Vertical Integration And Innovation In Creative Industries: Evidence From The Video Game Industry

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Abstract

Through the development of new intellectual property, creative industries contribute significantly to the economy. However, research on the effects of vertical integration on intellectual property in these industries is limited. Therefore, this paper focusses on the effects of integration in the video game industry, where publishers acquire developers on a large scale. This paper is an assessment of the effects of integration on the development time and quality of intellectual property. The analysis uses a dataset containing information about integration in the video game industry from different sources, and a web scrape of critic and user scores from Metacritic. This paper finds, using an OLS-regression, that integration is positively related to the quality of intellectual property. Moreover, integration does not harm nor improve efficiency or the quality of radical innovations. Hence, this paper argues in favor of less restrictive policy for integration in creative industries.

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Introduction

Industries that focus on the development and commercialization of intellectual property receive an increasing amount of attention. The United Nations and countries like the United Kingdom and the Netherlands all prioritize and heavily invest in these so-called creative industries (Gov.UK, 2018; Rijksoverheid, n.d.; United Nations, n.d.). These industries are associated with high contributions to economic growth and innovation (Müller *et al.*, 2009; Potts & Cunningham, 2008). For instance, in the UK, they contributed more than 100 billion to GDP in 2017 (Gov.UK, 2018). These industries include sectors such as video games development and publishing, marketing and advertising, and movie production (Department for Culture, Media & Sports, 2016).

In creative industries, there are various examples of vertical integration. For example, in 2009, Walt Disney, a movie producer and developers, bought Marvel, a movie and cartoon producer, securing Marvel's intellectual property rights for their own (Pomerantz, 2009). In the video game industry, vertical integration is commonplace with game publishers acquiring game developing companies (Williams, 2002). It might be interesting to look at the abundant vertical integration practices in creative industries and their implications for the creation of new intellectual property. If vertical integration affects innovation, governments might want to alter their policies accordingly.

Therefore, this paper will analyze this effect through four OLS-models. The first one examines the effect of integration on the development time. The second model examines the consequences of integration on the overall quality of games. Furthermore, this paper examines the impact of integration on the quality of games that create a new franchise. Lastly, there will be an examination of the relationship between integration and the quality of games that are part of an existing franchise. The results provide evidence that there is a positive relationship between integration and overall quality, and the quality of games in existing franchises. However, there is no reason to believe that integration affects development efficiency or the quality of games that create new franchises.

Hence, this research concludes that integration has a small positive effect on the creation of intellectual property; the overall quality increases, and integration does not hamper radical innovations or efficiency. This paper states that the positive effect is due to integrated developers having higher budgets/more resources. However, the impact is small, since stricter deadlines lead to rushed developments which negatively influence the quality of games. Future research should assess the influence of these two consequences of integration independently.

Theoretical Framework

Most literature on the subject of vertical integration relates to a firm's decision whether to integrate or not. Williamson (1975,1979,1991) contributed to research that attempts to explain the integration decision with the help of transaction costs economics. He argues that three determinants positively influence the transaction costs for outsourcing: transaction specificity, transaction frequency and the uncertainty involved in a transaction. When transaction costs for outsourcing are higher, a firm is more likely to adopt a higher degree of integration. This theory implies that for certain transactions, integration has benefits over outsourcing. While there is a vast amount of empirical work supporting the different determinants of the make-or-buy decision (see for instance Geyskens *et al.*, 2006, for a meta-analysis and overview), the literature examining the post-decision effects of vertical integration is less abundant.

Research on the general economic consequences of integration is provided by Chipty (2001), who examines the impact of vertical integration on consumer welfare in the cable television industry. She concludes that the operator's channel excludes some rival services' programs. However, efficiency gains of vertically integrated operators cancel out the harmful effects of integration for consumers. So, she argues that vertical integration does not harm consumers' welfare in this industry

Gill (2015) found that consumers will benefit from lower prices that arise from vertical integration. In this paper, he examines the movie industry in the wake of the 1948 antitrust case of Paramount. This antitrust case forced some major studios to lay off their theater divisions. This case meant that these theaters were no longer integrated but independent. Gill (2015) compared these two situations and found that after the antitrust case, prices increased more for the newly independent theaters compared to the previously independent theaters. This finding is evidence for a positive effect of vertical integration since consumers would initially benefit from lower prices at integrated theaters.

Focusing more on firm level, Forbes and Lederman (2010) found evidence for a positive effect of vertical integration on operational efficiency. They found that the length of delays at airports on a given day is shorter when a major airline is vertically integrated compared to nonintegrated airlines. Moreover, the positive effect of integration is more substantial as situations arise where quick adjustments to flight schedules have to be made (e.g. heavy rainfall).

Ciliberto (2006) found another positive effect of vertical integration on firm level. He found that when hospitals have joint-ventures with physicians or integrate them into the

hospital, the level of investment in new services rises. So, vertical integration might prevent underinvesting in innovations/new products.

Novak and Stern (2008), on the other hand, found some negative implications of vertical integration. Using examples from the automobile industry, they found that a lower rate of vertical integration in product development has a positive effect on a product's quality initially. However, later in the life cycle, a higher rate of integration relates to higher product quality. External firms can initially provide technological and efficiency advantages; hence, outsourcing is the best option. In time, however, a firm that vertically integrates is better able to respond to changes during the product development life cycle. They can develop new knowledge that offsets the initial technological advantage.

Gill (2008) also examined the consequences of integration on products. He looks at the total period a movie is shown in movie theaters in the Spanish market comparing vertically integrated and nonintegrated theaters. He finds that integrated theaters show movies from their mother company longer than nonintegrated theaters. This occurs especially when demand uncertainty for movies is high, so integrated firms specialize in these movies.

The research mentioned above provides evidence about a positive effect (over time) of vertical integration on consumer welfare, operational performance, investments and product quality. Leiblein *et al.* (2002) examined the effect of the vertical integration choice on innovation. They conclude that the organizational structure of transactions (i.e. make or buy) does not influence a product's level of technological advancement. More so, the performance difference depends on the outsourced or integrated transaction and the underlying reasons for the choice of governance structure.

Like Leiblein *et al.* (2002), Macher (2006) examined the make or buy decision in the semiconductor industry and extended on their conclusions. He argues that the choice of an organizational structure does affect technological development, though only when the transaction and the governance structure are aligned well. Specifically, an integrated firm is quicker to produce high-quality innovations compared to a specialized firm if it is complex to find solutions for problems. On the contrary, firms that specialize in producing semiconductors are more likely to have a higher innovation performance when problem-solving is simpler. Hence, innovation does seem to be influenced by vertical integration.

