely: 'negative effect between game performance and platform lifecycles' and 'decrease in performance caused by the launch of a new generation platform'. The hypotheses are based on assumptions made by other researchers regarding the decreasing game sales as soon as the platform matures, or when a new generation platform is launched. Since these circumstances are negative for the game sales, we expect that these two phenomena also have a negative effect on the game performance.

The main goal of this research is to expose the performance of games throughout the lifecycle of different platforms to the publishers, so they are able to make conscious decisions regarding the launch time of games. Thereby, the publishers are able to use game performance as a selection indicator in selecting developers to achieve higher game performance. A publisher is able to fulfill different services for developers. These services describe the distribution of the game, or a complete publishing deal in which all the developers' costs are covered, and everything in between. Publishers are usually large companies with good marketing strategies and brand recognition, which most consumers are familiar with. In order to accomplish these good marketing strategies, publishers are responsible for the creation and distribution of advertising, they are involved in relationships with the press, and focus on public events. Thereby, besides marketing, publishers are also responsible for the distribution of the games and often have good contacts with large retail chains. Since publishers are distribution and marketing oriented, they are able to reach any target market, since they have several subsidiaries in different continents. The role of a publisher can be described in the following tasks: keep close contact to the platform owners, thereby, financing, developing and distributing the game, and market the games to the end user. Besides external developers, they also fund their own employees' development costs of games. Before entering into a work relationship, the

publishers may have concerns regarding the developer and use these questions as selection indicators (Greenspan & World Intellectual Property Organization, 2014).

#	**Concern**
1	How successful were previous games created by the developer?
2	How successful has the developer been in delivering games on time and within the budget?
3	Is the developer currently working on other games which might interfere with the game being considered by the publisher? This can involve obligations to fix bugs or provide additional content for previous games.
4	What is the developer's financial situation? Unless it is only acting as a distributor, the publisher will want to consider the possibility of auditing the financial records of the developer.
5	What is the experience of the people that would work on the game for different platforms?
6	Have the people working on the game successfully worked together on other games?
7	Is the developer licensed to work on first party hardware?

Table 1. Concerns that publishers may have regarding a working relationship with developers, retrieved from Greenspan and WIPO (2014).

Publishers carry a higher risk, regarding investments in the game development but also their image, to platform owners and the consumers. With the use of this paper, publishers are able to add a selection indicator, namely game performance, in order to decide with which game developers they will come to an agreement. Therefore, they have to consider whether is it profitable to invest in game developers at the end of the lifecycle, and will the release of a certain game cover, for example, all the costs.

The setup of the paper is as follows, after this introduction, we will continue with the theoretical background, where the most important constructs will be discussed. This section is followed by the methodology, including measures and data analysis. Thereafter the results from the research are presented, and this paper ends with the answer on the research question and sub questions in the conclusion.

2 THEORETICAL BACKGROUND

In this chapter, the theories regarding the constructs 'platform lifecycles' and 'game performance' are discussed. The discussion serves a better understanding in these subjects.

2.1 PLATFORM LIFECYCLES

This part is intentionally removed from the uploaded version. Hence, the age of a platform is therefore an important characteristic in order to answer the research question. According to Rietveld and Eggers (2016), games that are released "at the end of the platform lifecycle generate nearly 30% lower unit sales than games launched early in the platform lifecycle" (p. 21). The decrease in sales of games in a later stage of the platform is also underpinned by Marchand (2016), due to saturation, and that games are lowered in price. Games are brought on the market throughout the lifecycle of a platform. The following section will describe, what influence the user-type of a game has on the platform lifecycle. User-types mean a differentiation between single-player and multiplayer. Single-player video games are designed to be played by one gamer, multiplayer games are designed to be played by at least two gamers. Thereby Marchand (2016) advices to release software (games) before the saturation point, especially when those games are single-player. Rietveld, Schilling and Bellavitis (2016), have another view on bringing games to market at the end of the platform lifecycle, that is in order to give the 'late adaptors' or the casual gamer a chance to buy cheaper games. These 'late adaptors', are more likely to stick with the platform, even when a new generation platform is launched. Casual gamers are classified as late adopters (Table 2) and known for buying products when the majority has already purchased and reviewed the product (Rogers, 2003). Thereby the platform lifecycles that are presented in the aforementioned papers are based on game sales, which means that as long as there are games sold for a certain platform, the lifecycle lasts (Rietveld, Schilling and Bellavitis, 2016). Most games are released further in the lifecycle of a platform (Clements & Ohashi, 2005). Thereafter, by releasing games later during the lifecycle, it is appealing that this will result in attracting more multiplayers to a platform. Since, it is likely that most of their fellow players own the same console, and you need at least two players for a multiplayer game.

Type of gamer	**Characteristics**	**Source**
Casual gamer	Late adaptor, *"has preference for positive and pleasant fictions, has played few video games, is willing to commit small amounts of time and resources toward playing video games, and dislikes difficult games". (p. 29)*	Quote: Juul (2010) ; Rogers (2003) ; Rietveld and Eggers (2016)

Hardcore gamer	Early adaptor, *"has a preference for emotionally negative fictions like science fiction, vampires, fantasy and war, has played a large number of video games, will invest large amounts of time and resources toward playing video games, and enjoys difficult games" (p. 29)*	Quote: Juul (2010) ; Rogers (2003) ; Rietveld and Eggers (2016)

Table 2. Two types of gamers, retrieved from Juul (2010).

Mostly games are bought by the gamers with the specification of being popular and/or high-quality. The effect is that some games have very poor performance, while other games are highly popular and bestsellers (Rietveld, Schilling & Bellavitis, 2016). However, this effect is considered to be nuanced, "since games launched earlier in the platform's lifecycle will more likely to have proven their performance" (Rietveld, Schilling & Bellavitis, 2016, p. 18). In the doctoral dissertation of Rietveld (2015), he stated that a concave curvilinear effect[1] was found between platform maturity (end of lifecycle) and the sales of the video games during the end of the platform lifecycle. Thereby, Rietveld and Eggers (2016) found a negative and significant effect of platform maturity on game sales ($p < 0.01$). Because the game sales are lower at the end of the lifecycle, we expect that the game performance will also decrease as soon as the platform matures. Therefore, we stated the following hypothesis:

H1. The age of the platform negatively affects the performance of games released throughout the platform.

The game industry is known as a two-sided market (Zhu & Jansiti, 2012 ; Gretz, 2009), since the platform providers need to attract both customers and developers of games in order exist and be successful. Different platforms have the ability to have its own developer and player communities. When a lot of games are available on a platform, even more than the competing platform, it makes it more attractive for customers to buy that certain console. However, this phenomenon is also appealing for game developers (Zhu & Jansiti, 2012). According to Tatikonda (1999): "Product/process lifecycle theory is supported by the findings that there is higher technology newness, greater product newness to the customer, and greater newness of

[1] "Curvilinearity is said to occur when the functional relationship between the dependent and the independent variables is negatively accelerated (concave)… A true curvilinear relationship is quadratic." (Ganzach, 1997, p. 236)

the target market (to the firm and industry) for platform projects than derivative projects. These findings support the belief that platform projects (that are, products earlier in the lifecycle) have greater overall technology and market newness than derivative projects (products later in the lifecycle)" p. 17. This means that when a new generation platform is introduced, it is very likely that the games that are launched on these generations, are technically incompatible with the previous generation platforms. When a new platform is launched, most publishers and developers have the urge to focus their production onto the next generation platform (Gretz & Basuroy, 2013 as referred by Marchand, 2016). Marchand (2016) expects that "a saturation effect that might lead to a decline in video game sales in later product lifecycle stages for a particular console system generation" (p. 145). Rietveld and Eggers (2016) found a negative and significant effect of next generation platform on game sales ($p < 0.01$). Since the game sales are lower at the end of the lifecycle, we expect that the game performance will also decrease as soon as a next generation platform is introduced. These statements will lead to the following hypothesis:

H2. The introduction of new generation platforms is negatively affecting the game performance on already existing platforms.

