FAUSTIAN BARGAIN OF VIRTUAL REALITY TECHNOLOGY

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In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Computer Science

By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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INCREASE IN VIRTUAL REALITY TECHNOLOGY

VIRTUAL REALITY TECHNOLOGY MARKET GROWTH AND INCREASE USAGE IN RECENT YEARS

According to the latest statistics from Statistica, the Virtual Reality industry is projected to grow from a 6.2 billion dollar market size in 2019 to an estimated 16 billion dollar market by the year 2022 (Alsop, 2020). As a result, the hardware and software costs for implementing Virtual Reality systems have been dropping as the technology gains traction in the mainstream gaming community (Hilfert, 2016). With the technology decreasing in cost of implementation and the quality of the 3D immersive environment improving, different departments and institutions have been exploring the unique advantages of Virtual-Reality based training for disaster response and preparedness (Hsu et al., 2013). These new found uses would help the growth of the industry immensely, but Virtual Reality technology has moral concerns that involve physiological and psychological consequences, as well as privacy and ethical issues due to a blur between the real and illusory (Spiegel, 2017).

With Augmented & Virtual Reality technology taking a notable role in Times' best invention of 2019 section, Virtual Reality technology is on the rise and has been getting the public's attention in recent years (Times, 2019). Virtual Reality technology has been explored as possible new tools for 3D model designing, since it allows a more cost effective and accessible method of interacting with 3D models (Krishna, 2020). The technical research uses Virtual Reality technology for 3D model interaction and proposes the usage of Virtual Reality technology for usage in disaster response training. The implementation of such usage is proposed through designing a multimodal process that can take an environment scenario into software and hardware replication.

While different usages for Virtual Reality technology are growing in concept and implementation, there is little public concern and awareness about the risks of its usage. A study in 2017 that analyzed social media perception about use of Virtual Reality technology on health care has shown that about 75% of the public comments showed positive perception while less than 16% showed concerns about Virtual Reality technology (Keller et al., 2017). The tightly coupled STS research focuses on the concerns that arise from the use of Virtual Reality technology and offers possible accommodations to mitigate these risks. The STS research will address the major social groups that interact with Virtual Reality technology and point out the common physical and psychological drawbacks the groups share. The research aims to increase public awareness of the issues with Virtual Reality technology and recommend possible social and legal reforms to counteract those issues.

INTERPRETIVE FLEXIBILITY ON VIRTUAL REALITY TECHNOLOGY

As a relatively new technology that has been on the rise within the last decade, Virtual Reality is still in its early stages of commercial development and especially in the area of laws and regulations (Volokh, 2017). Before Virtual Reality technology becomes a household item, it is important to note the possible issues with its use in order to promote safety and encourage public policy regulations. The STS research applies the Social Construction of Technology(SCOT) theory to Virtual Reality technology to understand the interaction between the technology with different social groups and point out the problems related to each social group . Interpretive flexibility of the SCOT theory is a state of technological acceptance by

society before it reaches a state of closure, when different social groups utilize the same piece of technology with different use and purpose (Bijker et al., 1987).

There are various social groups that already use Virtual Reality technology for its high level of immersion and interactive modules (Mabrook, 2019). While Virtual Reality has been around since its first creation in 1962, its main development has been within the entertainment industry in recent years (Barnard, 2019). Virtual Reality has increased in popularity as entertainment software and hardware continues to develop, leading other industries to take advantage of its increase in accessibility. These different industries can be grouped into six different social groups that encompasses both the users and the implementers; these groups include entertainment, health Care, military, education, 3D design, storytelling. Each of these groups has different subgroups that share common purposes for Virtual Reality technology For example the social group storytelling involves users of different industries that use Virtual Reality for the purpose of delivering a message or a story effectively to many users. These subgroups include museums, courtrooms, movies, tourism and other industries as shown in Figure 1 below (Thompson, 2020).

