Feasibility Analysis of Virtual Reality for Consumers

For

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By

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Letter of Transmittal

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Professor Tobias Peterson

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Dear Professor Peterson:

Here you will find my report, Feasibility Analysis of Virtual Reality for Consumers. In preparing this report, I have learned a great deal about virtual reality and the future of where it will thrive. In the rise of virtual reality, I learned that many companies are jumping on the bandwagon and trying to start their own virtual reality company or a subsidiary of another major corporation. I believe that the information will be a resource for my audience in evaluating this technological product. Thank you for opening your schedule for discussion, giving me advice, and the encouragement to approach this topic from a different angle.

This report has reshaped my attitude by allowing me to grasp the concepts that are in the four course learning outcomes of this class. I have learned to analyze and evaluate the credibility of sources by researching the author's background. This has led me to exemplify my skills in searching for a credible source for my document that has for a specific purpose and work-world audience.

Integrating credible sources has been a difficult obstacle for me as I wrote papers that needed visuals and proper signal phrasing. I am gracious to have the help provided by my professor to use quotations, paraphrases, and summarizations. Signal phrasing at the beginning of a phrase, clause, or even a sentence to set the tone of the speaker/author's context in which the quotation is established. Learning this skill has expanded my knowledge in integrating credible sources and exemplifying that I can properly introduce a quotation with the context and tone of the speaker that has a specific purpose and work-world audience.

Along the lines of the four course learning outcomes, I have absorbed the knowledge of incorporating visuals to convey information that satisfies the five pillars of technical writing: Factual, Active, Clear, Concise, and Specific (F.A.C.C.S). The ethical practice has allowed me to

break from my old habits in not properly citing visuals and using Purdue Owl to help cite my sources properly in my captions. Creating an effective caption to bring clarity with correct formatted white spacing and the accuracy to write an ethical document for a specific purpose and a work-world audience

Lastly, I brainstormed multiple research topics for my feasibility report and provided feedback to students on their research topics. I edited and revised other student's feasibility reports using F.A.C.C.S rubric. Thus, exemplifying that I am able to contribute successfully to a group in the creation of work-world documents.

This class has taught me time management and breaking down large research reports into smaller portions. Creating a schedule to achieve established short-term goals to help maintain order and focus. This leads to reducing stress and transforming a large mind-boggling report into a feasible report. In this future, I am going to utilize the ethics, teamwork, and organization to communicate with colleagues and teachers as I transfer to WSU Vancouver and hopefully in a couple of years, my co-workers.

I am proud of my work this project and welcome your feedback anytime. Please contact me through Canvas email or at s.singh10@students.clark.edu with any questions or concerns.

Sincerely,

Shanpreet Singh

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Informative Abstract

The feasibility of virtual reality for consumers is based on the new piece of technology that is emerging and changing the tech marketplace. Consumers will purchase this product for several reasons such as entertainment from gaming and augmented purposes or more serious matters such as job training and the health impact.

This technology has been proven to be helpful in various that consumers feel best suit themselves. The VR industry is growing and emerging to become one of the top products in the tech marketplace. Companies such as Google, Sony, Facebook, etc., have started to invest and create virtual reality headsets. Some examples of devices created by companies are Facebook's sub company Oculus, creating the Rift and Sony's PlayStation 4 compatible virtual reality headset. This creation of these devices can lead to advantages and disadvantages to physical and mental health. PTSD can be treated through virtual reality and that can help soldiers in need. However, the disadvantages are that it can cause digital eye strain and cybersickness. Companies are currently researching cures/solutions in reducing the chances of these side-effects. Lastly, job training is very significant in that VR can train medical students and military soldiers.

I believe and fully expect Initech to accept my proposal to invest in the product of virtual reality. The opportunity to invest is now and doing so will bring much profitable gains to Initech. Insuring this belief, I have created a document with a lot of statistics and facts to bring to the table.

