The significance of *Video Recording* and its interaction with society.

Video Tape Recording & Society

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Abstract

The *Video Tape Recorder* (VTR) is the first initial live image capturing device which involved the engineering of converting images from cameras into electrical impulses and storing such data onto magnetic tape. The invention of VTR has had a significant impact on society and has demonstrated effects or influences on aspects of society, specifically highlighted through the contrasts in periods before and after the breakthrough of VTR.

Video Tape Recording & Society

The *Video Tape Recorder* (VTR) was the first invention that had allowed for capturing live images. This report paper will cover; a brief history, the engineering technology, connected technologies, arising questions and future discussion of the progress of this technology and in relation to engineering, its influence on specific aspects of, and changes to society as well as a summary of society before and after the breakthrough of VTR. Limitations to the scope of this report include, the focus of VTR effecting American society therefore, most examples of its influence and effects investigated concentrate on the U.S. population.

Brief History of *Video Tape Recording*

Charles Ginsberg led the research as a part of Ampex Corporation, resulting in the invention of the videotape recorder in 1951. The invention was designed to record and playback video and audio data from magnetic tape. The entertainment industry has been altered since the breakthrough of Ginsberg's invention. The invention of VTR was first adopted by the network CBS.

In 1959 the first commercial video tape recorder was released for business, medical, airline and educational use. A former 1956 design was only affordable for large television networks due to its $50 000 US price tag.

By 1965 Sony had designed a model intended for household use and the price was reduced to under $1000 US and pre-recorded video tapes became available in 1967.

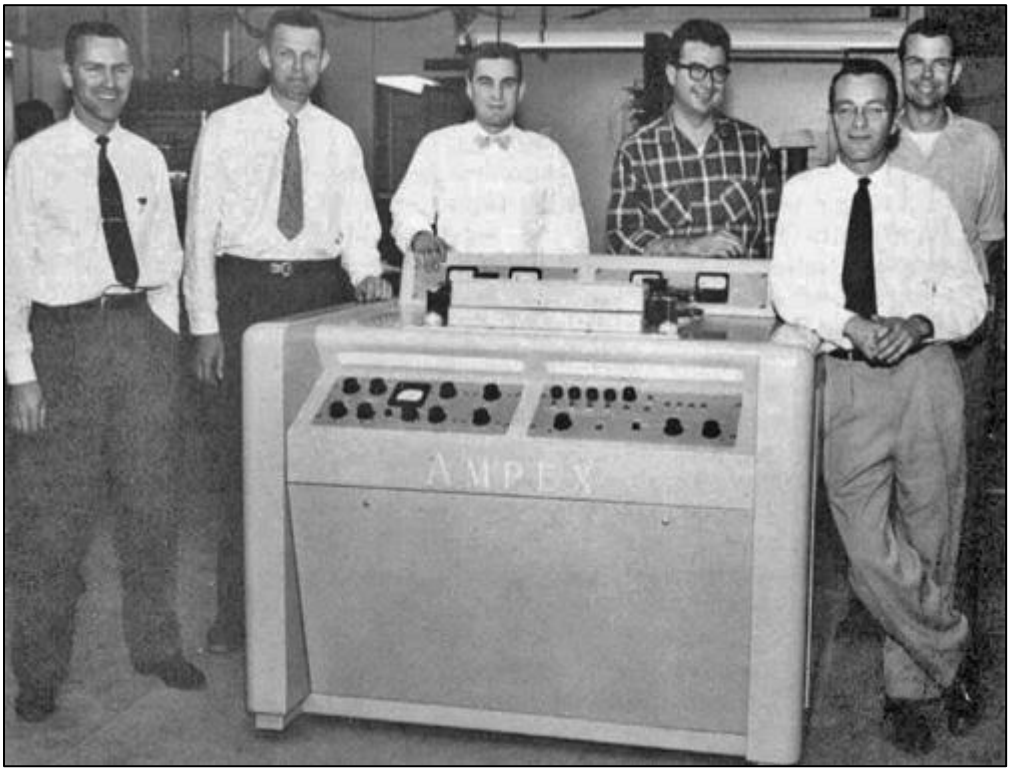

Figure 1 - Ampex Design Team w/ 1st Broadcast Video Tape Recorder

(Wirth, 2013)

The *Engineering Problem*

The design involved a machine that would run the magnetic tape with audio and video data at high speeds allowing for high-frequency response $\left(f = \frac{1}{T}\right)$. It was believed that if the tape operated at high speed it would provide necessary bandwidth to record video signals. However, the main issue that required an engineering solution was that video signals had much wider bandwidth than that of audio signals which, therefore, would require very high speeds of the running tape to record the data.

