

# Impact of Virtual Reality on Gaming

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**Abstract** - Video games became one of the crucial entertainment medium in twentieth century. In twenty-first century, its impact is multifold and drastically improved. After the advent of mobile phones and handheld devices, gaming industry revolutionized in these new market platforms. And for the past few years another factor, along with many others, is helping the experience of gamers' to enhance is Virtual Reality. Though being just a part of this gaming industry, VR has impacted noticeably and will continue to do so in upcoming decades. Now a days, people, especially young generation, is spending time in playing VR enabled games like never before. Hence the need to take a note of the impact on industry as well as consumers becomes essential. This paper discusses the impact of virtual reality on gaming with both industry and gamers' perspective.

**Key Words:** Virtual Reality(VR), Video Games, Digital Games (DG)

## 1. INTRODUCTION

Digital entertainment is capturing lot of market share for few decades and DG is a major part of it. As technology advanced; the quality and mediums of play are improved too. Inclusion of VR in gaming has taken it to the next level; mainly in the area of user interaction and involvement. In this section introduction of two main parts of this paper is given: Video gaming and VR.

### 1.1 Video Gaming

Video game is the electronic game which has visual feedback when player interacts with visual interface. It can be two-dimensional or three-dimensional. This includes various types of software and hardware combinations. Though video games appeared mainly in 1970s; it was 1980s when they became important part in the entertainment industry.

Initially started on the console platform; where a specialized device is developed for game, which connects to a video monitor for display purposes. Consoles are developed by specific companies to play specific games.

Consoles include handheld and arcade types. Where handheld devices are portable electronic circuit devices having integrated display, controller buttons and/or joysticks, speakers to elevate user experience on a single device. Started as a single game per console in 1970s, handheld consoles went on to include multiple games on single console after 1990s.

Arcade type console games use dedicated console for a game concealed in a large cabinet. The cabinet also has a video display (mainly CRT), joystick/s and/or other controls, speakers. Arcade games were top of their business in 1980s; then as technology advanced in game entertainment sector, cheaper and smaller options became available and arcades' popularity decreased.

Video gaming also adapted for the personal computer (PC) environment. Where PCs, as we know, are not dedicated gaming platforms but are used to play several games. And as PCs became popular, game developers also shifted their attention to them as a platform too. Now we see several dedicated PCs and laptops for enhanced gaming performance having displays with better refresh rates, powerful CPUs and dedicated graphics processors.

Mobile phone is also a huge platform for video games. In late 1990s games started appearing on mobile devices. Many of us might remember those popular *Snake* and *Tetris* games on old phones. Initially included for entertainment purposes, games on phone now became a bigger business for many companies around the globe. Especially after smart-phones appeared, iOS and Android phones created a fantastic platform for game developers. Smart-phones are well equipped with numerous sensors which give great implementation opportunities to developers; also they are portable and cheaper as compared to other options. Being a billion dollar industry, mobile phone gaming is surpassing PC and console game industries combined estimated worth more than \$130 billion.

Another platform for gaming is Web Browser. In 2000s it became a cross-platform option for games. Not heavy games, many others are developed using Java or Flash platforms and are implemented for integration and interaction on web browsers.

Virtual Reality became a buzzword in twenty-first century but its relation with games started back in 1968 when Ivan Sutherland, a computer scientist, developed "Sword of Damocles" the first VR environment at his lab. Which we can consider as a base of devices we use today in our VR experience. VR requires the player to use a head-mounted unit which has motion tracking and stereoscopic screens (a 3D display screen with depth perception) to immerse a player in the environment which is virtual and responds to user's head movements. VR requires a console, processing device or computer to couple with the head-mounted unit.

## 1.2 Virtual Reality

Virtual Reality (VR) can be defined as a simulation to give user a similar or different experience than the real world; VR is basically the technology that replaces real world with synthetic/virtual world. Hence the user experiences his/her presence in another domain or world.

VR uses systems and techniques to create virtual environments by using computers. In those environments, users can move, interact with objects and experience them as if they are in real world. VR involves hardware such as stereoscopic displays, different sensors such as motion sensor, different input devices and the software to integrate all these. These traits of VR make it a great candidate to be used for simulated training, entertainment, interactive education and yes, for game development.