The literature above shows the effects of vertical integration on various firm performance indicators and consumers. However, the literature on the relationship between vertical integration and innovation is not abundant. At the moment, most research on vertical integration in creative industries concerns with consumer welfare and pricing (Chipty, 2001;

Gill, 2015). Nevertheless, in creative industries, the creation of new intellectual property is a critical component in the contribution to the economy. Hence, research in this field is meaningful and can provide arguments for policy directions about integration behavior in creative industries. Therefore, this paper will examine the following research question:

What are the effects of vertical integration on the development of intellectual property in creative industries?

The video game industry

The video game industry is the creative industry which this paper will focus on. The video game industry (from now on VGI) has a global market size of 137 billion euros and has grown rapidly over the last two decades (see Figure 1). In the last five years, this industry realized a growth of almost 60%, which illustrates the booming business that is video games. Video games have become an essential part of today's pop culture with examples like Fortnite's rise to prominence and the mania surrounding Pokémon Go (for example see: Park, 2018 & Murgia, 2016)

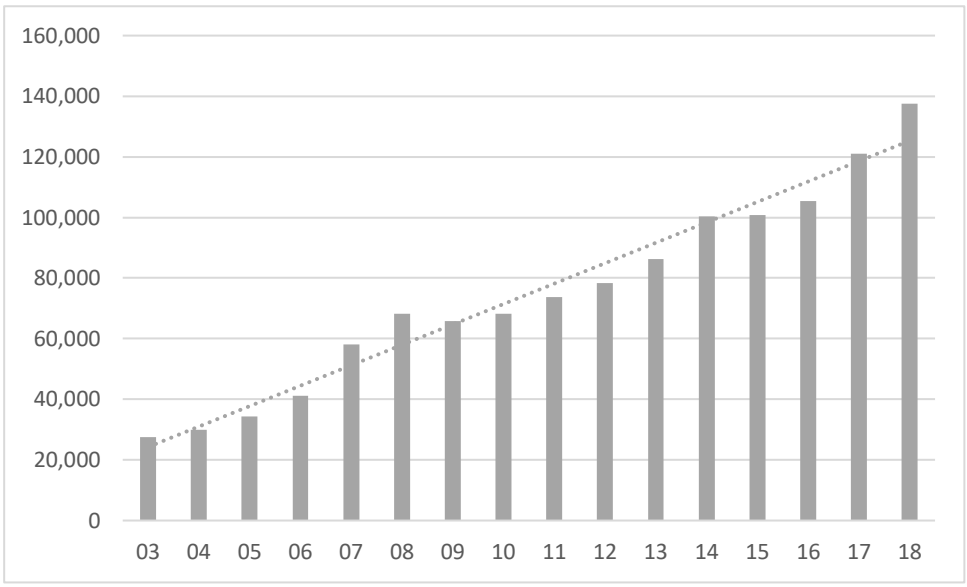

Figure 1: Global market size VGI 2003-2018 (in millions of euros)
Source: Own elaboration of Euromonitor data

The creation of new games within the VGI can be seen as the creation of intellectual property, which is a vital characteristic of a creative industry. The value chain of the VGI's

software consists of 5 activities: development, publishing, manufacturing, distribution and retail (Williams, 2002). This paper will only go in depth in the development and publishing phase of the value chain. However, it is essential to understand that consumers have to own a piece of hardware to play games. These pieces of hardware will be referred to as consoles and include examples like the PlayStation 4 and Xbox One. PC's are generally not referred to as consoles, but will nevertheless be part of the discussion in this paper.

Games are either created by a developer owned by a publisher (directly or indirectly), or they are developed by a "third-party" developer who is entirely independent (Williams, 2002). The third-party developer can license games (i.e. its intellectual property) to different publishers. There is a large amount of uncertainty involved when developing games, as development times are often long, and future tastes and technologies are hard to predict.

A game publisher acquires the rights of the intellectual property from an independent or dependent developer. A publisher promotes, manufactures and sells the game and retains part of the profits (Williams, 2002). Sometimes publishers also create ideas for new games. A game publisher does not necessarily have to be a console creator like Sony or Nintendo. Both a developer as well as a publisher can choose to produce or publish games for multiple consoles. However, most console creators also act like publishers in which they publish game specifically for their console. These games are called console exclusives. For example, the games in the Mario franchise are exclusively published by Nintendo for Nintendo systems and most of the time companies or divisions integrated within Nintendo develops them. To illustrate this further, three of the six most prominent companies in the VGI (Sony, Nintendo and Microsoft) publish and develop games as well as consoles (see Figure 2).

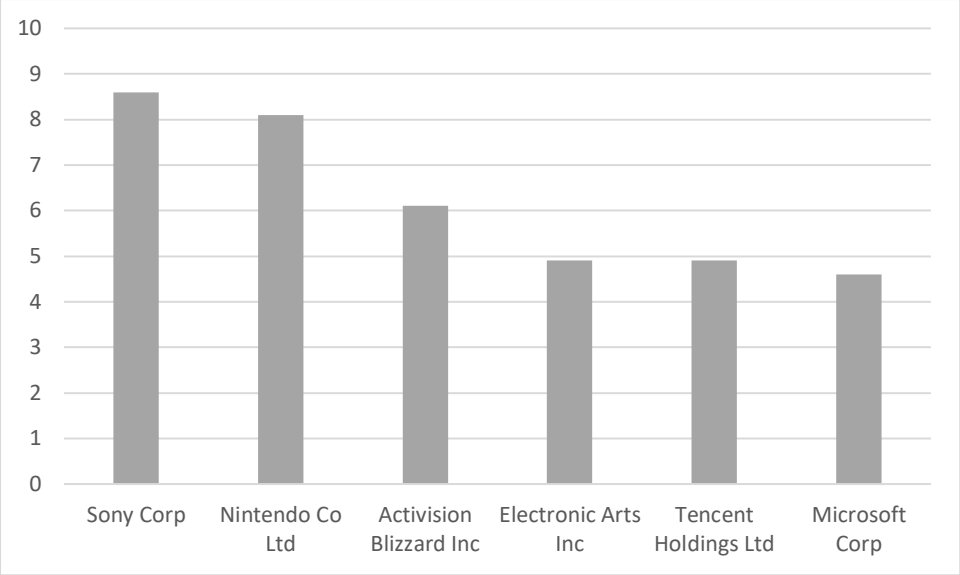

Figure 2: Company shares VGI in 2017 (in percentages)
Source: Own elaboration of Euromonitor data

In Figure 2, all companies except Tencent are original publishers who have acquired several independent developers to develop games (for a recent example see: Tassi, 2018). Tencent is a company focusing on mobile games as opposed to console games. Therefore this discussion will not include Tencent. The fact that many publishers integrate developers within their company implies that there are benefits from doing so. These benefits are not limited to developing console exclusives since Activision Blizzard and Electronic Arts are following the same strategy as console producers. These strategies might occur because the acquisition of development studios that have already developed successful game franchises with an established fanbase, provides a lower level of uncertainty regarding sales for the next entry in the franchise. Acquiring such developers could lead to exclusive publishing rights and hence exclusive, less uncertain revenues.