This section gives this research more depth into the different groups that are involved in the video game industry: the users, the owner of the platform, publishers and developers. These four groups are involved in the successes of the gaming industry, this mechanism is known as a two-sided platform. The platform owner needs to attract as much users as possible in order to attract game developers. The other way around, by attracting good game developers, the quality of the games increases, and therefore more users will buy the games. The job of the publishers is to attract these good game developers. For years, Sony and Microsoft have a target group and devoted fan base of 'hardcore gamers' (Table 2). These 'hardcore gamers' expected high game quality, good graphics and fast processor speed (Osterwalder, Pigneur, van Kranen & Clark, 2014 ; Eisenmann, Parker & van Alstyne, 2006). Before the Nintendo Wii was launched, Nintendo faced the fact that they were in a downwards spiral and were balancing to become bankrupt. This explains why the Nintendo GameCube has a relatively short lifecycle and ended as soon as the Nintendo Wii was launched. Although Nintendo had to compete with the other two platform owners in order to gain market share, their GameCube had a childish image according the hardcore gamers. The differences that the platform owners – Microsoft, Sony and Nintendo – accomplished in their business platform can be described as follows. Sony and

Microsoft kept focusing on the hardcore gamers, while Nintendo replaced its focus onto the casual gamer. Therefore, Nintendo was able to produce cheaper consoles, since these required less technical and less expensive requirements compared to the competitors (Osterwalder et al., 2014). So, we can conclude that all the platforms that are taken into account in this research had the same strategy, since Nintendo Wii was the first platform owner in order to change the business strategy. That means that all five platforms focused on the same target group, namely the hardcore gamers, gamers who expect realistic graphics, good game quality, fast processor speed and cheap consoles.

Continuing with the game developers and publishers, the large game publishers are likely to spread their chances in the gaming industry by publishing games that can be played on multiple consoles. Microsoft is a software producer, and is therefore able to produce its own games. Developers are smaller than most publishers, and are likely to produce games for the platform owners that makes it most profitable and provide the best circumstances. Therefore, the development of games is often funded by the producers of the games. Most developers are loyal to a platform owner and therefore create games for that certain platform, also because developers are mostly small companies, they do not have the capacity or knowledge to produce games for multiple platforms (Dhir, 2004 ; Zhu & Zhang, 2006). According to Eisenmann et al. (2014) "Developers favour platforms with more end users because this improves the odds that they will recover the fixed, upfront costs of creating complements" p. 6. So, all platforms that are taken into account in this research do have the same working relationships with the developers and publishers. The big difference between publishers and developers are that developers are the ones who come up with the idea, make the design (environment, characters) and make the game. Publishers are the ones who are responsible for manufacturing the game, the related costs, the distribution and marketing.

Users of the different platforms can be classified by their different needs. The Nintendo GameCube for example, was known for releasing games that were orientated relatively to small children and their image was 'childish'. While most gamers wanted for example realistic graphics, more action and a high game quality and belonged to an age group of 18 till 34 years old. PlayStation for example, was able to establish strong relationships with several developers, in order to be able to release games throughout the entire lifecycle of the platform (Ireland, Hoskisson & Mitt, 2008). Both PlayStation and Xbox had built a huge fan base of loyal gamers, which are classified as hardcore gamers. These gamers were prepared to buy expensive game consoles and the software that are launched on these consoles. Both manufactures were trying to attract customers to their platform by introducing new features for their consoles (Eisenmann

et al., 2014 ; Rusetski, 2012). All three manufactures kept focusing on the hardcore gamers, while Nintendo GameCube had a 'childish' image according these hardcore gamers. However, Nintendo focused with the Wii console onto a different target group, namely the casual gamer.

2.2 GAME PERFORMANCE

In order to create a successful platform, the software (video games) is important. These games are developed by the developers throughout the lifecycle of a certain platform. In order to be able to create new games and launch them on time, they can adopt a certain approach that will be described in this paragraph. As described in the previous sub chapter, hardcore gamers expect excellent graphics and more. Since a new platform will be released by the manufacturers every seven years, some degree of change is required in every new product and platform. Consequently, nowadays due to the increased complexity of modern technology, modularity has become an increasingly relevant approach in today's business environment (Langlois, 2002). Modularity can be described as the degree to which a complex product can be divided into smaller subsystems (modules) and through the standardized interfaces within a standardized architecture. Through the use of standardized interfaces, the modules can be replaced easily, these subsystems are able to communicate and yet function as a whole (Langlois, 2002; Baldwin and Clark, 1997; Colfer, 2007). The degree of innovation can be increased due to the adoption of modular designs, it decreases the time cycle in design and manufacturing, and the modular designs are able to gain enormous flexibility for as well as designers, producers, and users (Baldwin and Clark, 1997 ; Huang, Zhang and Lo, 2007 ; Hofman, 2010). In addition, modularity is able to reduce the need for information exchange and allows e.g. developers to work independently from other parties (Hofman, Halman, & Song, 2017). This is crucial since the lifecycles of technology is relatively short. According to Chen (1987) (as referred by Gershenson, Prasad and Zhang, 2003) modularity in software design usually refers to tools for the user to build large programs out of pieces. About software modularity, the aim is that the designs are changeable, the development is independent, and the degree of understandability (Gershenson et al., 2003). Next to product modularity, software modularity also aims to reduce complexity by also reducing connectivity between program parts (Gershenson et al., 2003).

All the constructs described above, contribute to a certain experience for the end users, or game performance. Since game performance is an important concept in this paper, it is required to operationalize the concept and explain how this is measured throughout the research. This part is intentionally removed from the uploaded version.

3 DATA AND METHODOLOGY

This section explains the steps that are taken for this, thus how the research is designed, the setup of the research, how the data will be analysed and the used methods will be justified.

3.1 DESIGN AND DATA COLLECTION

The design of the research that will be conducted in the first semester of the academic year 2016/2017 will be explained in this chapter. In order to answer the research question: *"How is game performance affected by the launch time of games on videogame platforms?"*. The first step is a literature research into the topics that will be discussed. To get a deeper understanding of these topics and gain knowledge on the subjects. About the data collection, in order to answer the research question, the following steps have been made. To gather information for the research to determine how game performance is affected by the launch time on particular videogame platforms, the first step is to execute a literature review. This literature review gives insight into earlier conducted research for the field of interest. Therefore, to gather this information, two databases were used: Google Scholar and a database provided by the University of Twente, called Scopus. The information retrieved from these sources are theoretical. However, the theory on these constructs available are very scarce, and therefore the theory part of this paper is limited. This research examines whether there is a relation between the two variables and gives answer to the 'how' question.

In order to determine the game performance, there was need to first select games over several platforms. The dataset that is used in this research contains three hundred games divided over five different platforms. These five different platforms are chosen because they belong to the three biggest platform owners in the gaming industry: Sony, Microsoft and Nintendo. Two platforms from Sony and Microsoft are chosen, and one platform of Nintendo, which counts up to a total of five platforms. Only platforms that are released after the year 2000 are taken into account. For each platform, sixty games are randomly assembled and several information sources are retrieved from these games, see Table 3.

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Table 3. Constructs that are gathered for each game on all platforms.

Because our interest lies within the lifecycle of a platform, the sixty games were assembled from each year that the platform exists[2]. In total a number of three hundred games will be used for the analysis. Now that the dataset is complete, the next step is to gather all the review scores per game from critics and users. The following sources are used to gather secondary data: *mobygames.com* (information about developers and publishers), *metacritic.com* (scores given by critics and users), and *vgchartz.com* (how many games are sold in the USA, Europe and the rest of the world). This is done for all three hundred games over five platforms (PS2, PS3, Xbox, Xbox 360 and GameCube). All this data is assembled in Microsoft's Excel and then exported to IBM SPSS 23©, with the purpose to process and analyze the data. The results of this secondary research are presented in Chapter 4. After retrieving information from these platforms (Table 3), we used IBM SPSS 23©, in order to process the found data with the main goal to answer the research question.

3.2 MAIN VARIABLES

In this paper, different measures are used in order to answer the research question. There are two main variables that will be defined, namely 'platform lifecycle' and 'game performance'. The operationalization of these two variables can be found in Table 4. How these variables will be measured throughout this research, can be found in the next paragraphs.

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Table 4. Operationalization and measurement of the dependent and independent variable.

3.2.1 INDEPENDENT VARIABLE

This study contains one main independent variable, namely: 'platform lifecycle'. Platform lifecycle in this research will be identified through normalized values of the lifecycle. In Table 4, one is able to find the definition of this variable and the measurement. Therefore, the investigation is done for all three hundred games, because, the five lifecycles that will be studied have different lengths in lifecycles. Now one is able to compare all these lifecycles and couple the game performances to these lifecycles.