VR concept was used back in 1930s where Link Trainer, the commercial flight simulator, was created by American inventor Edwin Link in 1929. Then in 1930s, a science fiction writer S. G. Weinbaum wrote a story mentioning an idea of a goggle pair which makes the user experience a fictional world through hologram, taste, touch and smell. But then Morton Heilig who is considered as a pioneer in VR technology and cinematographer created *Sensorama* in the decade of 1960. This has a theatre cabinet, having arcade style arrangements inside. It allowed user to see stereoscopic films along with enhanced experiences of seat motion, aromas, winds and sounds during the show of film. This helps the immersion of viewer into the film. Since then use of VR concept by many authors and inventors increased.

VR is widely used because it can train users for different situations without the risk of actual harm or cost. VR mainly deals with human brain which uses different perceptual cues like visual, smell, motion, acoustic and haptic. Training brains with VR works on the concept that brain can't easily differentiate between real and virtual happenings when created a certain environment, as we can create in VR. Hence when trained in virtual, it is trained as in the real world training. Out of many use cases, in this paper we are mainly focusing on VR's use in games and its impact.

## 2. VIRTUAL REALITY IN GAMING



Virtual reality's size in gaming industry is ever expanding for past few years. The new era of VR in gaming started since the advent of Oculus VR and VR gear by Samsung, HTC also launched Vive in 2015 with enhanced controls and then at the end of that year, VR in gaming reached more than \$4 billion.

There are around about 230 VR development companies since then which produce different VR software and hardware. Oculus VR, Google, Microsoft, Unity, Samsung just to name a few giant ones among those. VR gaming market revenue already has reached more than \$15 billion in 2019. It is estimated that these companies will make revenue of around \$23 billion in 2020 which was around \$3.5 billion in 2016. These stats show how market is moving fast in VR game revenue. So we can see the great emergence of VR's role in gaming industry.

VR mainly focuses on 5 types of senses the user can experience. Of course for this more VR hardware, such as VR suit, is required to experience some; for others the head-mounted VR kit is enough:

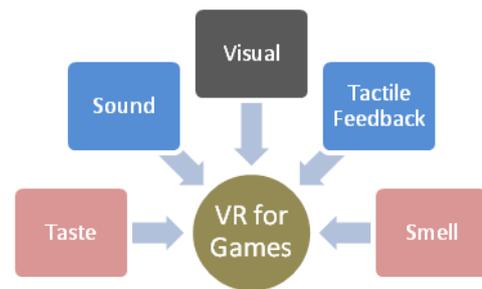


Fig -1: Types of Senses in VR

1. **Visual:** The user experiences his/her presence in a virtual environment visually; in 3D and 360 degrees. Special lenses are used in the VR headset.
2. **Sound:** When moving in virtual environment, different sound inputs along the way are used to enhance the experience of user. To make the environment feel real, the inputs are designed according the user's interaction with the virtual world, the object's distance and the user's direction in the virtual world.
3. **Tactile Feedback:** It deals with touch sensation; it mainly consists of vibrations for short or long periods and of different intensities and frequencies. These are used according to game need. For example, in shooting game the player may experience one kind of vibration in hand while shooting with a gun, other type of vibration while shooting a pistol or a different type of vibration while got hit by a bullet and so on.
4. **Smell:** Sense of smell is also a good tactic to make user feel real in the environment. But implementing

it in VR was not simple as VR is not a scent device. Now companies like Feelreal are implementing masks which can be used with popular VR sets in current market to give users the smell experience while playing by using the combinations of scents provided.

5. **Taste:** Taste sense generation in VR is yet another tedious task. Scientists are working on it in different universities. These work on thermal taste technology; which produces different temperatures on tongue, hence activating different taste sensations without the use of chemicals. This technology may be included in mainstream VRs in upcoming years and can be utilized for various game situations and domains.

### 3. THE APPLICATION DEVELOPMENT PROCESS USING VR

There are few important tasks the VR developer deals with throughout the development process

