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High-definition television as a future television system

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Abstract

High-Definition Televison [sic](HDTV) is a television system that provides greater resolution and a wider aspect ratio than our current television system. HDTV presently is considered to be any system that proposes to scan over 1,000 lines. For instance, in the United States a 1,050 line system has been proposed, compared to the current 525 line system used today in the United States.

HIGH-DEFINITION TELEVISION AS A FUTURE TELEVISION SYSTEM

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CHAPTER I

INTRODUCTION

High-Definition Televison (HDTV) is a television system that provides greater resolution and a wider aspect ratio than our current television system. HDTV presently is considered to be any system that proposes to scan over 1,000 lines. For instance, in the United States a 1,050 line system has been proposed, compared to the current 525 line system used today in the United States.

In Japan a 1,125 line system has been experimented with and has been quite successful. In Europe, development work on HDTV is in progress, but prospects look dim in the near future for many European countries. While most countries view HDTV as a relatively recent invention, Japan began research of HDTV over 12 years ago.

While HDTV has been experimented with for at least ten years, no major steps have been really taken in broadcasting HDTV signals. The reason for the slow progress is the problems that HDTV faces. Compatibility of television receivers in the public's homes leads the way. In order to broadcast HDTV signals to the homes a different television receiver must be purchased that is compatible with the HDTV signal. These receivers would probably cost over twice as much as current receivers. This reason alone may keep the public skeptical about HDTV.

Another problem concerns the wide bandwidths that are required to broadcast HDTV. In order to broadcast HDTV signals on existing very high-frequency (VHF) and ultrahigh-frequency (UHF) channels, enough space would have to be provided equivalent to five VHF and UHF channels in the United States. While this seems very impractical, the real problem is with the Federal Communications Commission. The regulations would have to be changed in favor of HDTV.

Although these problems of HDTV may seem insurmountable, there are alternatives that have proven to be successful. Sending HDTV signals by direct-broadcast satellite (dbs) is a very strong proposal. Another alternative to the bandwidth problem is being implemented by CBS. They are working on a process by which they divide the HDTV signal into two channels for transmission.

While HDTV may be a giant step forward for television, it may not be such a great technological advance for motion picture film. If HDTV does indeed take over, film equipment could be replaced. Although HDTV probably will hurt motion picture film to some extent, there is the possibility of motion picture film utilizing the HDTV system. HDTV and film can work together as film becomes an originating medium.

The leader in HDTV is undoubtedly Japan. The Japanese Broadcasting Corporation (NHK) has done a great deal of work in the area of HDTV. The Japanese are very enthusiastic

concerning this new television system and have plans to begin broadcasts of HDTV signals as early as this year.

The future of HDTV is very bright. While there are a few skeptics that say HDTV will be a short-lived television system, there are many more that feel HDTV is the future television system and broadcasters will have to adapt to it eventually.

Statement of the Problem

While it may be important to understand how HDTV progressed in the early years of television, the intention of this research paper is to express what is being done today in HDTV. A great deal has been written on HDTV, some of it positive and some negative, but the existence of HDTV is real and must be dealt with.

Our current television system today has been around for over 30 years and there is increasing skepticism of its quality. Now that television serves other purposes than entertainment, an alternative to our current 525 line system may well be needed.

While broadcasting of HDTV signals is still in the future, the time will come when the television industry will have to make a decision concerning this new high resolution system. This research paper intends to provide a better understanding of this new television system called High-Definition Television and the role it will play in the years ahead.

CHAPTER II

REVIEW OF LITERATURE

High-Definition Television Compared to Standard Television

In order to understand what high-Definition Television (HDTV) means, one must compare it to the standard television system. The greatest difference between HDTV and the standard system is the number of scanning lines. The United States standard television system scans 525 lines and was adopted by the National Television Systems Committee in the 1950's as the first color TV system.

The standard in Europe was developed after the United States system and scans 625 lines. Today we are still using these systems and the need for a new system is growing. Marbach (1984) explains that viewers are becoming impatient with the existing standards. "TV no longer just serves the simple function it did in the days of Howdy Doody and Ed Sullivan" (Marbach, 1984, p. 70).

The number of lines HDTV scans vary from country to country. In the United States, CBS is experimenting with a 1,050 line system. In Japan they have been working with a HDTV system which scans 1,125 lines. In either case HDTV scans at least two times as many lines as current systems. Since HDTV has many more lines than the standard system, the detail is also improved. Each scanning line is made up

of dots and the more dots there are the better the resolution of the television picture.