Initial Efforts & Engineering Technology

The video recording systems initially designed utilized similar technology to audio recorders but were unsuccessful. By 1953 Dr. Norikazu Sawazaki had developed what is known as a helical scan video tape recorder, which involved transverse-scan technology – recording heads are mounted on a spinning drum and record tracks in the transverse direction, across the tape. This technique would allow for a practical tape speed to be reached. The Ampex VRX-1000 became the world's first commercially viable videotape recorder introduced in 1956.

In summation, this was all due to a machine that could run the tape at slower rate with the recording heads rotating at high speeds meaning a high-frequency response could be achieved.

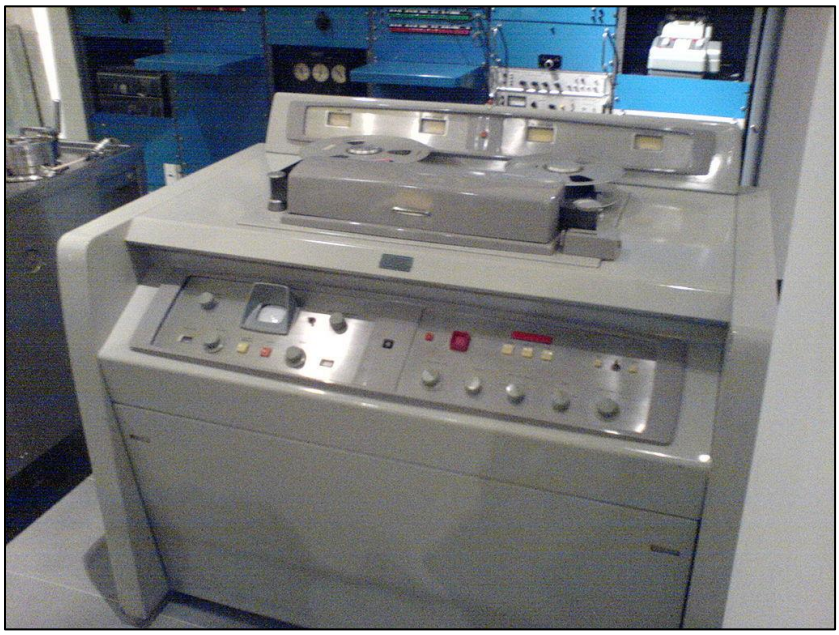

Figure 2 - AMPEX Quadruplex VR-1000A (Credit: Karl Baron from Lund, Sweden)

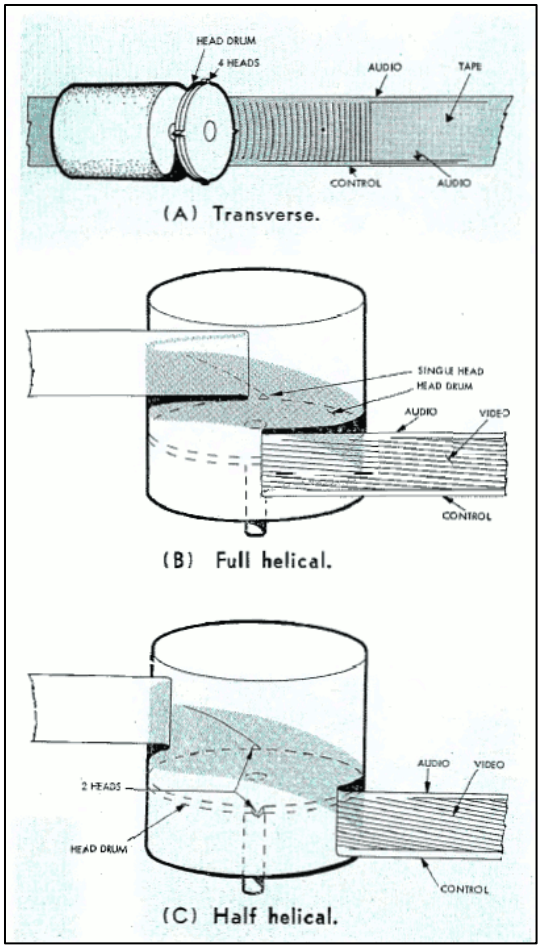

Figure 3 - Scanning Techniques used in Video Tape Recorders

(Magnetic tape - Wikipedia, 2021)