Developers might also experience positive effects from integration, such as higher budgets to work with due to extra investments. However, integration could also lead to conflicting interests, that might influence the creation of intellectual property. As described by Gill and Warzynski (2014), the coordination between development and publishing is sometimes conflicting. A publisher wants to publish the game at a moment that most suits marketing prospects as to increase sales. So, a publisher sets deadlines and payment schemes for the developer to assure they meet the release date. When a publisher integrates a developer, these deadlines can be enforced stronger. This stricter deadline enforcement could lead to

developers having to rush games that they do not deem complete or qualitatively sound. Rushed development might harm the quality of games but may increase efficiency as well.

This paper will not focus on console exclusivity, and its effects on network effects and competition as other papers have done (see for example Lee, 2013). Moreover, it will not focus on the effect of vertical integration on video game sales and prices as performed by Gill and Warzynski (2014).

Instead, this paper will focus on vertical integration between developers and publishers and its implications on the creation of new intellectual property. As described above, there are consequences of vertical integration on innovations in the VGI. Therefore, this creative industry will be examined to answer the proposed research question.

Hypotheses development

To assess how vertical integration affects innovation, an investigation of the development time of intellectual properties can be useful. If new games are more quickly developed, then this might indicate that vertical integration accelerates innovation.

Macher (2006) concludes that when problem-solving is complex, a vertically integrated firm is quicker in developing innovations. Moreover, Forbes and Lederman (2010) argue that integrated firms are operationally more efficient, especially when there are a lot of potential adjustments.

In the VGI, development time and costs are unpredictable (Williams, 2002). Moreover, development is prone to quickly changing preferences and technologies. Complex development implies that publishers have to adjust contracts with developers frequently and face problems that are not easily solved. Moreover, the stricter enforcement of deadlines in integrated companies implies a faster development process with fewer delays. Hence, given these industry characteristics and previous research, the development of innovations might benefit from vertical integration. Therefore, the first hypothesis is:

H1: Games dependently created have shorter development times.

Another interesting investigation could focus on the quality of intellectual property created. If integrated developers develop qualitative better games, than this indicates a positive effect of integration on innovation.

Macher (2006) states that the quality of innovations from integrated companies is higher when problem-solving is complex. As described above, problem-solving is not easy in the VGI. Hence, integration in the VGI might positively influence quality. Novak and Stern (2008) also provide evidence for a positive effect of integration on product quality. They argue that quality increases over time because of developing firm competencies.

However, in the VGI, publishers enforcing stricter deadlines with more control might lead to more rushed, qualitatively worse games. This effect is assumed to be mitigated by larger budgets due to investments by the publisher (Ciliberto, 2006). Further, as hypothesized in hypothesis 1, efficiency gains might decrease the adverse effects of rushed development. Given the previous literature and the industry characteristics, the following hypothesis is formulated:

H2: Integrated developers develop qualitatively better games.

Publishers prefer to sell "hit-titles" games (Williams, 2002). These titles are initially very successful and help the publisher benefit from high sales (and margins). Publishers capitalize on these titles with follow-up games and side-activities relating to the franchise (e.g. competitive e-sports). There is a multitude of examples of publishers acquiring developers after they have developed a promising and successful franchise (see Webb, 2019 for a recent example).

However, the publisher might demand an allocation of resources in favor of existing franchises compared to new franchises. This inequality might lead to qualitative worse new intellectual property than before. If this is true, then the radical innovations made (a new franchise) are not as large compared to incremental innovations to already existing franchises. This consequence of integration might result in policy advise different from the results of the other hypotheses. The following hypotheses help to examine whether vertical integration hurts radical innovations in this industry:

H3a: Integrated developers develop qualitatively worse new franchises.
H3b: Integrated developers develop qualitatively better games of existing franchises.

Data

The acquired data for this research derives from a web scrape of VGChartz and Metacritic (Kirubi, 2016). VGChartz is a website which regularly updates weekly sales of various games. Metacritic is a website which gathers scores from reviewers from different sources on a scale from 0 to 100 and user-reported scores ranging from 1 to 10. This dataset provides information about video game's name, sales, genre, platform, review score, user score, year of release, PG rating, developer and publisher from 1980 till 2016.

Information about mergers and acquisitions between publishers and developers was collected from various sources[1]. This information was not always readily available, which explains the vast number of different sources. From this information, two variables are created: year of integration and a dummy whether a game is developed independently from a publisher or not labelled Integrated. A game is seen as independently developed when the publisher has less than 50% of ownership over the developer. If two developers develop a game and one of them is not independent, then the game is seen as not independently developed.

Moreover, a game created in the year of integration (or disintegration), is viewed as developed by the company owning the developer in the period before. This is because a game's development time is assumed to be at least a year, so a game is in development the year before integration. Further, if a developer and publisher have the same parent company, the game is also not identified as independently developed. Lastly, the name of a developer before a merge is changed, if the developer changes name after the merge. This transformation allows for better comparison over time.

Concerning the data used, this research only considers games released on the last three generations of consoles with observed critic scores. The last three generations refer to the period between 2000 and 2016. Moreover, different games of a franchise are grouped in a unique variable. This variable allows for a distinction between new and existing franchises. Games with the same core gameplay, characters, story or fictional world are part of the same franchise. The core gameplay is weighted heavier, which means that games with the same characteristics but with different genres are not grouped. As an example, a Mario platformer and a Mario Kart game share the same characteristics; however, they have vastly different gameplay. Therefore, these games are part of two different franchises.

[1] to complete this dataset. These sources include websites such as Eurogamer, Gamesindustry.biz and various company websites. The list of sources consists of more than 200 links which can be obtained from the author on request.

The sales for games are grouped in Summed_Global_Sales since the original dataset contains multiple observations for the same game on different consoles. For this, Games are assumed not to have significantly different quality for different consoles. When the summed global sales are smaller than one million copies, the observations hare dropped. The quality of these games is assumed to have no significant consequences for companies or consumers.

For the analysis of hypothesis one, a variable representing development time is added. This variable is equal to the difference between the year of release of a game, and the year of release of the same developer's previous game and is named Year_Gap. Observations are observed as missing if developers have no preceding games in the dataset since these observations are always 0 otherwise.

