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LIVE 3D PRODUCTION OF SPORTING EVENTS, THE FUTURE OF SPORTS BROADCASTING

by

Scott A. Changnon

B.S. Southern Illinois University, 2010

A Research Paper
Submitted in Partial Fulfillment of the Requirements for the
Master of Science Degree

Department of Mass Communications and Media Arts
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RESEARCH PAPER APPROVAL

LIVE 3D PRODUCTION OF SPORTING EVENTS, THE FUTURE OF SPORTS BROADCASTING

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Scott A. Changnon

A Research Paper Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Masters of Science

in the field of Professional Media and Media Management Studies

Approved by:

Dr. John Hochheimer, Chair

Graduate School
Southern Illinois University Carbondale
November 2, 2011

AN ABSTRACT OF THE RESEARCH PAPER OF

Scott A. Changnon, for the Master of Science degree in Professional Media and Media Management Studies, presented on 27 October 2011, at Southern Illinois University Carbondale.

TITLE: LIVE 3D PRODUCTION OF SPORTING EVENTS, THE FUTURE OF SPORTS BROADCASTING

MAJOR PROFESSOR: Dr. John Hochheimer

The broadcasting of live sporting events in America has embarked into a new frontier of three-dimensional (3D) high-definition (HD) broadcasting. In this research paper, I examine what the future holds for live 3D broadcasts of sports in America. I believe that there is a future of sports in 3D. In this paper I go over the history of both sports media and 3D technology as well as gather opinions from professionals in 3D manufacturing, 3D sports media, 3D advertisers, and 3D retail. 3D is here and as time goes on, more and more 3DTV's will be in American homes.

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I would like to formally thank William Edwards with Panasonic who visited the campus of Southern Illinois University to give a seminar on sports in 3D. The seminar was a definite success and his knowledge and insight helped me understand where 3D and sports is going to be in the next five to ten years. In the College of Mass Communications and Media Arts, I want to thank Jan Roddy and Linda Gassel for always being there to answer any questions I had regarding my project as well as being supportive. I also would like to thank Dr. John Hochheimer for his willingness to be my committee chair and guiding me through this research project. Lastly I would like to thank my father and mother, Marc and Janis Changnon, for being so supportive since I became a Saluki back in August of 2006.

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CHAPTER 1

INTRODUCTION

Sports are a very important part of American culture. No matter what time of year, people throughout our country can be heard saying, “This is the big game of the year.” In the United States this phrase is repeated numerous times a year by sports fans in every part of the country. Traditionally, American’s have watched their beloved sports teams on television, whether from the comfort of their homes or at a local sports establishment. In recent years, however, the broadcasting of sporting events has embarked upon a new frontier that broadcasts three-dimensional (3D) high-definition (HD) video live and on-demand to consumers of new 3DHD television sets. Several professionals in the sports broadcasting industry are studying this technology and their opinions on the success of this new technology have many wondering if 3D will become part of everyday sports broadcasting or if it will fade away.

There are many forms of 3D technology such as 3D photography, 3D animation graphics, 3D production of sports, 3D gaming, 3D motion pictures, and many more. I am focusing my research on 3D production of sports. 3D sports can be defined differently in terms of production and reception compared to other forms of 3D. During 3D productions, traditional camera placements at sporting venues for 2D no longer remain the same. In order to get a true 3D picture, 3D cameras need to be close to the action, which requires more cameras to be positioned closer to the playing field. The reception of watching live sports in 3D gives the viewer ‘telepresence’, which is defined by Peter Seel as technologies

that give the user the illusion that they are in a place other than their actual location (Seel, 2010: 316). My research is mainly focused on those who watch sporting events on a high-def 3D television while wearing 3D glasses.

Why choose to study sports in 3D? It was the fall of 2010 when I decided to focus my final research paper on sports in 3D during Dr. John Hochhiemer's MCMA-593 seminar course. When Dr. Hochheimer asked us to come up with a proposal for a final research paper, I thought, what subject would be in my best interest to research considering the career I wanted to pursue? I am currently a graduate assistant with Saluki Athletics' Video Services Department and I am pursuing a career in sports video production when I graduate. After a lot of investigation I decided to research sports in 3D. The sports production world is ever changing and why not research something that I have little knowledge of and something that I may be working with in the future?

Sports being broadcast live in 3D is currently in its infancy having only been available to the consumer since the summer of 2010 when ESPN launched their newest channel 'ESPN 3D'. It is my belief that the broadcasting of live sporting events in 3D will be adopted in a similar scenario to how consumers adopted high-definition from standard-definition. By utilizing Everett M. Rogers' diffusion of innovation theory, I can further evaluate if watching sporting events in 3D will be adopted by the masses. Rogers defined diffusion as 'the process by which an innovation is communicated through certain channels over time among the members of a social system'. Rogers' theory has five characteristics that can influence potential consumers in deciding to adopt a new technology or not: (1)

Relative advantage, (2) Compatibility, (3) Complexity, (4) Trialability and (5) Observability (Seel, 2010). Throughout this paper I will examine each characteristic to see if 3D technology has the potential to be adopted by consumers.

To help support my theory that the future of sports in 3D will succeed, it is important to research the history of 3D technology and the history of sports media to determine what the future has in store for this technology. Since 3D is currently in its infancy, it is important to grasp the knowledge and opinions of manufacturers of 3D products, professionals in the sports broadcasting industry, 3D advertisers, and lastly the retail outlets that sell 3D products to consumers, in order to get a good understanding of where 3D will be in the near future.

CHAPTER 2

HISTORY OF 3D TECHNOLOGY

3D technology is not as new as most would believe it to be. As Daniel Minoli states in his book *3D Television (3DTV) Technology, Systems, and Deployment,* while it was nowhere near as cutting edge as the technology we see today, three-dimensional technology has been around for over half a century in cinema and a variety of films over the years requiring inexpensive polarized glasses (Minoli, 2011). Christoph Fehn, co-author of the book *3D Videocomunication: Algorithms, Concepts, and Real-time Systems in Human Centred Communication*, wrote a more detailed history of 3D Technology. The earliest versions of 3D technology can be linked to the history of stereoscopy that has been traced as far back as 1838 when British researcher and inventor, Sir Charles Wheatstone developed a mirror device that "enabled the viewer to fuse two slightly different perspective images into a single three-dimensional percept (Schreer, 2005)." Wheatstone's rather bulky and not easy to handle invention was the original *stereoscope* that was eventually altered to be more handy and user-friendly by Sir David Brewster in 1844. By the end of the 19th century both Europe and the United States enjoyed the stereoscopic photographs through the *stereoscope* (Schreer, 2005).

