

# VR GAMING – NEW SENSATION OR PREMIUM GIMMICK

Gaming consumers' WTP for VR HMDs

Master's Thesis  
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Abstract

Virtual reality (VR) gaming has developed during the recent years as a viable alternative for regular video games. However, VR head mounted displays (HMDs) have not managed to appeal to the mainstream gaming public on a large scale. Previous studies have shown that VR gaming can be more immersive and satisfying than regular gaming but expensive HMDs and poor quality in offered games often make the experience less than optimal. Nausea-like sensation, cybersickness, experienced by some individuals while immersed in VR games is also a nuisance that is difficult to eliminate entirely.

By utilising willingness-to-pay (WTP) principle and a multiple statement model created to chart respondents' motivators for gaming, a survey questionnaire was created for the purpose of this thesis to find out how much gaming consumers are willing to pay for a VR HMD at the moment and whether gamers motivated by a certain dimension like challenge or competition are more likely to pay more than other gamers.

Over two weeks, 134 valid responses were gathered through convenience sampling and online forums with gamer users. The WTP varied greatly as some respondents either owned VR HMDs already or were willing to pay large sums for them, while others were willing to invest very little if at all to experience VR gaming. The average WTP proved to be 400 € but a high variance combined with reliability issues for an open-form WTP statement renders it to be more of an approximation. Through multiple linear regression it became also evident, that different gaming motivator values cannot be used to predict WTP valuations.

Those respondents who were willing to pay the most for a VR HMD praised the technological prowess and future potential of the platform, whereas those who were not willing for a sizable investment doubted the quality of the current devices and VR games, which were deemed simple and dull. Supporting question on VR usage revealed that only one third of the respondents who already owned a VR HMD used it at least once a week. Cybersickness was occasionally experienced by some respondent but it did not feature as a common factor in WTP justifications.

With the insight provided by these survey results, it can be safely noted that VR developers have to concentrate on making VR games with higher quality to pair with the developed technology that the HMDs already feature. Although the survey and its analyses have its limitations, the sentiment of the consumers clearly indicates a demand for better content before any mainstream success for VR gaming can be achieved.

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**Keywords** virtual reality, gaming, consumers, WTP

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# 1 Introduction

## 1.1 Motivation

During the recent years video game technology has advanced at an ever-growing speed along with technology in general. The last ten years have seen the advent of virtual reality (VR) applications that have been implemented into gaming. The point of these applications is for the player to wear a blindfolding, plastic headband with two screens inside, one for each eye. These head mounted displays (HMD) are connected to the gaming device which, instead of a regular screen, sends its image to the glasses. This feature combined with varying possibilities for the player to turn the gaming view by moving their head, and control the game with special VR controllers in their hands, creates a strong feeling of being inside the game itself (Pallavicini et al., 2018; Yildirim et al., 2018). If executed successfully, the potential immersivity of VR games is manifold compared to that of regular video games (Evans & Rzeszewski, 2020).

Even before making their entrance in the gaming industry, VR HMDs, their applications and various complementing controllers have started to be utilised in other industries as well. VR technology's benefits for various training and education purposes as well as real estate business are undisputable, just to name a few examples (Ozacar et al., 2017; Shu et al., 2019). VR technology has the potential to revolutionise multiple practices and applications affecting both our daily lives as well as manufacturing, service, and development industries. Therefore, the significance of VR technology's success in the gaming industry is immense. Consumer entertainment applications of this technology have the possibility to generate considerable profits and attract investments and therefore fuel the further development of VR applications (Smith, 2021; Yildirim et al., 2018). This means that without a mainstream success for VR gaming globally, the implementation of VR technologies in other industries could be slower and inefficient.

However, the current demand for VR gaming appliances and the games themselves is not as high as expected. This might stem from the considerable high prices for VR HMDs and other applications for consumer gaming use, as well as the mediocre quality and reviews received by some of the games made exclusively for VR gaming (Smith, 2021; Yang & Nam, 2018). Therefore, the goal of my study is to present a justified review on the current demand for VR HMDs and games along with the reasons behind this. The



conclusion is achieved by conducting a consumer survey which utilises willingness-to-pay theory, so that respondents provide a hypothetical sum, which would be the maximum amount they would be ready to pay for a VR HMD. This sum should indicate the products' value for the respondent in question (Kalish & Nelson, 1991). Justification for the given price is then gathered through further questions. This survey is directed to consumers who identify themselves as active gamers, to limit the potential novelty aspect of the gaming products in question to their VR attributes, and to gain quality insight from informed and interested consumers.

This study is important since it gives insight for the VR game developers as well as the companies behind the current VR gaming appliances that helps them to develop more appealing and better working VR games and to update the current VR software and hardware respectively, which would result in more satisfying VR gaming experiences and ultimately heightened demand for VR gaming products. As explained above, better demand for VR gaming would financially boost the development of VR technology in general and speed its sensible implementation in various industries, the resulting appliances ranging from being at least practical and making the daily and working lives of people easier, to potentially having industry-transforming capabilities.

## **1.2 Research Problem**

The primary research problem of this study is the following question, how much are gaming consumers willing to pay for a VR HMD? Finding at least an approximate answer for this question benefits the VR industry by giving an indication of potential customer attitudes and demands towards the HMDs.

The secondary, supporting research question is the inquiry on if there exists a certain gamer demographic that is willing to pay more for VR devices than others. Insight on this matter would help VR HMD producers to target their marketing towards the most inclined prospects, in order to get more VR devices on the market and more VR experiences to the gaming society

## **1.3 Structure of the Thesis**

This thesis proceeds next to the literature review on the topics at hand. First, the development and status of virtual reality in gaming context is discussed. Then, consumer adoption theory is explained and pondered along with willingness-to-pay principle, finally

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examining the latter in the context of consumer adoption. The literature review concludes with the presenting of the study model utilised in the thesis.

The empirical part of the thesis starts with the justification and description of the chosen study method and its items. After this, the collected data is described and dissected, ultimately resulting in a documented analysis process which produces both statistical and qualitative findings. To conclude the study, the implications of these findings are discussed along with their possible practical applications and limitations, leading to the suggestions for future research.

## 2 Literature Review

### 2.1 Virtual Reality in Gaming

#### 2.1.1 Development

Even though virtual reality has been a constant subject of research for the last 30 years or so, its applications have not been remotely as practical and present in the daily lives of consumers as other information technology innovations such as computer mouse and other traditional interface controlling gadgets. According to LaViola (2008), Nintendo Wii gaming console and Sony's EyeToy camera accessory for PlayStation 2 console were the first applications that succeeded in commercializing VR technology before the turn of the last decade, although it is debatable whether they were truly tapping into VR or more towards augmented reality (AR). In more recent years, VR technology has gained a steadier foothold in video game industry since the 2016 advent of multiple competing HMD products that are meant to be worn by a user in order to play games made especially or enhanced for VR. The most notable trio of these products are the trailblazer Oculus Rift and HTC Vive which are meant to be used with desktop computer, and PlayStation VR for PlayStation 4 gaming console (Yildirim et al., 2018) (Pallavicini et al., 2019).

#### 2.1.2 Comparison to Regular Video Game Experience

Recent studies have shown that VR gaming truly is more immersive than regular gaming on a flat screen (Pallavicini et al., 2019) as well as more appealing and satisfying than gaming otherwise on a handheld tablet or flat screen (Pallavicini et al., 2018; Shelstad et al., 2017). There are also contradictory study results which point out that VR gaming does not always provide any more satisfaction than regular gaming despite the fact that the sense of presence is a strong indicator for overall satisfaction (Evans & Rzeszewski, 2020; Yildirim et al., 2018). Evans & Rzeszewski emphasize that to truly capture the benefits and immersivity of VR gaming, the games itself have to be designed strictly for VR use. Existing games ported for VR, while numerous, cannot harness the full extent of VR medium.

Yildirim et al. (2018) provide another point of view with their argument that the game mechanics affect greatly the potential added enjoyment generated through the use of VR. Some game genres benefit more from the sensations brought by VR than others. Besides, since all of these studies are conducted monitoring the playing experience of a limited group of people, it is worth noting that demographic factors like age and gender, as

well as personal preferences and previous gaming experience most probably affect how VR gaming compares to regular gaming, since these factors generally partly dictate if a certain game is enjoyable or not for a player (Erfani et al., 2010).

The most notable and well-studied negative aspect of VR gaming is the possibility of motion sickness caused by HMD usage known as cybersickness that is experienced by some players. Rebenitsch & Owen (2016) position cybersickness to include similar symptoms as motion sickness, like nausea and dizziness, which are triggered when the user of VR HMD experiences visual movement in the virtual reality while remaining still. Although VR gaming has been studied to also cause eyestrain faster than regular gaming (Mohamed Elias et al., 2019), cybersickness seems to be more immediate and concerning issue, which has to be tackled in game development stage at the latest (Rebenitsch & Owen, 2016). Yildirim's (2019) research suggests that cybersickness might not occur as easily in VR games in which the player does not need to move their virtual self, since the experienced dissonance between what is seen and actual body movement is lower. Rebenitsch & Owen support this notion by concluding that game developers can mitigate cybersickness symptoms by limiting the freedom of in-game navigation as well as narrowing the player's field of vision.