Other variables that are potential control variables or help to construct control variables are also added to complete the dataset. The methodology section will describe which variables are used. First, a dummy variable representing exclusivity is created, which is 1 if a game is exclusively published. Exclusive is the name of this variable.

Further, a few variables related to franchises are made. A first example is a variable representing the entry in a franchise named Serie_Entry. A dummy is created from this variable that is equal to one if the observation is part of an existing franchise. So, when the variable Serie_Entry is bigger than 1. This variable is called Existing_Franchise. The same is done for the variable New_Franchise, which is equal to 1 if Serie_Entry is smaller than 2. These two variables help in creating several control variables and variables of interest. The dummy Integrated_New_Franchise is equal to one if both New_Franchise and Integrated are equal to one. Integrated_Existing_Franchise is a dummy equal to one if both Existing_Franchise and Integrated are equal to one. These two variables will help in analyzing hypothesis 3a and 3b, respectively. Lastly, a variable representing franchise reputation is created. This variable is equal to the accumulated sales of previous titles in the same franchise as the observation. So, if a game is the third entry in a franchise, then the variable Accumulated_Franchise_Sales is equal to the summed global sales of the first and second entry combined.

In the same way, a couple of variables for developers and publishers are constructed. Variables equal to the number of previous games published or developed are examples of such variables. Product_Number_Publisher and Product_Number_Developer represent publisher and developer experience, respectively. Using these variables, also the accumulated sales for these publishers and developers are captured in a variable the same as for franchises. These variables are labelled Accumulated_Publisher_Sales and Accumulated_Developer_Sales.

Descriptive statistics

Table 1 presents the descriptive statistics of the variables described above. The two quality measures, critic score and user score, provide conflicting glances at the effect of integration on quality. While integrated games have a higher average critic score, they show a lower user-score. This finding is probably due to a positive bias of consumers towards independent games. It seems that independent developers have more goodwill than dependent developers. However, observing the results from t-tests show that only the difference in critic score is significant at the 5%-level (see Appendix 1). Hence, this higher mean critic score is indicative for hypothesis 2.

The difference in the means of the variable Year_Gap provides some evidence for the first hypothesis. Dependently created games have significantly lower development times than independently developed games (see Appendix 1).

Furthermore, Table 1 shows that a large portion of the observations is a console exclusive, especially independent games. A t-test of the difference in exclusives between integrated and independent games shows that there is a significant inequality (see Appendix 1). This result indicates that exclusivity might bias the integration decision.

Both the existence and reputation of franchises are significantly more substantial for the integrated observations (see Appendix 1). So, this is minor evidence that these variables capture different characteristics of independently and dependently created games.

Experience and reputation of both publishers and developers follow the same reasoning as franchises. All four variables capturing these characteristics are significantly more present for integrated games (see Appendix 1). Thus, these characteristics seem to influence the integration decision as well.

Genres and PG are not included in Table 1 because it would provide an unclear view of these categorical variables. The variable Genre consists of 12 different genres: Adventure, Fighting, Misc, Platform, Puzzle, Racing, Role-playing, Shooter, Simulation, Sports, and Strategy. These genres are all differently represented in the dataset. The variable PG, consisting of E10+, T (teen), and M (mature), is also unequally distributed in the dataset.

Table 1: Descriptive statistics

Variables	All	Integrated games	Independent games
Mean Critic_Score	77.11 (11.86)	78.64 (10.91)	74.67 (12.89)
Mean User_Score	7.56 (1.20)	7.53 (1.17)	7.61 (1.26)
Mean Year_Gap	1.35 (1.44)	1.20 (1.37)	1.72 (1.54)
% Exclusives	39.1%	33.9%	47.5%
% Existing Franchise	60.1%	68.3%	46.9%
Accumulated_Franchise_Sales	10.12 (20.01)	13.31 (23.37)	5.01 (11.16)
Product_Number_Developer	7.19 (9.28)	9.84 (10.78)	2.95 (2.98)
Product_Number_Publisher	50.25 (53.98)	56.39 (57.30)	40.39 (46.59)
Accumulated_Developer_Sales	28.05 (73.25)	42.08 (90.24)	5.54 (9.81)
Accumulated_Publisher_Sales	186.26 (204.65)	208.03 (212.15)	151.34 (187.00)
Number of Observations	1260	776	484

*Standard deviations between parentheses

Methodology

This section explains the methods and variables of interest per hypothesis. Furthermore, it will explain the control variables and assess the validity of the assumptions of the models assessed.

Hypothesis 1

This analysis uses a linear regression model of the following form:

$$Y = \alpha + \beta_T T + \sum_{i=1}^{5} \beta_i X_i + \varepsilon$$

Where the treatment variable T consists of the dummy variable Integrated and the dependent variable Y is the Year_Gap variable. When this gap is smaller, then this is seen as an indication for higher efficiency. Moreover, X is a vector of control variables such as Genres, PG-ratings, Product_Number_Publisher, Existing_Franchise and Product_Number_Developer. β_T represents the effect of a dependently produced game (T=1)

on the year gap. Lastly, ε is the error-term and α the constant which is equal to the mean of Y when all other variables are 0.

Hypothesis 2

In addition to the same treatment variable, Critic_Score and User_Score are two different measures for Y. These scores are an indication for the (perceived) quality of games. These scores are assumed to be based on the fulfilment of expectations. Thus, when certain characteristics of games are different from expected, then the quality score will be adjusted accordingly. This assumption is important for identifying the possible control variables that influence expectations and hence, critic and user scores. X is again a vector of control variables which includes Accumulated_Franchise_Sales, Accumulated_Developer_Sales and Accumulated_Publisher_Sales instead of Existing_Franchise, Product_Number_Developer and Product_Number_Publisher. These variables are omitted because of multicollinearity. Again, ε is the error-term and $\gamma\alpha$ the constant. Lastly, β_T is the effect of a game developed by an integrated developer (T=1), on the respective quality score.

Hypothesis 3a

The same linear regression model, as described for hypothesis 2, is used to analyze this hypothesis. The Y, X and ε represent the same. However, the treatment variable T now is the dummy Integrated_New_Franchise. β_T is hence equal to the effect of a game being independently produced and the first entry in a new franchise (T=1), on the critic or user score.

Hypothesis 3b

Again, this hypothesis uses the same model and variables, as the preceding two hypotheses, except for T and β_T. The treatment variable in this model is the variable Integrated_Existing_Franchise. So, β_T represents the effect of a game being independently produced and part of an existing franchise (T=1), on the respective quality measure.

