DIFFUSION OF VIRTUAL REALITY IN AUDIENCES VIEWING POPULAR MUSIC

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by

Michael J. Harmon

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APPROVED:

Robin Johnson, PhD
Thesis Director

Marcus Funk, PhD
Committee Member

Grant Wiedenfeld, PhD
Committee Member

Ronald Shields, PhD
Dean, College of Fine Arts and Mass Communication

DEDICATION

I would like to dedicate this paper to my older brother, James Harmon, who passed away in May 2017. You will always continue to be a major inspiration in my life and I wouldn't have continued to pursue interests in music and research without your guidance and wisdom.

ABSTRACT

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Virtual reality hardware has recently expanded into more consumer markets with products such as Google Cardboard, Samsung VR and the Oculus Rift while the software applications hosting the content make it much more available for audiences to access different types of VR content including music content such as music videos or live events. This thesis conducted a survey to determine how members of an online community listen to music and how they choose to use or are likely to use these VR platforms for different VR content to provide insight as to which media content that producers and advertisers can focus on to create more successful VR content. A survey was taken by 246 participants, and the results show that although members of online communities consider a variety of different uses for VR platforms, music experiences aren't yet being adopted by enough of them while other VR content such as video games are much more popular.

KEY WORDS: Virtual Reality, Diffusion of Innovations, Early Adopters, Internet Communication Technologies, Music,

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CHAPTER I

Introduction

This thesis examines the current or likely usage of virtual reality technology by internet community groups to create an immersive experience and what types of media content is being or is likely to be experienced using VR. Virtual reality headsets, or HMDs (head mounted displays), have become a popular part of the media-viewing experience on mobile and gaming devices in the past few years. People have begun purchasing them to play video games, and they also have access to a large portion of immersive 360-degree video content (Kuhl 2015). Virtual reality HMDs for various devices such as mobile devices and computers are becoming so popular they have been shown at events such as the Consumer Electronics Show 2017 convention in Las Vegas where Daniel Newman, the CEO of Broadsuite Media Group, stated, “this is what the future of product development and product experience will look like” (Newman 2017).

Virtual reality will surpass the U.S. 40-billion-dollar market by 2020, and large, multinational media and technology corporations are already taking advantage of this with Facebook investing $2 billion in the Oculus Rift headset (Wood 2017). Virtual reality hardware accounted for maximum share of the market in 2016 with Sony, Facebook, Google, and Samsung taking over 50 percent of the market share ("Global Virtual Reality Market" 2017).

Virtual reality is not only a new venture for technology firms, it also represents marketing opportunities for several industries looking to incorporate persuasive messages alongside media content such as music videos, journalism stories and video games. Jon Anselmo, the president of strategic digital services at Omnicom Media Group, states that

virtual reality holds many potentials for marketing and allows brands to reach consumers in more immersive ways (Poggi 2016). Advertisers can work with the music industry to make a profit through virtual reality advertising shown before music videos or even during them (Low 2017).

Virtual reality is becoming more popular as a use for mobile devices, and Samsung is a large part of the growing virtual reality industry as it has created a smartphone application called Milk VR (Kuhl 2015). Milk VR has content from all sorts of different genres from music videos, sports content, planet VR, and animated series' (Kuhl 2015). These applications with multiple forms of content show some of the different possibilities of virtual reality entertainment and will allow consumers to watch video content in a way that they might not have experienced before.

Speaking specifically about the use of music videos and concerts as media content in VR, Vivien Lewitt, YouTube's global head of artist relations states,

> We're beginning to see not only the ability to take your music and your live concert streams and your VR and 360 experiences with you on mobile devices, but to merge together the two in really unique ways to provide really fantastic experiences for fans (Hall 2017).

Several musicians are also using virtual reality HMD technology through their fans' viewing of music videos and even live concerts turned into 360 music videos. These musicians can connect through their innovation of virtual reality technology in music videos to reach a younger, smart-phone generation of music aficionados (Hall 2017).

For instance, a blues musician named Fillmore Slims used virtual reality technology to create a music video of his live concert footage and studio recordings using

12 cameras from different angles (Levin 2017). This means that video producers can also benefit from helping with creating the content for various musicians due to the creation of new job roles. Slims states that virtual reality has plenty of benefits such as preservation of his performances and it allows him to connect with more tech-savvy music fans of a younger age (Levin 2017). The Gorillaz have also become innovators of virtual technology by releasing a popular virtual reality music video at the time with over 3 million views on YouTube (Hall 2017).

These examples all show how virtual reality has the possibility of becoming an integral channel of distribution of multiple types of media content. Its diffusion to consumers brings up important questions. How is this technology being spread throughout the world, and how will the different groups of adopters utilize it? What kinds of media content are more likely to be chosen by people who have already adopted or who are considering adopting VR technology, and what kinds of media content are not being chosen? This paper surveyed users and likely users of virtual reality content to determine how media content producers and advertisers may learn from how this technology is being used by different types of consumers.

CHAPTER II

Literature Review

Virtual Reality Displays

Virtual Reality is increasingly used in a wide range of fields from manufacturing, exploration, defense, medicine and entertainment (Onyesolu 2011). Regarding manufacturing fields, virtual reality can help workers with assembly tasks (Boud et al. 1999; Mujber et al. 2004) and it has also been used in exploration for tourists to view different environments without having to physically be there to experience them (Chen 1999; Han 2016). Virtual Reality can even provide uses for defense by helping soldiers with PTSD symptoms (Rizzo et. al. 2015) and pain control (Maani 2008). Previous research has also stated the benefits VR can provide for various medical and health related fields such as surgical training (Aggarwal et. al. 2007; Seymour et. al. 2002) and clinical psychology (Riva et al. 2011).

