

# AFFORDABLE AUGMENTED REALITY AND VIRTUAL REALITY

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## Abstract

Generally Virtual reality headset prices have high price due to this reason most of the people cannot afford it. So the number of users will be very low so we are proposing some ways to increase the number of users of virtual reality headset. The main problem is that the price of VR headset is high if we low the price of the head set we can able to increase the number of users.to earn profit in VR we can introduce micro-transactions in it.

**Keywords:** NFT (non-fungible tokens); Micro-Transactions; Simulations in VR; Virtual Currency; Real estate in VR.

## 1. Introduction

Virtual reality is a technology where we can create virtual world and immerse us into those worlds the word virtual reality was first coined by Antonin Artaud in 1938 who was a French writer in his book named *Le Théâtre et son double* which has the word "virtual reality" in it .In 1970 Myron Kruegar coined artificial reality which was in use since then, A novel *The Judas Mandala* first uses the word virtual reality as a science fiction which is written by Damien Broderick. The virtual reality became prominent in 1980s after Jordan Lanier made the first business grade VR machine with VPL Research.

There are generally two terms if we discuss VR and AR the word AR refers to augmented reality the difference between Virtual reality and augmented reality is that in virtual reality we will get into a artificial world where these objects and environment are not present in the real world in AR virtual objects are added with the real world we can interact with those virtual objects.

Augmented reality combines the real world and Virtual objects and we interact with that virtual object in real time

Unlike virtual reality the augmented reality was introduced only in 1990s.the first augmented reality we commercially introduced in gaming industry. Generally AR has three components

- i. Physical world
- ii. Virtual objects
- iii. Real-time interactions

The virtual objects in above generally 3d models which are generated by the computers.

Simply we can differentiate Virtual reality and augmented reality in virtual reality we can only get virtual information but in augmented reality we can able to get both virtual information and real world information. Virtual reality is completely virtual but in augmented reality is like adding a layer to the real world

In Virtual reality we need a separate headset to get into it but in augmented reality smart phones are barely enough to handle it since we just need the render only some virtual objects in AR but in VR we need the render a whole virtual world so we need some really good hardware to handle it

So the cost of VR will be higher compared to AR. Now a days frictions are coming to reality so anything in possible in virtual reality. We can add (or) remove physics turn gravity on (or) off .we can set the gravity as in moon we can design our own avatar in the virtual reality. This avatar creation has been for many years in video games. We will implement this technology to VR.

## 2. Related Works:

J.M. Zheng et al [1] proposed a cutting-edge human-computer interface that simulates a real-world setting is called virtual reality (VR). In the virtual world, participants can move about. They have the ability to mould it, reach into it, grab it, and view it from various angles. Cyberspace is regarded as the pinnacle of virtual reality. In this parallel computer universe, information can be found everywhere like cities of light. Information workers enter cyberspace and navigate its data highways using a specialised virtual reality device. The most recent advancements in virtual reality are covered in the paper. Applications in the engineering and medical domains are taken into account.

Carina Girvan [2] proposed that in 2008 publications by Bell and Schroeder served as a foundation for the development of a comprehensive definition of the phrase "virtual worlds." However, the phrase has not changed much in the last ten years. Instead, the emergence of new terminologies that are sometimes used to categorise the sort of virtual world and other times are used synonymously with the term has caused confusion in the literature. The issue is further complicated by a renaissance of interest in virtual reality's possibilities that has occurred concurrently. There are consequences for academics and practitioners even if it is typical for terms to lack a clear and widespread understanding. In order to resolve these problems, this study offers a novel. his paper argues what it means for a world to be virtual, the user experience that is an essential aspect of this, and the technical qualities which afford this in order to present a new framework for the definition of virtual worlds. For the first time, the connections between frequently misunderstood terminology and technologies are revealed, giving researchers and teachers the conceptual clarity they so desperately need. The same technology have been described using a variety of terminology up to this point, and some terms have been overused to describe unusual tools. The word "virtual world" is used and understood in ambiguous ways, which hinders research advancement and could make the term analytically meaningless. Teachers are unwilling to spend the time and money necessary to use the technology for instructional purposes unless they have a clear knowledge of what a virtual world is and how it differs from other technologies they may consider adopting.