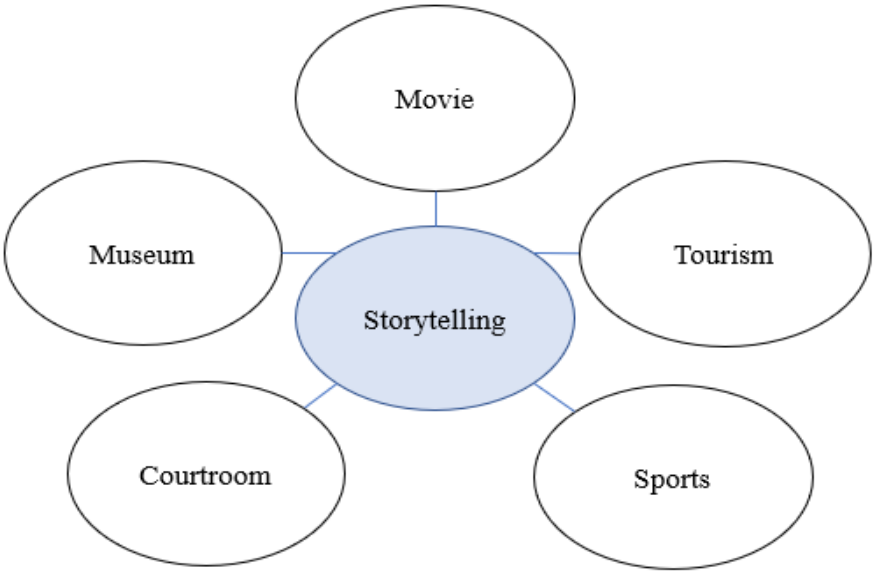

Figure 1: Storytelling Social Group Under Interpretive Flexibility of SCOT Theory: This figure shows the different subgroup industries that are encompassed in storytelling social group (Ha, 2021).

These different social groups then interact with Virtual Reality technology artefact with different goals and purpose for the same artefact. Each group interacts differently with the artefact under interpretive flexibility as shown in Figure 2 below.

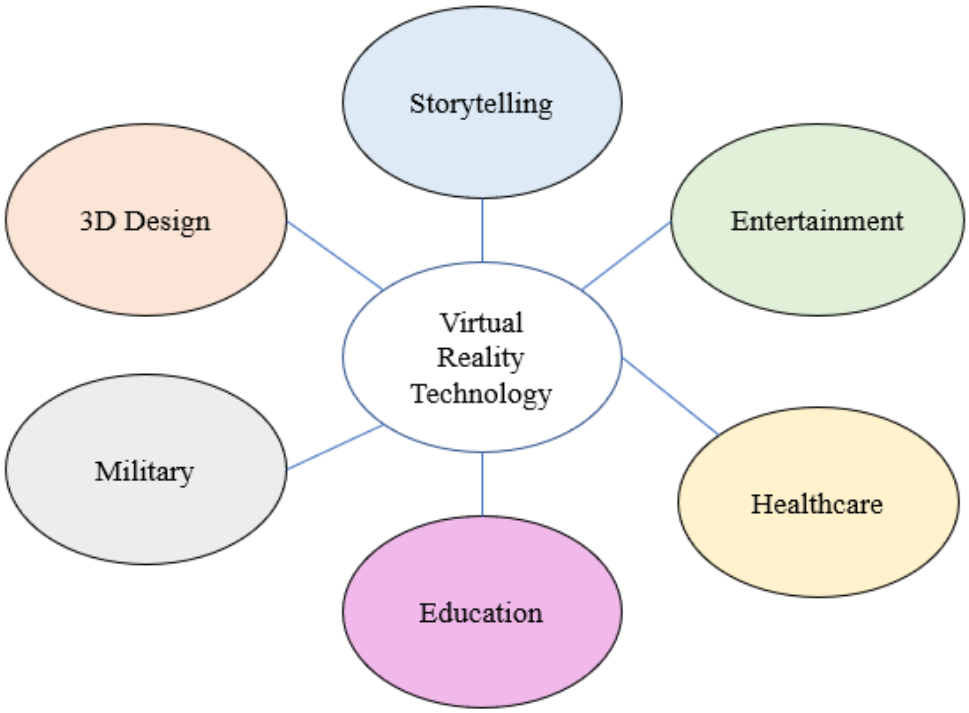

Figure 2: Virtual Reality Technology SCOT Artefact To Social Groups Model: The Virtual Reality technology at the center has a different relationship with each social group (Ha, 2021).