### 2.1.3 Consumer Preferences

The Washington Post news outlet recently wrote that while the ongoing global pandemic has boosted investments made towards VR gaming, its share of video game hardware and software revenue was only 0.4 percent in 2020 (Smith, 2021). The fact that according to a survey, less than one third of regular gamers in the United States own a VR HMD (Valentine, 2020) support the smaller revenue numbers of VR gaming but even still the fraction of shares seems particularly low. Cybersickness can well explain the lower current profitability of VR games since this unpleasant experience considerably lowers the enjoyment factor of VR gaming all the way to the level of traditional gaming according to Yildirim (2019). Therefore, it is an important factor to consider while developing VR games and HMDs.

Even though VR technology is rapidly developing, the retail prices for HMDs are still around 500 \$ depending on the brand (Pallavicini et al., 2018). With the cybersickness problems ever present as well as the fact that a large part of VR games currently available are modified versions of regular games (Evans & Rzeszewski, 2020), it is unclear how much money consumers are willing to invest in order to try out and hopefully enjoy VR

gaming. In order to comprehend why the adoption of VR gaming and HMDs worldwide has been slower than expected, Yang & Nam (2018) have conducted a study to find out what are the most important attributes of a VR HMD for a video game consumer in South Korea. Yang & Nam conducted a survey for a group of South Korean consumers that had previous experience with VR gaming. The results pointed out that the most important aspects of a HMD were related to its wearability, like comfort of use and especially weight, which is currently deemed too heavy in all the top three alternatives on the market.

Yang & Nam (2018) also calculated the overall willingness to pay by asking their survey respondents how much they would be ready to pay for a HMD with all important attributes at their peak. The average they came up with, 250.40 \$, was less than what any of the three biggest providers' products, Oculus', HTC's or Sony's, currently costs. They emphasized that Sony's offering falls into this price range but as a more inexpensive alternative, it also lacks the most attribute-wise.

## 2.2 Consumer Adoption Theory

### 2.2.1 History

One of the earlier iterators of consumer adoption theory is Everett Rogers with his book *Diffusion of Innovations* (1995) which was first published in 1962. In this book, Rogers divided consumers into five categories depending on their propensity to accept new innovations. These categories are innovators, early adopters, early majority, late majority, and laggards. After this description, considerable part of the research concentrated on finding out whether innovators can act as opinion leaders and positively influence the adoption of a consumer product (Summers, 1971). The results of the survey study conducted by Summers supported previous studies in finding no strong relationship between innovators and opinion leadership.

A new framework for consumer adoption was suggested by Kalish (1985) who divided this process in two steps: awareness and adoption. To be interested in a new product, the consumers have to be aware of its existence first. This awareness step is controlled by the advertising efforts of the producer, which spread information regarding the product. This information is then passed on among potential adopters. After being aware, some of the consumers can adopt the product if they approximate its value for them higher than its price. This willingness-to-pay principle will be discussed further below but suffice to say that Kalish also identified that this product value for an individual customer can be affected by various factors. For example, a product value diminished by uncertainty

of its features can climb higher once the consumer receives more product information through its early adopters. Page Moreau et al. (2001) offer their own addition to the research of product adoption with their study indicating that if a product is related to a previous product of the same domain by its usage or attributes, experienced consumers are likely eager to adopt it. Alas, a product that is new and unrelated to previous ones might be harder to adopt for experienced users when compared to consumers that have little or no experience of products of that domain.

### 2.2.2 Innovation Diffusion

Rogers (1995) argued that while much of the previous research on consumer adoption had focused on the differences of people; some accepting new innovations and products sooner than others, it would be beneficial to investigate the innovations itself, to find out what makes certain products more appealing than others. The 1983 released 3rd edition of Rogers' book introduced five distinct attributes for innovations which Rogers selected after studying past research on the topic while keeping in mind that these attributes would have to be succinct and as general as possible.

The first attribute of an innovation according to Rogers (1995) is the relative advantage it offers compared to the concept it aims to supersede in its purpose or task. Briefly put, this can be seen as the objective value of the innovation. The second attribute is compatibility, which measures if the innovation echoes existing values of society, past experiences regarding similar products and the needs of the consumer. The research of Page Moreau et al. (2001) regarding the product relations towards past products in its domain studied product adoption through the viewpoint of this attribute. The more compatible an innovation is in and out of its domain, the more appealing and therefore easier to adopt it is.

The next attributes presented by Rogers (1995) that can be used to measure the rate of adoption for an innovation are complexity and trialability. Complexity measures whether the innovation is difficult to comprehend and use, whereas trialability investigates if an innovation can be experimented on a limited basis and on the consumer's own terms and to what degree this is possible. Both of these attributes are essential in lowering the uncertainty surrounding a new innovation, which might block the consumer from moving from awareness step to adoption of an innovation, as argued by Kalish (1985). The final and fifth attribute chosen by Rogers is observability, which focuses on whether the results of an innovation are easily observed in the society and by potential adopters. An

innovation that clearly affects the daily lives of its users is a stronger candidate for adoption than one that has effects and benefits that are not easily explained or tangible.

The attributes mentioned above are only the primary influencers of innovation diffusion and somewhat subjectively chosen by Rogers (1995). However justified these choices are, there are countless other factors that affect whether an innovation is adopted into society and how fast. Robertson (1967) warned more than 50 years ago that a theoretical model of innovation diffusion is hard to create, since there are so many variables that affect the process. Robertson reminded that in order for an innovation to properly diffuse into society, which would require a certain mass of consumers adopting it, the innovation has to either be superior to already existing alternatives or considerably successfully advertised.

More recently, Hall (2004) listed that innovation diffusion has been studied through multiple perspectives and that the scholars' decision of viewpoint has mostly depended on the intended purpose of the research results. These perspectives are historical, economic, network theoretical and sociological, which is the perspective of Rogers' (1995) five attributes, according to Hall. This argument is justifiable, since those attributes; relative advantage, compatibility, complexity, trialability and observability all reflect the innovation's value and usability experienced by a person or to society in compatibility's case. Thus, in studying what are the features of a successful innovation Rogers also sheds light on what kind of people are the early adopters of this kind of innovations. In her conclusion, Hall identifies the need for future research on innovation diffusion where the methodology focuses on the choice that the potential adopter faces when being exposed to a new innovation.

### 2.2.3 Adoption of Consumer Electronics

As vast and complex product group as consumer electronics are, including a large number of novel innovations, Thomas Tan (2003) has identified through research on potential and existing music device consumers that the image of a consumer electronic product is an important factor contributing to its adoption. This image consists of the product's physical appearance but also its brand (Thomas Tan), which offers the brand experience and credibility as well as a perceived sense of uniqueness to the consumer (Dwivedi et al., 2018).

In the research of Thomas Tan (2003) all of the five attributes of adoption introduced by Rogers (1995) are present as factors affecting the adoption of a consumer electronics

product. Thomas Tan posits that the most influential factor is clearly the relative advantage of the product, which is consistent with the emphasis Rogers gives to his attributes as well. Secondly, Thomas Tan's research shows that the perceived risk of adopting the product is also a crucial factor. This feature was first suggested by Ostlund (1974). Therefore, when choosing whether to adopt a new product, the consumer most importantly judges what does that product possibly offer to them, perhaps easier tasks or new, delightful experiences, and is there a chance that it takes something away, like disproportionate amount of money or time wasted while learning how to utilize the product that can later prove to be obsolete or rendered useless by another product or practice.

For a consumer electronics product to flourish, it needs to attract a certain mass of adopters relatively early after its launch to secure the development of further complementary products and services (Yang & Nam, 2018). Without this early success, the growth of the specific industry will be seriously hindered. Setterstrom & Pearson (2019) have studied that an individual's urge to belong to a certain social group can positively influence their willingness-to-pay for a product, which in this specific study was massively multiplayer online games (MMOG). As Thomas Tan (2003) concluded in his study, product image plays a considerable role in a consumer electronics product's adoption. This image, when successful, can position the product as desirable for certain social groups, as was the case for various MMOGs in Setterstrom & Pearson's research. To quickly succeed in moving a critical mass of consumers from product awareness step to product adoption (Kalish, 1985), the image for a consumer electronics product would do well to please a large social group, even so that their willingness-to-pay would be maximized.

## 2.3 Willingness-to-pay

### 2.3.1 Development and Utilization

The willingness-to-pay (WTP) principle, previously known as reservation price, assumes that each consumer can name a maximum price for a distinct product, which indicates its perceived value for them (Kalish & Nelson, 1991). This WTP can be raised, according to Le Gall-Ely (2009), if the producer understands what are the factors that influence the WTP for a certain product for a certain group of customers. In practicality, consumers are willing to pay more for products that feature attributes they appreciate.