Introduction of the VTR

History defines that by 1956, VTR technology was in common use by the television industry and hence, it had opened a new path of technology and development about recording video and audio for playback.

Film was the initial medium that was available for recording however, the magnetic tapes and overall engineering method posed limitations and the overall engineering technology required demand for new studies in this field. This pushed the bounds of electronic companies and engineering with various organizations investigating these limitations throughout the 1950s.

Citations

(Magnetic tape - Wikipedia, 2021), (Wirth, 2013), (Motion-Picture Technology – Sound – Recording Techniques, 2021)

Society's Change due to *Video Tape Recordings*

The allowance of audio and video magnetic recording had a great impact on the world of broadcasting. The videotape, which would be a large physical cassette around 1976 is an example of how VTR pushed the boundaries of engineering recording technology. This format of videotapes became a very popular format for household and small business use. Furthermore, this invention of VTR had allowed for a new business of video store rentals to be born. Alike, VTR allowed for television to be pushed forward propelling related technologies and pushed forward media.

Figure 4 - Examples of Various Video Tapes

(Magnetic tape - Wikipedia, 2021)

Effects on Individuals & Groups in Society

In future years, this would be replaced with a differing format of VTR in the form of CDs and DVDs. Therefore, displaying once again how VTR was continuously evolving with engineering research and studies. Furthermore, VHS was born during the cassette era, standing for *Video Home System*, demonstrating the wide use of the invention throughout the population of society, specifically with individuals, families and the common working class person being able to have access to this technology. This technology would also be primarily used by such individuals and groups of people for leisure purposes, improving and opening a new world of entertainment aimed at being more accessible and effecting the ways in which people would begin to pass their time. People would spend, over the years, more time in front of a television set and watch programs more often during the day. ***(See Appendix Figure 2.)*** Furthermore, individuals across the *United States* (U.S.) could view programs on a schedule rather than anticipating the live broadcast and these schedules would be more uniform to the average individual's daily routine. For example, CBS's earliest videotape broadcasts included *'Douglas Edwards with the News'*, which would be broadcasted at the end of a working day (7:30pm) for individuals to watch across U.S. The program would be a regular 15-minute nightly newscast allowing for information to be spread to viewers in an efficient time and would therefore, reach a greater number of viewers as it would be able to be broadcast dependent on the time zones across the country.

During the 1950s, millions of Americans moved into housing with the post-war era allowing for the growth of suburbia. In turn, this allowed for citizens to spend money on appliances such as the television, enlarging this necessity for technological research and progress with video and audio transmission.

Figure 5 - Douglas Edwards with the News - 1st Broadcast using Videotape (CBS Television City in Hollywood on 11/30/56)

(Wirth, 2013)

Effects on Organizations within Society

Prior to the introduction of VTR, television would be broadcast live with no means of pre-recording broadcasts other than with traditional film which was expensive and time-consuming. The magnetic tape, therefore, allowed for television networks to produce pre-recorded content for broadcasting with higher quality than that of films of the era. This is evident through CBS being able to present the program across the U.S. at different time zones.

Furthermore, VTR broadcasts allowed for organizations or governmental groups to spread information more efficiently, especially with visual information. VTR replaced live broadcasts that were reaching a limited audience, due to time zones, and were slowly amassing a

larger audience allowing for television and visual information propagation to be able to compete with radio broadcasts or written communication of the era.

The film industry also experienced an impact due to this new VTR technology development. The way films were made, the way that films are presented, and the economic structure of the industry are examples of how VTR technology had affected film. The breakthrough of VTR however, did not have immediate effects on the film industry. In fact, it was not until the 1970s and 1980s that recorded movies would be a practical for home viewing.