In the future, there may be different industries that adapt the use of Virtual Reality technology, but in broad terms, it should fall under one of the social groups as a subgroup unless the usage differs widely from the traditional methods so far.

DRAWBACKS OF VIRTUAL REALITY TECHNOLOGY

GENERAL CONCERNS WITH VIRTUAL REALITY USAGE

Virtual Reality technology has moral concerns that involve physiological, psychological, and ethical issues due to a high level of immersion that blurs the line between the real and illusory for its users (Blascovich & Bailenson, 2011). As most of its graphical and interactive development is a byproduct of the video game industry, Virtual Reality technology shares many features of video game technology and thus shares its negative effects as well (Zyda, 2005). The high level of immersion can cause mental health risks depending on the intensity of the content, and extended usage can cause bodily neglect and nausea (Spiegel, 2017). Due to the immersiveness of the Virtual Reality environment, it can also cause dissociation from objective reality and increase in dissociative behavior for people with preexisting symptoms (Aardema et al., 2010).

There are also less obvious concerns of ethical issues that involve privacy and autonomy as Virtual Reality provides entertainment of social experience that merges traditional social networks with Virtual Reality to intensify the already known concerns of social networks. In terms of privacy, the Virtual Reality technology hardware can reveal information about user's physical information as well as behaviors patterns that can be recorded as data for companies that run the virtual social network platform, and these data can possibly be misused by these companies or be vulnerable to hackers (O'Brolchain et al., 2015, pg.7). For autonomy, the use of Virtual Reality social network will worsen the effects of "Filter Bubble", which is a 'personalised searches in which algorithms decide on the search results shown to a user based on information about the user' (O'Brolchain et al., 2015, pg.13). The companies that manage the social network

platform can also manage what information is presented to the users as well as distort certain information that can effectively manipulate its users.

INTERACTION WITH SOCIAL GROUPS

These concerns relate to the social groups mentioned above according to the SCOT theory. Since different social groups have different uses and purposes for Virtual Reality technology, the drawbacks also differ depending on how they use the technology artefact. One group, the entertainment social group, is shown in Figure 3 below.