When motion pictures came around, the popularity of the stereoscope declined but the concepts of the stereoscopic images were still fresh on people's minds. The Lumière brothers were able to show off their modified stereoscope in Paris during the 1903 World Fair, showing the first three-dimensional short

movies. The only problem was that one person could only view these short movies at a time through the modified stereoscope (Schreer, 2005). Peter Seel also wrote about the history of 3D technology in his journal, *Digital TV in 3D: A passing fad or the next step in the evolution of digital television?* R.M. Hayes' study (as cited in Seel, 2010) found that the first demonstration of projected 3D motion images was shown at the Selwyn Theatre in New York in December of 1922. The *Teleview* shutter system was a device created by Laurens Hammond and William Cassidy that patrons were given prior to the screening. A rotating shutter in each *Teleview* shutter system was synchronized to the motion images on the screen that allowed the content to be displayed to each eye in sequence at eighteen frames per second. Those who attended this demonstration were blown away at the 3D imagery that was created much like the stereoscope (Seel, 2010).

The first full-length feature film shot in 3D, *The Power of Love*, was also shown in 1922 at the Ambassador Hotel in Los Angeles to a large audience. In order to create a three-dimensional picture, the anaglyphic process separated the projected left and right-eye images. 3D popularity fell off the map for a while until the 1950's when Hollywood returned 3D in order to make more money. The 1952 film, *Bwana Devil*, was the first 3D feature film created in Hollywood on a low budget. The film had astonishing success and earned approximately $100,000 in one week at one theater, which was unheard of at the time. This started the 3D craze in Hollywood that would eventually bring out 3D films such as *House of Wax* (1953), *It Came from Outer Space* (1953), Alfred Hitchcock's

Dial M for Murder (1954), and more. Hollywood produced over sixty-five 3D movies until the films did not meet viewer's expectations due to low quality films that were being produced. Today however, large-scale three-dimensional productions have found a niche market in specially equipped cinemas in theme and amusement parks as well as IMAX theatres (Schreer, 2005).

The world of sports and 3DTV production finally came together in 1998 when the Japan Broadcasting Corporation, or NHK, developed a "3D HDTV relay system" that used a satellite to transmit a live stereoscopic feed of the Nagano Winter Games to a live audience in Tokyo. Four years later during the 2002 FIFA World Cup soccer tournament in Korea, they transmitted a live feed by both satellite and a terrestrial network (Schreer, 2005). In 2008, the Dallas Mavericks of the NBA teamed up with Fox Sports Net Southwest for a high definition broadcast of the first live sporting event in 3D via satellite. The total estimated cost of the production on March 25, 2008 was approximately $200,000 (Dickson, 2008).

Games had been tested live in 3D before via fiber-optic links, however this was the first time a sporting event was broadcast in 3D live via satellite in the United States. Senior executive producer of FSN Southwest Mike Anastassiou directed the historic game while wearing 3D glasses. Anastassiou said that unlike regular HD games he has produced in the past, the 3D cameras respond to less movement. Instead of zooming in on a player, Anastassiou let the player come to the camera. "I let my shots breathe, and didn't cut in as many 'hero shots'," said Anastassiou about the game. What Anastassiou meant by letting

his shots ‘breathe’ and not cutting to as many ‘hero shots’ was that in a 2D production, he would generally to use more camera movement and rapid switching of shots in order to achieve the “courtside seat effect.” Fusing two HD cameras together generates images for each eye that when projected at the same time delivers a great 3DHD experience (Dickson, 2008). Unlike 3D movies like “Avatar” that grossed approximately $2.78 billion dollars worldwide in the box office, live sporting events in 3D are more of an expensive investment towards the future of sports in 3D (Internet Movie Database, n.d.).

In his book Daniel Minoli reported that ESPN 3D aired its first 3D televised game of the FIFA World Cup soccer match between South Africa and Mexico on June 11, 2010. Other 3D events that have been broadcast live already have been an additional 25 World Cup matches, the 2011 BCS National Championship Game, college basketball and football, and the Summer X Games. Just recently the 2011 Masters PGA golf tournament in Augusta, Georgia was aired on ESPN 3D as well (Minoli, 2011). According to ESPN.com, ESPN 3D finished airing the entire Little League World Series on August 28, 2011 and has started airing the 2011 College Football season to start the second year of the channel’s existence. Although ESPN 3D did broadcast all of these events in 3D, not everyone in America had the luxury to view the 3D events. In order to watch ESPN 3D, consumers had to subscribe to a 3D tier through service providers like DirecTV, Comcast, or AT&T U-verse who can provide this channel (Dickson, 2010). ESPN representatives have stated, “ESPN’s commitment to 3D is a win for fans and our business partners. ESPN 3D marries

great content with new technology to enhance the fan's viewing experience and puts ESPN at the forefront of the next big advance for TV viewing" (Minoli, 2011).

The history of three-dimensional technology has come along way from the original stereoscope in 1838. With 3DHD channels that are available today such as ESPN 3D, or the number of 3D movies like Avatar, to the 3D products available to consumers like 3D camcorders, 3D has sustained success for now. In order for that success to continue however, I believe sports media will play a major role. With sports in 3D, there is always new sporting event that is being broadcast each week and I believe that the unpredictability of sports shot in 3D will keep consumers of 3D happy and entertained. In order to understand why I feel that the broadcasting of live sporting events in 3D will be adopted, it is important to reflect on the history of sports media in the same way that I looked at the history of 3D technology.

CHAPTER 3

HISTORY OF SPORTS MEDIA

Television and sports really started to mold together in 1947 when NBC broadcast the first televised World Series of the Brooklyn Dodgers and the New York Yankees (Hilliard, 2010). In 1948 there were approximately 200,000 television sets in the United States. At this time broadcasters wanted to invest in sports programming to increase demand for television sets even though advertising within sportscasts really hadn't arrived yet. According to the Museum of Broadcast Communication website, "although the stunning acceptance and diffusion of television cannot be attributed solely to sports, the number of sets in use in the U.S. reached ten and a half million by 1950" ("Sports and Television," 2011).

As the number of television sets filled homes in America, broadcasting sports at the time was relatively cheap. Unlike content regularly shown on the television, there were no sets to build or actors and writers to hire, allowing sports to be produced at a much smaller price. To put this in perspective, James Stewart, who stared as George Bailey in Frank Capra's *It's A Wonderful Life,* made roughly $600,000 per film during that time. With sports that price tag did not apply. As other genres developed and the loyal viewership of those genres were taken up by both men and women each week, sports moved to prime-time on the weekends which proved successful to the niche market ("Sports and Television," 2011).

Gary Edgerton, author of *The Columbia History of American Television* wrote in depth about *The Gillette Cavalcade of Sports*, a commercial network television program premiered for the world featherweight championship bout between Willie Pep and Chalky Wright on September 29th, 1944. The Gillette Razor Company continued this sponsorship for the next sixteen years. Boxing during that era was very popular, NBC and Gillette were able to have fights with boxing's greatest names such as Joe Louis, Sugar Ray Robinson, and Rocky Marciano that received TV sponsorship in *The Gillette Cavalcade of Sports*. Edgerton explained in his book that reviews at the time predicted, "this is the kind of event that'll make people buy televisions, not the endless boring cooking shows that seem to turn up on every channel. Boxing became something of an institution in early television' (Edgerton, 2007)." By the mid 1960's, Gillette could not afford to remain the sole sponsor of the select sporting events. The amount of sports content on network television had grown rapidly and a variety of advertisers were able to get a piece of the pie. Between 1970 and 1985 there were large increases in money made from sports covered on television. For example in 1970, networks paid $50 million to broadcast the NFL, $18 million for the MLB, and $2 for the NBA. By 1985 those figures had grown to $450 million, $160 million, and $45 million respectively. This not only meant more sports were covered but the quality of the coverage was better ("Sports and Television," 2011).