1. **The development direction:** The direction depends on the requirements of application; in our case the game. Also the platform/s for which the VR is being developed, the most common platforms are Desktop devices (HTC Vive, Oculus Rift etc.) or mobile devices (VR gear by Samsung, Google Cardboard etc.). The VR application developed for mobile platform is for mobile phones, smart-phones and tablets. Where desktop development focuses on VR devices like VR helmets and VR glasses.
2. **VR Software:** Developer needs to deal with interactive 3D development technologies while developing for VR games. Games are developed by giving special attention towards immersive experience, presence effects, movements and graphical optimization effects. VR engines are the preference of many developers; the most popular are *Unity Engine* and *Unreal Engine*. Both of them have a wide array of tools, a better control over 3D environment, facilities to import own created content (Pictures, videos, audios etc.), program integrity with languages like C# and inbuilt game-play.
3. **VR Content:** Content is one of the important part while developing VR environment; not only for games but for any VR application. It uses 3D modeling techniques provided by engines for arrangement and representation.
  - a. **Graphics Content:** As we know VR mainly consists of Virtual elements, the graphical content is core for VR development. The user's first impression of the VR game is

influenced mainly by graphics content. Most of the content can be preloaded or is available, as it is given by the engine's store; *Unreal Marketplace* for *Unreal Engine* and *Unity Asset Store* for *Unity Engine*, and most of it is available for free. User can also create own graphics content such as graphics images, templates; videos etc. and integrate that in the VR environment.

- b. **Audio content:** To increase the immersion factor of the VR game for the user, correct audio while game-play plays an important role. Audio effects and background score in different situations of game create a noticeable impact on users. This content can also be imported to the engines according to need.
  - c. **Other content:** This includes the content generated for smell experience generators and taste experience generators. Though not the mainstream practices in VR experience; these contents can also play vital role in overall immersion.
4. **User Interface (UI):** As in the case of any software, VR game interface also need to have good attention from the developer. UI is the entry point and if not interactive as well as attractive, user may lose interest. UI and UX testing is a firm necessity at this stage of development process.
  5. **The VR Development process:** After gathering all necessary components, the developer now has to compile them together to make their interaction and presentation seamless. This should be started with numerous prototypes; then reduce and refine the complexities. Then comes the analysis/testing phase where testing and development team goes on to use the VR game for real, using VR hardware and on the actual user's platform as specified. Here the process only stops after a complete flawless (as per their perspective) product is done.

### 4. OVERALL IMPACT ON VARIOUS FACTORS

As we can see the introduction of VR technology in gaming industry has shook gaming market in profitable ways; we should give attention to some main factors.

The market revenue has gone up by almost 3000% from 2015(around \$0.66 billion) to 2019 (more than \$15 billion) and is expected to grow in an ever increasing rate to reach \$100 billion by 2022. This generates enormous opportunities in this field of technology.

The job market study from 2014 in the field of VR and AR(Augmented Reality) shows that, the job

opportunities in 2019 are increased more than 1300%. It is also a fact that the job market is expanding for this field; so opportunities are growing as demands and challenges are coming in the industry.

The advent of VR in gaming made the gaming environment enriched with new elements, the better Virtual world experience, better interaction ways and possibilities with the game arena. Virtual objects look more appealing when interacting with VR hardware. The immersive experience with this makes games more engaging than before the introduction of VR in games. Another big advantage of VR's introduction in games is that, while in traditional game setups user remain stuck in front of screen for hours while playing; in VR type games, user moves and makes gestures and more physical actions than just moving the fingers. So it actually burns up calories while playing a VR enabled game, few examples are VR tennis, VR cricket, some VR shooting games.

VR's inclusion in games has some cons too. The cost of the systems that run VR games fluently is on a bit higher side than the regular machines with basic configurations. Some health issues also noted by users while using this technology in games like headache, blurred vision. Not so severe but considerable effects. The use of immersive VR games can turn it into an addiction, and overuse of it might make it into a bigger problem; hence limited use and enough rest to eyes is advised.

As the cost of VR hardware and games will decrease, it will become more available and accessible to users and then it will be a common life tool like we saw in the case of smart-phones. The possibilities generated with VR are manifold and useful. And VR has really become the 'Next Big Thing' in the video gaming world.

## 5. SUMMARY

Video Gaming and Virtual Reality are both bit old concepts as per their introduction to the world. As technology advanced, the merger of them has proven to revolutionize both industries. As the client base and demand of VR games is increasing for the past few years, VR games are not remained an experiment but became a major player in gaming. As it is surpassing traditional gaming techniques new challenges and opportunities are awaiting in VR gaming. And industries are ready to tackle them.

## CONCLUSION

The study of Impact of Virtual Reality on Gaming shows how technology can lead to the things which were not imaginable a few decades back. The true gaming experience in virtual world and interaction is possible because of VR. Yet scope for more refinement and development is present. VR revolutionized gaming industry and more doors are opened

for developers; and consumer market is ready for this immersive experience in upcoming years.

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