Consumers interested in investing or purchasing in virtual reality in the future should consider these recommendations:

- What is the overview of the virtual reality market?
- What companies are currently investing in virtual reality?
- How does virtual reality affect our health?
- What is an example of how can virtual reality can be used in the real world?

Introduction

The world is large and filled with different environments and locations that might not be able to be experienced in a person's lifetime. Experiencing and dreaming up these bucket list places or activities are two different things, however, what if you could experience the beautiful sights and sounds of let's say Kyoto, Japan. Japanese culture is special and inimitable. If you could see the Japanese Kyoto gardens at the comfort of your home, then why not try it?

Imagination is the reason that humans are thriving in technology and achieving unimaginable experiences. Virtual reality is the next big technological innovation that has caught the world by storm by its amazing immersive aura to the brain. The definition of virtual reality is quite magnificent in that the experience "can include 4 of the 5 senses, including vision, hearing, touch, and possibly even smell" (Mullis). The way virtual reality functions are by tricking your brain into believing you are in a 3D world. In an article written by Alex Mullis, a former development engineer/writer for Android Authority says, "the first way VR does this is with the stereoscopic display. This works by displaying two slightly different angles of the scene to each eye, simulating depth. This along with other ways to simulate depth like parallax (farther objects to you seem to move slower), shading and techniques create an almost life like experience. An example of what a stereoscopic display looks like can be found above" (Mullis). The weapons are slightly angled differently because the sight in which both of your eyes will view these images will line up perfectly to show one perfect image. That is the wonderful stereoscopic screen view in which varies as you change from one virtual reality headset platform to another.

Figure 1: Sensoroma - First virtual reality device (Source: Virtual Reality Society)

Virtual reality has said to have begun in the 1950s, but researchers have discovered some "early elements" that have been traced all the way back till 1860's (Virtual Reality Society). The first signs of the concept of virtual was set back during the 1920's when the world's first flight simulator was created by Edwin Link and designed to train novice pilots. This eventually lead to the *Sensorama* (invented in 1957) to become the first type of multimedia device. This device used a rotating chair and consisted the following elements:

- A viewing screen within an enclosed booth which displayed stereoscopic images.
- Oscillating fans
- Audio output (speakers)
- Devices which emitted smells

Virtual reality headsets have arrived here in present day after a long struggle in the past 60 years (as of 2017). Companies such as Facebook, Sony, and Google have started research,

development, and began selling virtual reality devices. There are many applications of virtual reality in places like education, healthcare, and entertainment/gaming.

This report will provide the primary target audience – Initech and the public with technological interest- with a clear, ethical, unbiased data on the benefits of purchasing a virtual reality headset and how this will impact our society. Virtual reality has been rising in the past few years and consumers all over the world have been seriously considering on purchasing these devices because of the health & learning benefits paired with the amazing interactive entertainment/gaming experience. I hope to be explicit with any misconceptions that may discredits virtual reality and those reading this document will consider investing in this technology.

Collected Data

Industry Overview

Virtual reality's performance has changed the global marketplace dramatically. In *Virtual Reality Industry Report*, Greenlight Insights forecasts moderate VR industry growth in a short time-span, growing into a major global marketplace by 2021. Greenlight Insights report offers proprietary insights provided in multiple categories with great focus, mosaic approach, and rigorous research methods. They construct unbiased opinions and let their data explain the process in which lead to their conclusion about virtual reality. They are anticipating a moderate growth within the next 5 years predicting a $67.6 billion increase from $7.2 billion (2017) to $74.8 billion (2021. This will the lift virtual reality industry into a major global marketplace in the year of 2021. Greenlight Insights, partnered with *Road to VR*, display trends to keep an eye out for in 2017 with major corporations such as Microsoft with their Windows 10 operating system that include VR-related hardware and software. This introduction of new hardware platforms from top PC manufactures will accelerate the availability of affordable headsets and VR-ready computers (Road to VR). Concluding, consumers across the globe will purchase these headsets because of the affordability.