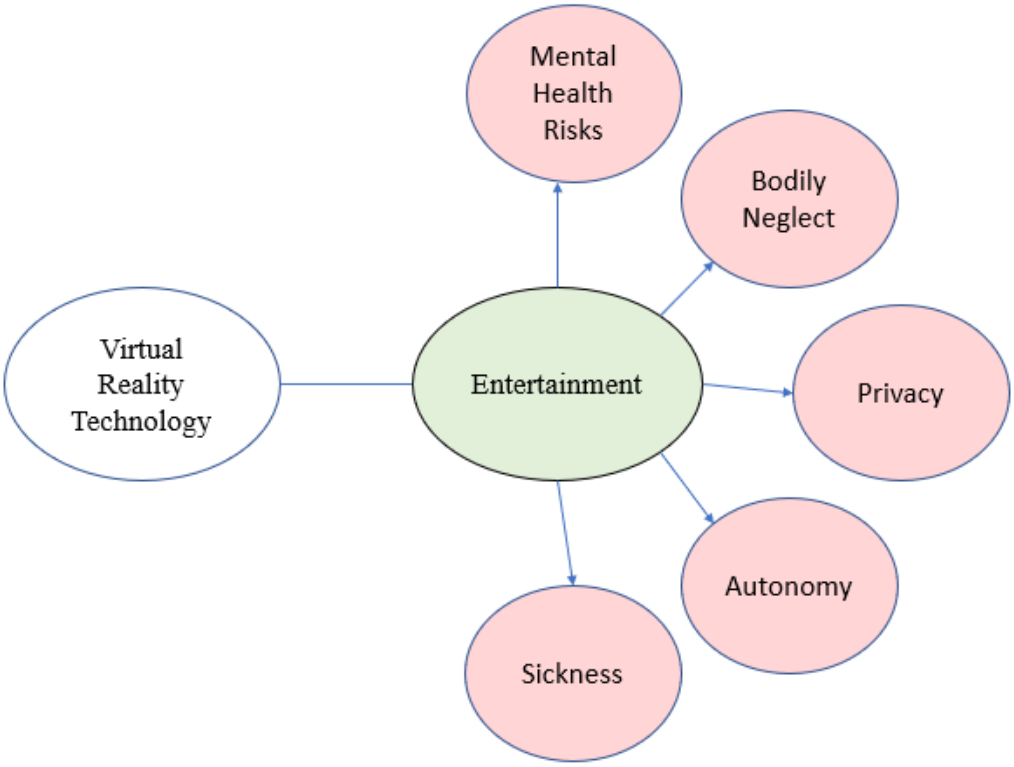

Figure 3: Virtual Reality Technology SCOT Artefact To Entertainment Social Group: The figure shows Virtual Reality technology used by the entertainment social group that leads to the possible concerns on the right.
(Ha, 2021).

Mental health risks of disassociation,bodily neglect, and sickness mentioned earlier can be caused by extended usage in interactive settings, often caused by multiple hours of using Virtual Reality technology for video games or media users. The entertainment social group also includes virtual social network users, who fall under the risks of privacy and autonomy. This group is closely related to the traditional video game users but these risks are intensified compared to traditional methods of entertainment.

ISSUES WITH CURRENT INTERPRETATION OF VIRTUAL REALITY

FAUSTIAN BARGAIN OF TECHNOLOGY

As the famous American author Neil Postman has said, every technological advance constitutes a Faustian bargain, meaning that there is always a tradeoff (Postman, 1998). Virtual Reality technology is no exception to this tradeoff especially with the physical, psychological, and ethical concerns mentioned earlier. These issues will only get worse unless the user's understanding of these concerns is increased and legal guidelines are set to protect the user's wellbeing. Pushing for these changes will mitigate the risks of using the technology in the future and further promote the development of said technology as well. For any emerging technology, Nwaneri (2017), of Harvard law, points out that "it is our job to be ready" (pg. 627).

SOCIAL AND LEGAL POINT

The social view of Virtual Reality technology is positive with industry growing at a fast pace (Alsop, 2020). However, as a relatively new technology that has been on the rise within the last decade, Virtual Reality is still in its early stages of commercial development and especially in the area of laws and regulations (Volokh, 2017). A regular user may understand the physical implication of using Virtual Reality technology as one feels nauseated and disoriented with long

use. Unfortunately, the hardware companies that provide the technology do not provide users with potential psychological, privacy and ethical drawbacks (Oculus, n.d). While some precedents and legal guidelines for protecting intellectual property exist for Virtual Reality software and hardware companies, few guidelines protect users from physical, psychological, or privacy concerns. Much of the legal precedents are still set under the same conditions as traditional video games while the level of immersion is completely different. Precedents such as the *Sanders v. Acclaim Entertainment, Inc*., where the court ruled that manufacturers are not liable for the ideas and contents of games that caused the dissociative behavior or the Columbine Shooters, are already set as a strong precedent that works on Virtual Reality technology (Nwaneri, 2017, pg. 625). Laws pertaining to virtual goods and freedom of speech that may affect the autonomy of the users are also currently in favor of virtual platforms as well, meaning the companies that provide the hardware and software background can endorse certain behaviors and restrict others in the virtual platforms they provide (Koburger, 2019).

INCREASE IN PUBLIC AWARENESS FOR SOCIAL REFORMS

USING THE SCOT THEORY INTERPRETIVE FLEXIBILITY TO ORGANIZE COMMON DRAWBACKS

The current legal and social standpoint of Virtual Reality technology is inadequate as shown above, and can lead to more problems as virtual reality grows increasingly popular. It is important to point out the most common issue so those can be addressed first before dealing with the more specific issues that relate to different groups. All the groups use Virtual Reality technology for its high level of immersion and interactivity with the virtual environment. Figure

4 shows the common factors that each group shares in interacting with virtual reality. So in effect each group uses these factors for their implementation of the technology.