The first version of a HMD VR device was created in 1968 by Professor Ivan Sutherland (Han 2016) after his research in 1965 that predicted the use of these devices to control computers with visual input (Sutherland 1965). The term “virtual reality” was first used in 1987 to describe it as an "immersive visual experience created by a computer" (Han 2016). Han describes four types of HMD VR devices that are currently available in the consumer market: The mobile removable type, the PC type, the console type and the assembled type.

The mobile removable type, which includes the Samsung Galaxy Gear VR, involves wireless connection to a mobile device such as a smartphone (Han 2016). The PC type, which includes the Oculus Rift, is different because it involves sitting down

with a cord connecting the HMD to a desktop computer (Han 2016). The console type, which includes the Sony HMZ, is similar because it requires connecting a cord to a video game console, specifically the Playstation 4 and PSVita gaming consoles instead of desktop computers (Han 2016). The assembled type, which includes the Google Cardboard, is the cheapest of the four devices because it is assembled from cardboard and two lenses providing the lowest quality VR experience out of all the previously mentioned HMDs (Han 2016).

Another recent form of research done on virtual reality HMDs, was conducted in 2016 and focused on how HMD virtual reality content differs from the traditional two-dimensional screen experience through controlling viewpoints with head movements (Stein 2016). "Users tend to spend more time examining objects, exploring them from different angles, and searching for details compared to conventional screen-based games" (Stein 2016 p. 55). Stein mainly discusses how virtual reality was further developed over the past 30 years from digital gaming devices, and he directs his interests to the first commercially-available virtual reality HMD — the Oculus Rift, which was released to consumers in 2016.

Although the Oculus Rift is more of a gaming-type of HMD as opposed to Samsung Gear VR and Google Cardboard, Stein makes the important distinction that VR-HMDs have the possibility of becoming a common medium for a vast amount of the population (Stein 2016).

What previous research does not wholly reveal is what type of media content is seen by consumers as appropriate or natural for a VR experience. Although there are four types of VR devices on the market, is there a type of media content that is being utilized

more by consumers? Do fans of particular kinds of media content see VR as an appropriate technology for their enjoyment of media content? In the following sections, the role of technological innovations and popular music content is discussed. Previous literature on innovations in consuming popular music provides the basis to determine if music fans see the new VR technology as a legitimate way to experience musical videos and performances.

New technology has always been the largest driving factor in the evolution of recorded music ever since music recordings began to be released commercially in the past with devices such as the phonograph and cylinder recordings in the late 1800s (Rutter 2016). Could virtual reality technology be the next step in the evolution and distribution of music videos in a similar way that technology has changed the distribution of recorded music?

Research on Music Videos and MTV

There has been a limited amount of research done on virtual reality videos and an even more limited amount of research done on virtual reality music videos. No current scholarship focuses directly on virtual reality and music videos or music usage. There have, however, been a plethora of content analyses done on music videos from a variety of genres and concentrations that show how television technology spread music videos in the 1980s (Jones 2005) and how the internet is further diffusing and changing music videos after television (Cheng 2011; Edmund 2014). Since virtual reality music videos can only be found through streams on the internet this can connect to this research to some extent (Kuhl 2015).

According to research conducted on the history of music videos, the creation and popularity of the television was essential to music videos and their dissemination among audiences (Viñuela 2010). Viñuela's research further states that musicians in the 1960s would appear on television as a form of long distance advertising that they could do without having to appear in person. These occasional televised performances throughout the 1960s and 1970s eventually led to the appearance of several music television channels in the early 1980s (Baxter 1985). These music television channels brought in a new style of digital media to television with disordered scenes, fast cuts, and editing that created a dream-like state for viewers of the content (Tapper & Thorson 1994).

Music videos did not have an official platform of distribution for record labels until MTV came along in 1981 (Cheng 2011). Even though MTV was not the only channel showing music videos, they had exclusive rights to show certain music videos before others, which made it an important distribution channel of music videos and their diffusion among audiences through television (Baxter 1985). MTV had 80 percent of its on-air content in the form of music videos that showed musicians playing their greatest hits throughout the 80s (Baxter 1985) as the channel transitioned slowly from non-stop music video airing to intertwined television shows between music video content (Cheng 2011). In the 1990s, however, MTV had largely given up on airing music videos in favor of reality and comedy shows (Jones 2005). In the late 1990s, the internet began to become the major platform for record labels to turn to for the distribution of music videos (Cheng 2011).

P2P Distribution of Music Videos

In 1999, the first P2P or peer-to-peer network was established on the internet, and it was called Napster (Becker and Clement 2006). Software such as Napster allowed users to connect through their computers to other users around the world and share any file that they have for free; these files could include anything such as songs, documents, images, and videos (Becker and Clement 2006). According to Becker and Clement (2006), the major innovations that P2P networking provided included the ability for people to download multiple documents from multiple users instead of only being able to download one song from a single website at a time.

A collaborative community was formed through consumers that turned their computers into servers through Napster. This dramatically expedited the process of downloading music and music videos and made Napster experience the fastest diffusion of software in the history of the internet at the time (Becker and Clement 2006). The diffusion of P2P networks was sped up through internet browsers and the digital format of song files called MP3s; music fans increasingly began using these P2P networks to get their fix of music and video content outside of radio and television (Cheng 2011).

Digital Streaming of Music Videos

After P2P networks created a community through consumer file-sharing on the internet for audio and visual content through downloads, digitally streamed content through websites and software became the next innovation (Cheng 2011). Streaming had been around long before the internet in the form of radio allowing listeners to hear media content immediately without downloads and MTV doing the same for music video content, however, digital streaming was seen as a new innovation to the technology with

the addition of on-demand content that allowed users to listen to their preference of music immediately without having to wait on downloads to complete (Deorr et. al. 2010). Streaming video was seen as an alternative to long downloading times from early P2P software as it allowed for more immediate enjoyment of on-demand entertainment accessible at all times with the advent of YouTube in 2005 (Cheng 2011).