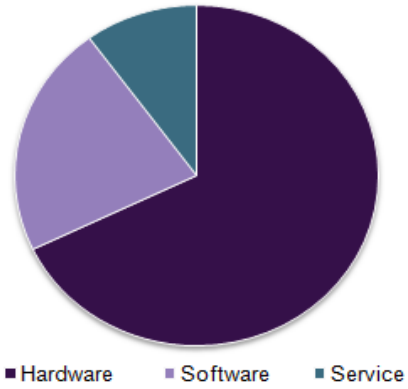

Figure 2: The Pi-Chart above shows the amount of service, software, and hardware that is included in virtual reality

The Rise in Virtual Reality Headsets

The biggest thing to know when investing in a product is the supply and demand curve. I have some knowledge from my macro-economics class and learning about the supply verse demand curve. In-context to virtual reality, finding the consumer base and figuring out whether it is growing or not is important. Too much supply and little demand will lead to a fall in equilibrium price, but the effect on the equilibrium quantity cannot be determined. For any quantity, consumers now place a lower value on the good and the producer are willing to accept a lower price; therefore, price will fall. Although, data shows that the demand is increasing and this is notifying the virtual reality corporations to increase their supply. This increase of supply and demand will increase the equilibrium output, but the price cannot be determined. *However, I mentioned earlier that the PC manufacturers are producing more*

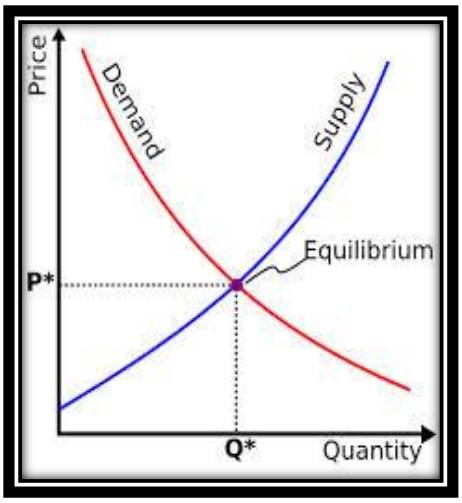

Figure 3: The graph provided above is a supply & demand curve

virtual reality oriented hardware and software that will accelerate the affordability of the supply and soon allow consumers to be able to purchase these headsets at a fixed price (Road to VR). Also, according to SuperData, a games & interactive media intelligence company, virtual reality has a growing consumer base which includes:

- Eighty-three percent (83%) of PC VR users have the space for room-scale VR
- Male millennials are most likely to use console headsets over any other device (52%) since 3 in 4 are gamers.
- Forty-eight percent (48%) of females over 35 try headsets at home, often using a family member's device.
- Retail demos are the most popular way American consumers become interested in VR before buying.