3.2.2 DEPENDENT VARIABLE

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[2] Sixty games are assembled over a platform lifecycle, when a platform exists for 10 years, that means (60/10) 6 games are assembled each year. The initial requirement for a game to be assembled into the dataset, is that the respondent has an email address.

So, all these scores are added up together and then divided by the weight[3]. Analyses are made on both individual scores and aggregated scores of users and critics. Finally, these individual scores are added up and divided by two, and this gave the aggregated score of games. The aggregated scores are in this research used to measure the game performance. This is done for each platform separately, and all platforms together.

3.3 DATA ANALYSIS

The analysis of the secondary data can be described as follows; first all the raw data gathered from the sources were assembled in Excel (Table 3). Thereafter, the data was imported into the data analysis programme IBM SPSS 23©. There is one dataset which contains all three hundred games, and thereby five other datasets which contains sixty games each, that belong to a specific platform. The release dates of all the games have been recoded into different variables and grouped with the function 'Date and Time Wizard' under 'Transform'. Thereby, the release dates were grouped into release years, depending on the length of the lifecycle. Since not all platform lifecycles last equally, the lifecycles were normalized[4] in order to generate fair distributions for all platform lifecycles.

In this research a linear regression analysis is conducted, the most important assumptions to do so are: independence of the observations, normal distribution and homoscedasticity (Cohen, Cohen, West and Aiken, 2003). The first assumption is met, since all games are selected randomly from the different platforms under certain conditions. To test this regression analysis there is need for a test of normality, this can be done through the Shapiro-Wilk Test of Normality in SPSS. However, usually the Shapiro-Wilk Test of Normality is used for small sample sizes – from 3 till 50 (D'Agostino, 1971). Royston (1982), for example, was able to conduct this test up to 2000 cases involved. According to *Central Limit Theorem* (CLT) one can assume that data is normal distributed when available in large sample sizes or if the distribution of the sample size increases the normality can be guaranteed (University of Amsterdam, 2014 ; Clinical Research Unit, 2016, Online Statistics Education, n.d.). Homoscedasticity can be calculated through IBM SPSS 23© as well, with the function 'Linear' under 'Analyze' and is shown in Appendix 2, figure 2.5. Now can be concluded that all our assumptions are met to conduct a regression analysis. In order to determine the strength of the relationship within this effect, the Pearson Correlation Coefficient (Pearson's r) will be tested.

[3] More information can be found in appendix 8.

[4] Ascending values to variables from 0 – 1.

The next analysis that will be conducted is related to the introduction of new platforms and its effect on already existing platforms. By using IBM SPSS 23©, the aggregated scores of users and critics are divided into two groups. One group represents 'before', and gives the game performance before the next generation platform is launched. The second group represents 'after' and provides the game performance after the introduction of a next generation platform. Besides the different analyses, we found some empirical evidence that it does indeed matter on which platforms the games are released. This is because, the results of the analyses show different results per platform. Chapter 4 gives a better overview about these results.

4 RESULTS

First, the results from the secondary data that is gathered in this research are presented. This part is intentionally removed from the uploaded version.

4.1 GENERAL RESULTS – PLATFORMS

This section represents the general findings of the secondary data. In our dataset we analysed five different platforms, including two of them, which are followed by a next generation platform. All graphs which provide the information that will be described here, can be found in Appendix 3 - 7.

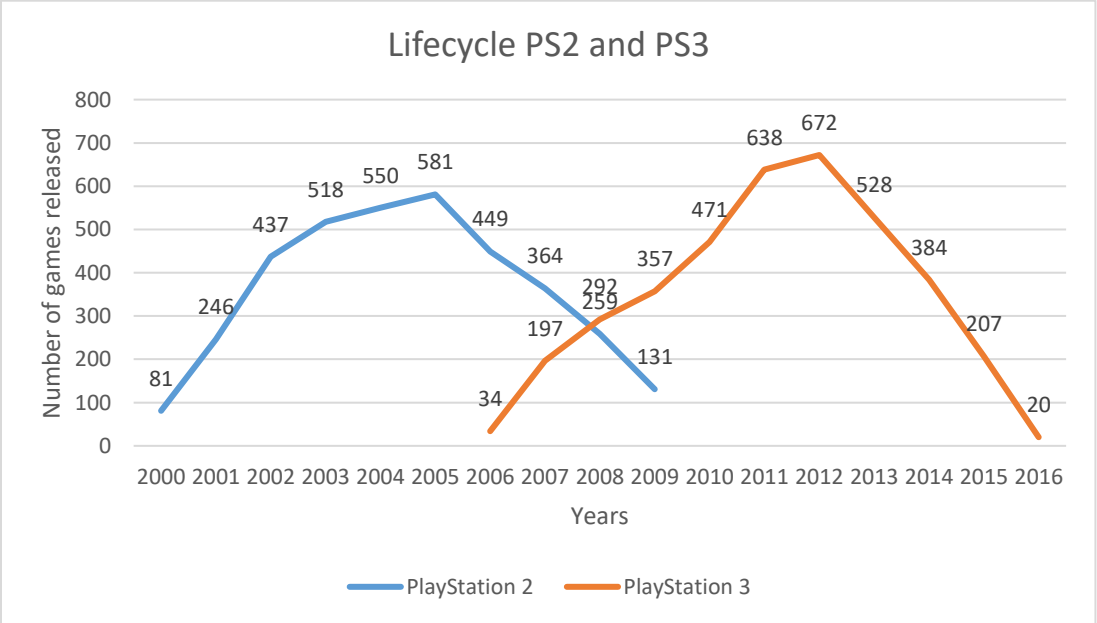

Figure 1. Lifecycles PlayStation 2 and PlayStation 3, N = 7.416 games.

Figure 1, illustrates the lifecycles of two platforms, and shows that as soon as the PlayStation 3 is released, the number of games brought on the market for PlayStation 2, declines. Besides figure 1, nearly the same illustration can be presented for Xbox and Xbox 360, considering the

shrinking releases of games for Xbox, due to the release of Xbox 360. Thereby, as shown, the lifecycles and in maximum releases for PlayStation are nearly equal, this does not represent the results of Microsoft's Xbox range. The lifecycle of Xbox 360 is significantly longer, and more games were sold at this platform. Now, still one platform has to be discussed, which is Nintendo's GameCube. This one has a very short lifecycle, of only 6 years and different to the other platforms, the peak year of games released onto the platform is almost right in the beginning. Thereby, after the introduction of Nintendo Wii, no more games were sold for the GameCube (Rietveld & Eggers, 2016). Xbox 360 is the platform that existed for the longest and PlayStation 2 is the platform on which, by far, the most games are sold. In the next section, the average scores as given by users and critics on *metacritic.com* will be discussed.

The review scores available per game, are rated by critics and users. The games which are sold for PS2 score on average a 7.20 with a minimum score of 3.0 and a maximum 9.15. PS3 scores on average a 7.21, with a minimum score of 3.2 and a maximum of 9.15. To go further with Xbox, the games which are sold on this platform receive an average score of 7.32 with a minimum score of 2.8 and a maximum of 9.15. Xbox is followed by Xbox 360, with an average game score of 6.67, with a minimum score of 1.7 and a maximum of 8.9. And last but not least, the GameCube of Nintendo, with an average game score of 7.31, a minimum score of 4.95 and a maximum of 9.5. These game scores are all based on 60 games per platform, as rated by the users of the games and critics (game performance).

All release dates are grouped together in IBM SPSS 23© and the scores as rated by the users and critics are grouped into game performance and linked to release years, so one is able to receive the average game scores per year. These results can be found in Appendix 3 – 7.

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Table 5. Average scores given by users over the lifecycle of PlayStation 2. N = 102

Table 5 is made for each platform and it is interesting to see that since the introduction of PS3 in 2006, the average scores for the games of PS2, have been decreased. It is possible that the games released in a later stage of a lifecycle are of less quality than in the beginning of the lifecycle. To discuss the average scores of PS3, these are throughout the lifecycle nearly equal. The lifecycle of Xbox is relatively short and ended almost directly with the introduction of Xbox 360. The measured game performance was steady throughout the lifecycle of Xbox. An interesting fact is that on November 22nd 2013, Microsoft released the Xbox One, so the same effect occurred for Xbox 360 as for PS2 (after the release of PS3), the average scores decreased.