The Entertainment and Sports Programming Network (ESPN) launched on cable television in September of 1979, but before that where else could sports

enthusiasts find news and coverage of the teams they closely followed? In his book *ESPN The Company: The Story and Lessons Behind the Most Fanatical Brand in Sports,* Anthony Smith mentioned that ABC's Wide World of Sports was the weekly outlet for sports fans. The only time fans could catch a glimpse of their favorite team(s) scores and highlights was during a few minutes on the local news channel. When an unemployed sports announcer, Bill Rasmussen, and a group of sports buffs decided to lease unwanted satellite transponder space to broadcast Connecticut college sports and New England Whalers hockey games in Bristol, Connecticut, they had no clue what was in store for them. Little did Rasmussen know that ESPN would become the "most powerful and prominent name in sports media" (Smith, 2007). Nearly a year after ESPN launched in 1979, ESPN reached approximately four million homes. By 1986 that number went from four million to thirty seven million households that subscribed to the all sports network. Additionally during the mid 1980's, superstations like WGN and WTBS as well as the premium channel Home Box Office (HBO) provided sports programming at a national level ("Sports and Television," 2011). At this point, more options were available for Americans to watch sports. In 2007, the UBS announced that the determined value of ESPN was at $28 billion and that it accounted for 40 percent of Disney's $70.7 billion market capitalization (Smith, 2007).

ESPN has expanded its programming across multiple media platforms that all started with the TV in 1979. Since then in 2003 ESPN went from standard definition television to high definition television on March 30, 2003 to

now producing live and on-demand content on the Internet to be watched via computers, tablets like the Apple iPad, and a variety of smart phones. Now, ESPN has added a new media platform for sports programming, 3D sporting events ("The HD Experience," 2008).

As Americans have continued to move from basic television and even the online experience, 3D television is on the horizon in hopes of becoming the next best sports media platform. With 3D broadcasting underway, the presence of ESPN 3D as well as DirecTV being the most competitive 3D service provider, many wonder if it will succeed. In her article Marguerite Reardon reports that some critics wonder if the required glasses to see 3D will turn people away (Reardon, 2010). It can be compared to 1948 when broadcasters wanted to invest in sports programming to increase demand for television sets and hope advertisements would come. Now broadcasters are investing in the 3D coverage of sports, movies, entertainment, and other genres hoping to get 3D televisions into the home. In 2011 there are four channels available to those who subscribe to a 3D tier through service providers like DirecTV who provides these genres to paying customers. I will go into further detail on these channels in chapter five. In another book that Daniel Minoli wrote titled *3DTV Content Capture, Encoding, and Transmission*, Minoli mentions how DirecTV is partnering up with CBS, FOX Sports Net or FSN, Turner Broadcasting System, NBC Universal, and more to help provide additional programming (Minoli, 2010).

Three-dimensional technology is here and growing each day but will three-dimensional technology thrive in the 21st century? After a thorough study of the

history of both three-dimensional technology and the history of sports media I believe three-dimensional technology will succeed. Yet the extent of this success remains unclear. Will history repeat itself as it did in 1948 with the emergence of the television set? Will 3D televisions reach the popularity of high definition television sets? I believe the niche market of sports fans and movie buffs will help provide profitable success to three-dimensional technology because the number of 3DTV's sold in 2011 is nearly three times as high as what was predicted at the beginning of 2011 (Smith, 2011). This evidence shows that the 3D content available, mainly sports, movies, and television shows, are being watched by consumers.

There are many factors that will determine the success of 3D which are the high costs, required glasses, cable and satellite providers, and more. Based on my research, I do not believe 3DTV will ever be as successful as the emergence of the television in 1948 and the emergence of even HD in the last decade, but, there will be enough success to make the use of 3D profitable in specific niche markets.

CHAPTER 4

MANUFACTURING OF 3D PRODUCTS

The programming that ESPN 3D is broadcasting is only possible thanks to the technology of 3D. Peter Seel also wrote about how 3D technology works in his journal stating that there are primarily two methods for creating 3D images on a two dimensional screen. The method that has been around the longest is anaglyphic stereoscopic technology where the right and left eye images are double exposed in each frame. The 3D images can be seen through the cheap cardboard glasses with red and blue plastic lenses that have been used for recent Super Bowl advertisements and during the 2010 Grammy Awards when there was a special tribute to Michael Jackson. The newer method is electro-optical technology using battery powered 'active shutter' glasses that electronically can synchronize alternating displays so those wearing the glasses can see the high-resolution 3D picture. Unlike the older anaglyphic stereoscopic technology, electro-optical technology provides very sharp and clear 3D images with every frame in high resolution and double exposure is not required (Seel, 2010).

Although the newest method of electro-optical technology (active glasses) is by far the best in terms of quality, the anaglyphic stereoscopic technology (passive glasses) is used just as much in present day. Senior business development manager for Panasonic Solutions Company, William Edwards, visited the campus of SIU in August of 2011 to give a 3D seminar to students and faculty. In his presentation he was able to explain the difference between

passive and active glasses. There are positives and negatives seen in both methods of viewing technology.

The positives of using passive glasses, for one, is that they are inexpensive since they do not require a power source. According to Phil Conner and Robert Wiley's article *Active 3D vs Passive 3D*, passive glasses can cost as little as five dollars a pair making it easier for a large family to afford to watch 3D content (Connor & Wiley, 2011). Edwards discussed to the audience at SIU another advantage of wearing passive glasses, "If you are in a sporting or broadcast environment and you want to see all the displays in 3D, the type of glasses to see all the displays have to be passive." The negatives of using passive 3D glasses are that they give half the picture quality to the viewer, ergo there will be less depth to the 3D and the quality will be low. Also if someone is wearing passive 3D glasses, they have to keep their head looking straight at the screen, if they tilt their head either left or right, it can break the 3D effect (Edwards, 2011).

Where the positives for passive glasses helps movie theatres, sports bars, master control rooms for production companies needing to view multiple 3DTV's with the same set of glasses, things aren't so positive for the home viewer. The positives of using active 3D glasses are mainly for the consumer who has one 3DTV to watch sports, movies, and shows in 3D. Unlike passive glasses that only give half the picture quality, active glasses give full picture quality meaning each eye is able to see full 1080p for crystal clear depth and detail. Active 3D glasses are powered by a small battery and are connected to that specific 3DTV

via an infrared emitter or IR emitter for short. The active 3D glasses equipped with an IR receiver pick up the signal from the 3DTV and while 3D content is being displayed, the glasses are shuttered turning one eye on and the other eye off, all in a fraction of a second, at a speed too fast for the eyes to see that gives the three dimensional image. Active 3D glasses are by far superior to passive 3D glasses, however the negative features are the prices. Where a pair of passive glasses may cost five dollars a pair of active glasses cost from fifty to one hundred dollars (Connor & Wiley, 2011). Another negative feature of wearing active glasses can be the eyestrain it can put on a viewer and the tiring of the eyes can lead to headaches (Edwards, 2011).