"Modern technology now provides new alternatives in the electronic distribution of music and is providing an infrastructure that is cheaper to run and maintain" (Rutter 2016 p. 15). This quote, from Paul Rutter's "The Music Industry Handbook," summarizes the major shift from traditional to digital content that began with P2P file sharing networks and continued to evolve with video streaming websites. Digital streaming is stated by those involved in the music industry to be an "unavoidable final destination" of music content (Rutter 2016 p. 290).

Music videos, in regard to their content and purpose, began to change with the advent of streaming services. According to Edmond (2014), the music industry mainly viewed music videos as a costly promotional tool for an album release before streaming sites such as YouTube were made available to the public. Instead of just viewing music videos as a brief promotion, the music industry could now consider them as a source of revenue streams from third party downloads in iTunes stores and they also had significantly reduced production costs which led to an increase in revenue for record labels from the music video content itself (Edmond 2014). Cheaper production costs and consistent revenue meant more music video content could be made available on streaming websites.

Recent Music Video Research

Modern research on music videos focuses on post-television effects of content on YouTube and how this technology has changed the way viewers interact with and interpret music videos (Cheng 2011; Edmond 2014; Shackman 2008). A study in 2014 analyzed the future of music videos after YouTube was created and how this technological innovation changed music videos and made them popular again through more available access and cheaper production methods (Edmund 2014). Edmund's research on music videos focused on how digital convergence played a major role in making music videos a popular part of entertainment content again. As stated in the previous section of this paper, Edmund described that both multiple revenue streams and reduced production costs of music videos online are giving record companies more return on their investments than television through repetitive music video viewing and advertising that surrounds the content on YouTube.

The invention of the internet and the shift in technology from traditional to new digital media has changed music videos completely in regard to their distribution process and terms of interactivity (Edmund 2014). Edmund states that this has made them a more immersive experience as individuals can control what they watch, and when, instead of relying upon a random playlist of music videos being selected for them on television and radio. YouTube is known as having revolutionized free music access in the industry with musicians regularly uploading music and visuals from their computer to cultivate a "buzz" as stronger commercial entities (Rutter 2016 p32).

In 2011, research was conducted on the analysis of music videos as a promotional tool. Cheng (2011) applied the diffusion of innovation theory and the utility maximum

theory to show the effect that the internet had on music videos (Cheng 2011). Cheng discusses how the internet, YouTube, and the iPhone are all innovations that are extensions of each other. She mentions that the iPhone and iPod are the most current forms of music video distribution after digital streaming began since they mark the innovation of being able to watch music videos on the go with streaming content through mobile devices. Cheng's research relates to how this paper examines the way that virtual reality will be a next step in the distribution of music videos through YouTube and mobile phone technology.

Edmund (2014) and Cheng (2011) both show, through their separate research, how the digital media of YouTube and the creation of the smart-phone has changed the way that music video content is enjoyed, but neither of them mention virtual reality due to the fact that this technology had not been widely released to the public consumer yet in 2014 (Stein 2016).

The above literature review about innovations in technology affecting music distribution and consumption suggests that new innovations such as VR technology will be seen as a legitimate way to experience music in the coming years. Diffusion of innovations theory is the most widely used mass communication theory to understand the process of how a successful new technology spreads to consumers. The next section provides an explication of the theory and it applicability to the thesis.

CHAPTER III

Theory Explication

Diffusion of Innovation Theory

The diffusion of innovation theory created by Everett Rogers (2003) is a useful way to define how virtual reality media content is spreading. Diffusion of innovation theory might also be helpful in determining how consumers of one types of media content such as music are using or will likely use this technology when it becomes more popular within a social system. This social system is mainly comprised of music lovers and virtual reality will possibly diffuse among music aficionados then, eventually, other music consumers in the early majority of adopters.

"Diffusion is the process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers 2003, p. 5). According to Rogers, diffusion is considered unique because it refers to the communication of new ideas and the new iterations of old ideas. This most certainly applies to virtual reality since it is a rather new technology that only started becoming available as a form of online distribution in the past few years (Kuhl 2015). Most HMDs were not fully developed and widely released to the public until 2014 to 2016 (Han 2016).

The four main elements required for successful diffusion are the innovation itself, the communication channels it is distributed through, the time it takes to diffuse among a system, and the social system itself (Rogers 2003, p. 11). However, the type of media content is not included as a reason for successful diffusion, and previous studies have not interrogated whether different types of media content affect diffusion of innovations. The

reason that content is important to this thesis is that virtual reality applications can contain different types of media content such as sports, gaming, travel, television and various entertainment such as music (Kuhl 2015).

Different types of media content are supplying the four sections of diffusion because the innovation is already in the form of HMDS while the communication channels are currently in place with websites such as YouTube (Cheng 2011; Rutter 2016, p. 32) and other smart-phone applications supplying virtual reality music videos (Kuhl 2015). While time is currently an ongoing determining factor since virtual reality is still in its early adoption stage, it is important to understand what role, if any, the type of media content has on diffusion research in general and VR specifically.

Rogers states that there are five categories of adopters of innovations: innovators, early adopters, early majority, late majority, and laggards (Rogers 2003, p. 282). These five categories are the stages that a technological innovation passes through before being adopted into a social system and this thesis focuses on categorizing adopters. Innovators launch the new idea into the system by bringing the innovation from outside of the system's boundaries and adopting it.

Innovators serve as the first 2.5 percent of the population in a social system to adopt innovations while early adopters make up the next 13.5 percent (Rogers 2002). Rogers (2003) further states that early adopters are more local and have the highest level of opinion leadership, so they serve as a role model for others in the social system to look up to and follow whenever a new innovation is praised by them (Rogers 2003, p. 283). Individuals that can be called potential adopters in the early and later majority of adopters

will look to the early adopters for advice and information about innovations (Rogers 2002).