At last, the average scores of Nintendo GameCube, are on average – except the last year – very high.

The market share of the games sold around the world is divided into three categories, namely: 'North America, Europe, and Rest of the World'. For 4 out of 5 platforms, the fact is that more than 50 percent (for 3 out of 5 even higher than 60 percent) of the games are sold in North America. Except the games sold for PlayStation 3, these are below 50 percent. For all platforms, the category Europe is the second largest market after North America.

As described earlier in the theory, publisher feel the urge to launch the same game on multiple platforms. In this research, the games are all unique, which means that when a game is released on both PlayStation 3 and Xbox 360, the game is chosen once, so either on the platform of PlayStation 3 or Xbox 360. In appendix 3 – 7, one can see on which other platforms the games that appear in the analysis are also released.

4.2 RESULTS AGGREGATED PLATFORMS

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5 SCIENTIFIC RELEVANCE

As mentioned before in the introduction, the purpose of this research is to examine the lifecycle stages of a platform and how this affects the game performance. Currently, there are no previous studies into the effect between game performance and the platform lifecycle. The results of this research allow to gain insight into the game performance, and thereby the variables that are able to influence the game performance. Since there were two platforms that were very steady regarding game performance, it can be stated that these platforms were successful, in terms of game scores. In consequence, it does not necessary mean, that when a lifecycle comes to an end, due to the introduction of a new platform, that this affects the game performance.

6 CONCLUSION

Previous studies that have been conducted, contain a lot of information on game sales related to platform performance. Currently, there are no studies into the effect of platform lifecycles on game performance. This study revealed the effect of video game platforms on game performance and the strength of this relationship.

In this study, it was the purpose to examine the research question that is related to this paper, which was stated as follows: *"how is game performance affected by the launch time of*

games on videogame platforms?". Besides this research question, two sub questions are formulated, to be able to further elaborate on this subject. Thereafter, two hypotheses were stated, and in these hypotheses, these two themes are central: 'negative effect between game performance and platform lifecycle' and 'decrease in performance caused by the launch of a new generation platform'.

Before answering the research question, it is necessary to first answer the two sub questions. The answer to the first sub question *"how does the age of a videogame platform affect the game performance"*, the following answer is formulated. Generally, the older a platform gets, the lower the game performance becomes. In sum, the game performance is negatively affected by the age of a platform. The second sub question is *"how does the introduction of a next generation platform affect the game performance on already existing platforms"*. Generally, the game performance on an already existing platform decreases, as soon as a new generation platform is launched. Which means that the introduction of a next generation has a negative effect on the game performance. This information creates a more specific answer to the research question *"how is game performance affected by the launch time of games on videogame platforms?"*. With the use of sub questions, the answer to the research question can be stated as follows: based on the results presented in Chapter 4, the research concludes a weak, but significant negative correlation between 'game performance' and 'platform lifecycles'. Examining the determination coefficient, it can be concluded that 6.4% of the variation in game performance, can be declared by the time that games are launched on a platform. The effect is negative because the R is -0.228. The overall game performance is negatively affected by the launch time on videogame platforms. To further elaborate on this 'launch time', games that are released later during the lifecycle will have a significant lower performance compared to games released earlier during the lifecycle. Thereby, if games are launched after the introduction of a new generation platform, on an already existing platform, the perceived game performance is lower.

Based on empirical findings, it does depend on which type of platform the games are launched. There is nearly no relationship neither an effect between game performance and platform lifecycles on the platforms of PlayStation 3 and Xbox. The next step is examining each platform separately in order to determine if the launch time during the particular platforms is affecting the game performance. These results are presented in Chapter 4.3, and we come to the following conclusion. There is a significant negative relation between the variables game performance and platform lifecycles for PlayStation 2, Xbox, Xbox 360 and GameCube. However, besides these outcomes, there is one platform that is different, and that platform is

PlayStation 3. The results for this platform are that the game performance at the end of the platform is higher, since the R in the linear regression is positive. Consequently, all platforms participate in the effect between lifecycles and the measured game performance, each to a different degree. By examining all the platforms separately, the conclusion can be made, that it does depend on which platform the games are released.

In order to declare this phenomenon, information is gathered about the four players in the two-sided game market. Namely, the users, platform owners, publishers and developers. Platform owners need to attract as much users to the platform as possible, in order to attract game developers. Since the three platform owners all had the same target group, namely the hardcore gamers, there are no differences spotted here. However, according these hardcore gamers, the Nintendo GameCube had a childish image, compared to the other two platform owners. These hardcore gamers expect from the platform owners high game quality, good graphics and fast processor speed. Nintendo was not able to reach the expectations of these gamers, and after the Nintendo GameCube, they focused on the casual gamers with the introduction of Nintendo Wii. However, there is need for game developers and good publishers, to enable the platform owners, to provide games compatible to their consoles of high quality and good graphics.

Greenspan and WIPO (2014), developed some selection indicators (Table 1) for publishers, in order to select game developers for a working agreement. This paper, can help publishers to add another selection indicator, namely game performance. The gain for publishers by adding another selection indicator, is that they are more aware which developers are able to design games, with a high performance. The results of this paper state that the game performance significantly deceases as soon as a new generation platform is introduced, and when a platform matures. By adding the selection indicator game performance, publishers are able to determine, which developers develop games with a high game performance and good quality. Additionally, they are able to determine the best moment to publish games. The best moment for releasing games differs per platform, but now they gained insight into the patterns of the game performance. By determining the best moment and developers, based on the game performance, they will likely have more game sales (since the game sales also decrease at the end of a lifecycle, or after the introduction of a new generation platform). It is now known, that when games are released later during the platform lifecycle, the game performance is significantly lower, than released earlier on the platform.

6.1 LIMITATIONS AND INDICATIONS FOR FURTHER RESEARCH

Limitations are present in this research, since it contains analyses of data which is already available and therefore not new. First, after examining 5 different platforms, which are produced by three most influential manufacturers (Sony, Nintendo and Microsoft). Nowadays there are more platforms available on the market, so it is not sure whether the findings can be generalized over the whole gaming industry. Second, after retrieving 300 mail addresses (sixty per platform) in August 2016, it was the purpose to send mails with questionnaires to developers. This was the purpose to give more depth into the already analyzed data. Apparently, the negative effect that has been found, can be further elaborated through the responses of the people involved. This limits the dataset, because the assembled games had the initial requirement that a member of the development team, could be reached by an email address.

In this research, games that are released on multiple platforms are taken into account. But, for the analysis, a certain game was only chosen once. In order to get a clearer view on which platform performs better, it is relevant to assemble the games that are released on multiple platforms, and retrieve the aggregated scores from users and critics per platform. Therefore, future research can measure the performance of the games on each platform and determine whether there is one platform that performs different from another.

Suggestions for further research can be to examine the negative effect found between ‘game performance’ and ‘lifecycle of the platform’, this can be done to gather the responses from the developers on the questionnaires.

7 REFERENCES

Alblas, A., & Jayaram, J. (2014). Design resilience in the fuzzy front end (FFE) context: an empirical examination. *International Journal of Production Research*, *53*(22), 6820-6838. doi:10.1080/00207543.2014.899718

Arreola, A. H., Habbari, S., & Petrova, A. G. (2010). Business Dynamics and Innovation in the Home Video Game Industry. *Jönköping International Business School - Jönköping University*.

Baldwin, C. Y., & Clark, K. B. (1997). Managing in an Age of Modularity. *Harvard Business Review*, *75*(5), 84-93.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). Applied multiple regression/correlation analysis for the behavioral sciences (Third). Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Colfer, L. (2007). Theory and Evidence on the Correspondence between the Structure of Products and Organizations. *Harvard Business School.*

D'Agostino, R. B. (1971). An Omnibus Test of Normality for Moderate and Large Size Samples. *Biometrika*, *58*(2), 341. doi:10.2307/2334522

Dhir, A. (2004). 6 Gaming Consoles. In *The digital consumer technology handbook: A comprehensive guide to devices, standards, future directions, and programmable logic solutions* (pp. 77 - 93). Amsterdam: Newnes.

Eisenmann, T., Parker, G., & Van Alstyne, M. W. (2006). Strategies for Two-Sided Markets. *Harvard Business Review*, 11.