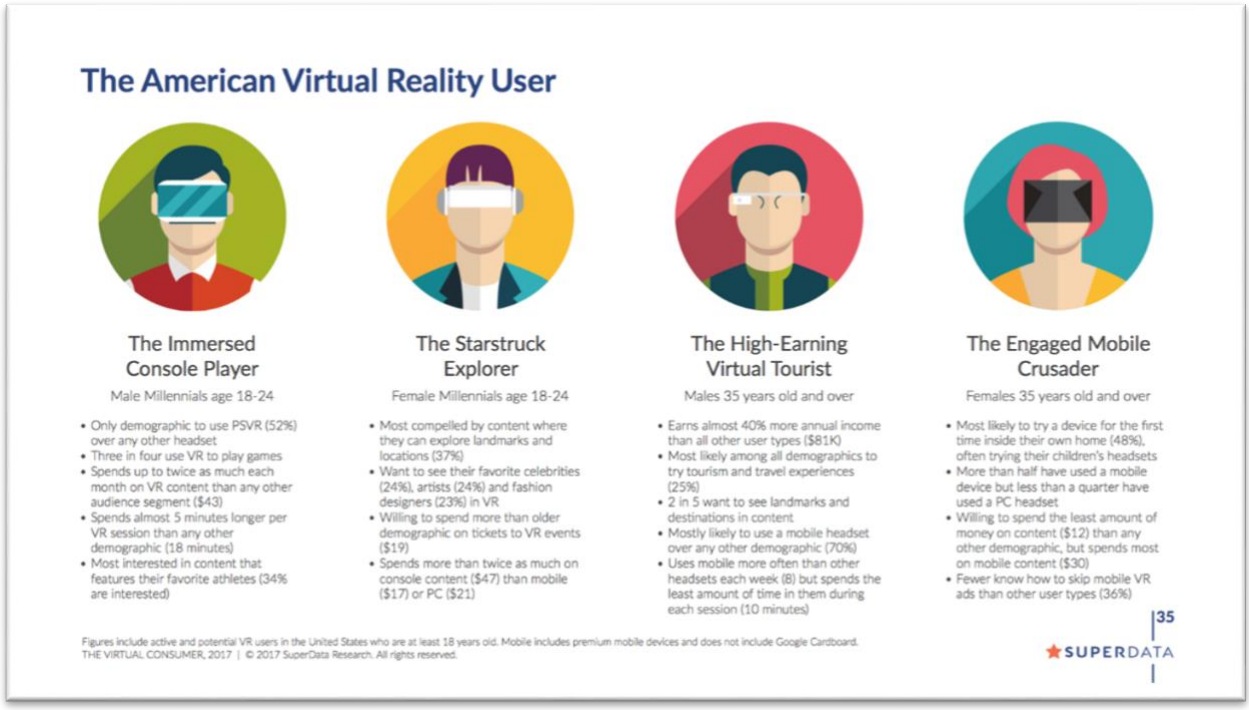

Figure 4: Virtual reality consumers (Source: SuperData)

What Corporations are Currently Investing in Virtual Reality?

Consumers that are willing to purchase a virtual reality headset, have a good market to decide on what variety of specifications they want in their headset device. The corporations that are currently investing in virtual reality are HTC, Oculus who was bought by Facebook for approximately $3 billion (Heath), Sony, and other major corporations such as Apple, Google, Samsung, etc. These companies have developed amazing technology for gaming consoles, phone, and PC compatibility. Some examples of the Sony PS VR and the Facebook Oculus.

Facebook Oculus

Oculus is a PC compatible virtual reality company that has emerged in recent years. They have created the Oculus Rift, a headset that allows consumers to step into their favorite video game, watch immersive VR movies, jump into a destination on the other side of the world, or just spend time with friends in VR. They believe that their Rift's "magic of presence" starts from their advanced display technology combined with precise, low-latency, constellation tracking system which enables the sensation of presence. The headset has a Touch controllers that are intuitive to the consumer's actions and this brings a natural sense of real motion. The rift is Windows compatible and they have an app created just for virtual reality. Further branding their connections with top manufacturers, they are providing a range of systems that are optimized for Rift. The prices for the Oculus Rift costs around $500 and the Oculus Touch costs $99.99 dollars.

Sony PS VR

Sony is a gaming company that entered the VR marketplace with their popular PS VR. They provide highly anticipated titles including Star Wars Battlefront. The gaming augmented experience in games like PlayStation 8VR Worlds, Golem, and RIGS Mechanized Combat League. They believe that their product brings a "new world of unbelievable gaming experiences" through PlayStation VR. They even have something like what Oculus has in that they created a PlayStation Move Motion hand held controller that is intuitive with the consumer's actions along with the PlayStation camera that records your movement and implements it into the game. The PS VR costs around $400 dollars and with a bundle it costs $500 dollars.

Other Major Corporations

Besides those two corporations and their great virtual reality devices, companies such as Apple, Google, Samsung, and Microsoft have begun and have some products available in the market. These products are Google's Cardboard, Samsung Gear VR, and Microsoft's Hololens. The HoloLens is competing with Sony's PS VR and partly with the Oculus Rift due to its gaming console compatibility. This market is growing larger and larger as companies are beginning to emerge and compete with one another. The market will soon develop into heavy competition so that the prices of virtual reality will drop as the technology develops.