According to a news release from August 8th, 2011 retrieved from www.fullhd3dglasses.com, Panasonic, Samsung, Sony, and X6D Limited (XPAND 3D) announced a partnership on the "Full HD 3D Glasses Initiative." This initiative means that all four of these companies will be working together to develop and license radio frequency (RF) system 3D active glasses technology. These companies will also implement RF and infrared (IR) system protocols between the 3D active glasses and all types of 3D displays ("Full HD 3D," 2011a). I believe that the Full HD 3D Glasses Initiative will be great for the growth of 3DTV Technology. With this initiative, these companies will be introducing universal active 3D glasses to consumers. This means that once this initiative is implemented, a consumer can watch any of the four major 3DTV, 3D PC, 3D projector, and 3D theatre brands with the same pair of active 3D glasses. This means the 3D movie fanatic can bring his or her active glasses from home

to the theatre and the sports fanatic who goes to a friends house with his or her own pair of active 3D glasses can do the same, even if his or her friend has a Sony 3DTV rather than a Panasonic 3DTV.

Masayuki Kozuka, general manager of Media & Content Alliance Office, Corporate R&D Division, with the Panasonic Corporation was quoted in the press release stating, “We hope the expanded collaboration on this 3D standardization initiative will make a significant contribution toward accelerating the growth of 3D-related products.” Jurack Chae, vice president, R&D Team, Virtual Display Business, Samsung Electronics was also quoted in the release saying:

> To-date, active 3D technology has proven to be the most popular choice for consumers in the 3D TV market. According to the NPD Group, Active 3D technology took an average of 96 per cent share of the U.S. 3D TV market in the first half of this year [2011]; and this Full HD 3D Glasses Initiative will help further drive consumer adoption and understanding of active 3D–the technology that provides the clearest and most immersive 3D experience available (“Full HD 3D,” 2011a).

Representatives from Sony and XPAND 3D also gave positive reactions to the initiative. These four major companies are being supported by Bluetooth SIG to help standardize 3D glasses with Bluetooth technology. “These market leaders are coming together to make 3D experience better for the consumer. It makes perfect sense that Bluetooth technology would be a vital component of that solution, both for its mass market ubiquity and the freedom and convenience it

provides," said Bluetooth SIG executive director, Michael Foley ("Full HD 3D," 2011a). Nearly a month later on August 30th, 2011, the same website posted a new press release stating that Royal Phillips Electronics, Sharp Corporation, TLC Corporation, and Toshiba Corporation have expressed support to the "Full HD 3D Glasses Initiative." This is another improvement to the growth of getting 3DTV's into the home because more companies are joining the bandwagon of a new technology standard for 3D active shutter glasses. An exact date has not been set but the newest press release states that the license program for the initiative is targeted to commence in late September 2011. The release also reports that in late 2011, the Full HD 3D Glasses Initiative has planned to place a distinct logo on all products manufactured under the license ("Full HD 3D," 2011b).

So what about the other name brand manufacturers? Returning to Phil Connor and Robert Wiley's article, "LG and Vizio are producing only passive 3D in their LED-LCD TV lineups…Toshiba is producing both active and passive 3D and also trying to bring the market to the first 3D TVs without glasses (Connor & Wiley, 2011)." Regardless of who is producing active or passive 3D in their TVs, the market for 3D has definitely grown in 2011. For those who wish to enjoy 3D at home for a relatively cheap price, LG, Vizio, and Toshiba can help providing 1080p HD when watching regular 2D content and half picture quality when watching 3D content. For those who have a higher income, going with name brands such as Panasonic, Samsung, and Sony provide both 1080p HD *and* 3D picture quality for consumers.

When analyzing Everett M. Rogers' diffusion of innovation theory, three of the five characteristics, relative advantage, compatibility, and complexity, are seen regarding the manufacturing of 3D products. Rogers' first characteristic to look at is the relative advantage characteristic that consumers will evaluate regarding 3DTV technology. Rogers' relative advantage characteristic is defined as "the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factors" (Rogers, 1995: 15). Launching an innovation like 3D technology, the price is always going to be the number one factor for consumers and also for networks interested in broadcasting 3D content. During the seminar put on by Bill Edwards from Panasonic, he spoke in detail about professional industry based 3D cameras used for networks like ESPN 3D. Panasonic, as well as other companies, build small high-def box cameras with regular size lenses. Panasonic as well as companies like PACE, 3ality, and P+S Technik that make 3D rigs, use these box cameras to slide the two cameras either closer or farther apart to create the z-factor (Edwards. 2011).

What is the z-factor? When working on a 2D production, broadcasters focus on the x and y factor, the height and width of the shot. When working with a 3D production, broadcasters focus not only on the x and y but the z-factor as well which is the depth that the viewer sees. What rigs do is take two separate cameras side-by-side to create the 3D images and cameramen carry these portable rigs to capture shots during games. According to Edwards, "They [rigs]

are not cheap, empty without glass, without lenses, without cameras, are in the $60,000 to $200,000 range. Generally speaking a full rig with servos and lenses are around $500,000 a piece." Edwards said that during an ESPN 3D broadcast, there are around ten of these cameras around the field or stadium and approximately a half-dozen smaller hand-held 3D cameras. Although the cost of these 3D camera rigs may be high, Edwards said that these rigs are usually rented, not purchased. (Edwards, 2011).

What is the relative advantage of this new innovation? Although the costs of producing and watching sports in 3D is high, there is a business model for 3D. Unlike the digital television transition when television stations had to go from standard definition to high definition, networks could not charge the consumer extra, so there was no business model or moneymaker with the DTV transition. With 3D however, there is a business model, charging consumers extra to watch content in 3D. For example, for anyone who goes to see a 3D movie in theatres, there is an extra charge to see the movie. Another example would be consumers who have a 3DTV in the home. In order to get the 3D tier from their cable service provider like a Comcast or DirecTV, they have to pay extra for that tier. These extra charges are in place to even out the production costs of broadcasting a live sporting event or making a movie while still profiting from broadcasting 3D content. Edwards commented on this business model for 3D saying "Those types of technologies are creating a business model for the ESPN's, the CBS Sports, and other venues to generate revenue to pay for the costs that are involved in this (Edwards, 2011)." Personally, I believe that the

innovation of 3DTV has relative advantage not only because of the business model it is able to create but the satisfaction that comes with viewing 3D. Consumers definitely get the bang for their buck when its all said and done because the viewing experience is special.