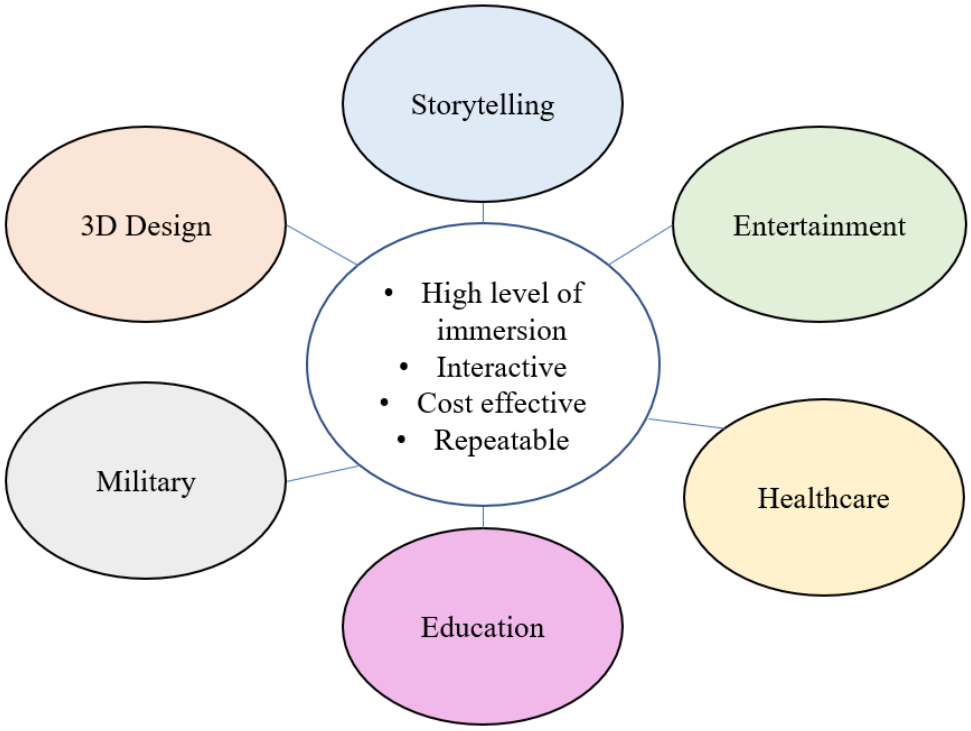

Figure 4: Virtual Reality technology SCOT Artefact Common Factors For All Social Groups: The figure shows Virtual Reality technology that is used by different social groups but they all share common factors in the center bubble.
(Ha, 2021).

The factors such as heightened immersion and interactiveness can cause physical and psychological harm, such as motion sickness, caused by the discord between interaction and visual queues, and dissociation, caused by high levels of details that immerse the users in the virtual environment (Spiegel, 2017). The cost effectiveness and repeatability increases the risk of extended usage for the users, that can lead to possible bodily neglect. The level of bodily neglect can range from actual physical harm due to extended usage without taking care of oneself for groups such as entertainment and storytelling, to neglecting the need for physical methods of

implementation for groups such as military, education, healthcare, and 3d design. The common drawbacks of sickness, dissociation, and bodily neglect all stem from the most fundamental benefits of Virtual Reality technology and are related to physical concerns.

Privacy and autonomy concerns of the entertainment groups doesn't pertain to military or 3D design groups that will most likely use the technology within the organization's control. While national security concerns of military groups might be applicable to the entertainment and health care group as well since foreign entities might take advantage of manipulation of those groups, but not for 3D design groups. The ethical concerns differ for each social group due to different usage environments and the purpose, so there are multiple different ethical drawbacks that can be derived from each of the groups. These discrepancies in concerns are not fully explored but rather the common concerns are expressed by observing the common usage terms.