According to Prof. Chih-Hung Wu[3], by combining education through NFTs, less physical infrastructure and in-person interaction are required, and students from all over the world can overcome geographic boundaries, allowing for increased involvement in education . If education can make use of this capability, it will lead to a new way for students and teachers to learn.

According to Švelch, J.[4], Video game players now spend over \$22.4 billion annually, and game makers are attempting to increase the profitability of their goods by moving away from a single sale and towards ongoing involvement with the player. From a media impacts and game design viewpoint, The Evolution and Social Impact of Video Game Economics investigates fundamental shifts in the economic structure of the video game industry. This book examines how game designers have altered player engagement strategies to enable ongoing financial transactions. Contributors examine the effects of planned obsolescence, impulsive purchase, and emotional control as well as the introduction of microtransactions and downloadable content (DLCs).

Hiroshi Yamaguchi [5] proposed that We see that many users buy virtual goods in the virtual worlds of MMORPGs (Massively Multiplayer Online Role-Playing Games) with real money, a practise known as "eBaying." I examine the value of virtual goods in the virtual and real markets by extending the Castronova (2001) model. The analysis shows that the game's design includes an incentive for eBaying. Additionally, because they are utilised in a small number of communities, are not subject to interest rates and are not controlled by central banks, I describe virtual currencies as Local Exchange Trading Systems (LETS). These currencies have the potential to be global LETS because they are not restricted by regional limits. eBaying effectively means that there are exchange rates between virtual and real money.

Martin Nĕmec et al,[6] main goal is to outline and detail experiments with developing training apps using VR technology. More potential and uses are made possible by the introduction of newand more sophisticated virtual reality headsets. The current state of virtual reality and its use in education are the topics of this essay. The basics of virtual reality are covered in the first chapter. The chapters that follow go into more detail on a few virtual reality experimental apps that were created. Finally, the advantages of those applications are discussed, along with some common user reactions.

Mantovani et al,[7] proposed the effect of recent changes in healthcare delivery on medical professionals' education. For healthcare professionals who have been in practise for an average of 30 to 40 years, continuous educationhas become a substantial problem due to the fact that medical knowledge doubles every 6 to 8 years.Virtual reality (VR) is a recent development in educational technology that offers great prospects to improve healthcare instruction. Virtual reality (VR) offers a fun and dynamic learning environment that encourages experience learning. The sophistication and skill sets taught by the various virtual training programmes currently available in the healthcare industry range from telesurgery applications to simulations of the human body and brain to immersive 3D environments for training psychiatrists and psychologists in the management of mental disorders. The paragraph also outlines key projects and research in this area, highlighting its existing shortcomings and potential future paths.

B Xie et al,[8] discussed the development of virtual reality (VR) technology for various training applications. First, we provide an overview of how current software and technology are generally used to develop and deliver VR training experiences. The difficulties and potential solutions of incorporating VR training into several application areas, including first aid, medical, military, workforce, and educational training, are then covered. We also go over the typical evaluation techniques and assessment procedures used to confirm the efficacy of VR training. The article's conclusion explores potential future directions for utilising developments in VR technology to create fresh training scenarios.

Daniel W. Carruth,[9] Virtual reality technology has become more accessible and cost-effective, making it a viable tool for education and training. Its immersive and engaging nature has led to positive learning outcomes in various domains. Virtual learning environments offer the opportunity for safe and controlled on-site training, access to otherwise unaffordable equipment, and the ability to explore and test solutions. However, the effectiveness of knowledge and skill acquisition in virtual reality is still being studied. To create effective virtual learning environments, it is crucial to understand the learning objectives, recreate real-world tasks, and assess user performance and learning. This process presents unique challenges and opportunities at each stage.