The second characteristic in Rogers' diffusion of innovation theory is compatibility. Compatibility is defined by Rogers as "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995: 15). As stated in Peter Seel's journal entry, broadcasting anaglyphic 3D content with existing DTV technology is possible. In the past, this type of 3D broadcasting was used during the 2009 Super Bowl which featured multiple commercials in 3D. In order for viewers to see the 3D content, they would have had to pick up the free polarized plastic glasses from sponsors at retail and grocery stores across the country. In terms of active-shutter technology being compatible to the conventional HDTV displays, we aren't quite there yet (Seel, 2010). Eventually as time goes on, more and more homes will have HDTV's that are 3D ready. Edwards says the future of 3D is going to change in the next few years:

> I think all of the displays will be 3D-ready eventually. Right now there are some that don't have 3D capabilities…in the very near future, everything will be 3D [ready] and now with the consortium of all the prime manufacturers getting together for the common technology. The same type of glasses will work on product A or

> product B, so I think the market place is becoming more standardized (Edwards, 2011).

Right now the compatibility characteristic is not where it needs to be in regards to the innovation of 3DTV technology, however, almost all brand new HDTV's are also 3D-ready and eventually, all new HDTV's will be 3D-ready.

Complexity, Rogers' third characteristic to whether a consumer will decide to adopt a new technology or not, will not be an issue with the diffusion of 3D as Peter Seel believes. Rogers defined complexity as "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 1995: 16). The 3D glasses, both passive and active, are not difficult to use. Other 3D technologies for the consumer such as 3D cameras, 3D Blu-ray players, and others will function just like their conventional counterparts will, making them easy to use and understand (Seel, 2010). For those who are in the 3D production industry, Final Cut Pro, a non-linear video editing software, is capable of editing 3D content shot on consumer and professional 3D cameras. Tim Dashwood, president of Dashwood Cinema Solutions, was interviewed at the National Association of Broadcasters (NAB) Show in 2010 and was asked about Dashwood's new 3D plug-in to Final Cut Pro.

> When you shoot with two cameras, you will never get them perfectly aligned [when] using more in-expensive rigs, were trying not to spend too much time on-set perfectly aligning them, so we wanted to fix all of that disparity in post [production]. So I developed the tool to do that and eventually we decided to release

> it to the world…the whole plugin suite [Stereo3D Toolbox] is $1,499 [while] the second flavor of Stereo3D Toolbox is Stereo3D Toolbox LE, that's the limited edition version, so we are releasing that for $99 (Dashwood, 2010).

Dashwood explained that both *flavors* of Stereo3D Toolbox, the whole suite and the limited edition version, are great options for both the professional and for the average Joe who shoots video in 3D for a hobby (Dashwood, 2010). I believe that this plugin helps ease the complexity of 3D video editing and it ultimately helps the innovation of 3D technology.

The manufacturing of 3D products is definitely growing each day and prices of these technologies are getting less expensive as time goes on and more consumers adopt 3D. The competition of passive and active 3D viewing technology is beneficial for both consumers and the manufacturers because it gives the choice of full 3D picture quality for an expensive price or half 3D picture quality for a less expensive price. For those willing to pay extra for active 3DTV's, the top name brands have now come together with the "Full HD 3D Glasses Initiative" making one pair of electro-optical active glasses compatible to view 3D content on those top name brands. All three of Everett M. Rogers' characteristics of his diffusion of innovation theory discussed in this chapter show great potential for the adoption of 3DTV technology, I will discuss Rogers' final two characteristics in upcoming chapters. The relative advantage definitely goes to the manufacturers benefit due to the business model networks and motion picture companies have put together making 3D viewing a special experience

that will cost a little bit extra. Compatibility is not where it needs to be in terms of the number of 3DTV's in households, however, right now all brand new name brand HDTV's are 3D-ready. So as time goes on more and more 3D-ready TV's will be in households across the country, even the world. Lastly the complexity of 3D all depends on the perceptions 3D technology gives. Putting on a pair of 3D glasses and watching a TV is not something difficult to understand and use. Now with Dashwood's two versions of its plugin for Final Cut Pro, Stereo3D Toolbox, professional editors and the average Joe hobbyist can easily edit 3D content. The manufacturers of 3D products have definitely done their homework and are making 3D the best it can be at this time and now the broadcasting of 3D comes into play.

CHAPTER 5

BROADCASTING OF 3D SPORTING EVENTS

"Sports broadcasting could be a key accelerating factor in the diffusion of 3D television," said Peter Seel in his journal entry, "The effect of three-dimensionality is most pronounced when objects are close to the camera" (Seel, 2010). As a sports fan, growing up watching sports in 2D, going from standard definition to high definition, and now being able to experience sports in 3D, I don't think it can get any better! For those who have yet to experience 3D, it is difficult to explain the special viewing experience and the 'telepresence' you feel when watching. I believe the broadcasting of sports live in 3D will be a major factor in the adoption of 3D technology into the home. Without the launching of ESPN 3D however, the diffusion of 3D, especially sports in 3D, would not be anywhere near where it is today. This chapter will focus primarily on the launching and current status of ESPN 3D, the challenges of producing live sporting events in 3D, and focus on other networks considering broadcasting sports in 3D in the future.

Everett M. Rogers' last two characteristics, trialability and observability, may be the most crucial characteristics to examine to see if the adoption of sports in 3D will pick up in the future. It doesn't matter if there is relative advantage, compatibility, and complexity to 3D if trialability and observability are absent. I will go further into Rogers' trialability characteristic in chapter seven, while focusing now at the fifth characteristic, observability. Rogers defined observability as "the degree to which the results of an innovation are visible to

others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it" (Rogers, 1995: 16). I believe one of the key factors to the adoption of 3DTV's into the home is the 3D content that is available. DirecTV leads the pack as far as 3D programming goes with four major channels consumers can subscribe to in a $10 per-month package. This 3D tier has n3D, 3net, DIRECTV CINEMA, and ESPN 3D as the channels a subscriber can choose from according to DirecTV's website ("Leading the 3D," 2011).

N3D is a 24/7 3D channel that Panasonic has sponsored to DirecTV in hopes of getting 3DTV technology one step closer to being mainstream. "N3D will offer content from CBS, Fox Sports, HDNet, MTV, NBC Universal, and Turner Broadcasting System, among others," said Wendy Donnell in an article for pcmag.com. "Making more 3D content available is a step in the right direction, but it still remains to be seen whether 3DTV will become ubiquitous (Donnell, 2010)." The key to getting 3D mainstream is available content and manufacturers like Panasonic, who have invested so much in this technology, is doing everything in their power to get the content to the viewer.

Sony Corporation, Discovery Communications, and IMAX Corporation launched the 24/7 3D channel titled 3net on February 13, 2011. 3net has a wide variety of programming from "America's National Parks", which airs on Wednesdays taking viewers on 3D tours of the landscapes of America's national parks, to "Live Fire" a series that brings the viewers into U.S. military training camps, to "Puppy Bowl VII" an annual event during Super Bowl Sunday that now

is aired in 3D. These three programs are only a fraction of shows available on this channel 24/7 ("Introducing 3net," 2011). During the 2011 Consumer Electronics Show in January 2011, Sir Howard Stringer, Chairman, CEO, and President of the Sony Corporation was quoted saying, "3net is a critical component of the growth of 3D, as it will deliver a rich array of immersive high-quality programming directly to consumers ("Introducing 3net," 2011)." A channel like 3net offers programming other than sports that help give a balanced mix of programming giving the consumer exactly what they want, more programming to choose from.