Diffusion research focusing on early adopters usually directs focus on differences in adopter innovativeness, which is usually described by figuring out the time of adoption leading to a decision of whether it is early versus late adoption (Fichman 1992). Other research on early adopters' innovativeness defined earlier adopters by when the individual first used the innovation (Brancheau and Wetherbe 1990). Brancheau and Wetherbe (1990) further described differences in adopters by stating that a later adopter could be classified as users who had no yet adopted the innovation at all or by a certain date close to the innovation's release.

The early adopters, at the current point in VR's lifespan, are the most likely to adopt head-mounted displays because they are eager to try a modern technological innovation and tell others about it. They would most likely see the potential of virtual reality technology. Early adopters also have a high social status and good financial standings which allows them to purchase quality head mounted displays to use and spread the benefits of this technology to others in their social system (Rogers 2003, p. 282).

The early majority are one of the larger groups of adopters making up the next 34 percent of the population in a social system (Rogers 2002) and they have a longer technological adoption period than the innovators and early adopters, they communicate ideas with their peers which provides interconnectedness but they do not serve as the role of opinion leaders (Rogers 2003, p. 284). The late majority take time to adopt an innovation because they only do so after the majority of a population have started to

regularly use an innovation and they are the next 34 percent to adopt the innovation (Rogers 2002; Rogers 2003, p. 284). The final category of adopters, the laggards, who make up the last 16 percent of the population in a social system (Rogers 2002), take the most time to adopt an innovation as they only look to the past innovations and communicate with few others that have the same traditional values as themselves (Rogers 2003, p. 285).

Diffusion of innovation theory has not yet been applied to virtual reality and it could prove to be especially useful in analyzing how this technology is changing media content and its distribution among fans. Early adopters of reality could be the ones who are most likely to consume immersive music videos, and innovators are marketing and advertising to these consumers more as time passes on.

Research Questions

The music industry has been profiting from the VPL (Video Performance Ltd.) collecting revenue for music video airing and streaming since 1984, so they could continue to make this profit from music videos with the addition of virtual reality music video content (Rutter 2016, p. 149).

Since this research mainly focuses on members of online communities who are early adopters of both VR and VR music content, it is necessary to develop research questions pertaining to how they enjoy their music content. To further understand how members of online communities who have adopted VR technology are or are not adopting music VR platforms, it is also important to ask them about their usage of VR content to see how they are adopt the technology or would like to adopt it.

RQ1) Are members of online communities in virtual reality and music message boards adopters of VR music content?

RQ1a) Are members of online communities that are adopting virtual reality music content early adopters?

RQ2) Among members of online communities on virtual reality and music message boards, why do adopters of VR music content say they are watching VR music videos?

RQ3) How does usage of VR technology content differ among adopters and non-adopters of VR music videos?

CHAPTER IV

Method

Overview of Survey Methodology

Survey methodology is the most appropriate social research method to answer the research questions posed in the previous chapter. Surveys are usually in the form of questionnaires that are useful for providing data about the characteristics of a target population (Fowley 2014). According to Fowler, a sample of a target population can represent the population and the questions they answer from the survey can describe the characteristics of the respondents. This is helpful in defining the audience that is using virtual reality to watch music videos as long as the sample is an accurate representation of the target population of early adopters. An internet survey, which this research utilizes, can help reach a wider demographic of audiences since it has no geographic limitations and can be taken without any time constraints (Wimmer and Dominick 2014).

While survey methodology is beneficial to research, it also has various limitations. If the survey is not worded correctly or the placement of questions is inappropriate, then it can bias the results of the research as a whole (Wimmer and Dominick 2014). Another limitation is that if the wrong respondents are used in the survey then there can be too much random variation from the true details of the population which would create a sampling error (Fowler 2014). Getting a proper amount of responses is also another issue that most online surveys face if they don't provide some sort of incentive.

Survey methods are used in mass media research to support or negate hypotheses or propositions but they can also be used to gather information on existing or changing

patterns of behavior which is usual for audience research (Hansen 1998). According to Hansen (1998), surveys in mass media research are also helpful in finding out about opinions and behavior, which are essential aspects to figuring out why audiences are adopting virtual reality and whether or not they're watching music videos with this technology.

Previous Diffusion Surveys

Understanding audience attitudes is a common theme among diffusion research using survey methodology. Previous diffusion research involving survey methodology have studied various populations to understand the attitudes toward how innovations diffuse (Evens et al. 2010; Pashupati 2008; Westlund 2008).

The aim of this research, however, is to discover whether this innovation (virtual reality HMDs) is being adopted by a specific population of digitally competent internet community members and to see what kinds of content are being used or likely to be used with VR HMDs. The survey addresses whether users own or are likely to own the technology, the length of time that an adopter has owned their VR HMD and what kinds of media content is being experienced or is likely to be experienced if a user is considering obtaining at VR HMD. Previous surveys have focused on similar diffusion questions (Brancheau and Wetherbe 1990).

Previous diffusion researchers have used the survey method to analyze information about adopters of various forms of music technology: new media technology (Yang 2009), the diffusion of a new jukebox technology (Seys et al. 2013), and to categorize different adopters of digital music technology within music education (Stampfli 2006).

Distributing the survey using internet communities on Reddit

Reddit.com is a website comprised of a community of technologically-competent members that participate in discussions over a wide variety of topics (Gilbert 2013). It is often referred to as the "front page of the internet" where users can upload their choice of text, video, images and links in various discussion boards (Duggan 2013; Gilbert 2013). Reddit became popular and widely used after President Barack Obama took part in an "Ask Me Anything" series back in August 2012 (Duggan 2013). While there is a limited amount of academic research that has been conducted on Reddit so far, there have been analyses that have explored various topics of users (Massanari 2017; Naguti 2016; Wasike 2011).