Health Impact

In the many areas of healthcare, virtual reality is used in a wide-range from diagnosis, surgery, rehabilitation, treatment, and counselling/therapy. Virtual reality is used in many ways that

include medical job training. However, in this section we are going to focus on the medical advantages and disadvantages in using virtual reality.

Advantages

The advantages of virtual reality are that it can act as a therapist. Besides developing better hand-eye coordination and the retention and recall improvement, according to the Virtual Reality Society says ”the device can be utilized as a way to treat people who have developed post-traumatic stress disorder (PTSD),” (Virtual Reality Society). This can extend to phobia treatment too. An example of PTSD, provided by the Virtual Reality Society, is that of the soldiers who served in the front lines of large battles and wars. This leads to traumatic events and virtual reality teaches techniques for dealing with these symptoms.

Disadvantages

The disadvantages of virtual reality are that it has side some side effects that come along with it’s fun and enjoyable experience, as does everything. Keep note that some of these side effects don’t always happen, but every human is different and it can be minor, some may be minor, few are serious, and some are very rare depending on a person’s brain reaction. The most common side effect from using virtual reality is something I experienced during my first time using it, caused nausea and dizziness or in the cyber world known as cybersickness. The first application I used on my Samsung Gear VR was Rilix VR, which is one of the best current virtual reality simulators. This simulator fulfilled the excitement of riding roller coaster and took place in a Diamond Cave, where you get a 360-degree scenery view, plus, the thrill of twists and turns in which caused my side effects. During the sequence of long turns and bats flying around my surrounding, I started to feel my body drift in the direction of the turn because I was totally immersed. This immersion can cause injuries that are simply due to lack of awareness. When I was immersed, I had to take my headphones off to reimburse my attention to my surroundings. After a long time with bright lights and too much graphic material, your eyes do start to get tired and this is called digital eye strain.

Digital eye strain is still being researched. A company called Essilor, known for their medical attention in the vision industry, has provided some information in possible people with a disorder and trying to use virtual reality. Essilor’s information concludes, “the market is filled with young gamers-an estimated 26 percent of all gamers are under 18-and focus, tracking, and depth perception is still developing into middle childhood. This could put children at risk for developing early myopia, or nearsightedness, and digital eye strain.” Essilor further explain how this can be combatted ways to get fight ocular stress include having your child's vision checked before school starts, encouraging 20-second breaks from screens every 20 minutes and making longer breaks where they perform physical activities mandatory. “

This fight has lead a company called Vivid Vision in taking advantage of this opportunity. According to Essilor, “self-correction behavior by releasing a new system for eye clinics called Vivid Vision for Amblyopia. Their setup melds their specially built games with a powerful computer, touchscreen monitor, Oculus Rift VR headset, and a Leap Motion and Xbox controller to fix amblyopia, a condition where the vision in one eye is compromised because the eye and brain aren't communicating properly, and strabismus, or crossed eyes,” (Essilor). A solution to create less turmoil would decrease the chances of problems with virtual reality and consumers will believe that interacting with virtual reality is less of a safety hazard and attract more consumers in purchasing this emerging product.

Training

Virtual reality has been perceived as a gaming device, but with its augmented technological progresses, it has sparked innovative ideas in how we can implement this technology in training our military and medical students. This device’s augmented reality introduces an audience such as, the military, or medical students to a concept or experience in which allows the individual to feel the experience and learn from their mistakes in practice rather than in the real world where they could be the cause of death (medical) or the face of death (military).