Voelckner (2006) reminds us that the real WTP of a customer can not be observed precisely and that the different methods used to measure it only strive to get as close to the truth as possible. As the real figure is unobservable, it is impossible to decide which



method is best for measuring WTP. The study of Voelckner also proved that WTP queries with no obligation to actually purchase anything with the named price result in respondents giving higher WTP answers than in a study where the respondents have to buy a product for their named price. With no pressure to purchase anything, it is easier to give high WTP answers. This means that hypothetical WTP studies tend to provide skewed results that need to be taken into account. The research of Wertenbroch & Skiera (2001) concludes also that consumers submit substantially lower WTP figures in hypothetical surveys compared to those with purchase constraint. The other hindrance of these non-incentivized surveys they identified was the fact that respondents tend to depend on the prices they normally pay in the same product category instead of coming up with a WTP closer to their actual value for the product. Alas, both studies (Voelckner, 2006; Wertenbroch & Skiera, 2001), identify that the purchase-obligated WTP surveys can be impractical or even impossible to conduct, especially in the case of non-tangible product ideas, prototypes or in relatively expensive product categories.

In their review of WTP measuring methods, Breidert et al. (2006) divide them into two main categories. The first category includes those methods that utilize market data and different experiments like auctions to produce revealed preferences from the consumers. The revealed preferences are closer to the true WTP figures, since they come from events including actual purchase data or where respondents have given their WTP while knowing at least the possibility that they have to purchase something with it. This supports the positive factors Voelckner (2006) mentioned about purchase-obligated surveys. The other category presented by Breidert et al. consists of surveys that directly or indirectly request the respondent to state a WTP for a product. Therefore, this category produces stated preferences, which as the above-mentioned studies (Wertenbroch & Skiera, 2001; Voelckner) also argue, are easier to gather but often are not as close to the abstract, real WTPs as the revealed preferences.

The higher WTP given by respondents in a survey without purchase obligation is identified as hypothetical bias by Le Gall-Ely (2009). This bias appears in all methods where the respondent does not actually have to pay the amount anywhere but especially in those methods that generate stated preferences, as categorized by Breidert et al., (2006). Nevertheless, Breidert et al. admit that sometimes even surveys that directly request the respondents' WTP for a product are practical method choices because of resource or time constraints faced by the research. Le Gall-Ely also warns about strategic bias, which can

occur in real-world market studies, if the respondents have an agenda to affect a product price by over- or underestimating their WTP for it.

### 2.3.2 WTP in Context of Consumer Adoption

The above-mentioned study on WTP regarding MMOGs (Setterstrom & Pearson, 2019) proved that complex social influence is a considerable factor for a consumer choosing from different MMOGs. For a MMOG to ascend into a socially desirable position its retail or more often monthly price needs to be carefully thought, balancing customer acquisition and making profit. As eg. Kalish (1985) argued in his research, WTP is an important and heterogenous aspect that affects the rate which an individual is ready to adopt a new product. Kalish further discussed that the WTP is discounted if the individual has not received adequate information regarding the product. Especially considering new consumer electronics products, the information available can be scarce initially. More information can be gained through word-of-mouth from early adopters which is consistent with the effects of social influence in Setterstrom & Pearson's research; a product's positive reputation and meaningful existence in a social group can heighten the WTP for it among the members of the group.

In a case of unfamiliar, new product, information regarding its producer can affect the WTP for it. Dwivedi et al. (2018) studied that a company that invests resources in creating positive and memorable brand experiences can position itself as credible and unique in consumers' minds. This has a heightening effect to WTP towards products of said company, even new innovations. Thus, the lack of information on the product is compensated or even offset by the positive brand image that the consumer has regarding the producing company.

## 2.4 Study Model

Previous studies on VR gaming have focused on the attributes of the technology and devices, comparing the features of different HMDs (Yang & Nam, 2018), assessing VR gaming against regular gaming through comparison of user interface (Yildirim et al., 2018), and evaluating the effect novel technologies will have on VR gaming experience (Elbamby et al., 2018). While the study of Yang & Nam utilised WTP in calculating the value of VR HMDs, actual gaming experience was outside of their research scope.

Regular video gaming has been around long enough to have been studied also from the enjoyment point-of-view. Not sufficing with technical studies is reasonable since

enjoyment is a desirable outcome of video gaming and it cannot be achieved solely through technological features (Yildirim et al., 2018). A ground-breaking study conducted by Sherry et al. (2006) shifted the focus from technical features and negative effects towards the reasons and gratifications of video gaming. They wanted to know why do people play. After interviewing United States' college undergraduate students around the ages of 18 and 22 in a series of focus groups, the researchers managed to compress the different reasons for gaming into 20 statements that can be divided into six different motivators.

Sherry et al. (2006) formulated the following six dimensions that motivate people to play video games. Some choose to play for arousal. For them, the emotions that a high-paced action game or otherwise impressive features stimulate are the reason to take up video games. Others like gaming for the challenge it provides. Some respondents of the study found it desirable to beat or solve the game and felt a sense of accomplishment through these feats achieved in games. The third dimension identified is competition. For some, proving their skills to others and gaining pride, status in a group or even money through it proved enjoyable. Then again, the prime motivation for gaming can be diversion. Some felt that gaming offers a welcome respite from stress and responsibilities. In addition to this relaxing effect, they could play games just to pass the time. The fifth motivator was identified to be fantasy. Some gamers enjoy especially those things that they cannot do in real life, like racing with different vehicles, exploring imagined worlds and portraying as somebody else. The final dimension is social interactions. Many respondents of the study found gaming a pleasant way to interact with their friends.

Utilising the above-mentioned 20 statements as scale questions, where marking a statement low on scale means that the respondent does not agree with the statement at all and by marking high means that they fully agree with the statement, Sherry et al. (2006) conducted the latter part of their study where they asked a group of university students to document their time spent playing video games during a typical week and also answer the 20-item questionnaire. Through statistical analysis, the researchers could determine how the six different motivators, manifested on the scale questions, related to the respondents' gaming time patterns. Meaning in its simplest form: what kind of gamers play the most. By pairing this motivator-based questionnaire formed by Sherry et al. with consumers' WTP data, it would be possible to determine purchasing preferences of different type of gamers.

## 3 Methodology

### 3.1 Method Justification

Since the primary research question of this thesis is about finding out what gaming consumers are willing to pay for VR HMDs, a survey questionnaire directed for this demographic is a reasonable method (Wertenbroch & Skiera, 2001). However, scholars have proved that WTP is hard to measure accurately especially with surveys (Le Gall-Ely, 2009), since various consumer agendas and lack of real purchase obligation may skew the respondents' WTP estimates up or down (Breidert et al., 2006). Therefore, by adding the gaming motivator questionnaire conceived by Sherry et al. (2006) to the survey it is possible to gather more reliable insight on what kind of gamers submit higher WTP values for VR HMDs. In other words, by analysing the results of this combined survey, we can find out what gamer demographics are willing to pay higher prices for VR products.

### 3.2 Survey Design and Items

In addition to including the 20-item statement questionnaire and a WTP question, the survey (appx. A) was designed to begin with general demographic questions. The respondents were asked to provide their age, sex, highest completed education, and employment status. The responses to these questions reveal the demographic representativeness of our gamer consumer respondents. As with all the subject items, no question was mandatory to answer. This decision was made to maximise the number of respondents who finish the whole questionnaire and therefore provide quality data for this study. Generating the survey on Google Forms free online platform was another choice that was made to keep the survey accessible for respondents.

The first subject items of the questionnaire further map out the demographics by asking what gaming platforms the respondent utilises regularly and whether they have tried or even own a VR HMD for gaming. Then, to gather data on two additional factors that might explain WTP values, the respondents who have tried VR gaming are asked if they have experienced cybersickness while doing so and how often have these symptoms occurred, while VR HMD owners are also asked about their VR gaming frequency.

The bulk of the questionnaire is formed by the 20 statements by Sherry et al. (2006) charting the gaming motivators of respondents. A Likert scale of 1 through 7 was chosen for these items to allow respondents to position themselves more accurately in relation to

the quite exact statements. Finally, the respondents are asked to provide a sum in euros, which they would be willing to pay for their preferred VR HMD equipment. The current market price range from 300 to 1500 € is provided as a help in forming a tangible price level. In order to gather some qualitative data as a context for these WTP answers, respondents are asked to provide justification for their chosen price. In the final item of the questionnaire, respondents can submit their email address if they want to participate in a raffle for gaming related gift cards.