According to Wasike (2011), Reddit is a platform that is open to anyone that wants to form their own community based on a niche interest that can be casual to very serious, these specific interest posts are named as "subreddits." These niche interests can include anything from animal GIFs to world news headlines which shows how versatile the topic selection is within the subreddits (Duggan 2013). According to Duggan (2013), Reddit is comprised of mainly young males, from ages 18-29 years old, which means that they could potentially be users of new technology. Many of these subreddits discuss topics from computing to science or fandom interests which means that there is a high probability that Reddit users are aware of current virtual reality technology in virtual reality and music subreddits so the Reddit community could be a valuable population of technology users to study.

Reddit Users

This survey was distributed to Reddit users since they are more likely to be early adopters of or considering adopting virtual reality than residents of the local area of Huntsville, Texas. The reason for choosing Reddit users is that it has a massive amount of "subreddit" categories that allow a wide range of online community members to find their specific interest (Olson & Neal 2015). Since virtual reality is still in its early adoption phase of diffusion, it would be more difficult to reach out to the local population that is using this technology rather than focusing on the population using or at least discussing it online within Reddit forums. That means that a sample of the Reddit community that talk about virtual reality and virtual reality media content in specific threads would be an accurate representation of the target population.

Survey Questions

The survey used in this thesis consists of 16 questions depending on how the respondents answer; these questions were unique as they weren't based on previous survey instruments since the previous surveys mentioned didn't focus on the media content itself. First, Reddit users participating in the survey read a brief introduction consisting of consent documentation and a question asking if they are 18 or older to partake in the survey. Consenting and age-eligible participants moved on to the next set of questions about various details about their age and gender to provide additional demographic information. The next survey question asked participants about which ways that they currently use internet or mobile technologies to listen to music by asking them to choose from a list of options. These options included: streaming music services, video sharing sites, virtual reality headsets, online music stores and satellite radio services.

If participants didn't choose VR headsets as a platform for music out of the available choices, they were directed to a set of choices of media content asking about how they would use VR if given the opportunity to understand their possible VR media usage. If participants chose VR platforms as a form of listening to music, they were directed to an additional set of questions asking about their current VR usage in terms of different types of media content including video games, television shows or movies, music videos, live journalistic stories, live music events and a final option of selecting other. Participants were given an option to openly answer about the other VR content that they use that wasn't listed among the options.

After selecting their appropriate media usage, the VR users were asked about how long that they have owned a VR device. The VR users were then asked about how many devices that they currently own and which headsets that they used most often. In the final section of the survey, open ended questions asked about users' attitudes toward using virtual reality. Questions included: "What do you enjoy most about virtual reality?"; "When do you usually listen to music? Why?" These questions added context as to what draws VR users toward the technology and how their music habits could connect with their VR usage. To see whether participants watch music videos with virtual reality headsets, the survey concluded with a final question asking: "Have you ever used VR to watch a music video? Why or why not?"

Survey Distribution

The survey questionnaire was approved by an Institutional Review Board (IRB) at a public university in Texas before its distribution among Reddit users.

The survey was made available on Jan. 12, 2018, and was closed on Feb. 12, 2018. The survey was first distributed through various subreddits such as r/SampleSize, r/virtuality, r/WeAreTheMusicMakers, r/GearVR, r/AndroidVR, r/Gear360, and r/GoogleCardboard. Five days later, the survey was posted in other forums such as: r/electronic music, r/AustinMusicians, r/TheWaveVr, r/LetsTalkMusic, r/musicians, r/redditmusicclub. Two days later it was submitted to r/VRFilm, r/youtube360, and r/oculus subreddits. After 12 days, to garner more results, the survey was reposted to most of the subreddits. As shown in table 1, out of the subreddits, r/WeAreTheMusicMakers, r/electronicmusic and r/Oculus had the largest amount of subscribers.

Table 1

Subreddit Groups and total subscribers per group

Subreddit	Subscribers
r/electronicmusic	380,514
r/WeAreTheMusicMakers	252,554
r/Oculus	106,523
r/SampleSize	60,370
r/LetsTalkMusic	53,965
r/GoogleCardboard	28,708
r/GearVR	27,815
r/musicians	9,343
r/AndroidVR	3,070
r/redditmusicclub	1,556
r/Virtuality	1,537
r/Gear360	1,423
r/AustinMusicians	1,034
r/VRfilm	695
r/youtube360	369
r/TheWaveVR	229

CHAPTER V

Results

Demographics

A total of 312 responses were collected from Reddit, 20 respondents had answered no to being 18 years or older and 46 of them didn't complete at least 50 percent of the survey so they were excluded, leaving a remainder of 246 responses.

Of the respondents, 61.4 percent (N=151) were 18-32 years old, 38.6 percent (N=95) were 33-60 years old. Of the respondents, 91.9 percent (N= 226) were male, 6.1 percent were female (N=15) and 2 percent (N=5) chose other as their gender. In regard to respondents' locations, 58.1 percent (N=143) were from the United States, 10.2 percent (N=25) were from The UK, 9.3 percent (N=23) were from Canada, and 22.4 percent (N=55) were from other various European nations.

Reddit Users' Music Usage

In order to answer RQ1, about whether Reddit users are adopters of VR music content or not, Reddit users were asked about how they listened to or watched their music content online as shown in table 2. Of the respondents 80.1 percent (N=197) said that they used streaming services, 74.4 percent (N=183) used video sharing sites, 30.5 percent (N= 75) used online music stores, 17.1 percent (N= 42) used virtual reality headsets, and 5.3 percent (N=13) used satellite radio services. This shows that although a small percentage of Reddit users have used VR at some point to enjoy music content, there are adopters of the technology in the Reddit population studied.