Military

The army, navy, and air force have adopted virtual reality for training purposes. Particularly for combat situations that are placed in different settings to test appropriate reaction. The simulation enables soldiers to practice without risking their lives or the chances of getting severely injured. These methods of training, provided by virtual reality, has been proved to be safer at a lower cost than traditional methods of training (Virtual Reality Society). The virtual reality simulations, according to Virtual Reality Society, include:

- Flight simulation
- Battlefield simulation
- Medic training (battlefield)
- Vehicle simulation
- Virtual boot camp

These simulations are conducted using *HMD* paired with a tracking system and gloves to enable the interaction with the virtual environments. The army uses virtual reality for medic training and recruitment campaigns to show rookies how life as a soldier. In an article written by the Virtual Reality Society, talking about the British Army using virtual reality to recruit 18 to 21-year-old men and woman using the interactive display

content. They plan to grow their army and transition to the simulation training in which includes army vehicles such as tanks. The trainees to handle all types of environments and weather conditions. The learning aspect goes in depth into learning techniques from experienced soldiers.

The navy uses virtual reality in the form of submarine simulators. This simulator provides helpful and interactive experience for soldiers to operate hydraulic arms in which “pitch and roll as a real submarine would” (Virtual Reality Society). The other simulator mimics naval ships like the Royal Navy ship, to learn steering, navigation, and general ship handling techniques. Emphasizing the importance of teamwork and the variety of situations an individual or team can face. The Australian Navy invested in a multi-million-dollar virtual warship to train recruits. The interaction with the virtual world allows Australian recruits to expect unexpected air attacks and analyze their approach to those reactions.

Lastly, the army has their air attacks in which are soldiers that are part of the air force. The air force has been trained since the 1920’s when the first flight simulator was created. Flight simulation, according to Virtual Reality Society, “the simulator contains a series of monitors which display images of a virtual landscape, for example a battlefield scenario. These images are presented in the same way as if viewed through the windows of a real-world aircraft which require the trainee pilot to react accordingly.” This sets recruits to match real aircraft experience and teach flying skills, deal with emergency, and communicate with ground control.

Medical

Healthcare professions require a vast amount of professional experience and skill, especially if they are in surgical or trauma-related procedures. Acquiring real world experience like “on-the-job” simply isn’t feasible, as every decision is critical. In an article, created by Christopher Pappas, the founder of the eLearning Industry’s Network, he becomes vocal about virtual reality and its hands on online training that provides the best quality practice for caring their patients. He furthermore talks about how the tutorials provided by the virtual reality devices allowing them to interact with objects and get a sense of what healthcare professionals face in their time being on the job. Christopher Pappas currently holds an MBA and a MEd in learning design from Bowling Green State University located in Bowling Green, Ohio.

Conclusion

Virtual reality is the next big technological product on the rise. The product is a computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person. In my research, I found that the virtual reality marketplace is projected to increase $67.6 billion from 2017 to 2021 by experts such as Greenlight Insights. The market is made up the top tech companies such as Google, Sony, and Microsoft. Facebook joined the market with a purchase of Oculus, another large company that produces the top virtual reality headsets, for approximately $3 billion. The market for virtual reality has stretched its capabilities, integrating its benefits of immersion to the work force and medical field. In the medical field, it treats as a scape goat for those who have post-traumatic stress disorder (PTSD). For others, it can be a way to improve your hand-eye coordination and recall/retention. However, the disadvantages can be that it may affect eyesight or cause dizziness. This is still being researched and companies such as Vivid Vison are stepping up to find diverse options in reducing the chances of these side-effects. Lastly, virtual reality is used in the work field to train nurses and doctors, plus, the military. Training these important fields have its benefits as the chances of casualties/ injuries are decreased because nurses have the experience to cure and the military have the experience to survive through different scenes that virtual reality provides.

Recommendations:

Initech should definitely invest in virtual reality. The tech market is expanding and as computers develop, the prices of these headsets start to decrease and consumers will use that saved money to purchase these products to get trained, play games, or experience things they have never experienced. Silicon Valley's largest company Apple, has started to invest in virtual reality because companies such as Samsung have partnered with Facebook's sub company Oculus in creating the Samsung Gear VR. My recommendations are that Initech should invest in these stocks choices provided by Alexa Davis of Forbes:

- Google Alphabet
- Facebook's Oculus
- GoPro
- HTC Corporation
- Largan Precision
- Microsoft
- Nvidia
- Qualcomm
- Samsung Electronics
- Sony

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