Furtado, A., & Santos, A. (2006). Applying Domain-Specific Modeling to Game Development with the Microsoft DSL Tools. *3rd Brazilian Symposium on Computer Games and Digital Entertainment (SBGames2006).*

Ganzach, Y. (1997). Misleading interaction and curvilinear terms. *Psychological Methods*, *2*(3), 235-247. doi:10.1037//1082-989x.2.3.235

Gershenson, J. K., Prasad, G. J., & Zhang, Y. (2003). Product modularity: Definitions and benefits. *Journal of Engineering Design*, *14*(3), 295-313. doi:10.1080/0954482031000091068

Greenspan, D., & World Intellectual Property Organization. (2014). *Mastering the Game: Business and Legal Issues for Video Game Developers* (8th ed.). Creative Industries.

Gretz, R. T. (2009). Console Price and Software Availability in the Home Video Game Industry. *Atlantic Economic Journal*, *38*(1), 81-94. doi:10.1007/s11293-009-9209-3

Hofman, E. (2010). Modular and architectural innovation in loosely coupled networks: matching customer requirements, product architecture, and supplier networks. University of Twente.

Hofman, E., Halman, J. I., & Van Looy, B. (2016). Do design rules facilitate or complicate architectural innovation in innovation alliance networks? Research Policy, 45(7), 1436-1448.

Hofman, E., Halman, J. I. M., & Song, M. (2017). When to Use Loose or Tight Alliance Networks for Innovation? Empirical Evidence. Journal of Product Innovation Management, 34(1), 81-100. doi:10.1111/jpim.12325

Huang, G. Q., Zhang, X. Y., & Lo, V. H. (2007). Integrated Configuration of Platform Products and Supply Chains for Mass Customization: A Game-Theoretic Approach. *IEEE Transactions on Engineering Management*, *54*(1), 156-171. doi:10.1109/tem.2006.889074

Huizingh, E. (2014). *Inleiding SPSS 22: Voor IBM SPSS statistics 22* (12th ed.). The Hague, Netherlands: Academic Service.

Ireland, R. D., Hoskisson, R. E., & Hitt, M. A. (2008). *Understanding business strategy: Concepts and cases*. Mason (Ohio)[etc.: South-Western Cengage Learning.

Juul, J. (2010). *A casual revolution: Reinventing video games and their players*. Cambridge, MA: MIT Press.

Langlois, R. N. (2002). Modularity in Technology, Organization, and Society. *Journal of Economic Behavior & Organization*, *49*, 19-47.

List of best-selling game consoles - Wikipedia, the free encyclopedia. Retrieved July 10, 2016, from https://en.wikipedia.org/wiki/List_of_best-selling_game_consoles

Marchand, A. (2016). The power of an installed base to combat lifecycle decline: The case of video games. *International Journal of Research in Marketing*, *33*(1), 140-154. doi:10.1016/j.ijresmar.2015.06.006

Marchand, A., & Hennig-Thurau, T. (2013). Value Creation in the Video Game Industry: Industry Economics, Consumer Benefits, and Research Opportunities. *Journal of Interactive Marketing*, *27*(3), 141-157. doi:10.1016/j.intmar.2013.05.001

Metacritic.com. (2017). How We Create the Metascore Magic - Metacritic. Retrieved from http://www.metacritic.com/about-metascores

Neto, B., Fernandes, L., Werner, C., & De Souza, J. M. (2010). Developing Digital Games through Software Reuse. *Journal of Information Processing Systems*,*6*(2), 219-234. doi:10.3745/jips.2010.6.2.219

Online Statistics Education: An Interactive Multimedia Course of Study, & Rice University (Lead Developer), University of Houston Clear Lake, and Tufts University. (n.d.). Sampling Distribution of the Mean. Retrieved from http://onlinestatbook.com/2/sampling_distributions/samp_dist_mean.html

Osterwalder, A., Pigneur, Y., Kranen-van H., & Clark, T. (2014). *Business Model Generatie: Een handboek voor visionairs, game changers en uitdagers*. Deventer: Vakmedianet.

Popular Search Results at Metacritic - Metacritic. (2016). Retrieved from http://www.metacritic.com/search/popular

Rietveld, J. (2015). Value Creation from Complements in Platform Markets: Studies on the Video Game Industry. (Unpublished Doctoral thesis, City University London)

Rietveld, J., & Eggers, J. P. (2016). Demand Heterogeneity and the Adoption of Platform Complements. *SSRN Electronic Journal*. doi:10.2139/ssrn.2714366

Rietveld, J., Schilling, M. A., & Bellavitis, C. (2016). Strategic Governance of Platform Ecosystems. *Platform Strategy Research Symposium*, 1 - 36. Retrieved from http://questromworld.bu.edu/platformstrategy/files/2016/06/platform2016_paper_3.pdf

Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.

Royston, J. P. (1982). An Extension of Shapiro and Wilk's W Test for Normality to Large Samples. *Applied Statistics*, *31*(2), 115. doi:10.2307/2347973

Rusetski, A. (2012). The Whole New World: Nintendos Targeting Choice. *Journal of Business Case Studies (JBCS)*, *8*(2), 197. doi:10.19030/jbcs.v8i2.6808

Sommerville, I. (2011). Software Engineering (9th ed.). Boston: Pearson

Tatikonda, M. (1999). An empirical study of platform and derivative product development projects. *Journal of Product Innovation Management*, *16*(1), 3-26. doi:10.1016/s0737-6782(98)00038-1

University of Amsterdam. (2014). Normaliteit - Methodologiewinkel. Retrieved from http://wiki.uva.nl/methodologiewinkel/index.php/Normaliteit

University of Tilburg. (2017). Tilburg University - Correlaties. Retrieved from https://www.tilburguniversity.edu/nl/studenten/studie/colleges/spsshelpdesk/edesk/correlat/

Video Game Charts, Game Sales, Top Sellers, Game Data - VGChartz. (2016). Retrieved from http://www.vgchartz.com/

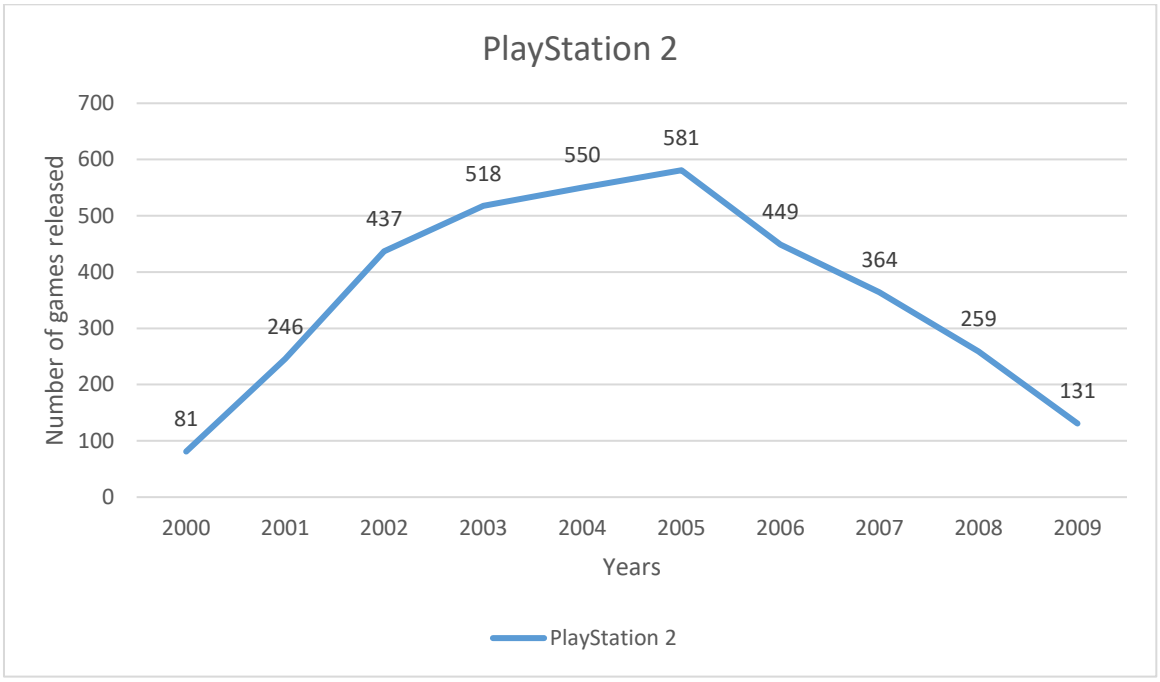
Video Games Database. Credits, Trivia, Reviews, Box Covers, Screenshots - MobyGames. (2016). Retrieved from http://www.mobygames.com