### **3.3 Data Collection**

To collect an adequate amount of data solely from gamer consumers, the survey was posted to the online discussion forum of a Finnish video game magazine in addition to utilising convenience sampling. This forum is accessible only by the magazine subscribers and they appear under their real identities, which should minimise faulty responses or submissions by internet bots. To boost the survey visibility, it was later posted to open online discussion site, Reddit, while acknowledging the added possibility to attain invalid data along with proper submissions.

## 4 Results

### 4.1 Data Acquired

#### 4.1.1 Description of the Data

The survey managed to attain 174 responses during the time period of approximately 2 weeks it was kept open. Unfortunately, most of the later stage responses were spam, which is most probably due to the fact that the survey was posted on Reddit later on, where users operate under nicknames and eliminating bots is impossible because of the global scale of the platform. After deleting the faulty responses, 134 remained. Most of these responses contained answers to all items, although some respondents had opted not to include written elaboration on the WTP they had given, and few respondents did not provide a numeral value for the WTP item.

The received data allows to form general demographic statistics, and also additional data points on the cybersickness that respondents have encountered and usage frequency of owned VR HMDs. For each of the 20 Likert scale items, an average value with standard deviation can be calculated, as is the case for the WTP. Written justifications of WTP valuations can be tapped into for supporting, qualitative findings.

#### 4.1.2 Analysis Process

The Google Forms platform provides basic statistics on the demographic items of the survey (appx. B). From these pie charts, it can be noted that half of the respondents were between ages 25 and 30 and no one was over 50 years old. Only 15 % of the respondents identified themselves as female. Over 75 % of the survey participants had either undergraduate or graduate degrees and over 80 % were either part-time or fully employed. The most popular gaming platform among respondents was clearly PC with 94 responses. PlayStation consoles gathered over 50 mentions while Mobile was chosen in 35 submissions and Nintendo Switch in 29. Many other consoles than what was offered as ready alternatives, were mentioned as well, which proves that the survey respondents have a wide combined experience in gaming platforms.

As the pie charts below show, VR gaming was familiar for most of the respondents (69,4 %), whereas only 26,5 % of them owned at least one HMD. Further questions on owned VR device usage and cybersickness did not provide as clear answers with their numerous alternatives, although only one third of those who responded to the former admitted to using their VR HMD at least once a week, while approximately the same

percentage of respondents felt that they experience cybersickness at least sometimes after initial adjusting to VR gaming. The number of respondents for the cybersickness item is higher than the number of those who had tried VR gaming, as is the number of responses in the VR HMD usage item higher than the amount of VR HMD owners, which proves that some “Never” responses on both items are actually from those who were not eligible to answer these items. Therefore, the percentage of “Never” responses on the items is artificially bloated and should be considered slightly smaller.

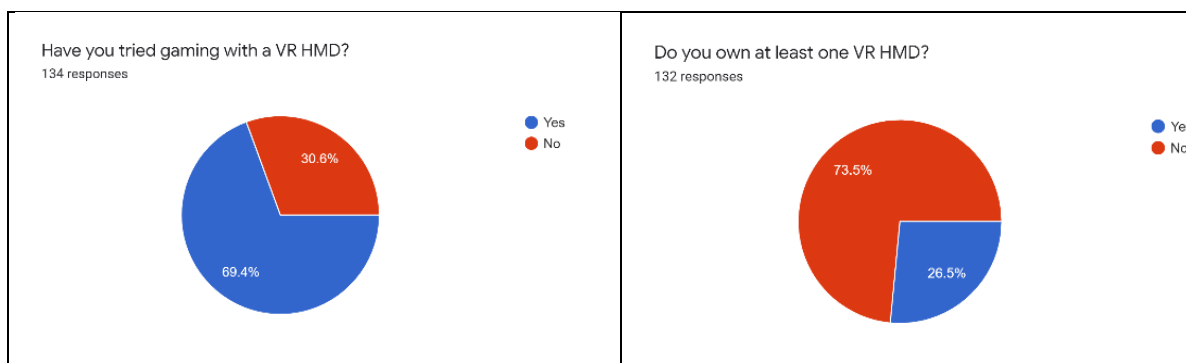


Figure 1. VR gaming experience

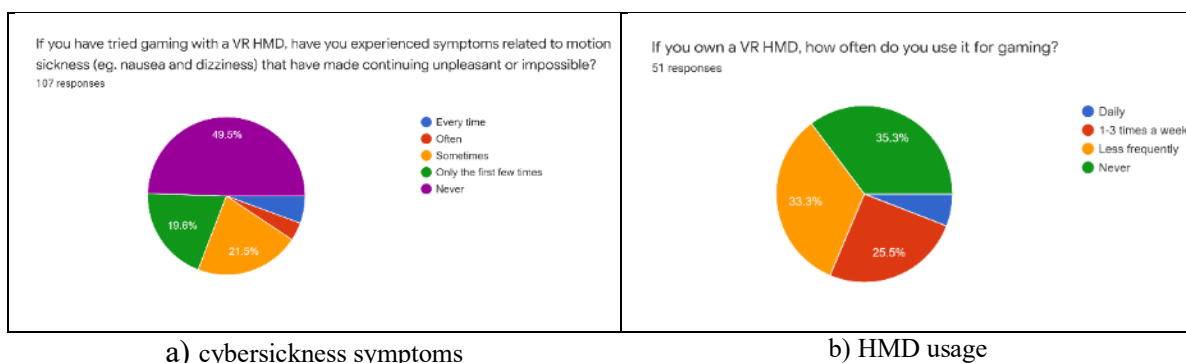


Figure 2. VR HMD usage and cybersickness symptoms

The distribution of responses for the 20-item scale questions by Sherry et al. (2006) can be seen in appx. C. The average valuation and standard deviation for each item were calculated and are presented below, grouped in the motivator dimensions that each statement represents. Challenge and Arousal dimensions received the highest valuations, while Competition items had the lowest averages. This indicates that the respondents of the survey enjoy the challenge and arousal that gaming offers and do not prioritise competing. The higher standard deviation of the two Social Interaction statements means that social aspect of gaming was very important for some respondents but almost of no meaning to others.

Table 1: Gaming motivators

	Average	Standard deviation
<b>Competition</b>		
I like to play to prove to my friends that I am the best	2.89	1.92
When I lose to someone, I immediately want to play again in an attempt to beat him/her	3.46	1.68
It is important to me to be the fastest and most skilled person playing the game	2.89	1.66
I get upset when I lose to my friends	2.98	1.62
<b>Challenge</b>		
I feel proud when I master an aspect of a game	5.46	1.27
I find it very rewarding to get to the next level	5.14	1.18
I play until I complete a level or win a game	3.88	1.50
I enjoy finding new and creative ways to work through video games	4.77	1.41
<b>Social Interaction</b>		
My friends and I use video games as a reason to get together	4.46	2.04
Often, a group of friends and I will spend time playing video games	4.06	2.12
<b>Diversion</b>		
I play video games when I have other things to do	4.15	1.65
I play video games instead of other things I should be doing	3.83	1.74
<b>Fantasy</b>		
I play video games because they let me do things I can't do in real life	4.45	1.57
Video games allow me to pretend I am someone/somewhere else	3.89	1.83
I like to do something that I could not normally do in real life through a video game	4.53	1.59
I enjoy the excitement of assuming an alter ego in a game	3.48	1.68
<b>Arousal</b>		
I find that playing video games raises my level of adrenaline	4.90	1.38
Video games keep me on the edge of my seat	4.56	1.34
I play video games because they stimulate my emotions	4.25	1.52
I play video games because they excite me	5.37	1.07

The WTP given for a VR HMD varied greatly among respondents from 0 euros all the way to 3000, with two respondents even willing to pay as much as necessary as long as the technological quality of the device is on par with the price. The average WTP was approximately 400 € although with a standard deviation of 370, indicating that some are willing to pay much more than what the market offers but others would pay very little.



Through multiple linear regression performed on the scale items (X-factors) related to WTP (Y-factor), as Sherry et al. (2006) related them to gaming hours, it becomes clear that these gaming motivator valuations cannot be used to predict WTP for VR HMDs. With the R square ranging from 0.013 to only 0.055 in the six different dimension group of statements, and significance F as high as 0.16 at its lowest, it seems that the data sets of scale item scores and that of WTP values are not compatible for more advanced statistics.

## 4.2 Statistical Findings

Although predicting what gamer motivators would warrant for higher WTP towards VR HMDs failed with the available data, it was discovered that this sample of 134 gaming consumers, who are motivated the most by the challenge and excitement provided by video games, are more willing than reluctant to pay the current market minimum price of approximately 300 euros. While cybersickness symptoms have been a hindrance to some VR HMD users, more pressing issue is the fact that over half of the HMD owning respondents use their device less frequently than once a week. To delve deeper into the actual purchasing and VR attitudes of these respondents, it is necessary to analyse the written justifications for their WTP valuations.