Table 2

Reddit users' music usage through Internet Communication Technologies

Music Technology Preference	%	Count
Streaming music services such as Spotify or Pandora	80.1%	197
Video sharing sites such as Youtube or Vimeo	74.4%	183
Online music stores such as Apple, iTunes, Google Play or Amaxon Music	30.5%	75
Virtual Reality headsets such as Google Cardboard or Samsung VR	17.1%	42
Satellite radio services such as SiriusXM	5.3%	13

Early Adopters of VR Music Content

Of the 42 music VR listeners, 66.7 percent (N= 28) owned their devices for more than a year, 7.1 percent (N=3) owned them for 10-12 months, 2.4 percent (N=1) owned them for 7-9 months, 2.4 percent (N=1) owned them for 4-6 months, 11.9 percent (N=5) owned them for 1-3 months and 9.5 percent (N=4) owned them for less than a month. Of the respondents, 38.1 percent (N= 16) only owned one headset, 33.3 percent (N=14) owned two headsets, 9.5 percent (N=4) owned three headsets, 14.9 percent (N=6) owned four headsets and 4.2 percent (N=1) owned fourteen headsets.

To answer RQ1a, about whether Redditors in virtual reality and music subreddits are "early adopters" of VR technology or not, for the 42 VR music listeners that completed the rest of the survey, a Pearson's r correlation test was conducted between the length of time an individual owned a VR headset and the different selections of media content they used it for. There was no other significant correlations between length of time owning a device and VR content usage other than a negative correlation (P=-.475**) between the length of time an individual owned a VR device and watching VR music videos.

This surprisingly negative correlation means that the shorter amount of time that someone owned a VR headset for, the more likely they were to use it for music VR content. These adopters are using the technology to adopt a new type of media content that hasn't been used before as opposed to the users that have owned VR for longer but declined to adopt it for such purposes. Even though a majority of music listeners have had a VR device for over a year, the most active listeners have had it for a lesser period of time.

Since Rogers (2002) stated that early adopters make up the next 13.5 percent of adopters after innovators, the percentage (17.07%) of users (N=42) stating that they used VR for music, further shows that Reddit VR music listeners can be considered as early adopters of VR music content in relation to the rest of the Reddit population studied.

Reasons for Watching Music Videos in VR

In order to answer RQ2, about why adopters of VR music content say they are watching music videos, (N=39) respondents answered an open-ended question at the end of the survey. When asked about if they had ever watched a music video in VR and what the reason for doing so was, respondents stated a variety of reasons. Over half of these respondents answered that they had experienced music videos in VR in some format and had only positive comments to add about their experience.

Participants cited reasons such as more enjoyment or immersion within the experience. One participant said, "It can be much more immersive than flat screen performances." This coincides with previous claims of the immersive focus of VR content. Another participant stated, "It seem like an interesting experience, and it was enjoyable, although I'm not a huge consumer of music videos in general." This

participant's comments show that VR music videos could might possibly motive people who don't typically watch music videos to engage in viewing them more than they normally would as long as the videos take hold of the technology properly.

Media Content Preference

In order to answer, RQ3, about how usage of VR technology differs among adopters and non-adopters of VR music content, as shown in table 3, adopters of music VR content were asked about their VR content usage and non-adopters of music VR content were asked about their likely VR content usage. A comparison between non-adopters' and adopters' media content selection was made to show these differences.

Adopters' media usage and non-adopters' likely media usage showed a similar percentage of not watching music videos at all. For instance, 35.7 percent of adopters say they weren't watching music videos in VR while 33.8 percent of non-adopters were not at all likely to watch them, however an interesting result is that 57.1 percent of adopters stated that they sometimes watched music videos. This shows that even though a percentage of adopters didn't use VR music video content at all some extent, over half of them had actually watched music videos at some point but weren't often doing so.

Although both adopters and non-adopters showed a preference for video games, non-adopters had a much higher percentage of most likely using video game content. For instance, 60.3 percent of adopters were very likely to play video games in VR as opposed to 33.3 percent of non-adopters stating that they already played video games very often in VR.

This also proved to be the case for TV shows or movies, as non-adopters were more open to using VR to watch this type of content. Fifty percent of the adopters

sometimes watched TV shows or movies but only 11.9 percent of them stated that they would watch TV shows or movies most of the time. Non-adopters were more open to TV shows and movies because 31.4 percent of them stated that they would be moderately likely and 14.7 percent were very likely to watch them. Non-adopters had more interest in likely using TV shows or movies as their VR content of preference than current adopters.

Of the adopters, 69.0 percent were not watching journalistic stories at all while 31.4 percent of non-adopters were not at all likely to watch them. A higher percentage of non-adopters were more open to watching journalistic stories as 18.6 said they would be moderately likely to watch them while none of the adopters stated that they watch them most of the time.

Non-adopters were also much more likely to use VR to view live streaming events as a much higher percentage were open to utilizing the content than adopters already exposed to it. Of the adopters only 2.4 percent said that they would watch live events most of the time or very often. Of the non-adopters, 28.9 percent would moderately likely and 13.7 percent would very likely use VR for live streaming events.

Non-adopters also showed a higher percentage of other uses for VR as 14.2 percent were moderately likely and 29.4 percent were very likely to use VR for other purposes. Among these purposes, non-adopters stated that they would use it for adult content, sporting events, virtual tours, art galleries and education. Adopters were less open to using VR for other purposes with only 4.8 percent saying they used it most of the time and 9.5 used VR for other purposes most of the time. Adopters said that they would use it for similar other purposes as non-adopters, stating that they would use it for adult content, touring, art and social applications.