VTR had allowed for the television industry to also conserve resources and produce content with economic efficiency, saving money that would be invested in re-running live broadcasts. Furthermore, time could be spent more efficiently, for example spending more time on producing content and recording shows/broadcasts or simply having employees/staff work less hours.

Effects on Technology & Engineering due to Video Tape Recording

With the introduction of VTR, television as a technology was further pushed and it quickly took over radio as the most popular news and media outlet, therefore, VTR had popularised even more purchases of television sets. VTR allowed television to become a significant part of family life in the 1950's and at the start of the decade only 9% of households owned a TV set but by the end of the decade that number rose to 86%. (***See Appendix Figure 1.)***

The VTR also allowed for the development of the *Video Cassette Recorder* (VCR) by the late 1970s, therefore, allowing for progress in engineering technologies stemming from this idea of recording visual and audio data using tapes. Similarly, the *Video Home System* (VHS) is an example of video recording on cassette tapes that was a result from the breakthrough of VTR.

The technology as a whole allowed for the development of practices and established techniques of information transmission in relation to the world of media. For example, the term *'West Coast Delay'* was transitioned from radio to television which involved this concept of running the same program on television that had been seen by one side of the U.S. (specifically the East Coast) to the other parts (such as the Midwest and West Coast) over a few hours.

The introduction of VTR technology and therefore, pre-recorded broadcasts had affected advertisers and how ads would be heard/seen. The more popular and successful advertisement companies would be able to utilize VTR technology to run an advertisement and a new market was born for companies that specialize in recording advertisements for established companies. In the public service medium, advertisements around this post-war era would promote Americanism, Capitalism and Consumerism with the government run advertisements and major enterprises able to take advantage of the high costing VTR technology. These advertisements included promotion of smoking tobacco, Coca-Cola and specifically the experimentation with slogans.

Citations

(Wirth, 2013), (Bellis, 2017), (Nuwer, 2013), (Rethinking Content Delivery, 2012)

Society prior to *Video Tape Recording*

Prior to VTR's, the solution to recording and re-running broadcasts on television was accomplished using kinescope which was a method of motion picture camera photographing a T.V. screen. This would result in resolution nowhere near to live television and would also be time consuming. Furthermore, the process would be very labour intensive with the film being unloaded from the camera and then rushed off to be processed and printed. The process would

also require editing and sound track implementation which themselves would require more labour.

By the 1950s specific consumeristic markets began to fall in terms of sales. One specific example is evident within the tobacco industry and medical advances amplified the fear of cancer and hence, this industry required a boost to sales. Ideally, people after the war began to look to spend money on technology, furniture, clothing and automobiles which need a boost in promotion. Families would spend more time on leisure activities such as travelling, holidays, and tourism requiring this medium of large-scale advertising, improved by VTR.

Prior to VTR families would watch sitcoms live on television and would be focused on conveying ideas that align with the American population, such as traditional family roles, middle-class social norms and rarely touched on social issues. Therefore, upon the introduction of VTR this convention of television programs and film making could be broken – over decades the price of such technology would decrease, and smaller filmmakers/writers could have access to express their ideas and convey these to audiences. Similarly, this would give the public a voice and opinion at what is the content that they would like to see both with film and television – power was given to the viewer.

Prior to VTR there were three major options present for individuals to view films. People would visit theatres that catered specifically to re-showing a film or would have to enjoy silent films accompanied by live music and text. Furthermore, during this era, theatres were smaller and more prominent with multiple in a single town or suburb. Another option during this time involved organisations re-broadcasting movies on television on an annual date. An example of a movie that was re-broadcast is *'Casablanca'* by Michael Curtiz, captured or recording initially using the inefficient method mentioned earlier in this section. Furthermore, only the smaller

stations would more commonly broadcasting these films. Lastly, individuals could purchase a projector copy of a film which was not overly expensive but still usually limited to the middle-class to wealthier population in society during this era.