## 4.3 Qualitative Findings

Some 20 respondents gave a written elaboration on why they would be willing, at least in the future, to pay more than the current minimum market price for their preferred VR HMD. Almost all of these answers had some conditions for the improvement of the technology or games that are offered for VR before purchasing an HMD would be topical. One respondent “would probably pay more if there were more interesting games to play”, while other argued that “VR is moving on rapidly, so I don’t expect the lifetime of a VR HMD to be over 2-3 years”. The constant development of new HMD models also made some other respondents apprehensive of purchasing a device that might soon be outdated. Still, one respondent who was willing to pay more than the market might ask for a VR device reminded that “new display technology costs a bit but the experiences you get from VR are worth the price”.

A much larger amount, 70 respondents, provided insight on why they would not be willing to pay the current market price for a VR HMD of their preferred quality level. Most of these respondents either concluded that their financial situation does not allow for the investment or they are not willing to do it since the quality of the product and available VR

games is not up to their standards. “The games offered on VR rarely offer complex gameplay mechanics” and “nice toy, but mostly impractical for most games” are statements that represent the sentiment of majority of these answers. Quite a few respondents were not interested in VR gaming to begin with. This is a similar position that can be seen in the low percentage of HMD owners who use their device at least weekly. VR is seen as a technological gimmick that might be interesting initially but offers little in lasting entertainment value, or in other words “I don’t see VR HMD bringing so much more excitement to gaming” and “many games are closer to sandboxes and tech demos instead of fully fledged games. It just doesn’t seem worth the investment until more games are introduced”.

## 5 Conclusion

### 5.1 Implications of the Results

The analysed survey data implies that gaming consumers' WTP is closing in on the market prices of the devices. To say that consumers on average are willing to pay 400 € for an HMD would be overstated, since most individuals provide inflated WTP values for products when they do not have any kind of obligation to follow through with the purchase (Le Gall-Ely, 2009). The high variation on given WTP values point out the fact that there are large amounts of consumers who are either willing to pay large sums for VR HMD, or not willing to purchase the product in its current state under almost any circumstances. This division hints that VR technology is not properly diffused to the society yet.

By examining the attributes of innovation diffusion presented by Rogers (1995), it is safe to say that for majority of consumers, VR HMDs have not yet achieved a relative advantage compared to regular video gaming, therefore the objective value of the innovation is not as high as the market price suggests. Also, while the technology can be tested and its effects are observable, it is quite complex, which relates to the fact that VR gaming is not fully compatible with the regular games; the jump from watching and interacting with a flat screen to being immersed in a three-dimensional virtual environment is not a small one, and positions orientation and adaption barriers for many. As among the survey respondents, many were generally not interested to engage in VR gaming.

While the gaming motivator values could not be used to predict WTP and therefore interest towards VR gaming, this outcome was not without merit. The notion, that no gamer motivation demographic was more willing to pay for HMDs than the others implies that VR gaming might not have achieved a desirable status in any larger gamer social group. This lack of meaningful existence hinders the appeal and WTP for it as studied by Setterstrom & Pearson (2019). VR HMDs have not broken through to the mainstream gaming community as a must have product yet.

### 5.2 Practical Applications

The results of the survey support the argument of Evans & Rzeszewski (2020) that in order for VR games to harness the potential of the technology, they have to be developed for VR from the start. Ported games from other platforms with a VR effect modified on top of them can only encourage comments like of those survey respondents that thought VR

games to be “gimmicky” or lacking in gameplay mechanics. To use 3D-movies as an analogy, for the VR games to truly capture the imagination of its audience, the VR experience has to be something they have never seen and tried before, not merely a quirky extra addition. Not many 3D-movies have transcended above this extra effect feeling, but as studies have proved (Pallavicini et al., 2018; Shelstad et al., 2017; Yildirim et al., 2018), VR gaming at its best has the potential to be more immersive and appealing than regular gaming.

It seems inevitable that for VR gaming to succeed, there needs to be more VR games developed that manage to tap into the strengths of the technology and offer experiences which could not be possible on any other platform. This way, VR gaming could start to appear more appealing even to consumers who are not regularly playing regular video games. The technology itself is developed adequately already, since the more inexpensive market alternatives cost less than what large portion of players would be willing to pay, if the experience gained when playing VR games with the HMD would be better. Through carefully planned and developed game offering, can VR HMD transcend its gimmick image and remain in regular use for a larger percentage of device owners than one third.

### 5.3 Limitations

Since this study’s empirical part consists of a consumer survey that was designed to be as easy to use as possible and fairly quick to answer for maximising the number of proper responses, there are some limitations to the results gained through it. The most evident shortcoming is the utilisation of open-ended question for WTP, since the values gained this way are not the most accurate and tend to skew especially higher than what people would be willing to pay in an actual purchase situation, or exhibit certain agendas against or for the product in question (Breidert et al., 2006; Le Gall-Ely, 2009). Considering this limitation, the WTP average of 400 € should be seen here as an estimate of the current sentiment towards VR HMDs among gaming consumers, not as an advice for pricing strategies. It is worth also acknowledging the standard deviation of 370 € in the WTP average, which emphasises the wide spread of WTP positions of gaming consumers.

The other great limitation of this study is its inability to produce a more satisfying answer to the secondary research question. The idea of combining a half of an existing study model, the 20-item scale questionnaire by Sherry et al. (2006) with a different kind of data set than in the initial study was worth exploring but unfortunately did not bear as complete result as the original study the model was used in. Another, albeit smaller

limitation affecting the integrity of the survey data was the faulty answers most likely submitted by bots through the open online forum, Reddit. While efforts were made to delete the most obvious cases from the responses, some might have remained, skewing the scale question averages slightly.

## **5.4 Future Research Suggestions**

This thesis has demonstrated that there is demand for VR HMDs among gaming consumers but along with a great deal of frustration towards the inadequate experiences that can be achieved with them. As Yang & Nam (2018) have studied the consumer preferences for HMDs' technical and tangible features, may this study shed a light on perhaps the greatest issue blocking the mainstream adoption of VR gaming: the games and their lack of tapping into VR attributes. Future commercial research on VR gaming should focus on finding the makings of a killer app for VR games. What are the game features and aspects that cannot be achieved on any other platform than VR, and how are they implemented in a game so, that even the most casual gamers with no inclination towards VR could be interested to know more? For VR to be a desirable platform, the services offered on it have to be an appealing if not superior choice compared to competing, flat alternatives.

## References

- Breidert, C., Hahsler, M., & Reutterer, T. (2006). A Review of Methods for Measuring Willingness-To-Pay. In *Innovative Marketing* (Vol. 2, Issue 4).
- Dwivedi, A., Nayeem, T., & Murshed, F. (2018). Brand experience and consumers' willingness-to-pay (WTP) a price premium: Mediating role of brand credibility and perceived uniqueness. *Journal of Retailing and Consumer Services*, 44, 8. <https://doi.org/10.1016/j.jretconser.2018.06.009>
- Elbamby, M. S., Perfecto, C., Bennis, M., & Doppler, K. (2018). Toward Low-Latency and Ultra-Reliable Virtual Reality. *IEEE Network*, 32(2), 78–84. <https://doi.org/10.1109/MNET.2018.1700268>
- Erfani, M., Seif El-Nasr, M., Milam, D., Aghabeigi, B., Lameman, B. A., Riecke, B. E., Maygoli, H., & Mah, S. (2010). The effect of age, gender, and previous gaming experience on game play performance. *IFIP Advances in Information and Communication Technology*, 332, 293–296. [https://doi.org/10.1007/978-3-642-15231-3\\_33](https://doi.org/10.1007/978-3-642-15231-3_33)
- Evans, L., & Rzeszewski, M. (2020). Hermeneutic relations in vr: Immersion, embodiment, presence and hci in vr gaming. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 12211 LNCS, 23–38. [https://doi.org/10.1007/978-3-030-50164-8\\_2](https://doi.org/10.1007/978-3-030-50164-8_2)
- Hall, B. H. (2004). *Innovation and Diffusion*. <http://www.nber.org/papers/w10212>
- Kalish, S. (1985). A New Product Adoption Model With Price, Advertising, And Uncertainty. *Management Science (Pre-1986)*, 31(12), 17.
- Kalish, S., & Nelson, P. (1991). A comparison of ranking, rating and reservation price measurement in conjoint analysis. *Marketing Letters*, 2(4), 327–335. <https://doi.org/10.1007/BF00664219>
- LaViola, J. J. (2008). Bringing VR and spatial 3D interaction to the masses through video games. *IEEE Computer Graphics and Applications*, 28(5), 10–15. <https://doi.org/10.1109/MCG.2008.92>
- Le Gall-Ely, M. (2009). *Definition, Measurement and Determinants of the Consumer's Willingness to Pay: a Critical Synthesis and Directions for Further Research*. *Definition, Measurement and Determinants of the Consumer's Willingness to Pay: a Critical Synthesis and Directions for* (Vol. 24, Issue 2). SAGE Publications. <https://hal.archives-ouvertes.fr/hal-00522828>