INCREASE IN PUBLIC AWARENESS WITH SCOT THEORY

With representation of the most common drawbacks shared by the current social groups on Virtual Reality technology, this research aims to educate the public and increase awareness of the issue. As the public's understanding of the issue grows, it can lead to social and legal changes that can address the legal issues that were raised earlier. This can also lead to a systemic benefit of encouraging the developers and providers of Virtual Reality technology to take these concerns into consideration as public's awareness of the issue will put them under scrutiny for those aspects. The increase in public awareness will introduce a SCOT concept to the current Virtual Reality technology as society's understanding of the technology encourages regulation by the government and consideration by the providers to cause changes in the development of the technology as seen in Figure 5 (Bijker et al., 1987).

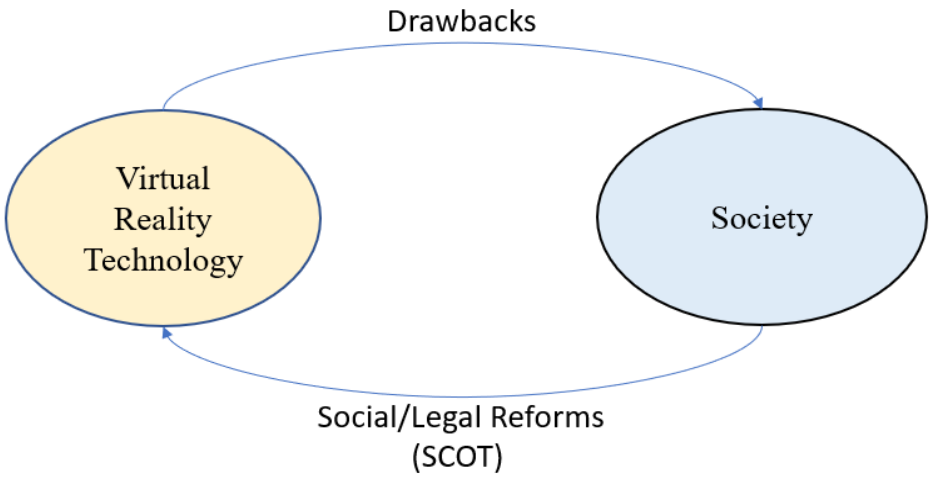

Figure 5: Increase In Public's Awareness Of The Virtual Reality Technology Drawbacks: The figure shows Virtual Reality technology pushing the drawbacks to society and with increase in awareness of the most common issues shared by the social groups, society in turn affects the development of Virtual Reality technology by social and legal reforms.
(Ha, 2021).

UTILITARIANISM ETHICS, TO INCREASE PUBLIC AWARENESS OF THE ISSUE

Under John Stuart Mill's concept of utilitarianism, there is an ethical reason to organize the drawbacks and to ultimately increase the public's awareness of the issue. Mill (2020) explains utility as a "standard is not the agent's own greatest happiness, but the greatest amount of happiness altogether" (p.14). For Virtual Reality technology, users are currently those who own and use a Virtual Reality device, but there are potential users of unlimited number of people in the future that can benefit from social and legal reforms due to increase in public awareness. According to this concept of utilitarianism, it is ethical to help increase the public's awareness of the issue since it can help all the future users of Virtual Reality technology.

VIRTUAL REALITY TECHNOLOGY IN THE FUTURE

While Virtual Reality has been a concept for many years , it has only recently become an accessible reality. In its current form, many different industries are trying it out for different purposes as it becomes more accessible. However, the current interpretive flexibility means that there are just as many problems to consider with different social groups all interacting differently with the technology artefact. It is imperative that the most common concerns are dealt with before the technology becomes even more widely used, and by pointing out the common concerns, the research benefits the public in increasing its awareness of the most immediate issue to deal with. Future work will require more in depth research into each social group and how different sets of guidelines have to be set for different uses, but at its current state, basic legal standards should be set to deal with the common concerns.

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