The aspect ratio is another important area to consider in a television system. Galluzzo (1982) stated that HDTV can provide a wider aspect ratio (screen size) of 5:3, rather than the 4:3 tube we've been staring at all these years. The wider aspect ratio of 5:3 is not recommended for the current television systems because of the poor resolution projected.

While HDTV seems to be a better system, the video bandwidth HDTV requires is a great problem. HDTV requires 30 MHz to transmit a signal, while standard television today only requires 4.2 MHz. The Federal Communications Commission is very strict concerning video bandwidth and HDTV may find it very difficult getting permission to transmit a signal. "There is simply a limited amount of spectrum space and a wide assortment of broadcasters (growing all the time) that must have a slice of the airwave pie" (Galluzzo, 1982, p. 51).

Sandbank (1983) stated that although HDTV may take the place of existing standards, the equipment used by the previous standards must not be forgotten, but "broadcasters must keep faith with the standards in existing domestic equipment" (p. 561). For instance, the transmision of HDTV signals to current television receivers.

Problems of High Definition Television

While High-Definition Television (HDTV) is an exciting new technology of the future, it still has many problems that are postponing its implementation. The detail that HDTV can offer television is remarkable, but HDTV must pay the price for this luxury. Leading the way of limitations is simply the standardization problem HDTV faces.

Jurgen (1983) suggested that it is not very probable that a worldwide transmission standard for HDTV will occur. No country will be willing to agree on a standard that is vastly different than their current standards. "But different transmission standards for different countries need not be a total barrier to the implementation of HDTV" (Jurgen, 1983, p. 47).

One of the main reasons that a worldwide standard would be hard to achieve is the many pieces of equipment that would have to be replaced. "The lack of worldwide standards for production of HDTV signals is mitigated by ongoing progress in the development of digital converters" (Jurgen, 1983, p. 47). These converters are capable of converting the number of scanning lines downward.

A few years ago CBS became interested in HDTV, when Japan was experimenting with this new system. CBS supported Japan until they developed their own HDTV system utilizing two channels. Whoever is the first to transmit HDTV signals,

someone else will be right behind them with a standard that is bigger and better.

Existing television receivers pose a great deal of problems for HDTV. Jurgen (1983) reports that a study group on HDTV said that full compatibility would not be achievable in HDTV. In the United States the receivers that are compatible with the current system have been around for over 30 years. The number of receivers increased a great deal since then. "If you think compatibility isn't much of a problem, consider these numbers: There are approximately 500 million television sets in use around the world, not to mention some 21 million videocassette recorders" (Mowrer, 1984, p. 42).

While this may sound devastating for the future of HDTV, there still would be acceptable levels of compatibility. CBS proposes a system that utilizes existing television receivers. Another alternative that may develop in the future is a gradual transition to digital television receivers. "A digital TV could provide better picture quality by eliminating the ghost that sometimes appears between images" (Changing Times, 1984, p. 74).

Wide Bandwidth Requirements

Jurgen (1983) explains that one channel of HDTV could require as much bandwidth as five of today's television channels. These wide bandwidth requirements make impractical the transmission of HDTV signals on existing channels. This

bandwidth problem may be reduced by alternatives that have arisen.

One alternative deals with the use of satellites. By using a satellite the HDTV signal could be transmitted to a dish antenna. Signals from a home user's dish could be sent to a cable TV operator's dish antenna and then transmitted to your home by cable. Direct-Broadcast Satellite (DBS) offers great hopes for the progress of HDTV. Berney (1984) states that CBS requires DBS signals in order to transmit their 1,050 line system. "Convinced that the advent of direct-broadcast-satellite (DBS) programming offers this century's best and perhaps last chance to get high-definition television (HDTV) on the air, CBS, Inc. has worked out the basics of a system that could make going to the movies pass'e" (Berney, 1984, p. 52).

While DBS sounds like a great technology for transmitting HDTV signals, skeptics (Hubbard, 1982) disagree with the idea of satellites transmitting HDTV signals. They feel that the public is not interested in an advanced television system. Whether or not the public want HDTV, CBS continues to develop HDTV.

CBS's Role in HDTV

In the United States, one television network has stepped forward in taking the responsibility of experimenting with HDTV. Green (1984) cites that CBS, assisted by Japan's Broadcasting Corporation (NHK), produced the first experimental

HDTV programs in the United States in January, 1982. CBS applied HDTV to a variety of production styles. "An NFL football game and the 1982 Tournament of Roses Parade were selected as representative of live multiple-camera switched-feed sports and special events production" (Green, 1984, p. 170).