According to the website of Direct Sat TV, an Elite Dealer of DirecTV, DIRECTV CINEMA is for the movie fanatic who can enjoy 3D movies fresh from the theatres in the privacy of their own home. This channel has three features; watch 3D movies that are regularly scheduled live, a pay-per-view feature of watching special events from boxing matches to concerts, and adult entertainment programming ("DIRECTV Cinema," 2011). I don't believe that watching 3D content will replace conventional two-dimensional viewing but I do believe that people will enjoy the occasional experience of watching a 3D movie like "Avatar" or "Thor" on a Friday night and this channel gives that extra entertainment that 2D programming can't provide.

In addition, DirecTV's fourth channel they offer on their 3D tier is ESPN 3D. Now with 24/7 programming, if there are no scheduled sporting events, games of all sports are being re-aired for the viewing pleasure of the sports fanatic. In his article, *ESPN 3D's College Football Coverage No Longer a Hail*

Mary, Jason Dachman with Sports Video Group, states in his article that ESPN 3D, from a technical and visual aspect, has grown tremendously since the channels launch in the summer of 2010. Dachman reported in his September 2011 article that ESPN 3D is going to introduce a “5D” approach to producing sporting events. The cost of producing a separate 2D sporting event as well as a 3D event became extremely expensive in the first year of existence. ESPN will be combining their 2D and 3D production into one mobile unit. “We’re looking at doing [a 5D production] a couple months into the [college football] season,” said ESPN 3D Coordinating Producer Phil Orlins in Dachman’s article, “It is something we feel good about coming off the Little League World Series [a completely 5D show ESPN produced through August].” For the Fall of 2011, ESPN 3D will broadcast 20 regular-season college football games, one of which being the ACC Championship game and six bowl games finishing off the college football season with the BCS National Championship game. Last season ESPN 3D only broadcast 13 college football games, including two bowl games (Dachman, 2011). I believe this progression from the launching of ESPN 3D to its current status is a major step in the diffusion of 3DTV technology. Especially broadcasting premiere games like the BCS National Championship game, ESPN 3D can continue to improve the observability of 3D to consumers. By being able to broadcast both a 2D and 3D sporting event at the same time, it eliminates costs and gives more opportunities to broadcast even more games, giving more 3D sports content to the viewer.

ESPN did not to decide to launch a 3D channel just for the heck of it, the company had to do extensive research before a decision could be made. Dr. Duane Varan, Executive Director and Chief Research Officer of the Disney Media & Advertising Lab and professor of New Media at Murdoch University, headed up the most comprehensive 3D study to date. Dr. Varan and his staff at Disney conducted research during ESPN 3D's coverage of the 2010 FIFA World Cup at the Disney Media and Ad Lab in Austin, Texas. This study gathered data from more than 1,000 testing sessions and 2,700 lab hours on how audiences responded to sports and advertisements in 3D. What Dr. Varan and his team discovered was some interesting and exciting results (Mayne, 2010).

One concern that Dr. Varan and his staff looked closely at during the study was the potential adverse health affects of watching 3D content. In order for ESPN 3D to continue with 3D programming, it was important that this concern was researched before the network could go further. Dr. Varan and his team gave eye exams to participants of the study before and after testing to see if their stereopsis (depth perception) had shifted in any way. Another form of research that Dr. Varan conducted was "eye gaze" which is mapping eye movement on screen, seeing where the eye is fixating on screen. For 3DTV, the Disney Media and Advertising Lab had to work with eye gaze vendors to develop new methods to successfully do that for 3D testing and Disney had to develop their own custom software to analyze the data (Varan, 2011).

"What was fascinating was two things, one, there are problems that people attribute to 3D which were equally present with 2D. An example [would

be] fatigue, people think that 3D perhaps contributes to fatigue, and its true, it does…but that was equally present when people watched in 2D," said Dr. Varan during a video interview at the Advertising Research Foundation (ARF) in June of 2011. "…we measured the same people coming in everyday and watching a game in 3D (approximate 3 hour experience) for five days in a row. What we found was that the adverse health effects that we measured on day one had largely diminished by day five." Dr. Varan compared this result to the acclimation of putting on a pair of glasses for the first time (Varan, 2011).

In a more recent video interview in September of 2011, Dr. Varan was asked again about the concern for health affects in watching 3D. Dr. Varan mentioned that one of the biggest problems are peoples frame of reference being a little bit off. When most people think of 3DTV they immediately think of 3D movies in theatres, not 3DTV in the home. When people watch 3D movies, they are in a dark theater and the viewer doesn't see anything but the screen and there can be conflict between what the eyes see and what the body is telling you. In regards to 3DTV, Dr. Varan says people have frames of reference, you see other objects in the room, its almost like you are looking through a window (the 3DTV). Dr. Varan commented that a lot of people commonly complain about nausea in cinemas. In the study Disney conducted, Dr. Varan found no evidence that nausea was occurring any more in 3D than it was in 2D (Varan & Mutizwa, 2011).

When looking at the data of stereopsis, or depth perception, Dr. Varan concluded that there were no adverse affects of stereopsis. "Amongst adults,

there was no variation, no variability in peoples real world depth perception," said Dr. Varan on the topic, "even if they had eight hours of exposure, or even if they watched 3D everyday for five days, still we found no evidence that there was any adverse effect in terms of depth perception (Varan & Mutizwa, 2011)." The fact that most of the health concerns that people originally had of 3DTV are just as unhealthy of watching a regular 2DTV is a huge sigh of relief for the progression of 3D technology. If this study did show negative health effects of fatigue or stereopsis, I am sure ESPN 3D and other 3D channels as well as 3D manufacturers would be in trouble.

Health effects was one of the most focused concerns during this extensive 3D study but it was also important to see if participants found the 3D viewing entertaining and enjoyable. Dr. Varan mentioned in his latest video interview that the study not only took participants' personal thoughts of 3D but how their bodies reacted. This study placed wires on participants to examine how the body reacts to the content by studying their electro dermal activity, which shows arousal levels to what they view in 3D. "We found that the 3D experience was superior, audiences enjoyed the experience more [than 2d], they were much more involved in the game," said Dr. Varan said to ABN's (Africa Business News) Godfrey Mutizwa, "the most dramatic difference was the sense of being there… the feed that you watched [on ESPN 3D] very much felt like you had a box office seat and you were watching the game through the window of the box office (Varan & Mutizwa, 2011)."

Some key findings from this study show that fans showed a higher level of enjoyment with the telecast itself and really felt that 'telepresence' while watching the World Cup soccer matches. The study reports that, "enjoyment increased from 65 per cent to 70 percent in 3D while presence went from 42 per cent to 69 per cent." In summary, the participants of this study gave more attention and favorable responses to 3D rather than 2D (Mayne, 2010). After personally watching sports on an active 3DTV, I admit that my sense of 'telepresence' was the selling point for me and during the Panasonic seminar, those who attended, felt the same way. I believe that once this technology is adopted, more and more broadcasters will begin to produce sporting events in 3D, ergo more consumers will begin to adopt 3D technology.