Citations

(Zwierzchaczewski, 2017), (Archive, 2009), (Oshima, 1994), (Bellis, 2017)

Arising Issues & Future Development

From VTR technology evolved digital cameras and allowed for improvements to such technology. Both television/video cameras and digital cameras began to use magnetic tape technology for a period of time in history. Furthermore, aspects of their engineering such as lenses, magnetic discs and solid-state devices developed in 1981 from the small steps that VTR technology took. Alike, this technology as allowed from influence on organisations such as NASA, with a specific example being highlighted through the use of analog to digital signal conversion amongst their space probes in mapping surfaces. This highlights how the breakthrough of VTR in the 1950s can have a cascading and almost ongoing effect, forcing engineers of the present to revisit methods and processes of the past. NASA had used aspects of VTR technology with the mapping of the moons surface in the 1960s as well as with the transmission of digital images to Earth.

With the progress of computer technology as an outcome of many other breakthroughs such as VTR, government influence on these technologies would be used to their individual advantage. To get an advantage over other nations aspects of VTR technology was employed in to spy satellites, denoting how technology can be utilized for ethically questionable reasons such as conflict. In contrast, however, government use of digital technology has helped with advancements in science surrounding digital imaging.

The questions or issues that arose from the investigating VTR is that of improving writing speeds to the tapes and storage of data with reference to thing such as storage space, speed (reading from & writing to) and lowering the cost. The cost storage systems evolving from VTR was more expensive with having higher operating speeds therefore, magnetic tape devices began to decrease in cost. This made VTR more affordable and common with the technology having a range of costs based on their quality and efficiency of operation.

Relationship to the World Today

The technology that is used in VTR is still applicable today with magnetic tapes being utilized for security and business due to its reliability. Furthermore, the technology is employed in hard disk drives such as Solid-State Drives used today. This is due to benefits of the design in some of the storage aspects VTR has introduced, such as durability, in contrast to other data storing media as they have shorter useful life and be prone to risks. The technology of magnetic tapes is also readable securely for almost 30 years, in contrast to other storage technology lasting five years.

Similarly, this technology in turn has allowed for development in areas of cloud computing – a major aspect of software and documentation sharing through areas, such as business, education and consumer use, in society. Therefore, it can be concluded that VTR technology has inspired the development of cloud sharing and hence, improved or solved issues of physical problems (damages) and logical problems (software failures) with regard to recording data. The breakthrough as a whole has even inspired modern storage system solutions which have higher read and write speeds – this was an issue with magnetic tapes hence, the solution of modern storage system stemmed from engineers questions how to improve writing speeds to a hard drive.

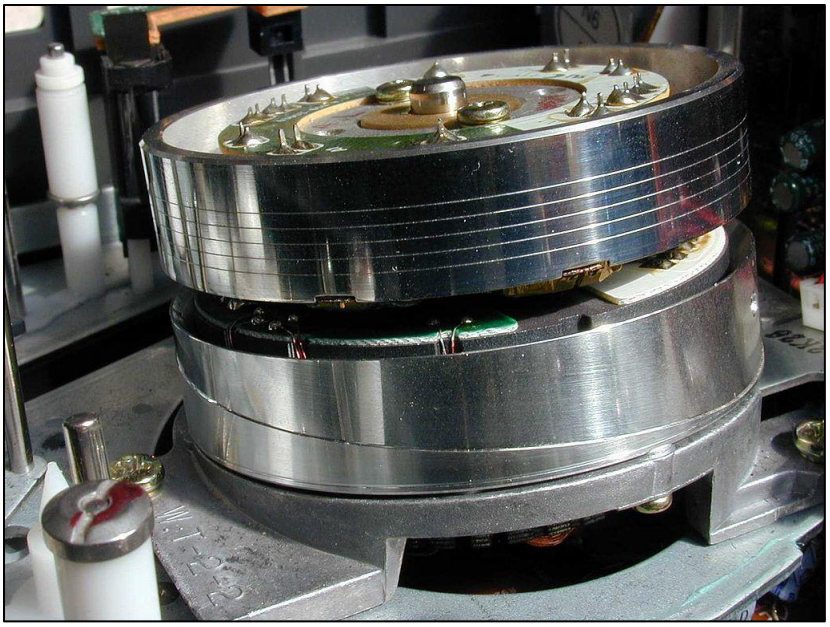

Figure 6 - VHS Helical Scan Head Drum

(Oshima, 1994)