Control variables

Compared to dependently developed games, a significantly larger portion of independently created games is exclusives. However, it is uncertain whether exclusivity biases

the treatment variable. The difference in exclusive games is probably due to inherent differences between integrated and independent games. Integrated developers possess more resources than independent developers (see hypothesis 2). Since developers have fewer resources, they are more likely to focus on exclusive games to save costs. This difference in resources might change the quality. Moreover, integrated developers are assumed to be more efficient (see hypothesis 1). As independent developers create more exclusives and are less efficient, the year gap is assumed to be larger. So, while it looks like exclusivity influences integration, quality and the year gap, it is a mechanism rather than a control variable. Therefore, the analysis will not include exclusivity as a control variable.

Given the assumption that the quality measures are based on expectations, genres and PG ratings might influence the critic and user score. If the game does not have the expected characteristics or features of its genre or rating, this might influence the quality score. Moreover, firms possibly hire other developers when a game has another genre or PG rating than most other games by a publisher or developer. The other developer might be more experienced in a particular genre or rating, which influences the integration decision. For the same reason, developers take longer when they are not experienced in the specific PG-rating or genre, negatively influencing the development time. Therefore, the analysis will include both these variables for all hypotheses. All genre's and PG ratings will enter the model as dummies for every specific genre and PG rating because of the categorical nature of the variables.

As described in hypothesis 3a and 3b, publishers are generally more inclined to acquire developers who have already developed successful franchises. Moreover, if a division or integrated developer create a new franchise, they are also more likely to keep the development in-house. Hence, the integration decision is probably positively biased by existing franchises. Existing franchises might also positively influence the year gap. A large part of the creative process is not necessary since many characteristics are the same. Furthermore, most technical assets are readily available, which will shorten the development process further. Moreover, existing franchises alter the expectations of consumers and critics and thus the quality measures. Critics and users better form expectations, since more information is known about a game when it is part of a particular series. Thus, existing franchises influence both the treatment as well as the dependent variables.

Therefore, a couple of control variables representing franchise reputation and existence enter the analysis. The analysis for hypothesis 2 and 3b includes Accumulated_Franchise_Sales. Hypothesis 3a omits this variable since it will always be zero

for new franchises. Hypothesis 1 will include Existing_Franchise instead of Accumulated_Franchise_Sales. Franchise reputation is not essential for the development time and therefore not included.

Following the same reasoning, Accumulated_Developer_Sales enters the model. A developer with a more prominent reputation (i.e. higher accumulated sales) is more likely to be acquired. Moreover, developers with a better reputation positively influence expectations in the same way game franchises do. Only developer experience influences development time, therefore Product_Number_Developer is included in hypothesis 1 instead of accumulated sales.

Publishers are the most dominant force in the integration decision. They acquire developers most of the time, not the other way around. Hence, they naturally have a substantial influence on whether a game is independently made or not. Moreover, publishers, like developers, have inherently different reputations and experience. Thus, the games of different publishers have differing quality and development times. Furthermore, a more prominent reputation means higher expectations. So, publisher reputation influences both the treatment variable as well as the critic and user scores. However, only publisher experience influences the year gap. Therefore, hypothesis 2, 3a and 3b will include Accumulated_Publisher_Sales in the analysis, while the model of hypothesis 1 uses Product_Number_Publisher.

The choice to vertically integrate is probably endogenous; the choice of a publisher which developer to acquire is not random (Masten, 1993). Independent and depend developers are inherently different. Adding the aforementioned control variables is believed to limit the endogeneity problem and increase the internal validity of the regression. Furthermore, the variables Summed_Global_Sales, Existing_Franchise, Series_Entry, Product_Number_Publisher/Developer are not used in hypothesis 2, 3a and 3b to prevent multicollinearity. The variables Accumulated_Developer/Publisher_Sales and Accumulated_Franchise_Sales depend on these omitted variables, which could lead to multicollinearity. Lastly, there are no severe outliers observed in the variables of interest, and robust standard errors will be used to counter possible heteroskedasticity.

Results

This section will present the results. First, there is a recap of the hypothesis after that the results of the model with the specified control variables. Lastly, each section will explain the implications and significance of the coefficients.

Hypothesis 1

Forbes and Lederman (2010), and Macher (2006) provide evidence for this hypothesis. When many post-transaction adjustments arise, and problem-solving is complex, then vertical integration can have positive implications on quality as compared to independently produced products. Based on their findings and the industry characteristics described by Williams (2002), the hypothesis states that integrated developers have shorter development time.

The results, as presented in Table 1, show no evidence to support this hypothesis, however. The effect of integration on the year gap is negative, yet not significant. This result implies that other than previous research, integrated developers are not more efficient than independent creators. A possible reason could be that publishing and developing are too different from each other. So, while publishers might set stricter deadlines, they do not so much interfere in the creative process. Hence, the work routines of developers do not change hand efficiency is unaffected. Therefore hypothesis 1 is rejected.

A consequence following from these results is that increased efficiency cannot mitigate rushed development. One could argue that as there is no significant effect of integration on development time, this also implies that there is no evidence that integration leads to rushed creation. However, rushed development occurs when the time granted is not sufficient to execute all plans for a game, and when this reflects on quality. The year gap provides no information about whether or not the years of development were sufficient. Hence, the possibility of rushed development is still apparent, and higher efficiency cannot diminish its effects.

Table 1: Coefficients OLS-analysis hypothesis 1

Variable	**Year_Gap**
Integrated	-0.167 (0.116)
Existing_Franchise	-0.062 (0.109)
Product_Number_Developer	-0.036*** (0.004)
Product_Number_Publisher	-0.001 (0.001)
Adventure	0.474 (0.902)
Fighting	-0.253 (0.242)
Misc	-0.277 (0.204)
Platform	0.026 (0.237)
Puzzle	0.053 (0.304)
Racing	0.185 (0.224)
Role-Playing	0.086 (0.213)
Shooter	-0.083 (0.171)
Simulation	-0.262 (0.251)
Sports	-0.268 (0.165)
Strategy	-0.210 (0.215)
E10+	0.159 (0.155)
M	0.562*** (0.183)
T	0.261* (0.149)
Constant	1.788*** (0.191)
F	12.84***
Observations	910

**Significant at a 10%-level*

***Significant at a 5%-level*

****Significant at a 1%-level*

Robust standard errors between parentheses

Hypothesis 2

Macher's (2006) and Novak and Stern's (2008) conclusions of a positive effect of integration on quality formed the basis for this hypothesis. However, dependently created intellectual property might have lower quality due to rushed development in order to meet stricter deadlines. However, based on the literature of Ciliberto (2006), and Forbes and Lederman (2010), it is hypothesized that larger budgets and higher efficiency mitigate the rushed development and increase quality overall.