Helena et al,[10] study focuses primarily on the determining role of vividness as it explores the influence of virtual reality in the context of transformational brand experience appeals. A thorough assessment of the literature on vividness impacts in marketing communications is provided, highlighting the significant gap that the majority of the research that are currently accessible exclusively focus on informational messages. A three-dimensional conceptual framework is then presented. They conducted an experiment to close this gap and show, using a transformational advertisement, that virtual reality produces more vivid and present feelings than traditional two-dimensional videos, with vividness having a positive impact on attitudes towards the advertisement both directly and indirectly through presence. Additionally, our research shows that vividness has a good impact on brand attitudes, which in turn encourages consumers to make purchases. This highlights Virtual Reality's strategic potential for marketing communications.

Wang Kun et al, proposed that [11] all natural simulation and realistic experience technologies and approaches are included in virtual reality. Its primary purpose is to replicate real-life experiences and human-computer interactions based on nature. Virtual reality systems are those that can fully or partially do this. This essay explores the use of virtual reality technology in the real estate sector as well as the hardware and software requirements for its development.

C Peukert et al, proposed [12] that Companies are trying to learn more about how consumers behave when shopping in high-immersive virtual reality (VR) systems as they become more widely available. High-immersive VR settings have the ability to strongly evoke a sense of reality, which could significantly alter consumer decision-making when contrasted to internet buying. We contrast consumer decision-making from two virtual shelves: (i) a high-immersive VR environment employing a head-mounted display and hand-held controllers; and (ii) a low-immersive environment exhibiting products as rotatable 3-D models on a desktop computer screen. We examine how immersion impacts consumer choice using an incentive-aligned choice experiment. Variety seeking, price sensitivity, and happiness with the decision made are the three main choice qualities that we are looking into. The empirical findings show that customers in highly immersive VR make a wider range of product selections and are less price-sensitive. Choice satisfaction did not, however, rise in highly immersive VR.

## 2. NFT (Non-Fungible tokens)

NFT are unique digital identifiers that cannot be duplicated or copied it is recorded in blockchain so that it is safer. The ownership of the NFT can be trade since it is in blockchain. NFT can be of any thing such audio, video, digital files, 3D models.so we can buy and sell 3d models or some other assets by using NFT to make profits for example we can buy a T-shirt and try it in AR and buy the T-shirt that suits you in the real world. Maybe NFT can be a piece of virtual land that can be Bought and sold like real world lands. Since blockchain is very secure it is much protected. Blockchain is used to store sensitive data such as financial related data that are more confidential and needed to be protected. If we need to create a virtual world NFT are most important as it takes care of digital ownership such as property, Photos, videos, movies, art etc. Some NFT are sold even in millions of dollars. NFT can also be used in education, events, collaborations etc.



Fig1: NFT (Non-Fungible tokens).



In metaverse we can use this concept of NFT to build a virtual world and make it a virtual civilization let us imagine a city and its need if we need a land in metaverse we can get it through NFT. we can also create a virtual currency that can be used in that virtual world this currency can also be converted to a real world currency. Since NFT has uniqueness virtual currency cannot be duplicated. Since NFT are in global level it is easier for transactions. We can purchase a virtual car to travel in that virtual world by using that NFT

NFTs have the ability to give virtual experiences in VR unprecedented degrees of authenticity and ownership. Users can feel more in control of and ownership over their digital assets by employing NFTs to represent virtual goods and real estate, and transactions can be carried out in a more secure and verifiable manner.

### **MICRO TRANSACATION:**

Microtransactions can appear in virtual reality (VR) in many of the same ways as they do in other kinds of games and apps. Yet, because they can involve the purchase of virtual goods and services that exist within the virtual environment, microtransactions in VR have the potential to give users an even more immersive and customised experience.

The purchase of virtual cash is one of the most well-liked kinds of microtransactions in VR. Within the VR world, this virtual cash can be used to purchase virtual goods like virtual apparel, accessories, or even real estate. Playing the game allows you to earn virtual currency, but you can also use real money to buy it.