While the football game was produced very similar to the standard production approach, Green (1984) stated that the director quickly realized that HDTV provided better shots than the current television system used today. Because of HDTV's wider aspect ratio, the offensive and defensive lines could be photographed in one frame instead of cutting to different cameras. "The resulting footage of the game rendered a true-to-life viewing experience that rivaled that of being in the stands" (Green, 1984, p. 170).

The experimental programming done by CBS was well beyond expectations. There was no doubt that the technology of HDTV was developing rapidly and was indeed superior to the current television system. However, the fact remains that even though HDTV may look good it hasn't solved the problem of standardization. CBS has developed alternatives to meet this problem, including a compatible system.

Two Channel system

Jurgen (1983) reports that the CBS Technology Center proposes a two channel system that will permit the transmission of HDTV signals. This system is made possible by the

satellites wideband FM transmission compatibility. "It will be possible to divide the HDTV signal into two channels for transmission and then put them back together without noticeable error upon reception" (Jurgen, 1983, p. 47).

By putting the HDTV signal on two channels a receiver could display a HDTV 1,050 line picture. The 1,050 lines would be divided between two transmission channels. Jurgen (1983) states that the first channel would transmit a 525 line signal with a 4:3 aspect ratio, while the second channel, called an augmentation channel, would transmit the information for the remaining 525 lines with a 5:3 aspect ratio.

This two channel system becomes very technical beyond this point. Berney (1984) explains that, "the system would put a signal compatible with conventional receivers on one satellite channel and on a second channel add an augmentation signal for 1,050-line, wide-screen video images" (p. 52). By understanding that two 525 line channels make up the 1,050 line HDTV system is a logical way to comprehend this new system. CBS hopes to develop commercial broadcasting soon with this HDTV system.

Jurgen (1983) cites that CBS has applied for six channels for experimental HDTV broadcasts so they can use three different HDTV programs. Whether they will get the channels is not known yet, but it is quite evident that CBS is taking HDTV to bigger and better places. Some of

these places that HDTV is going is worrying other industries, particularly the motion picture film industry.

The Motion Picture Film Industry

When discussing HDTV and how it may affect television, we may think of its great potential in the television industry. But what does HDTV mean to the motion picture industry? The filmmaking business has been around for a long time and it has survived even when videotape appeared and became a part of television. Motion picture film still is used in the production of movies and many television series that are being run. The reason that it has survived so long is because the current 525 line system used in the United States does not compare to 35mm film in resolution. When enlarging the 525 line system on a big screen the resolution deteriorates, unlike film.

Gross (1983) stated that while motion picture film has profited by its great picture, HDTV proposes a picture that is equal to or greater than 35mm film. If HDTV does develop into our current television system and all the HDTV equipment now in prototype replaces the equipment used in film, there may be trouble in the film industry. "Unions will fight the introduction of HDTV because the skills needed are not the skills which presently abound in the movie production business. Negative cutters and film processors would find their employment possibilities shrinking into oblivion" (Gross, 1983, p. 159).

Fox (1983) cited that since most television productions are still shot on film and transferred to videotape before being put on the air, the possibility for videotape taking over the film industry is even greater. It would be better to shoot on videotape in the first place if HDTV is used. Film producers would also like to shoot on videotape, and then transfer to film. The reason for this is that videotape is cheaper and can be edited electronically without physical cuts. "Producers could save 20 percent of their costs by using video-tape instead of film" (Fox, 1983, p. 834).

The reason that people in film don't use videotape today is because the existing standard of videotape has poor resolution when projected. HDTV proposes an alternative to film, since it offers better resolution than the existing standard.

HDTV Rises Above Film Industry

HDTV may change many aspects of television, but the motion picture film industry is most likely to be affected. Southworth (1983) stated that it seems possible that one of the first applications of HDTV may be in satellite-delivered programming to audiences at the theatres. The high equipment and production costs may be tolerated because of the revenue generated from transmitting HDTV signals. "current transponder costs may be as low as a few hundred

dollars an hour, a fraction of the expense of air-freighting cans of 35mm film around the country" (Southworth, 1983, p. 834).

The motion picture film industry may be threatened by HDTV, but videotape has been around a long time and film has stood up to it. Since HDTV still has a long way to go, film will be safe for awhile. The standardization problem that HDTV faces will keep the film business out of trouble for now. When HDTV does overcome its problems, the film industry will not necessarily disappear. There are alternatives the film industry has which they can adapt to and compliment HDTV in the future.