Table 2 presents the results that provide evidence for this hypothesis. If a game is dependently produced, the average critic score increases by 3.5 points. This result is significant at the 1%-level but not very big. Moreover, the effect on user score is not only small but also insignificant. So, the evidence for the hypothesis is apparent but limited.

Nevertheless, the small effect of integration on critic score resonates with the expectation that rushed development might decrease the positive effects of integration on quality. Furthermore, in hypothesis 1, efficiency is found to not significantly increase for integrated developers. Hence, only higher budgets can mitigate the negative effect of rushed development. Therefore, the overall positive effect of developing a game in-house on the critic score is limited yet significant. Given these results, hypothesis 2 cannot be rejected.

Table 2: Coefficients OLS-analysis hypothesis 2

Variable	**Critic_Score**	**User_Score**
Integrated	3.468*** (0.762)	0.075 (0.074)
Accumulated_Franchise_Sales	-0.003 (0.021)	-0.017*** (0.002)
Accumulated_Developer_Sales	0.011** (0.005)	0.001** (0.000)
Accumulated_Publisher_Sales	0.003* (0.002)	0.000 (0.000)
Adventure	0.003 (1.689)	-0.010*** (0.225)
Fighting	3.180** (1.441)	0.168* (0.158)
Misc	-1.085 (-1.567)	-0.249 (0.175)
Platform	4.216** (1.649)	0.524 (0.148)
Puzzle	4.289 (2.625)	0.369 (0.246)
Racing	5.106*** (1.447)	0.249 (0.138)
Role-Playing	7.683*** (1.157)	0.417 (0.132)
Shooter	1.271 (1.133)	-0.126 (0.111)
Simulation	1.495 (1.568)	-0.062 (0.218)
Sports	6.989*** (1.356)	0.044 (0.132)
Strategy	8.936*** (1.827)	-0.011 (0.307)
E10+	-1.312 (1.098)	-0.288 (0.129)
M	8.443*** (1.120)	0.266 (0.125)
T	3.806*** (1.062)	0.249 (0.107)
Constant	68.307*** (1.210)	7.431*** (0.127)
F	11.93***	7.53***
Observations	1257	1233

**Significant at a 10%-level*

***Significant at a 5%-level*

****Significant at a 1%-level*

Robust standard errors between parentheses

Hypothesis 3a

This hypothesis assumes that, although integrated games are of higher quality (hypothesis 2), resources are allocated unequally between games of existing franchises and new franchises within integrated firms. Publishers want to build upon certain "hit-titles", and will, therefore, allocate more budget to existing franchises (Williams, 2002). Hence, new franchises created by integrated developers will be lower in quality compared to a new, independently developed series.

The results in Table 3, however, provide no evidence for the hypothesis that integrated new franchises are qualitatively worse. Though the coefficient is negative for critic scores, it is not significant. One probable reason for this is that the distribution of resources between existing and new franchises is not entirely unequal. A publisher might decide to dedicate more extra resources to existing franchises without taking them away from the creation of new franchises. Hence, this explains why hypothesis 3a is rejected, which implies that there is no evidence that integration hampers the quality of radical innovations.

Table 3: Coefficients OLS-analysis hypothesis 3a

Variable	**Critic_Score**	**User_Score**
Integrated_New_Franchise	-0.451 (0.820)	0.098 (0.083)
Accumulated_Developer_Sales	0.016*** (0.004)	-0.000 (0.000)
Accumulated_Publisher_Sales	0.003** (0.002)	0.000 (0.010)
Adventure	-1.435 (1.739)	0.088 (0.227)
Fighting	2.785* (1.481)	0.175 (0.159)
Misc	-1.089 (1.557)	-0.268 (0.173)
Platform	3.890** (1.654)	0.486*** (0.150)
Puzzle	3.307 (2.625)	0.447* (0.245)
Racing	5.422*** (1.441)	0.194 (0.140)
Role-Playing	6.871*** (1.158)	0.434*** (0.130)
Shooter	0.920 (1.134)	-0.152 (0.118)
Simulation	1.427 (1.578)	-0.088 (0.227)
Sports	7.501*** (1.345)	-0.061 (0.135)
Strategy	9.010*** (2.020)	0.082 (0.317)
E10+	-0.988 (1.101)	-0.334*** (0.130)
M	9.042*** (1.208)	0.145 (0.128)
T	4.025*** (1.081)	0.193 (0.108)
Constant	70.102*** (1.200)	7.419*** (0.125)
F	10.25***	3.28***
Observations	1257	1233

**Significant at a 10%-level*

***Significant at a 5%-level*

****Significant at a 1%-level*

Robust standard errors between parentheses

Hypothesis 3b

As described above, there is a reason to believe that more resources are allocated to the creation of games of existing series. A bigger budget might increase the possibilities for developer teams, and hence the quality.

Table 4 presents the results of the analysis for this hypothesis. The coefficient of interest is significant for both the critic score as well as the user score. A dependently developed game which is part of an existing franchise is associated with a 4.0 higher average critic score and a 0.2 higher average user score. This effect is also 0.6 higher than the effect of integrated games on the critic score (4.021-3.468). Hence these results provide evidence that the quality of incremental innovations increases when integrated. Though the effect might be limited, the same reasoning as for hypothesis 2 applies for this hypothesis. Still, there is enough evidence not to reject hypothesis 3b.

Table 4: Coefficients OLS-analysis hypothesis 3b

Variable	**Critic_Score**	**User_Score**
Integrated_Existing_Franchise	4.021*** (0.750)	0.167** (0.074)
Accumulated_Franchise_Sales	-0.027 (0.021)	-0.018*** (0.002)
Accumulated_Developer_Sales	0.012** (0.005)	0.001* (0.000)
Accumulated_Publisher_Sales	0.003* (0.002)	0.003* (0.002)
Adventure	-0.436 (1.663)	-0.001 (0.222)
Fighting	3.202** (1.454)	0.176 (0.159)
Misc	-0.943 (1.549)	-0.244 (0.174)
Platform	4.148** (1.649)	0.527*** (0.147)
Puzzle	4.159 (2.640)	0.383 (0.246)
Racing	5.038*** (1.441)	0.240* (0.138)
Role-Playing	7.305*** (1.152)	0.417*** (0.132)
Shooter	1.195 (1.126)	-0.123 (0.110)
Simulation	1.254 (1.570)	-0.071 (0.217)
Sports	6.839*** (1.347)	0.026 (0.132)
Strategy	9.475*** (1.937)	0.009 (0.304)
E10+	-1.205 (1.092)	-0.290** (0.128)
M	8.597*** (1.189)	0.262** (0.125)
T	3.785*** (1.057)	0.245** (0.106)
Constant	69.017*** (1.173)	7.426*** (0.122)
F	11.95***	7.65***
Observations	1257	1233