Effects on Careers & Jobs

The breakthrough of recording video and audio data has caused a collision and overall progression with technological careers and jobs in society. An example of VTR effecting the progress of jobs and work within society is evident with *Information Technology* (IT). More specifically VTR has progresses the recording of data and has caused a collision of modern IT with older generations of IT – companies have aspects of their enterprise that adopting new storage methods while the old durable technology from VTR is still utilized amongst companies around the world. The old approach of tape-based storage for archive and backup uses is a practical solution that corporations employ and contain old data within physical areas such as basements. Furthermore, this still common form of data storage has opened a market for business involved in tape storage and specialised providers for security and archiving services. In contrast however, events such as audits or inquiries can pose a major risk for companies, since these older storage methods require time to read the data from the hard drives. Areas related to nuclear

energy, medicine or construction may require archived data to be read quickly to extract important data, but these old storage methods are not able to be instantaneously read.

While the practice of recording was revolutionary, for parts of the television and film industry over time, it became a harrowing issue – executives felt that the new ability to record programs for future use was hurting the labour and artistic process of their creation. To gain an outlook of their perspective, the new ability to tape programs for free violated copyright laws and revolutionised these laws. The famous court case of Sony Corp. of America vs Universal City Studios in 1984 resulted in a change in the way Americans used and consumed entertainment – the outcome was videotaping being made legal and the decline of revenue for the film and television industry being turned around by VHS creating a culture of movie/television show fanatics. Overall, sales and rental purchases of VHS tapes increased, and the entertainment industry prevailed with more revenue in to the film and television industry than ever before. This displayed a blend of technology, society and culture and business – the introduction of a new technology was viewed as damaging from the perspective of a specific industry/business, but was empowered by people and culture moulded during that era.

Historical Advancements

In 1972 Texas Instruments patented a filmless electronic camera which stemmed from VTR technology, as engineers and researchers attempted to make the process of recording more compact and efficient. Sony released the '*Sony Mavica*' electronic camera in August of 1981 – the first commercial electronic camera. The technology progressed by introducing mini disc and placing into a video reader connected to a television monitor or color printer. This was an example of how questioning and improvements upon VTR had caused this revolution of digital cameras.

Figure 7 - Sony Mavica (First Still-Video Camera)

(Sony Mavica - Wikipedia, 2021)

Furthermore, in the mid 1970's companies such as Kodak began their rise with inventing solid-state image sensors that "*convert light to digital pictures*", for professional and private consumer use. In 1986 the same company invented the world's first megapixel sensor and in 1990 the company developed the Photo CD system, known as the standard for defining color in the digital environment of computers (digitizing and saving photos onto CDs, launched in 1991) – displaying the revolutionary and ongoing effect VTR had on the technological progress of society with recording and storage.

Some areas of VTR technology, however, has met their end in terms of progress. For example, In 2006, '*A History of Violence*' was released on VHS and was the last movie to ever be released in this format. Furthermore, the final VCR was manufactured in 2016 – displaying evidence of how branches of VTR technology have met their limitations of progress in the eyes of engineers or researchers of the past, due to the demands and lifestyles of society.

Citations

(Harlow, 2021), (Nuwer, 2013), (Rolzen, 1969)