WikiStatistiek. (2016). Retrieved February 13, 2017, from https://wikistatistiek.amc.nl/index.php/KEUZE_TOETS

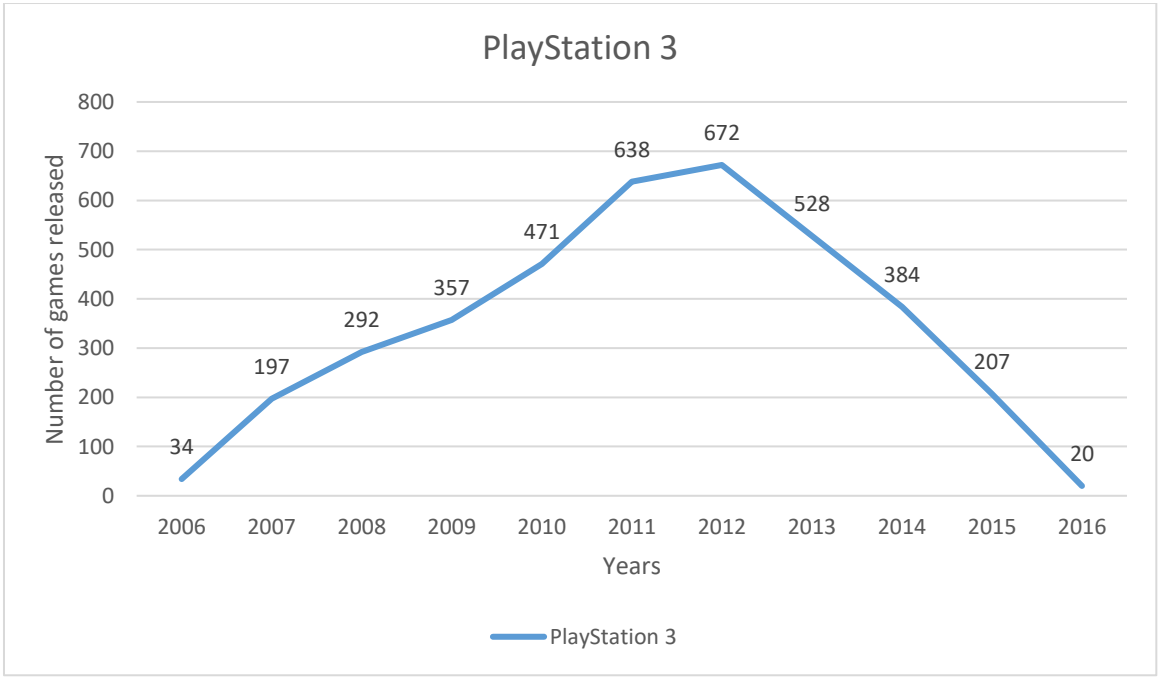
Zhu, F., & Iansiti, M. (2012). Entry into Platform-Based Markets. *SSRN Electronic Journal*, *33*, 88 - 106. doi:10.2139/ssrn.1350233

Zhu, F., & Zhang, X. (2006). The Influence of Online Consumer Reviews on the Demand for Experience Goods: The Case of Video Games. *International Conference on Information Systems ICIS*, 367 - 382. Retrieved from http://aisel.aisnet.org/icis2006/25

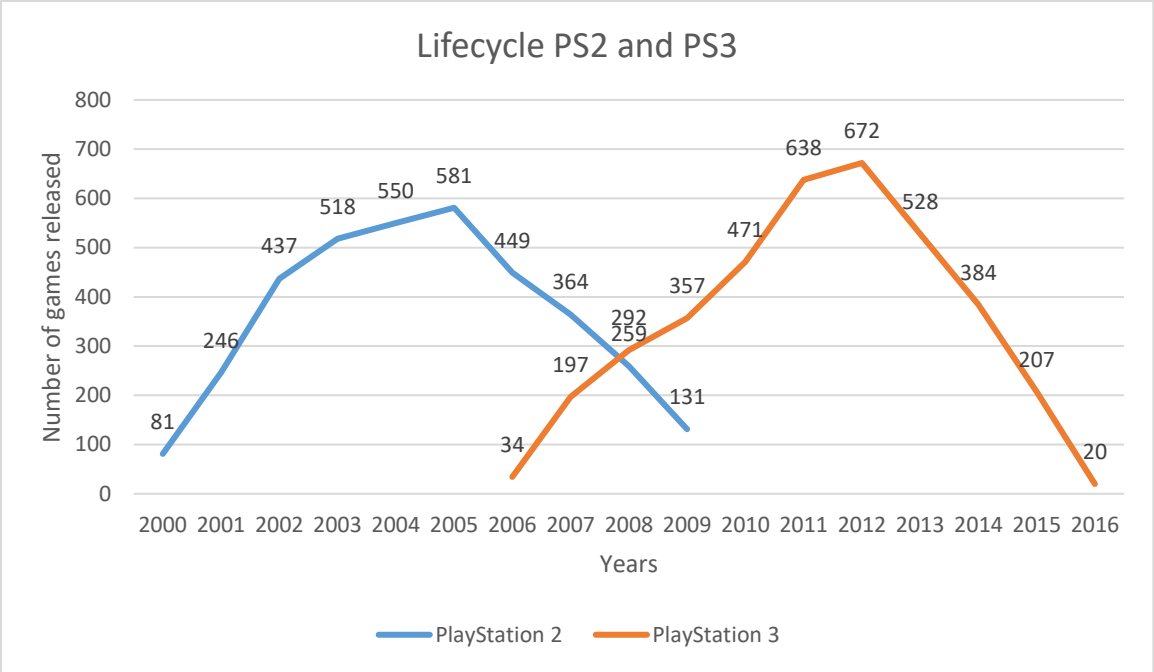
APPENDIX 1 – LIFECYCLES



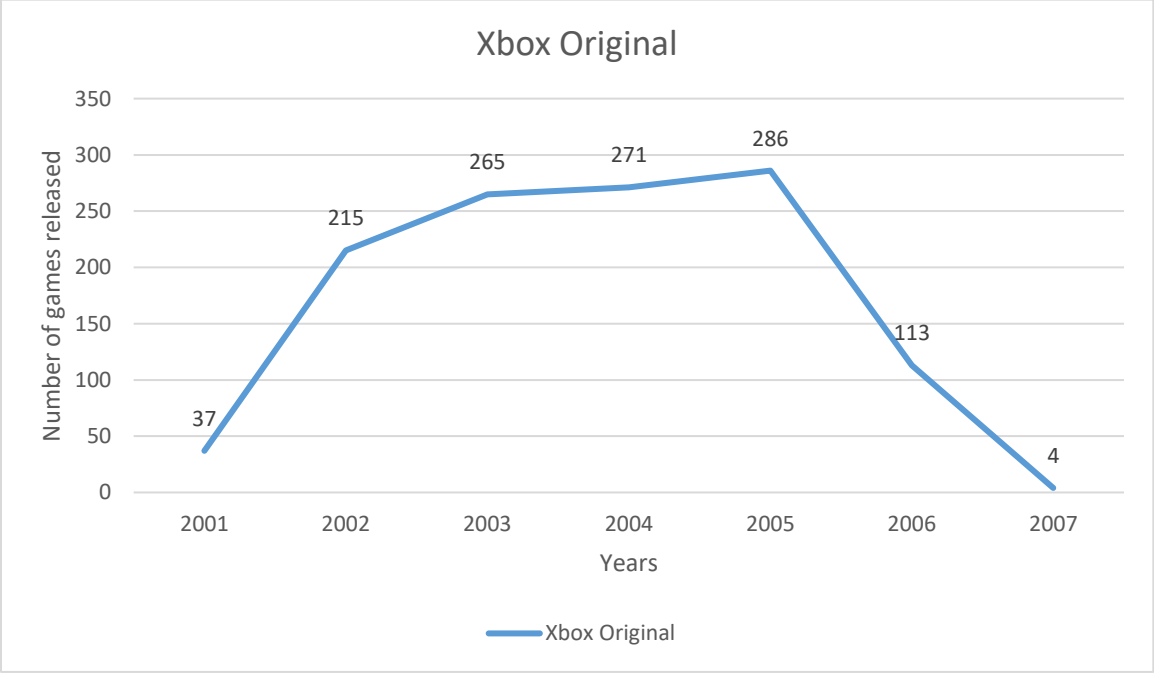
Appendix *Figure 1.1* Lifecycle PlayStation 2, N = 3.616 games.