**Significant at a 10%-level*

***Significant at a 5%-level*

****Significant at a 1%-level*

Robust standard errors between parentheses

Besides the interpretation of the coefficients of interest, there are some unexpected results for the other coefficients. For instance, experience with a particular franchise does not influence development time significantly. While the relationship in hypothesis 1 is negative, it is not significant. A possible reason could be that extra diligence offsets the efficiency effect of re-using assets. Furthermore, accumulated franchise sales seem to not significantly influence the critic score, but it does influence the user score. The negative sign of this coefficient indicates that users are more critical as franchise reputation increases. Moreover, critics seem not to be influenced by franchise reputation, which is different from expected.

Additionally, publisher experience and reputation do not or marginally influence the dependent variables. Different from developers, it seems that publisher experience does not result in a more efficient creation process. Moreover, publisher reputation does not influence critics and users. It seems that developer experience and reputation influence expectations more than publishers.

Furthermore, not all genres have a positive effect on the dependent variables. The different genres do not seem to influence development time at all. So, developer experience in a certain genre is not a factor for differing development times. Further, only specific genres influence the quality measures which indicate a positive bias towards these genres.

Lastly, the coefficients for the PG ratings also deviate from expected. Rating E10+ does not influence the dependent variables. These games target a younger audience who probably demand less quality. Hence, games with this rating do not influence expectation and perceived quality. The effect on development time is also not apparent.

All models presented have a significant F-statistic. This fact provides evidence that all variables used in the model are jointly-significant. Hence the used control variables, jointly limit the bias in the models.

Conclusion and discussion

This research set out to examine the relationship between vertical integration and the creation of intellectual property in creative industries. These industries focus on creating intellectual property and include but are not limited to the movie industry, the video game industry and marketing businesses. Firms in these markets contribute largely to GDP through their development of intellectual property (Müller et al., 2009). Mergers and acquisitions are abundant in creative industries. However, research and subsequent policy advise on the effect of these integration practices on the creation of intellectual property is not prevalent. This

paper, therefore, attempts to find these effects and contribute to research on creative industries. Especially in the creative VGI integration and the development of intellectual property is well observed, and therefore, the focus of this research. The question this paper attempts to answer is:

What are the effects of vertical integration on the development of intellectual property in creative industries?

Four hypotheses attempt to answer this question. These hypotheses focus on the effects of vertical integration between publishers and developers on the efficiency of developers and the quality of games they make. These hypotheses help in examining the effects on development times, overall quality, the quality of radical innovations and the quality of incremental innovations. Four OLS-models with control variables are used to examine the consequences of integration.

The findings suggest no effect of integration on development time (i.e. efficiency). A possible reason could be that publishers are not involved much in the development process. Thus, publishers might set stricter deadlines, but work routines are not significantly changed.

Furthermore, it follows from this research that integration positively influences the overall quality of intellectual property. The main reason provided for this result is higher budgets to work with. Rushed development possibly reduces the positive effect of integration on quality.

Moreover, there is no reason to believe that integration harms the quality of radical innovations. This might occur because publishers do not extract resources from the development of new franchises. However, the fact that the analysis finds no positive effect also implies that publishers do not allocate extra resources to the creation of new franchises.

However, the analysis provides evidence that the quality of incremental innovations is higher when for integrated firms. The positive effect found is even more significant than the average effect of integration on quality. Hence, this research argues that publishers allocate most or all extra resources to existing franchises. Publishers can capitalize more on the existing fanbase of the franchises through higher and more certain sales.

Hence, this research found solely positive or indifferent effects of integration on the creation of intellectual property. This paper concludes that the effect of integration on the development of intellectual property is positive since overall quality is higher (especially for incremental innovations) and integration does not hamper efficiency or radical innovations.

In addition to this paper's results, previous literature found positive effects of integration for consumers in creative industries (Chipty, 2001; Gill, 2008; Gill, 2015). In line with the results and previous research on the topic of vertical integration in creative industries, this research provides arguments for less restricting policy on vertical integration.

However, the conclusions presented are not without limits. The quality measures used are imperfect measures for perceived quality, for instance. The effect measured is the consequence of integration on the quality score, and not on other quality measures such as technical quality or the volume of critic and user scores.

The same applies to the efficiency measure used. The year gap between two games is not the only measure of efficiency. A developer who converts fewer resources in the same amount of work is also more efficient, for instance. Moreover, this measure cannot account for learning effects.

Furthermore, endogeneity issues might still tarnish the internal validity of this research. Even after controlling for factors influencing both the integration decision and the quality measures, there might still be unobserved variables influencing the results.

Lastly, the external validity of the analysis is not perfect, either. Since the VGI is inherently different from other creative industries, the conclusions in this paper might not apply to other industries. However, the research setting is possible to perform in other creative industries were merger and acquisitions arise (e.g. the movie industry).

Given the limitations above, future research should focus on improving the internal & external validity of these results. Moreover, performing the analysis with different quality and efficiency measures is also desirable. If panel data is available on developers and the respective quality of their intellectual property, then this data can be used to improve the internal validity. Measuring the effect of integration on the quality over time using individual fixed effects, can limit the endogeneity of the analysis. Most time-invariant developer characteristics influencing the integration decision and the quality measures will then not bias the outcomes. Performing the analysis described in this paper with data from other creative industries might provide evidence for a high external validity.

The possible reasons provided for the results, should also be further examined. The effect of rushed development and larger budgets should be isolated and independently assessed. This research would help companies in targeting the right determinants of higher quality and help in identifying problems occurring in integration. Removing practices which negatively influence quality will ultimately increase the quality of intellectual property. This research

already provided some evidence that efficiency does not increase because of integration; thus, the question arises if stricter development deadlines are warranted.

An examination of other possible reasons for the positive effect of integration on perceived quality could also prove beneficial. Examples would be higher marketing budgets, better marketing alignment and better release timings, for vertically integrated developers and publishers.

Lastly, future research should focus on other policy indulging effects. Adverse effects, such as employees working longer under more stress (crunch-times) and the increasing amount of gambling mechanics in games, are important considerations as well. If future research finds a relation between integration and these practices, then more restrictive policies on vertical integration might be desirable.

This paper can be considered a starting point for more research on the effects of mergers and acquisitions on the development of intellectual property in the growing creative industries.