Looking forward to the future, the London Olympics in 2012 will not only be broadcast in high definition but 3D as well. Panasonic along with Olympic Broadcast Services (OBS) have partnered up to broadcast more than 200 hours of 3D coverage around the world. Ken Kerschbaumer, editorial director for Sports Video Group, wrote about this recent news in his September 2011 article, *Romero Details Plans for 3D Coverage of London Olympics, Sees 300 Hours in 3D.* Kerschbaumer reported that the OBS CEO Manolo Romero says that the Olympic Games could very well surpass even 300 hours of 3D coverage, this making the 2012 Olympics the largest 3D sports production ever. "This is, of course, a very important event for the momentum of 3D. The big challenge is, there are some sports that have never been done in 3D," said Romero (Kerschbaumer, 2011).

According to Romero, there are currently 14 Olympic broadcasters that have agreed to carry 3D coverage of the Olympics next summer in London and there are expected to be more to sign-up as the date gets closer. In order for these broadcasters to get the 3D content to viewers, there will be signal via satellite of live 3D content, feature packages, and prerecorded 3D coverage (Kerschbaumer, 2011). This is an important time for broadcasters investing in 3D. Since 3D is still in its infancy, it's hard to determine if consumers will adopt it. Looking at Rogers' fifth characteristic of observability, as long as broadcasters continue to add more content, I believe things are looking up for 3D.

CHAPTER 6

ADVERTISING IN 3D

One benefit right now that the consumers have if they decide to purchase a 3DTV, along with the 3D cable or satellite tier, is that programming they watch will have limited commercial breaks due to the lack of inventory of 3D ads. In June of 2010, NYSportsJournalism.com published an article releasing information about what 3D advertisements would be run during the World Cup. Sony, Gillette, Disney-Pixar, and ESPN were the first 3D commercials to ever be broadcast during the launch of ESPN 3D ("Sony, Gillette," 2010).

Sony's 3D commercial was promoting its very own 3DTV during the World Cup soccer matches. Sony posted this commercial on YouTube.com, a one-minute spot primarily of soccer players and hundreds of soccer balls coming from all directions as well as sports cars, professional weight lifters, and lastly an explosion. The last seven seconds of the commercial show the physical 3DTV and off to the left you see 3D glasses while off to the right you see a Playstation 3 video game console, which can play 3D games ("Sony 3D," 2010). Since I was only able to view this commercial on YouTube and not a 3DTV, I could not see a 3D image. However, I was able to imagine what it would look like in 3D by seeing the speed of the shots, the cuts to new shots, and the amount of people or objects that go towards the screen. The end of the commercial, I think, is most important to show consumers the physical 3DTV as well as the 3D glasses and PS3 video game console. I think watching a commercial like this in 3D

would get the attention of the consumer and this could be big for future advertisers.

Gillette on the other hand produced a less chaotic 3D commercial. In the interview with Duane Varan at ARF, he spoke about the Gillette commercial specifically. “Just seeing the razor rotate around and there is something about that experience in 3D which is very different than the experience in 2D,” said Dr. Varan commenting that the commercial still looked good in 2D but the 3D experience was much more engaging (Varan, 2011).

Disney-Pixar ran a 3D advertisement for the trailer of *Toy Story 3*. Dr. Varan also mentioned this 3D advertisement in comparison to the study. He said both the 2D and 3D versions of this advertisement was tested and there were completely different patterns of visual fixation. “With 2D, people tend to take a lot of information at the periphery of their field of vision. With 3D, they tend to look very precisely at points,” said Dr. Varan on the *Toy Story 3* commercial. I think this is a key factor in 3D marketing. If you can get the viewer to fixate on a certain point in the screen, in this instance Dr. Varan said they majority of participants looked at the word “Disney”, it only adds to the effectiveness of the advertisement (Varan, 2011).

The fourth and final 3D commercial aired during the launch of ESPN 3D was from ESPN itself. This commercial had SportsCenter anchor Stan Verrett and Andrew Ethier from the L.A. Dodgers in the studio playing around with a baseball bat in front of a 3D camera. Just like all SportsCenter commercials ESPN has run in the past in 2D, humor plays a major role. Verrett tells Ethier

that the camera costs more than the space shuttle while swinging the bat close to the lens. Ethier tells Verrett to really take a good swing and with a loud crack, Verrett breaks the lens of the 3D camera ("Sony, Gillette," 2010).

These four 3D commercials were all originally shot in true 3D, nothing was converted from 2D to 3D and ESPN, according to journalist Stuart Elliott of the New York Times, will only be accepting true 3D produced commercials. In reference to commercials produced for HD, approximately 95 per cent are in HD. It is possible to convert a 2D video to 3D. At the same time it is possible to convert standard definition with an aspect ratio of 4:3 to high definition 16:9 but the quality will always be an issue. By making advertisers produce commercials in true 3D, this will ensure the best quality. Elliott also quoted Jon Collins, president of Framestore N.Y. (visual effects production company - Framestore), saying "Advertisers are slowly waking up to the idea of 3-D commercials. Once they see the benefits of having their logo floating about three inches from a viewer's nose." This is definitely promising for companies in the future to get their brand in crystal clear 3D (Elliott, 2010).

Looking back at the key findings in Dr. Duane Varan's comprehensive 3D study, it was found that 3DTV advertisements can be more effective. "We found that it [3D ads] significantly improved peoples memory of ads, we found that the likeability of ads went up," said Dr. Varan, "…even purchase intent went up so it was very dramatic results in terms of the advertising impact (Varan & Mutizwa, 2011)." Looking closer at the numbers of those results, participant's cued recall of 3D commercials went from 68 per cent to 83 per cent. While watching 2D ads

compared to 3D ads, purchase intent went from 49 per cent to 83 per cent and the overall liking of the 3D commercials went from 67 per cent to 84 percent. This study spared no expense, testing 3DTV's from five different manufacturers and used approximately 700 different measures used to analyze audience reaction (Mayne, 2010). With 3DTV broadcasting being so new, it will take some time for more 3D commercials to air. I believe as more 3D movies are 'coming to theatres near you', 3D commercials promoting these movies will help fill the inventory of 3D ads to put on available 3D channels. 3D advertising is definitely an investment but as the study showed, people pay more attention, enjoy, and can recall 3D advertisements.

CHAPTER 7

3DTV RETAIL IN THE UNITED STATES

As I stated in chapter 4, a representative from Panasonic held a 3D seminar at the College of Mass Communications on the SIU campus where students and faculty were invited to attend. Those who attended were amazed by their opportunity to view sports on a 3DTV. For most of those who attended the seminar, it was the first time they were able to experience sports on a 3DTV. Many of the students told me they have seen 3DTV displays at Best Buy, however, they had never seen sports on a 3DTV. A few of the students told me the only real experience they had with 3D was going to a 3D movie at the theatres. It has been over a year since the launch of ESPN 3D and yet many consumers are still not paying for it. Granted, the majority of those who attended the 3D seminar were college students, who are probably concerned about paying for their education instead of a 3DTV, but after they graduate and get a job, will they buy 3D or not? If consumers have the opportunity to see a 3DTV at a local retail store they're chances of purchasing a 3DTV will be enhanced.