Table 3

Adopters' Media Usage vs. Non-Adopters' Likely Media Usage

Media Usage	Not at all	Sometimes	About half of the time	Most of the time	Very often	Not at all likely	Moderately unlikely	Neither likely nor unlikely	Moderately likely	Very likely
Music Videos	35.7%	57.1%	2.4%	0.0%	4.8%	33.8%	26.0%	18.6%	15.7%	5.9%
Video Games	0.0%	21.4%	19.0%	26.2%	33.3%	5.9%	4.4%	4.9%	24.5%	60.3%
TV Shows or Movies	28.6%	50.0%	9.5%	11.9%	0.0%	13.2%	22.5%	18.1%	31.4%	14.7%
Journalistic Stories	69.0%	26.2%	2.4%	0.0%	2.4%	31.4%	27.0%	17.2%	18.6%	5.9%
Live Streaming Events	35.7%	57.1%	2.4%	2.4%	2.4%	26.5%	18.6%	12.3%	28.9%	13.7%
Other	38.1%	31.0%	16.7%	4.8%	9.5%	17.2%	4.3%	33.8%	15.2%	29.4%

Note: VR music adopters are on the left while non-VR music adopters are on the right

Discussion

Implications

The results of this survey show that virtual reality music content is not yet diffusing among all of the studied Reddit population in this research, but there are adopters that can be classified as early adopters since 17.7 percent of them stated that they would use a VR HMD for listening to music in some form. The results also show that respondents were interested in other types of virtual reality media content.

Since 66 percent of VR music listeners had their device for over a year but their length of time owning a device correlated negatively with their music video usage, this means that newer VR users are more likely to use VR for music videos. These adopters are using the technology to adopt a new type of media content that hasn't been used before as opposed to the users that have owned VR for longer but declined to adopt it for such purposes. These results show that VR music videos are not yet appealing to VR users that are well acquainted with their devices.

The results also show that VR music videos have appealed to some of the adopters in positive ways such as better immersion and more entertainment than a traditional two-dimensional experience. One adopter mentioned that he did not even watch music videos often but enjoyed the experience. This shows that if a VR music video is developed properly it may get more audiences to watch music content in this format.

The comparisons showing the differences between adopters and non-adopters of VR music content usage or likely usage shows that non adopters are open to a lot of content that VR music adopters did not use. Non-adopters said that they would most

likely watch TV shows or movies, journalistic stories and live streaming events more than adopters already did. Since more than half of the non-adopters (66 percent) chose video gaming as their VR content preference with no other higher percentage for any other media content preference, this shows that video games currently have a higher chance of being a major use of VR technology than other types of media content.

When respondents were asked about when and why they typically listened to music, most of them said that they do so outside of virtual reality experiences. Most of them said they listened to music during a car ride, gaming or working. Most of the respondents said that the reason they listen to music is to relax them or get them more immersed into the activity that they are currently performing to help with their productivity. This shows that current adopters of music VR content don't typically associate VR usage with music other than as background music during video games or other activities.

Limitations

One of the limitations in this survey was that Reddit users that didn't use VR for music weren't questioned as extensively about their VR usage as the VR music listeners. Asking the non-adopters of VR music content about why they don't use VR for music purposes could provide further insight as to what the music industry could do to gain more consumers by changing music VR content. Also, asking the non-adopters about the HMDs that they owned, if they owned any, could have provided more context about the VR music listeners as opposed to the VR users that don't listen to music in VR.

A limited amount of VR HMDs were listed as selections for respondents so a more accurate analysis of the headsets that are currently being released to the consumer

market could display a more valid prediction as to which device is being used most often since the only device with a significant amount of users was the Oculus Rift with 29.4 percent (N=10) stating that they would always use it for their content. Another possible limitation was that this research did not ask exact dates of purchase which could provide more detail in future research as to when adopters specifically chose to purchase their HMD and how close it was to its commercial release date.

A previously measured instrument to measure adopters' attitudes and innovativeness could provide more reliable results in future studies on VR adopters as this thesis was unable to find an instrument commonly used to measure these variables so it incorporated qualitative questions. Other music experiences were revealed in the open-ended questions at the end of the survey and showed that more types of music content should be added to future diffusion studies of VR as users cited VR visualizer experiences and interactive music VR content rather than just music videos. When respondents were asked to answer open ended questions about other uses for VR, most of them mentioned adult content, virtual tourism, chatting applications and various video content.

A final notable limitation in this survey in regard to demographics, was that only 6.1 percent of the sample population studied were females with 2 percent choosing other as their gender while 91.9 percent were males. This gives insight as to how males used VR devices but the technology isn't primarily geared towards male usage. Distributing the survey on Reddit may have limited the diversity of VR users so distributing a similar survey to a population that allows for more female participants would likely garner a chance to include a more diverse population of users in regard to their gender.

Future Directions

Based upon the data from this survey, future research needs to find ways to incorporate diversity to get a more accurate depiction of VR usage among all adopters and likely adopters of VR media content. How are female adopters or likely adopters using this technology as opposed to the male adopters studied in this survey? Future research on diffusion of VR content should include populations of online communities that provide more opportunities to increase diversity among genders of users enjoying VR content to gain a broader understanding of adopters and likely adopters of VR content.

Future research could also be conducted on how video game content seems to be morphing or channeling the diffusion of VR as a main focus of content since both VR music listeners and likely users of VR stated that they were mostly interested in video gaming content. It would be useful for future research on the diffusion of VR to ask why video games are more important to individuals than other types of media since it is the most popular use of the technology. What are these users' attitudes toward video gaming content?

The data from this thesis also shows that since music experiences in VR aren't being adopted by enough individuals on the internet, the music industry needs to try to capitalize on how to profit on this content in various ways since the technology is being utilized by musicians to some extent but not the actual VR users themselves. There are newer VR applications serving as channels of VR content distribution being released toward the end of 2018 and newer fifth generation (5G) mobile networks with higher speed will supposedly allow VR content users to enjoy content wherever they go

(Research and Markets 2018). Conducting a content analysis on these newer VR applications and surveying users about their experiences when mobile network speed is increased could provide more accurate information on music and other content within virtual reality.

When respondents were asked about what they like the most about virtual reality, the most common answer was that they enjoyed how immersive the experience was for them. Some respondents claimed that it allowed them to escape from the outside world and some just plainly stated that they used it for adult content. Since the most common answer to the open ended question at the end of the survey about why individuals liked VR mentioned that immersion was the main aspect of VR experiences that they enjoyed, this quality of immersion could be studied more thoroughly through different psychological theories of audience research.