- Mohamed Elias, Z., Batumalai, U. M., & Azmi, A. N. H. (2019). Virtual reality games on accommodation and convergence. *Applied Ergonomics*, 81(June), 102879. <https://doi.org/10.1016/j.apergo.2019.102879>
- Ostlund, L. E. (1974). Perceived Innovation Attributes as Predictors of Innovativeness. *Journal of Consumer Research*, 1(2), 23. <https://doi.org/10.1086/208587>
- Ozacar, K., Ortakci, Y., Kahraman, I., Durgut, R., & Karas, I. R. (2017). A low-cost and lightweight 3D interactive real estate-purposed indoor virtual reality application. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 4(4W4), 307–310. <https://doi.org/10.5194/isprs-annals-IV-4-W4-307-2017>
- Page Moreau, C., Lehmann, D. R., & Markman, A. B. (2001). Entrenched knowledge structures and consumer response to new products. *JMR, Journal of Marketing Research*, 38(1), 14.
- Pallavicini, F., Ferrari, A., Zini, A., Garcea, G., Znacchi, A., Barone, G., & Mantovani, F. (2018). What distinguishes a traditional gaming experience from one in virtual reality? An exploratory study. *Advances in Intelligent Systems and Computing*, 608(October), 225–231. [https://doi.org/10.1007/978-3-319-60639-2\\_23](https://doi.org/10.1007/978-3-319-60639-2_23)
- Pallavicini, F., Pepe, A., & Minissi, M. E. (2019). Gaming in Virtual Reality: What Changes in Terms of Usability, Emotional Response and Sense of Presence Compared to Non-Immersive Video Games? *Simulation and Gaming*, 50(2), 136–159. <https://doi.org/10.1177/1046878119831420>
- Rebenitsch, L., & Owen, C. (2016). Review on cybersickness in applications and visual displays. *Virtual Reality*, 20(2), 101–125. <https://doi.org/10.1007/s10055-016-0285-9>
- Robertson, T. S. (1967). The Process of Innovation and the Diffusion of Innovation. *Journal of Marketing*, 31, 6.
- Rogers, E. M. (1995). *Diffusion of Innovations, 4th Edition*. [https://books.google.fi/books?hl=fi&lr=&id=v1ii4QsB7jIC&oi=fnd&pg=PR15&dq=diffusion+of+innovations+rogers&ots=DMUuzNRtbW&sig=cV\\_lhXI7QrjyWts9eVDEDvDvp0U&redir\\_esc=y#v=onepage&q=diffusion of innovations rogers&f=false](https://books.google.fi/books?hl=fi&lr=&id=v1ii4QsB7jIC&oi=fnd&pg=PR15&dq=diffusion+of+innovations+rogers&ots=DMUuzNRtbW&sig=cV_lhXI7QrjyWts9eVDEDvDvp0U&redir_esc=y#v=onepage&q=diffusion%20of%20innovations%20rogers&f=false)
- Setterstrom, A. J., & Pearson, J. M. (2019). Social Influence and Willingness to Pay for Massively Multiplayer Online Games: An Empirical Examination of Social Identity Theory. *Communications of the Association for Information Systems*, 44(1), 34–61. <https://doi.org/10.17705/1CAIS.04402>
- Shelstad, W. J., Smith, D. C., & Chaparro, B. S. (2017). Gaming on the rift: How virtual reality affects game user satisfaction. *Proceedings of the Human Factors and*

- Ergonomics Society*, 2017-October(September), 2072–2076.  
<https://doi.org/10.1177/1541931213602001>
- Sherry, J. L., Lucas, K., Greenberg, B., & Lachlan, K. (2006). Video Game Uses and Gratifications as Predictors of Use and Game Preference. *International Journal of Sports Marketing and Sponsorship*, 13.
- Shu, Y., Huang, Y. Z., Chang, S. H., & Chen, M. Y. (2019). Do virtual reality head-mounted displays make a difference? A comparison of presence and self-efficacy between head-mounted displays and desktop computer-facilitated virtual environments. *Virtual Reality*, 23(4), 437–446. <https://doi.org/10.1007/s10055-018-0376-x>
- Smith, N. (2021). *Virtual reality is starting to see actual gains in gaming*. The Washington Post. <https://www.washingtonpost.com/video-games/2021/02/04/virtual-reality-future-games/>
- Summers, J. O. (1971). Generalized Change Agents and Innovativeness. *JMR, Journal of Marketing Research (Pre-1986)*, 8(000003), 4.
- Thomas Tan, T. W. (2003). *Factors affecting new product adoption in the consumer electronics industry*. Singapore Management Review. <https://www-proquest-com.libproxy.aalto.fi/docview/226849574/fulltext/6222768811E743CBPQ/1?accountid=27468>
- Valentine, R. (2020). *Three-quarters of all US households include someone who plays video games*. Gamesindustry.Biz. <https://www.gamesindustry.biz/articles/2020-07-15-three-quarters-of-all-us-households-include-someone-who-plays-video-games>
- Voelckner, F. (2006). An empirical comparison of methods for measuring consumers' willingness to pay. *Marketing Letters*, 17(2), 137–149. <https://doi.org/10.1007/s11002-006-5147-x>
- Wertenbroch, K., & Skiera, B. (2001). *Measuring Consumer Willingness to Pay at the Point of Purchase*.
- Yang, S. H., & Nam, C. (2018). What do Consumers Prefer for the Attributes of Virtual Reality Head-mount Displays, 29th European Regional Conference of the International Telecommunications Society (ITS): "Towards a Digital Future: Turning Technology into Markets? In *International Telecommunications Society*. <http://hdl.handle.net/10419/184971www.econstor.eu>



- Yildirim, C. (2019). Cybersickness during VR gaming undermines game enjoyment: A mediation model. *Displays*, 59(February), 35–43. <https://doi.org/10.1016/j.displa.2019.07.002>
- Yildirim, C., Carroll, M., Hufnal, D., Johnson, T., & Pericles, S. (2018). Video Game User Experience: To VR, or Not to VR? *2018 IEEE Games, Entertainment, Media Conference, GEM 2018*, 125–131. <https://doi.org/10.1109/GEM.2018.8516542>

## Appendix A: The Survey

### Survey on VR gaming

This survey constitutes the empirical research of a pro gradu thesis for Aalto University School of Business. The responses will be processed confidentially and only as aggregates, not individually. Some open-ended answers might be quoted in the thesis, but they will be presented fully anonymized in a non-identifying manner. There are no commercial third party partners involved in this study.

In this survey HMD refers to head mounted displays like Oculus Rift, HTC Vive and PSVR

If a question does not apply to you or you prefer not to answer, please leave it empty.

#### Demographics

##### 1. Age

*Mark only one oval.*

- Under 18
- 18-24
- 25-30
- 31-38
- 39-50
- 51-65
- Over 65

##### 2. Sex

*Mark only one oval.*

- Male
- Female
- Other

##### 3. Highest Completed Education

*Mark only one oval.*

- Elementary school
- High school / Vocational school
- Undergraduate (bachelor) degree in university / degree in university of applied sciences
- Graduate (master) degree in university
- Doctorate in university

## 4. Employment status

*Mark only one oval.*

- full-time
- part-time
- not employed

**Subject questions**

## 5. What platforms do you use for gaming regularly?

*Tick all that apply.*

- PC
- PS4
- PS5
- Xbox One
- Xbox Series X/S
- Nintendo Switch
- Mobile

Other:  \_\_\_\_\_

## 6. Have you tried gaming with a VR HMD?

*Mark only one oval.*

- Yes
- No

## 7. Do you own at least one VR HMD?

*Mark only one oval.*

- Yes
- No

## 8. If you own a VR HMD, how often do you use it for gaming?

*Mark only one oval.*

- Daily
- 1-3 times a week
- Less frequently
- Never









28. I play video games because they excite me

Mark only one oval.

1	2	3	4	5	6	7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. I get upset when I lose to my friends

Mark only one oval.

1	2	3	4	5	6	7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30. How much would you currently be willing to pay for a new VR HMD? (the current market price is somewhere between 300 and 1500 € depending on the model and available features)

\_\_\_\_\_

Below you have the chance to justify the price you have given above:

31. If the maximum price you are willing to pay is lower than what the stores offer for your preferred HMD, what are the reasons behind your lower valuation?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

32. If, instead, the maximum price you are willing to pay is equal to or greater than what the stores offer for your preferred HMD, what are the reasons behind your equal or higher valuation?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

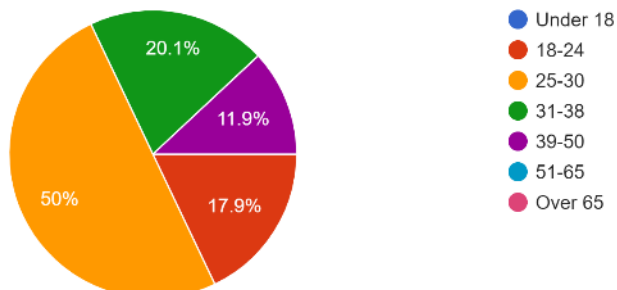
33. If you want to participate to the raffle of three Steam/PS/Windows/Nintendo web shop gift cards, please submit your email address below. This address will not be utilized in the research in any way and will not be linked to your answers.