Trialability, the final characteristic from Everett M. Rogers' diffusion of innovation theory, I believe, is the most important characteristic of the five. Rogers defined the characteristic as "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1995: 16). I believe the innovation of 3DTV technology will not succeed if consumers can't test the products for free before purchase. "…the lack of opportunity to try out (trialability) 3D technology may inhibit its diffusion," said Peter Seel in his journal

entry, "…manufacturers are turning to US retailers such as Best Buy to create 3D displays that mimic the home viewing environment" (Seel, 2010: 318). As time has passed since the launch of 3DTV broadcasting, retail stores like Best Buy, Sears, Target, Sam's Club, Walmart, and others, have set up 3DTV displays for consumers to look through 3D glasses and see what the top 3DTV's have to offer. It is important for these retail stores to continue to provide trained employees to answer any questions consumers may have as well as provide entertaining 3D content, such as sports or movie scenes, to demo.

As more 3DTV's enter households across the country and as more 3D programming is available to consumers, word of mouth about this innovation will help online sales. Now websites like amazon.com and even the big name retail store websites like Best Buy or Sears can offer cheaper prices than in-store and most sites offer free shipping. After reading Phil Conner's *A 12 Step Guide to Purchasing a 3D TV*, I never realized how purchasing 3DTV products are probably the best way to go for a consumer compared to in-store shopping. In step 11 of Conner's guide, he talks about online 3DTV purchasing. "Many times brick and mortar retailers have similar prices but charge exorbitant prices for the extended warranty, wall mounts, cables, and must charge sales tax," said Connor, "Most online dealers are more reasonable on these extras." Connor went on to mention how consumers can help trim the total cost by looking at 3rd party 3DTV extended warranty companies that have much cheaper prices for the exact same warranty plan offered in stores (Conner, 2011).

I think once the consumer continues to see more and more 3DTVs slowly fill homes across the country, and while popularity of the innovation grows, the smart consumer will go to online purchasing. By purchasing 3DTV products online, consumers can take advantage of convenience shopping. At any time of the day a consumer can place an order for a 3DTV that is cheaper and is guaranteed to arrive safely, right to the front door. Consumers who choose to go the online route must be careful to shop through a trusted Internet dealer. In his guide to buying a 3DTV online, Connor recommends that consumers go through authorized Internet dealers like a amazon.com that can offer "good competitive prices, and often free shipping, and no sales tax," said Connor about authorized online retailers. "The online retailers we are recommending here also have long term positive experience with the freight and handling of 3D TVs…If your TV arrives broken, you just refuse the shipment and they ship out a new one (Connor, 2011)."

The adoption of 3DTV technology into the average American household will not happen over night. It will take time for people to try out (trialability) 3D and realize that watching sports, movies, and television shows, in the third dimension, is truly a special viewing experience. In his article *CEA Updates TV, Tablet, Camera Sales Projections*, Steve Smith, reported that 3DTV unit sales, that were predicted to be a 65 per cent gain, actually had a 187 per cent gain through April of 2011. Smith went on to report that according to the Consumer Electronics Association (CEA), if this rate continues, sales could hit 3.3 million by the end of 2011 (Smith, 2011). So if sales are doubled and nearly tripled than

what was predicted in 2011, the investment that some manufacturers, networks, and service providers have made, seems to be going in the right direction. During an interview I conducted with Bill Edwards prior to the 3D seminar, I asked him where he personally thinks 3DTV technology will be in the next 5 to 10 years. His response:

> I think it took a while for everyone to clearly understand what high definition was during the inception of high def and that actually took a ten-year period for people to start seeing standard def moving into high def. 3D is just in its infancy so it's going to take a year or two or three, as you said five, for people to clearly understand the differences between high def and 3D. The youth are going to drive that, the folks that are growing up and experiencing 3D as the norm, will influence the families getting 3D and probably migrating to their own 3D domains for video games or all kinds of technologies (Edwards, 2011).

As Edwards pointed out, the youth are going to be the driving factor in the adoption of 3D. Not only will teenagers be begging their parents for a 3DTV but those who are in college and making their way into the professional job market will be able to purchase a 3DTV, especially as prices of 3DTV's drop.

CHAPTER 8

CONCLUSION

As I stated in my opening chapter, it is my belief that the broadcasting of live sporting events in 3D will be adopted in a similar scenario to how consumers adopted high-definition from standard-definition. Throughout my research I utilized Everett M. Rogers' diffusion of innovation theory to determine if 3D and sports will succeed in the future. The five characteristics I analyzed from Rogers' theory that can influence potential consumers in deciding to adopt a new technology or not are: (1) Relative advantage, (2) Compatibility, (3) Complexity, (4) Trialability and (5) Observability.

In regards to the relative advantage of 3D that I stated in chapter four, costs are going to be high not only for those wanting to watch at home, but for those manufacturers and networks producing and broadcasting the content. Although prices maybe high, the business model that is currently in place that charges extra for the 3D experience will eventually help lower prices for all parties. The compatibility of 3DTV is currently not quite there yet, but as I stated in chapter four, as time goes on more American households across the country will begin to own 3D-ready TVs giving the consumer the compatibility to watch both 2D and 3D content at their own discretion. The ease or complexity of 3D is where it needs to be especially for the consumer because the 3D glasses, 3D cameras, 3D Blu-ray players and other 3D products are just as easy to use and understand as current 2D products. Even video editors can add a plugin to non-linear software like Final Cut Pro to edit 3D content.

In chapter seven I examined the fourth characteristic, the trialability of 3D, what I believe to be the most important characteristic. If consumers can't go to a local retail store and get to try on the 3D glasses and experience the telepresence for themselves, 3D will not succeed. Like giving a consumer a test drive to a new car, retail store employees let consumers "test drive" the 3DTV and decide if purchasing a 3DTV is what they want. In covering the final characteristic, observability, in chapter five, I came to the conclusion that service providers and networks are providing more content as time goes on and future plans are looking bright. By providing consumers 3D programming options of watching either live or on-demand sports, 3D movies, or 3D television shows, it gives the consumer more reasons to subscribe to a 3D package.

In addition, by researching the history of 3DTV technology and the history of sports media, I was able to grasp where both are headed in the future. Although stereoscopic technology has been around since the 1800's, this re-birth of the technology has gone digital and in high definition. Ever since the 1950's when sports and media merged with professional boxing, it sparked a new way for Americans to be entertained across the country to watch all types of sporting events. With each passing year that goes by, events like the Super Bowl, the NBA Finals, March Madness, The Masters, and many other championship sporting events causes more Americans to seek the highest quality of broadcasting. 3D is able to accomplish, as a new technology, the ability to bring the feel and depth of a sporting event into the living room.

Based on my findings, I believe that live 3D production of sporting events will become the future of sports broadcasting in America. While I believe that 3D broadcasting will succeed in the future, as a dominating force in the broadcasting of sporting events, 2D broadcasting will still exist. I feel the viewer ship of 3D sports will fit in as a niche market for sports fanatics who want to get the best viewing experience possible, but at the same time, not being a technology that every American household deem as a necessity.

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