The purchase of cosmetics is another kind of microtransaction in VR. These include goods that players may buy and use to modify their avatars, such as clothes, accessories, and even virtual pets. Developers may give users a more immersive and customised experience by providing a variety of cosmetic things.

Microtransactions can be used to access premium features or content in some VR games and apps. For instance, a virtual reality game might offer a demo version that is free but has little content; nonetheless, gamers can purchase extra levels or features. Similar to this, a VR software might have a free version with only the most basic features, but users can upgrade for access to more sophisticated features.

The possibility of tangible products and services being linked to virtual purchases is one distinctive feature of microtransactions in VR. For instance, a virtual reality culinary simulation game might let users buy virtual supplies and links to real-world stores where they can buy the actual ingredients for the meal. Similar to this, a VR app that simulates a home renovation job might include virtual tutorials and tools in addition to links to real-world tool and supply shops.

Microtransactions in VR could be advantageous, but there are worries about how they would affect consumers. VR microtransactions, like other kinds, have the potential to promote obsessive or addictive behaviour, especially in vulnerable groups like children or people who have gambling addictions. Developers must consider the potential effects of any form of microtransaction and make sure that it is used morally and sensibly.

Finally, microtransactions have the potential to be very important in the development of VR. Developers may make an experience more personalised and engaging while still making money by giving customers a way to buy virtual products and services. Developers must take care to employ microtransactions in an ethical and responsible manner, and ensure that they do not have a negative impact on users.

### **Making simulations:**

Providing instructional and training simulations for students is one example of how VR simulations can be used to lower the cost of VR headsets. For instance, a business might develop a simulation of a virtual lathe machine that trainees can use to practise using the device without requiring access to a real one. The simulation would considerably lower the cost of training while offering students a safe and regulated environment to practise and develop the required skills.



Fig 2&3: operating lathe using VR.

fig 4: computer numerical control.

This strategy might also be used to other fields, such as healthcare, where virtual reality simulations can give students studying medicine a more authentic and immersive experience without the usage of pricey medical technology. For instance, a business might develop a virtual surgery simulation that enables medical students to practise surgical techniques in a secure setting. Before working with real patients, this would provide students the chance to hone their skills and gain confidence.

Performance-optimized VR simulations allow developers to create captivating, immersive experiences that work without a hitch on less expensive gear. This enables the delivery of high-quality training and educational experiences at a price far lower than that of conventional approaches. Additionally, developers may create experiences that are very relevant and significant for consumers by offering simulations that are suited to particular sectors and use cases.

Simulations based on virtual reality (VR) present an innovative and efficient method for instructing people in a variety of disciplines. The ability to practise and perfect one's skills in a secure and controlled setting is one of the major benefits of VR simulations. Here are a few instances of how virtual reality simulations can be used to train people.

Pilots can practise flying in a variety of weather conditions and emergency circumstances using VR simulations. These simulations give pilots a realistic experience that aids in the development of their abilities and knowledge, ensuring that they are well-equipped for circumstances that may arise in the real world.

To practise tactical scenarios and hone their decision-making abilities, soldiers in the military can employ VR simulations. These simulations allow soldiers to advance their abilities and knowledge without running the danger of harm or injury by simulating a variety of scenarios, including combat circumstances.

Doctors can practise operations and other medical procedures using VR simulations. Virtual reality (VR) simulations can offer a lifelike experience that enables medical professionals to advance their abilities and knowledge in a secure setting. This lowers the possibility of errors occurring during actual treatments, ensuring that patients get the best care possible.

Personnel in the construction sector can practise handling large machines and equipment using VR simulations. These simulations can offer a lifelike experience that aids in the growth of workers' abilities and knowledge, ensuring that they are well equipped for scenarios that may arise in the real world.