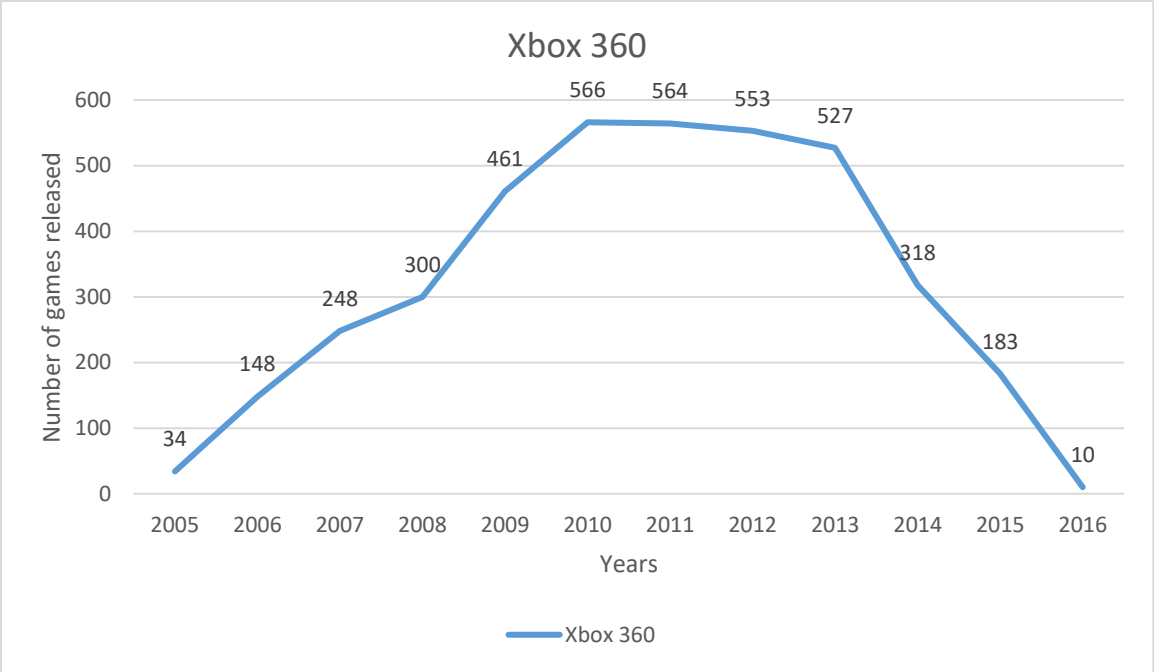
Appendix *Figure 1.2* Lifecycle PlayStation 3, N = 3.800 games.



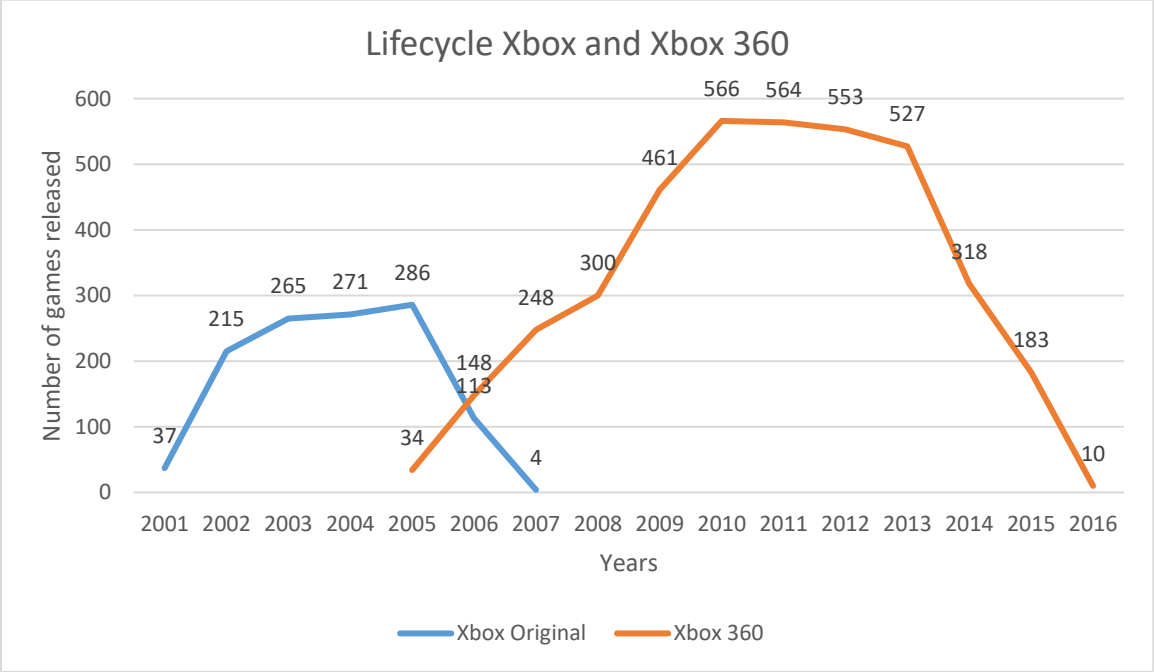
Appendix *Figure 1.3* Lifecycles PlayStation 2 and PlayStation 3, N = 7.416 games.



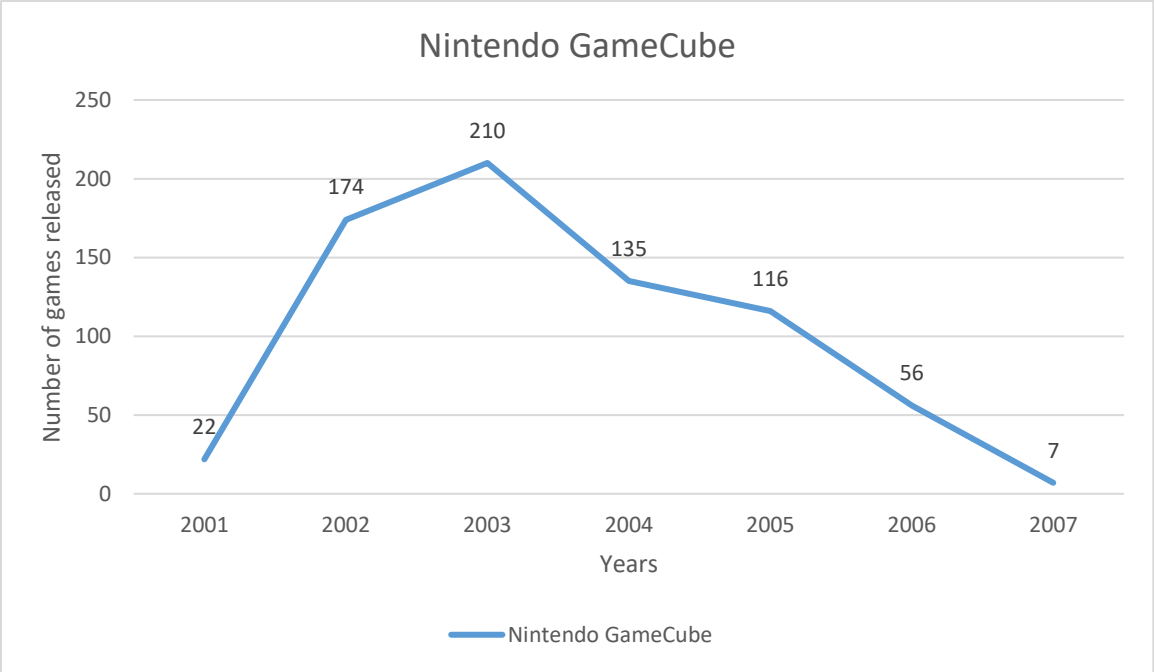
Appendix *Figure 1.4* Lifecycle Xbox Original, N = 1.191 games.