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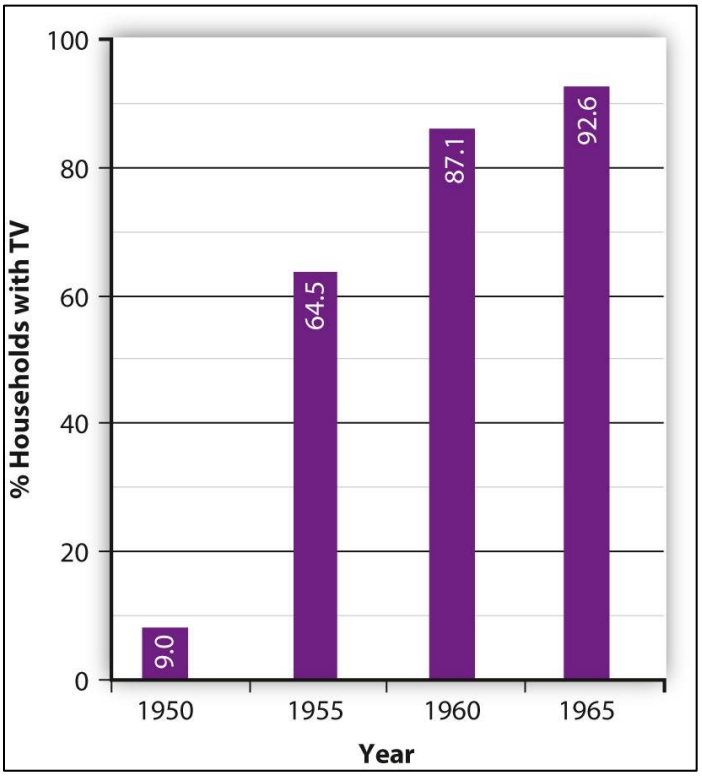
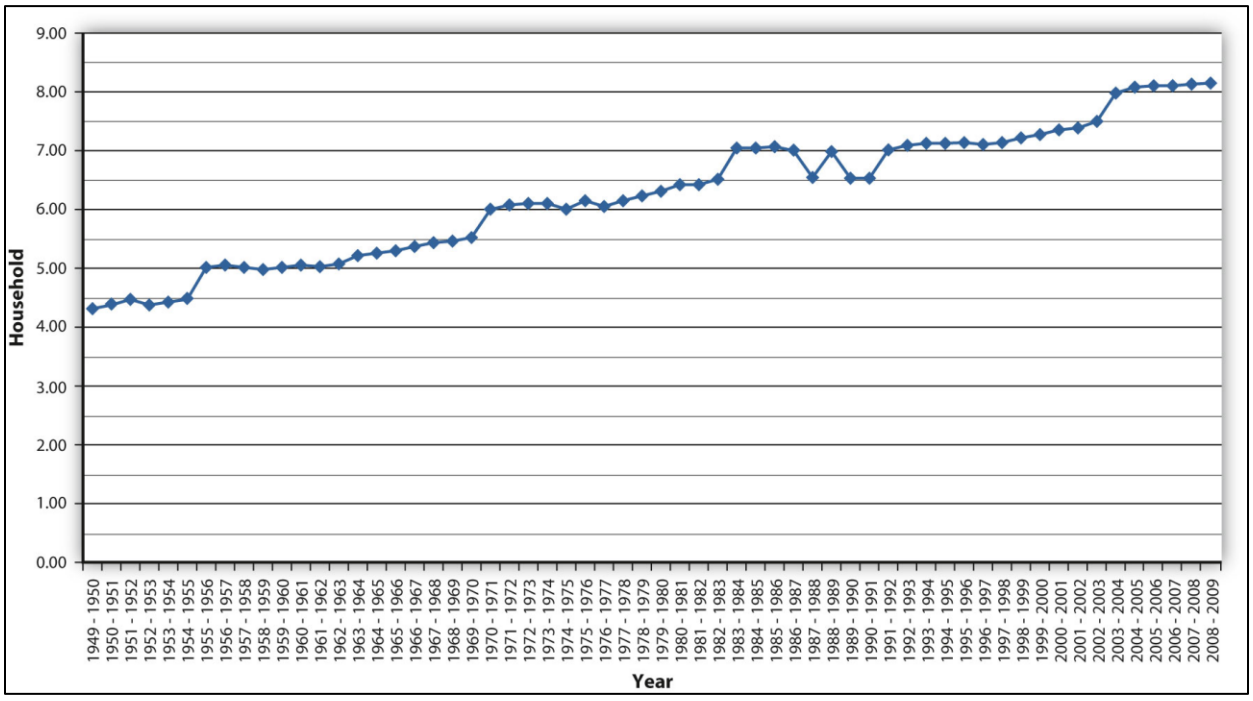
Appendix



Appendix Figure 1 - U.S. Households that owned a Television Set (Percentage Representation)

(Rethinking Content Delivery, 2012)



Appendix Figure 2 - Average Amount of Time Spent watching Television by U.S. Households (Credit: Nick Kapur)