Conclusions

A key contribution to this study is that media content is the major focus of having a role in whether adoption of VR is occurring. Even though Rogers (2003) stated that successful diffusion of an innovation requires the innovation itself, communication channels of distribution, time of diffusion and the social system it is diffused through, he doesn't mention media content as an essential diffusion process. Also, none of the diffusion research mentioned in this thesis focused on media content as an indicator of adoption so future research in diffusion could further study media content combined with these previous elements of diffusion.

Analyzing the different types of content available in current VR usage and measuring their frequency of usage in future studies could provide further avenues of research in diffusion and VR adoption studies.

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APPENDIX

Let’s begin with a few questions about yourself.

How do you self identify your gender?

__Male

__Female

__Other

How old are you?

_____

In what country do you reside?

_____

Thanks! Now, let's talk about the various ways you listen to or watch music.

How do you listen to or watch music using Internet or mobile technologies? (Select all that apply)

___Streaming music services such as Spotify or Pandora

___Video sharing sites such as Youtube or Vimeo

___Virtual Reality headsets such as Google Cardboard or Samsung VR

___Online music stores such as Apple, Itunes, Google Play or Amazon Music

___Satellite radio services such as SiriusXM

Thanks! Now, a few questions about how you would use VR if given the opportunity. (Non-adopters that didn't select VR headsets)

How likely are you to use VR to do any of the following? (Not at all likely to very likely)

Play Video Games

___ ___ ___ ___ ___

Watch Television Shows or Movies

___ ___ ___ ___ ___

Watch music Videos

___ ___ ___ ___ ___

Watch Journalistic Stories

___ ___ ___ ___ ___

Watch Live Streaming Events

___ ___ ___ ___ ___

Other

___ ___ ___ ___ ___

If other use, then what?

_____

(Adopters that selected VR headsets)

Thanks! Now, a few questions about how you use VR and music.

To what extent do you use VR for each of the following: (Not at all to very often)

Music Videos

___ ___ ___ ___ ___

Video Games

___ ___ ___ ___ ___

TV Shows or Movies

___ ___ ___ ___ ___

Journalistic Stories

___ ___ ___ ___ ___

Live Streaming Events

___ ___ ___ ___ ___

Other

___ ___ ___ ___ ___

If other use, then what?

_____

Thanks! Now, let's talk about the VR headsets that you own.

How long ago did you buy your first VR headset?

___Less than a month

___One to three months

___Four to six months

___Seven to nine months

___Ten to twelve months

___More than a year

How many VR devices do you currently own? (Please write a number)

_____

How often do you use each of the following headsets? (Never to always)

Samsung Gear VR

___ ___ ___ ___ ___

Oculus Rift

___ ___ ___ ___ ___

HTC Vive

___ ___ ___ ___ ___

Google Cardboard

___ ___ ___ ___ ___

Other

___ ___ ___ ___ ___

If you chose other, then what device?

_____

Thanks! Now, a few final questions about VR headsets and listening to music.

What do you enjoy most about VR?

_____

When do you usually listen to music? Why?

_____

Have you ever used VR to watch a music video? Why or why not?

_____

VITA

Michael Harmon

EDUCATION

M.A., Digital Media Studies. 2018
Sam Houston State University, Huntsville, TX
Advisor: Robin Johnson, Ph.D.
GPA: 4.0

Participated in a group project to develop Snapchat social media marketing proposal for social media course.
Developed a group research project proposal applying technology acceptance model to ridesharing applications for persuasion research course.
Conducted research on diffusion of innovation theory applied to virtual reality in music videos for mass communication theory course and thesis topic.
Conducted research on altruism in question answering forums for mass communication research methods course.

B.A., Art, *magna cum laude.* 2015
Howard Payne University, Brownwood, TX
GPA: 3.74

RELEVANT GRADUATE COURSEWORK

Digital Media Theory and History ♦ Critical Approaches to Media ♦ Social Media ♦ Advanced Digital Writing ♦ Digital Media Ethics and Law ♦ Mass Communications Research Methods ♦ Mass Communications Theory ♦ Digital Entrepreneurship ♦ Persuasion Research

WORK EXPERIENCE

Teaching Assistant 2017
Department of Mass Communications
Sam Houston State University
Huntsville, TX

Taught two writing for media courses that emphasized different writing styles for broadcast scripts, journalistic writing, public relations, advertising, and writing for a web series.
Developed writing assignments such as writing a broadcast script in proper broadcast news format.
Informed students how to write a print news story with a proper headline, lead, and organized story structure.

Instructed students about the differences in writing for public relations and advertising through additional writing assignments.

Gave students weekly exercises that stressed importance of proper grammar and appropriate formatting in writing for the media.

Taught students how to distinguish between the most important details within news stories.

Graduate Assistant 2015
Department of Mass Communications
Sam Houston State University Michael Harmon
Huntsville, TX

Planned sports broadcasting course schedule.

Taught students how to properly operate a camera: how to perform various shots of athletes and audiences, how to set up a camera and balance it on a tripod, and how to properly communicate through a headset during sports events.

Instructed students on how to set up a broadcast production at athletic events: students had to set up camera reels, tape down cables, figure out proper safety routes to avoid audiences tripping over equipment.

Informed students about proper broadcasting teamwork: students had to choose various positions from camera man to technical director, students had to synchronize camera work and graphics being sent from a broadcast van to a score board during sports events.

Assessed students on their ability to properly follow instructions on utilizing camera and broadcasting equipment during sports events.

Assisted with developing online courses and administering tests on broadcast production techniques including developing a budget for a fictional documentary production.

Student Worker 2014
Art Department
Howard Payne University
Brownwood, TX
Installed art galleries.

Set up art studios for courses.

Created poster designs for art galleries.

Printed and graded exams.