Overall, VR simulations provide a strong and efficient method of instructing people in a variety of subjects. For students to practise and hone their skills, they offer a secure and controlled setting, lowering the possibility of danger or injury in actual situations. We may anticipate seeing even more cutting-edge applications in training and simulation as VR technology continues to advance and become more widely available.



Fig 5: Flight simulation using VR .



Fig 6: Construction simulation using VR.

In terms of profitability, enterprises that produce VR simulations for training and education can make money by charging educational institutions, corporations, and individuals for access to the simulations. Given the rising demand for efficient and economical training solutions across numerous industries, this market has the potential to be very profitable.

In conclusion, employing VR simulations to lower headgear costs is a potential strategy that can make this technology more widely available. Companies may make money while promoting the use of VR technology by developing simulations that offer top-notch training and educational experiences. The secret to success is to design simulations that are performance-optimized and customised to particular sectors and use cases, giving users memorable experiences that are pertinent to their requirements.



**ADVERTISEMENT IN VR:**

Advertisements in VR provide a one-of-a-kind and highly immersive way for brands to connect with customers. Advertisers can engage with users in a natural and organic way by placing ads within the virtual environment, while also providing a new level of interactivity and engagement.

One of the primary advantages of VR advertisements is the ability to create highly targeted and personalised ads. Brands can create ads that are tailored specifically to individual users by leveraging data on user behaviour and preferences. This not only makes the ads more relevant and engaging, but it also increases the likelihood that users will take action on the ad, such as making a purchase or sharing the ad with their social networks.

**Advantages of advertising in VR:**

Another benefit of VR advertisements is the ability to create truly immersive experiences that allow users to interact with brands in ways that were previously not possible. A car manufacturer, for example, could create a virtual reality experience that allows users to explore the interior of a new car model, or a fashion brand could create a virtual reality fashion show that allows users to see and interact with the latest fashion trends. By creating these immersive experiences, brands can strengthen their connections with their audiences and leave a lasting impression, which can lead to increased brand loyalty and sales.

Of course, as with any form of advertising, there are risks and challenges associated with VR advertisements. Users may feel uneasy or violated, for example, if they believe that ads are invading their personal space or that their privacy is being compromised. Furthermore, some users may find the use of VR for advertising purposes to be intrusive or distracting, especially if the ads are aggressive or intrusive.

Despite these obstacles, the potential benefits of VR advertisements are significant. Advertisements in VR have the potential to revolutionise the advertising industry and usher in a new era of more engaging and immersive advertising experiences for users by providing a new and innovative way for brands to connect with consumers. It will be interesting to see how advertisers continue to explore this exciting new frontier in advertising as VR technology evolves and becomes more mainstream.

**Some example advertisements in VR:**

**Volvo XC90 Test Drive:** In 2014, Volvo developed a virtual reality (VR) experience that allowed users to take a virtual test drive of their XC90 SUV. Users were able to explore the car's features, take a virtual test drive, and even see what the car would look like in different colours and environments by wearing a VR headset.

**Coca-Cola VR:** Coca-Cola has also dabbled in virtual reality, launching a campaign that allowed users to take a virtual sleigh ride through a winter wonderland. The experience was created to promote Coca-Cola's "Taste the Feeling" campaign by allowing users to interact with Coca-Cola branding and products in a fun and engaging way.

These are just a few examples of how advertisers are utilising VR to provide consumers with engaging and immersive experiences. We can expect to see even more exciting and innovative uses of VR in advertising in the future as VR technology evolves and becomes more accessible.

**VIRTUAL CURRENCIES IN VR:**

Virtual currencies are a type of digital currency that can be used to purchase virtual goods and services in virtual reality (VR) environments. VR currencies can be spent in a variety of ways, including in-game purchases, auctions or virtual marketplaces, and even gambling.

One of the most common applications for VR currencies is in video games, where they can be used to buy virtual items like weapons, clothing, and other accessories. These virtual items can improve a player's in-game experience by adding new gameplay options or allowing for customization. Some games even allow players to buy and sell virtual items with other players, resulting in the formation of a virtual economy.