\_\_\_\_\_

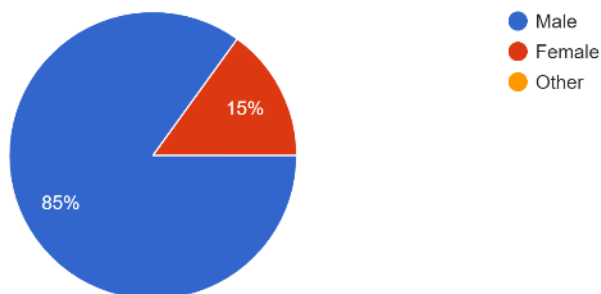


## Appendix B: The Demographics

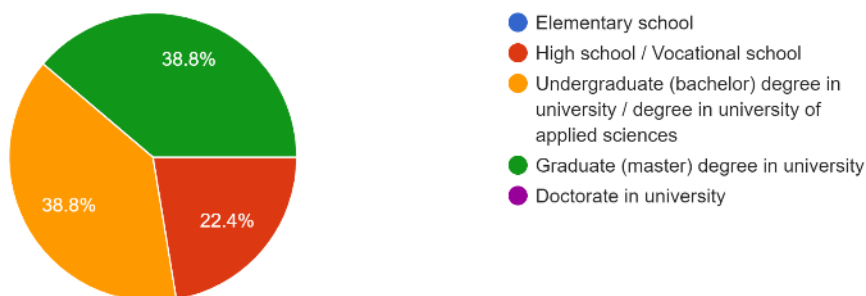
Age  
134 responses



Sex  
133 responses

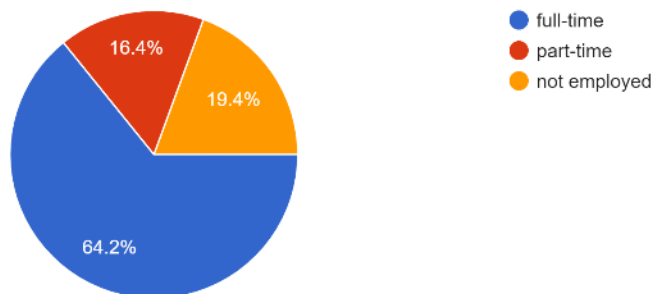


Highest Completed Education  
134 responses



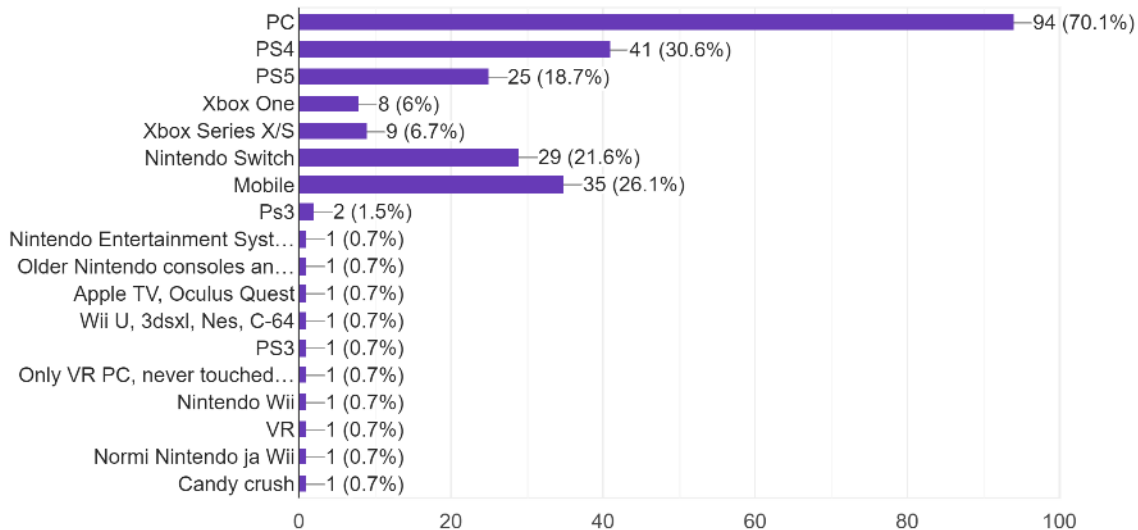
Employment status

134 responses



What platforms do you use for gaming regularly?

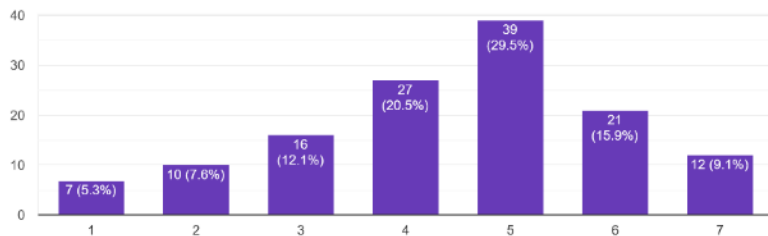
134 responses



## Appendix C: Scale Responses

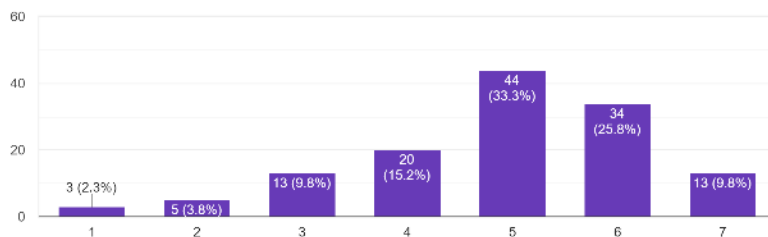
I play video games because they let me do things I can't do in real life

132 responses



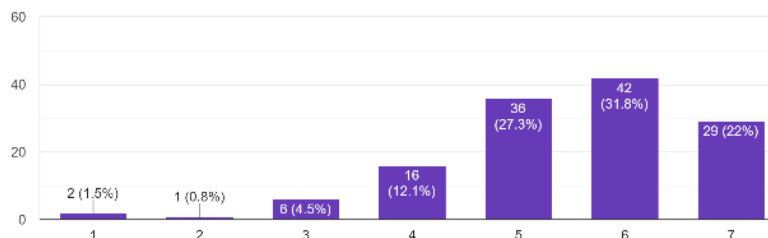
I find that playing video games raises my level of adrenaline

132 responses



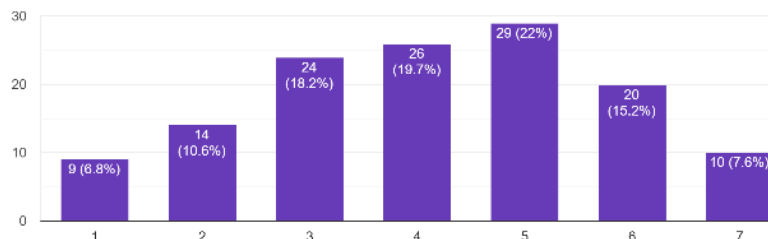
I feel proud when I master an aspect of a game

132 responses



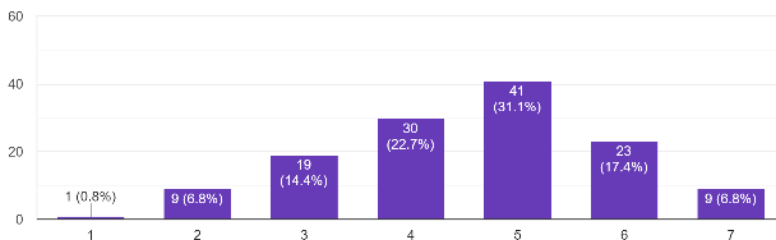
I play video games when I have other things to do

132 responses



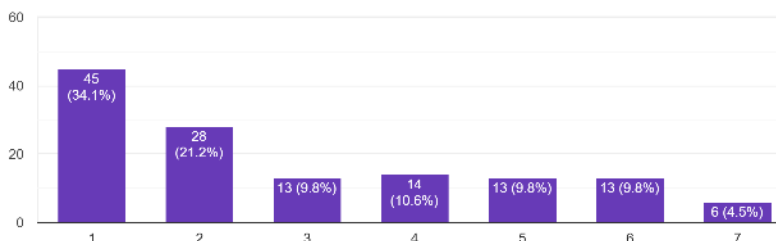
Video games keep me on the edge of my seat