Appendix *Figure 1.5* Lifecycle Xbox 360, N = 3.912 games.

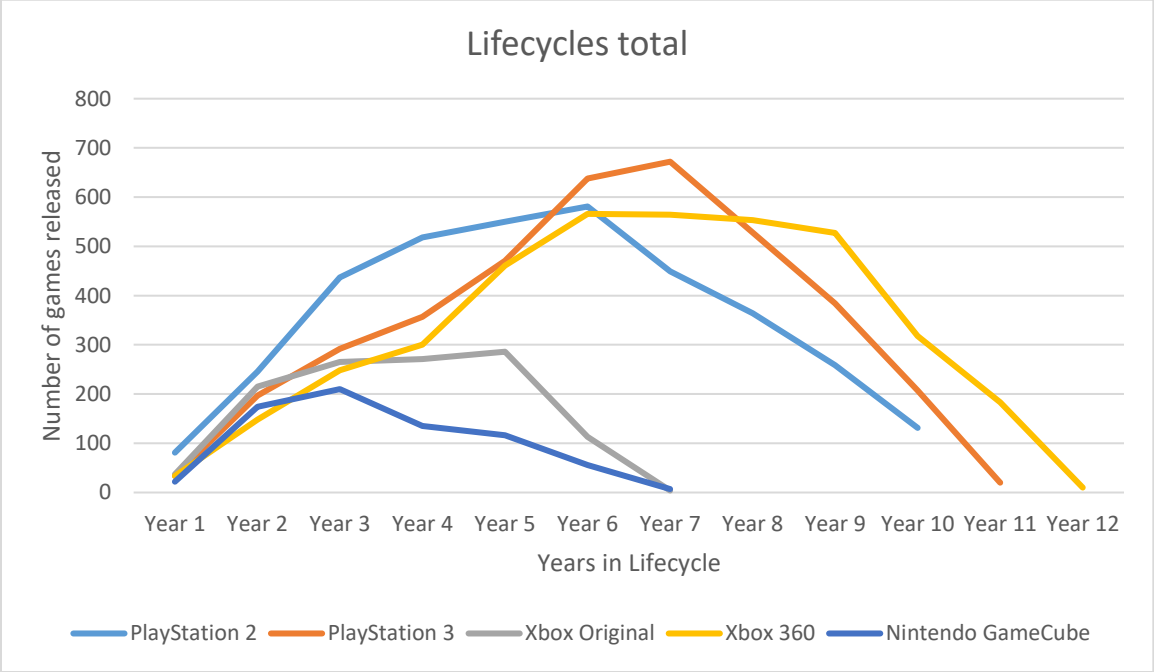


Appendix *Figure 1.6* Lifecycles Xbox Original and Xbox 360, N = 5.103 games.

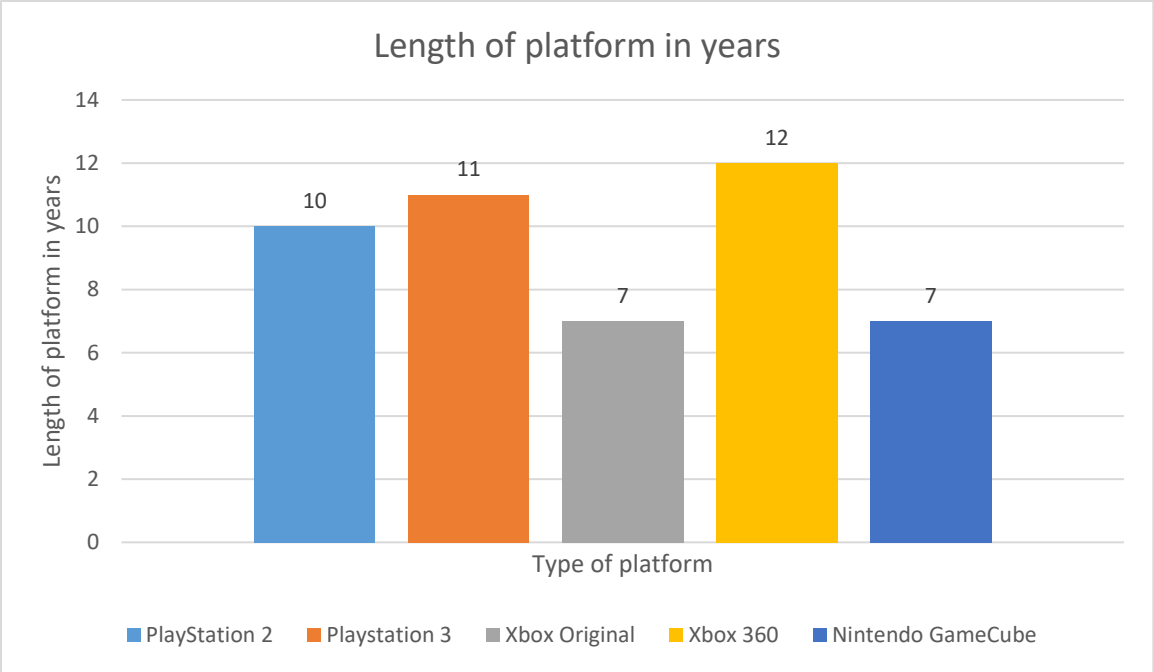


Appendix *Figure 1.7* Lifecycle Nintendo GameCube, N = 720 games.

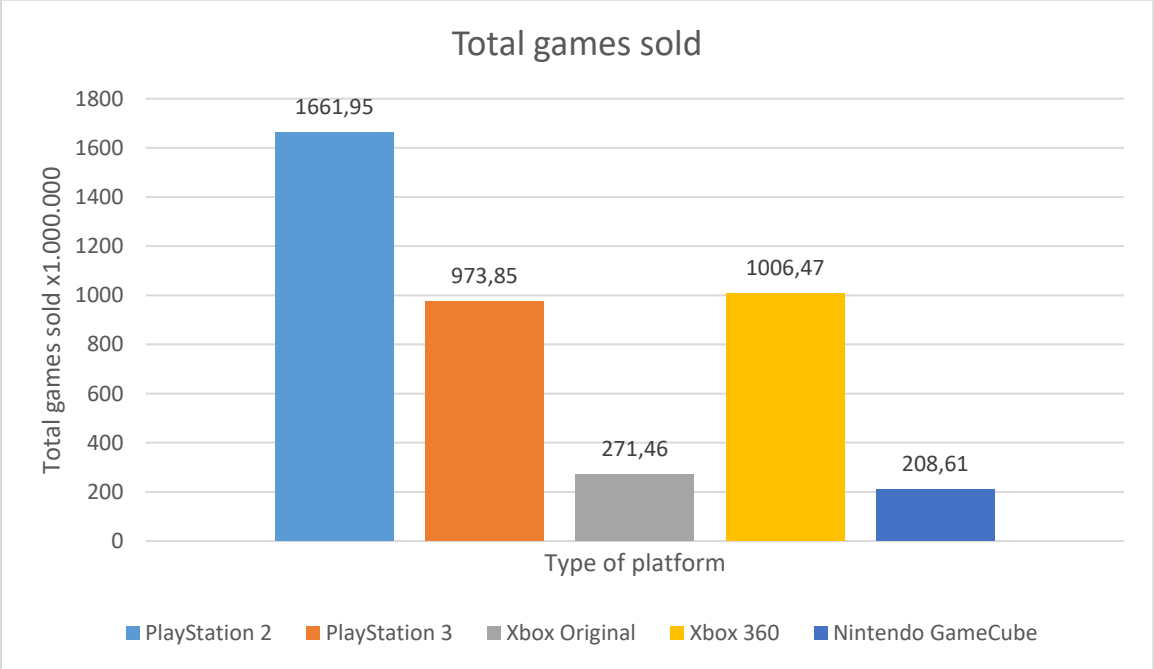
Lifecycles of all platforms (PS2, PS3, Xbox, Xbox 360 and GameCube) || N = 13.239 games



Appendix *Figure 1.8* Lifecycles of all platforms (PS2, PS3, Xbox, Xbox 360 and GameCube), N = 13.239 games.



Appendix *Figure 1.9* Duration of platform in years, N = 13.239 games.



Appendix *Figure 1.10* Total amount of games sold per platform x1.000.000, N = 13.239 games.

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