VR currencies can also be used to buy virtual real estate or land within VR environments, allowing users to design and personalise their own virtual environments. This can be especially appealing for businesses looking to establish a virtual reality presence because it allows them to create branded virtual spaces to showcase their products and services.

VR currencies are used in other types of VR experiences, such as social VR platforms and virtual marketplaces, in addition to video games and virtual real estate. In social VR platforms like VRChat, for example, users can buy virtual items like avatars, gestures, and animations to improve their social interactions with other users.

### Advantages of using virtual currencies:

One of the advantages of virtual currencies is that they can be designed to be secure and transparent, with transactions recorded and verified using blockchain technology. This can help to prevent fraud and hacking while also increasing transparency and accountability in virtual economies.

### Risk associated in virtual currencies:

The risks associated with virtual currencies, are security concerns and potential regulatory issues. VR currencies, like any digital currency, are vulnerable to hacking and fraud, and users must take precautions to safeguard their virtual assets. Furthermore, the use of virtual currencies in virtual economies raises concerns about regulatory and legal frameworks, particularly as these currencies become more common and valuable.

Overall, VR currencies represent a significant opportunity for VR developers, businesses, and users. VR currencies can help drive engagement and monetization within VR environments by enabling users to buy and sell virtual goods and services. However, as with any emerging technology, it is critical to understand the risks and challenges associated with virtual currencies and to use them with caution and care.

### REALESTATE IN VR:



Fig 7: Real-estate in VR.

The use of virtual reality (VR) technology is changing the way we buy and sell real estate. VR allows potential buyers to explore properties in 3D from the comfort of their own homes by creating immersive virtual environments. Here's a closer look at how virtual reality is changing the real estate industry:

**Virtual property tours** are one of the most popular applications of VR technology in real estate. A virtual tour allows potential buyers to thoroughly examine a property, moving from room to room, examining features, and getting a sense of the space. Buyers can get a sense of the property's potential by customising virtual tours to show different colour schemes, flooring options, and furniture layouts.

**Remote collaboration:** Virtual reality technology allows real estate agents and clients to collaborate remotely. Agents can use virtual reality to share virtual property tours with clients, allowing them to explore properties from different locations together. This is especially useful for clients who are unable to visit properties in person, as well as for agents who need to collaborate with other agents.

**Design and renovation visualisation:** Virtual reality technology can also be used to visualise property design and renovation ideas. Buyers and sellers can use virtual reality (VR) to create virtual designs for properties that include various materials, layouts, and furniture arrangements. This can assist buyers in visualising the potential of a property and provide sellers with a better understanding of what buyers are looking for.



VR technology can also be used to create immersive marketing and advertising materials for real estate properties. Virtual property tours can be used in online listings and social media advertising campaigns to provide potential buyers with a more engaging and interactive experience. Virtual reality technology can also be used to create virtual staging, which allows real estate agents to showcase properties using virtual furniture and decor.

### **Challenges and limitations of real estate in VR:**

VR technology can be expensive to implement, and it requires specialized equipment and expertise. Additionally, some buyers may prefer to view properties in person rather than through a virtual tour. Finally, there are still some technical limitations to VR technology, such as resolution and latency issues, that can impact the quality of the virtual experience.

### **What is the benefit if VR headset becomes affordable?**

Affordable virtual reality (VR) headsets have a wide range of advantages. The following are a few of the most important benefits:

1. **Accessibility:** With more individuals able to afford VR headsets, this innovative technology will be more widely available. This applies to people who previously couldn't afford pricey VR equipment or who live in places with only sporadic access to VR facilities.
2. **Social Interaction:** By allowing people to connect and communicate in virtual environments, VR technology may potentially enhance social interaction. People who are unable to travel or who have few social chances in their immediate environment could find this to be especially helpful.
3. **Training:** Affordable VR headsets may also help the workforce by allowing employers to give their staff members immersive, lifelike training experiences. This might be especially useful in professions like medicine, where students might practise operations and other procedures in a secure setting
4. **Entertainment:** VR technology has already made tremendous advancements in the entertainment sector, but more accessible headsets may create new chances for smaller developers and content producers to produce immersive and compelling content. Customers may be able to choose from a wider variety of VR experiences as a result.
5. **Education:** By delivering immersive and interactive experiences, virtual reality technology has the power to completely transform the way we learn. With the help of reasonably priced VR headsets, this technology might become more available in colleges and universities, enabling students to explore a variety of disciplines in novel and engaging ways.

### **Conclusion:**

The availability of low-cost virtual reality (VR) and augmented reality (AR) technology has the potential to transform how we interact with digital content and the world around us. These technologies are becoming more accessible to the general public, enabling a plethora of new applications and use cases in education, training, entertainment, and social media.

Affordable VR and AR technology can help people learn new skills, increase workplace productivity, and improve our ability to communicate and collaborate with others. However, there are still issues that must be addressed, such as improving hardware and software capabilities, addressing data privacy and security concerns, and ensuring universal accessibility.

By following /utilizing the policies of NFT, Micro-Transactions, advertisements, virtual currencies we can make the VR and AR devices more affordable.

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### **REFERENCES:**

- [1].Zheng, J. M., K. W. Chan, and Ian Gibson. "Virtual reality." *Ieee Potentials* 17, no. 2 (1998): 20-23.
- [2].Girvan, Carina. "What is a virtual world? Definition and classification." *Educational Technology Research and Development* 66, no. 5 (2018): 1087-1100.
- [3].Wu, Chih-Hung, and Chien-Yu Liu. "Educational Applications of Non-Fungible Token (NFT)." *Sustainability* 15.1 (2023): 7.
- [4].Švelch, J., 2017. The discourses of microtransactions' acceptance and rejection in mainstream video games. The evolution and social impact of video game economics, 101.
- [5].Yamaguchi H. An analysis of virtual currencies in online games. Available at SSRN 544422. 2004 Sep 1.



- [5]. Yamaguchi H. An analysis of virtual currencies in online games. Available at SSRN 544422. 2004 Sep 1.
- [6]. Němec, Martin, Radoslav Fasuga, Jan Trubač, and Jan Kratochvíl. "Using virtual reality in education." In 2017 15th International Conference on Emerging eLearning Technologies and Applications (ICETA), pp. 1-6. IEEE, 2017.
- [7]. Mantovani, Fabrizia, Gianluca Castelnuovo, Andrea Gaggioli, and Giuseppe Riva. "Virtual reality training for health-care professionals." *CyberPsychology & Behavior* 6, no. 4 (2003): 389-395.
- [8]. Xie, Biao, Huimin Liu, Rawan Alghofaili, Yongqi Zhang, Yeling Jiang, Flavio Destri Lobo, Changyang Li et al. "A review on virtual reality skill training applications." *Frontiers in Virtual Reality* 2 (2021): 645153.
- [9]. Carruth, Daniel W. "Virtual reality for education and workforce training." In 2017 15th International Conference on Emerging eLearning Technologies and Applications (ICETA), pp. 1-6. IEEE, 2017.
- [10]. Van Kerrebroeck, Helena, Malaika Brengman, and Kim Willems. "When brands come to life: experimental research on the vividness effect of Virtual Reality in transformational marketing communications." *Virtual Reality* 21 (2017): 177-191.
- [11]. Kun, Wang, and Hu Zong. "Application study of virtual reality in real estate industry." In Proceedings of the 3rd WSEAS International Conference on COMPUTER ENGINEERING and APPLICATIONS, pp. 247-251. 2009.
- [12]. Meißner, Martin, Jella Pfeiffer, Christian Peukert, Holger Dietrich, and Thies Pfeiffer. "How virtual reality affects consumer choice." *Journal of Business Research* 117 (2020): 219-231.