132 responses



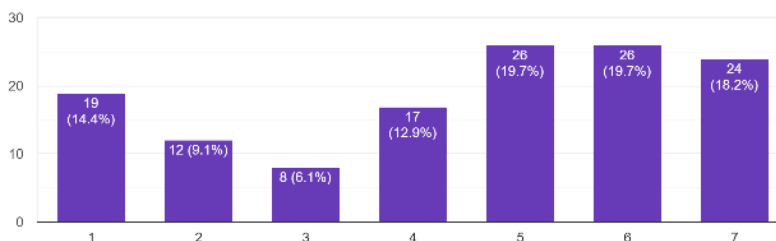
I like to play to prove to my friends that I am the best

132 responses



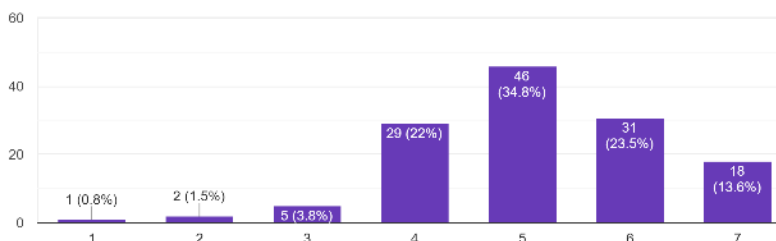
My friends and I use video games as a reason to get together

132 responses



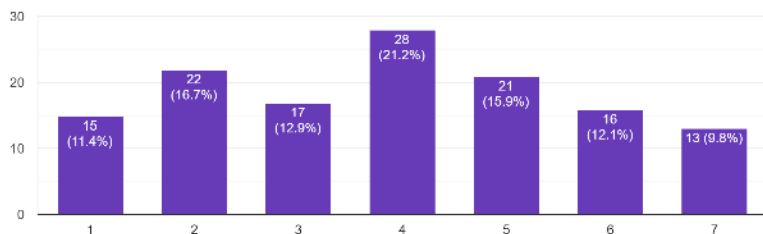
I find it very rewarding to get to the next level

132 responses



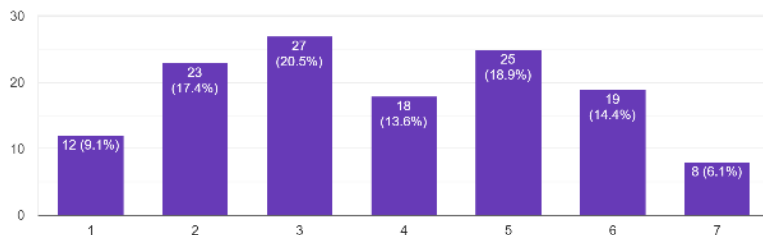
Video games allow me to pretend I am someone/somewhere else

132 responses



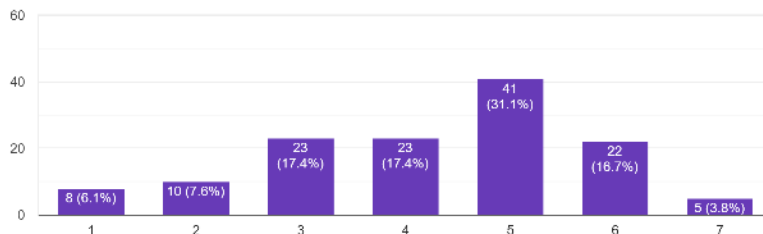
I play video games instead of other things I should be doing

132 responses



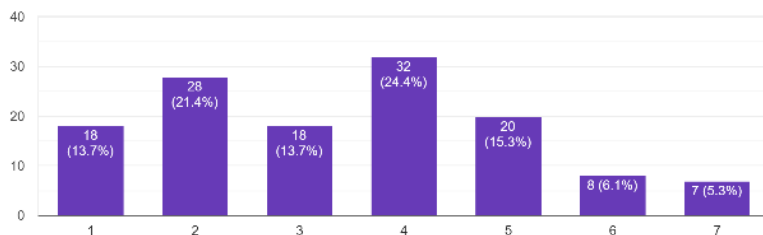
I play video games because they stimulate my emotions

132 responses



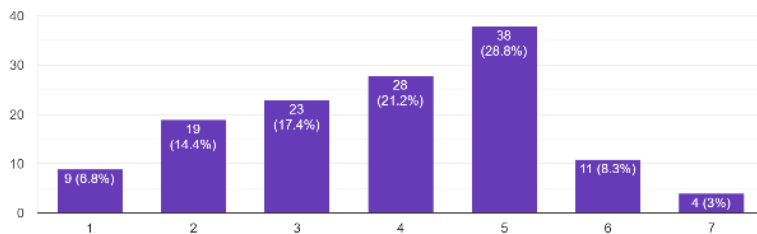
When I lose to someone, I immediately want to play again in an attempt to beat him/her

131 responses



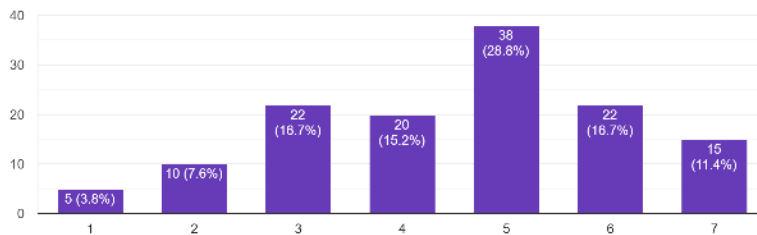
I play until I complete a level or win a game

132 responses



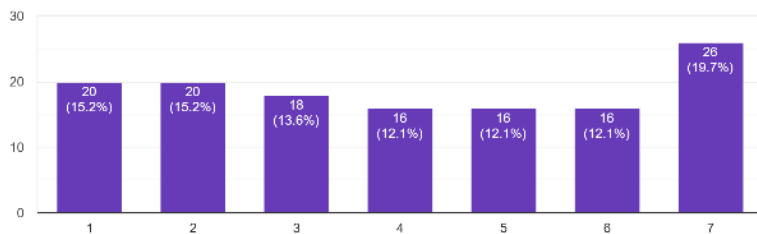
I like to do something that I could not normally do in real life through a video game

132 responses



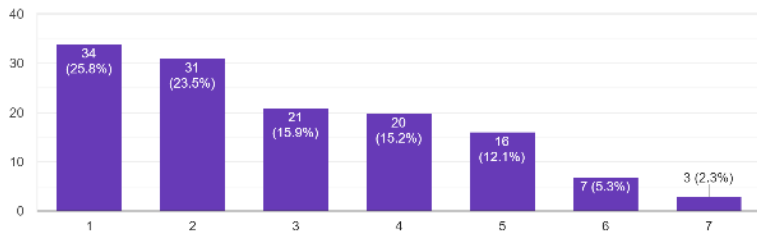
Often, a group of friends and I will spend time playing video games

132 responses



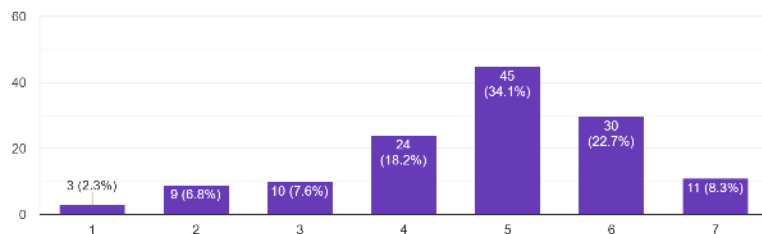
It is important to me to be the fastest and most skilled person playing the game

132 responses



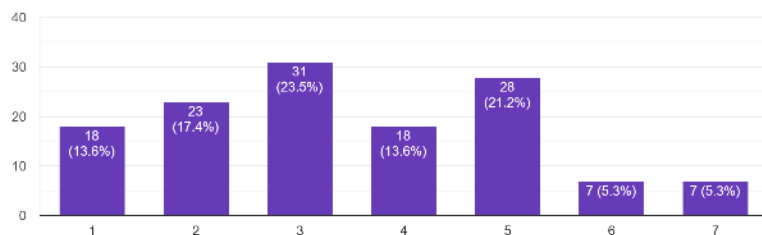
I enjoy finding new and creative ways to work through video games

132 responses



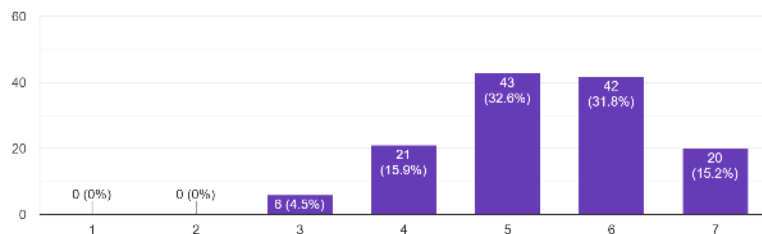
I enjoy the excitement of assuming an alter ego in a game

132 responses



I play video games because they excite me

132 responses



I get upset when I lose to my friends

131 responses