List of abbreviations

VGI = Video Game Industry

Appendix

Appendix 1: T-test results descriptive statistics

Variable	Mean difference	T-value	Pr(Mean diff. ≠ 0)	Significant 5%-level
Critic_Score	-3.969 (0.678)	-5.853	0.000	Yes
User_Score	0.080 (0.070)	1.131	0.258	No
Year_Gap	0.520 (0.103)	5.070	0.000	Yes
% Exclusives	0.136 (0.028)	4.862	0.000	Yes
% Existing Franchise	-0.214 (0.038)	-7.714	0.000	Yes
Accumulated_Franchise_Sales	-8.298 (1.135)	-7.308	0.000	Yes
Product_Number_Developer	-6.889 (0.502)	-13.735	0.000	Yes
Product_Number_Publisher	-16.003 (3.095)	-5.170	0.000	Yes
Accumulated_Developer_Sales	-36.534 (4.118)	-8.872	0.000	Yes
Accumulated_Publisher_Sales	-56.692 (11.750)	-4.825	0.000	Yes

Standard errors between parentheses

Bibliography

Chipty, T. (2001). Vertical integration, market foreclosure, and consumer welfare in the cable television industry. *American Economic Review*, *91*(3), 428-453.

Ciliberto, F. (2006). Does organizational form affect investment decisions?. *The journal of industrial economics*, *54*(1), 63-93.

Department of Culture, Media & Sports (UK) (2016). *Creative industries economic estimates*. Retrieved on April 30, 2019, from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/523024/Creative_Industries_Economic_Estimates_January_2016_Updated_201605.pdf

Euromonitor (2018). *Global company shares video games industry*. Retrieved on May 8, 2019 from https://www-portal-euromonitor-com.eur.idm.oclc.org/portal/StatisticsEvolution/index

Euromonitor (2018). *Global market sizes video games industry*. Retrieved on May 8, 2019 from https://www-portal-euromonitor-com.eur.idm.oclc.org/portal/StatisticsEvolution/index

Forbes, S. J., & Lederman, M. (2010). Does vertical integration affect firm performance? Evidence from the airline industry. *The RAND Journal of Economics*, *41*(4), 765-790.

Geyskens, I., Steenkamp, J. B. E., & Kumar, N. (2006). Make, buy, or ally: A transaction cost theory meta-analysis. *Academy of management journal*, *49*(3), 519-543.

Gil, R. (2015). Does vertical integration decrease prices? evidence from the paramount antitrust case of 1948. *American Economic Journal: Economic Policy*, *7*(2), 162-91.

Gil, R. (2008). Revenue sharing distortions and vertical integration in the movie industry. *The Journal of Law, Economics, & Organization*, *25*(2), 579-610.

Gil, R., & Warzynski, F. (2014). Vertical integration, exclusivity, and game sales performance in the US video game industry. *The Journal of Law, Economics, and Organization*, *31* (suppl_1), i143-i168.

Gov.UK (2018). *Creative industries sector deal launched*. Retrieved on April 30, 2019, from https://www.gov.uk/government/news/creative-industries-sector-deal-launched

Kirubi, R. (2016). Video game sales with ratings. *Kaggle*. Retrieved on April 30, 2019, from https://www.kaggle.com/rush4ratio/video-game-sales-with-ratings

Lee, R. S. (2013). Vertical integration and exclusivity in platform and two-sided markets. *American Economic Review*, *103*(7), 2960-3000.

Leiblein, M. J., Reuer, J. J., & Dalsace, F. (2002). Do make or buy decisions matter? The influence of organizational governance on technological performance. *Strategic management journal*, *23*(9), 817-833.

Macher, J. T. (2006). Technological development and the boundaries of the firm: A knowledge-based examination in semiconductor manufacturing. *Management Science*, *52*(6), 826-843.

Müller, K., Rammer, C., & Trüby, J. (2009). The role of creative industries in industrial innovation. *Innovation*, *11*(2), 148-168.

Murgia, M. (2016). Pokémon Go crosses $250m in revenues since launch. *Financial Times.* Retrieved on May 8, 2019, from https://www-ft-com.eur.idm.oclc.org/content/2dd63522-5fdf-11e6-ae3f-77baadeb1c93

Novak, S., & Stern, S. (2008). How does outsourcing affect performance dynamics? Evidence from the automobile industry. *Management Science*, *54*(12), 1963-1979.

Park, G. (2018). Fortnite was the biggest pop culture phenomenon of 2018. *The Washington Post.* Retrieved on May 8, 2019, from https://www.washingtonpost.com/technology/2018/12/27/fortnite-was-biggest-pop-culture-phenomenon/?utm_term=.b340dc8e6c21

Pomerantz, D. (2009). Marvel: how good a deal for Disney? *Forbes.* Retrieved on April 30, 2019, from https://www.forbes.com/2009/08/31/disney-marvel-deal-business-entertainment-marvel2.html#304e2b5e6876

Potts, J., & Cunningham, S. (2008). Four models of the creative industries. *International journal of cultural policy*, *14*(3), 233-247

.

Rijksoverheid (n.d.). *Rijksoverheid stimuleert innovatie*. Retrieved on April 30, 2019, from https://www.rijksoverheid.nl/onderwerpen/ondernemen-en-innovatie/rijksoverheid-stimuleert-innovatie

Tassi, P. (2018). Microsoft acquires Ninja Theory, Undead Labs, Playground Games and more for Xbox. *Forbes*. Retrieved on June 4, 2019, from https://www.forbes.com/sites/insertcoin/2018/06/10/microsoft-has-acquired-ninja-theory-undead-labs-and-playground-games/#1fc8b242277c

United Nations (n.d.). *UNCTAD's work on the Creative Economy*. Retrieved on April 30, 2019, from https://unctad.org/en/Pages/DITC/CreativeEconomy/Creative-Economy.aspx

Webb, K. (2019). The creators of 'Fortnite' just bought the studio behind one of the most popular games of the planet. *Business Insider*. Retrieved on May 13, 2019, from https://www.businessinsider.nl/rocket-league-epic-games-store-psyonix-2019-5/?international=true&r=US

Williams, D. (2002). Structure and competition in the US home video game industry. *International Journal on Media Management*, *4*(1), 41-54.

Williamson, O. E. (1975). Markets and hierarchies: Analysis and antitrust implications. New York; Free Press.

Williamson, O. E. (1979). Transaction-cost economics: the governance of contractual relations. *The journal of Law and Economics*, *22*(2), 233-261.

Williamson, O. E. (1991). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative science quarterly*, *36(2)*, 269-296.