Film Supports HDTV

Film and television have been together for about 35 years. During this time many changes have taken place in both medias. With the most recent change in TV, that being HDTV, the film industry must adapt to it. 35mm film will support an HDTV system with up to 2,000 lines and a bandwidth that exceeds 50 MHz.

The latest method of using film to compliment HDTV is 70mm film. Its high picture quality and full impression make it an attractive program source for HDTV. Ishida (1983) discusses a laser telecine which is capable of converting film pictures into HDTV signals without reducing picture quality. "Since this new telecine effectively utilizes the properties of a laser beam, both high-resolution

and superior signal-to-noise (S/N) ratio can be obtained" (Ishida, 1983, p. 629).

Laser technology also can be applied to 35mm film and to the conventional television system as well. Japan's Broadcasting Corporation developed a laser-beam recorder which transfers HDTV pictures onto 35mm films without noticeable reduction of picture quality. "For laser beam recording, various films can be used, but color print film is ideal in terms of resolution and granularity" (Sugiura, 1984, p. 648).

Many filmmakers are resisting the idea of HDTV, but Francis Ford Coppola likes this new television system. "With a video camera and cassette player, he can edit the videotapes instantly, which he believes will cut shooting costs by about 25%" (Changing Times, 1984, p. 74). Gross (1983) reported that Coppola became a strong advocate of using this electronic technology and produced two short high density television works, "Six Shots" and "Double Suicide."

The motion picture film industry may be in jeopardy because of HDTV, but it has been proven that its image quality can keep pace with HDTV for the time being. HDTV is only in its beginning as a possible television system, but Japan offers a HDTV system that looks very bright in the future.

Japan Leads the Way

The earliest work in High-Definition Television (HDTV) was done in the laboratories of Japan's Broadcasting Corporation (NHK). NHK started experimenting with HDTV 12 years ago assisted by four private companies, who were assigned to develop specific hardware. Fox (1938) stated that "Ikegami Tsushin developed the studio camera, Hitachi built a new pick-up tube, the monitor and recorder were Sony's work, and Matsushita built the large-screen receiver" (p. 834).

These Japanese electronic makers and many more are enthusiastic about developing new products associated with HDTV. The companies in Japan are realizing what HDTV means to the future of television. Not only do the businesses in Japan feel that HDTV is necessary, but so does the public. Viewers prefer a wider screen than the current 4:3 aspect ratio.

Fox (1983) reports that NHK's 1,125 line system will need a bandwidth of 20 MHz just for the luminance information and possibly 10 MHz more if the color information is kept separate. The trick in broadcasting HDTV signals is taking these 30 MHz and recording all this information on videotape which normally has to hold a total bandwidth of around 5 MHz. Though this trick presents a large problem for HDTV, NHK has presented alternatives that have worked.

Sugiura (1984) cited that the laser beam recording implemented by NHK is a process by which HDTV signals can be transferred to 35 mm film. This would solve the compatibility problem of television receivers and at the same time cut the cost of shooting motion picture film. "This new recorder can transfer high-definition television signals to 35mm color film pictures without any serious degradation of image quality and can be applied to electro-cinematography utilizing television systems" (Sugiura, 1984, p. 642). This laser beam recording system does not only save the motion picture film industry money, but the time saved will profit them also.

While the Japanese continue to push HDTV toward an acceptable television system, it may be just a matter of time before HDTV will be implemented not only in Japan, but worldwide. It's very hard to say when this time will come. Although Japan is very close to broadcasting HDTV signals, other countries are having their problems.

HDTV Around The World

In Europe the possibility of HDTV in the near future does not look good. They are experiencing problems that don't exist in the United States. Iversen (1982) stated, "there is no high-bandwidth delivery medium-cable, TV is not developed, and direct broadcast satellites are impractical where available spectrum must be divided among

15 countries" (p. 52). Even though it may look dim in Europe, development of HDTV is still proceeding.

Iversen (1982) reported that in West Germany experiments are being done at the University of Dortmund. Researchers are improving picture quality of the current 625 line system by eliminating the line interlace of the system. The 625 line system corresponds to a resolution of about 950 lines. While this may be well below the United States and Japan's HDTV systems, it's still a step in the right direction for Europe.

The British Broadcasting Corporation (BBC) has developed a system known as the extended PAL, which is a more sophisticated system than the British currently have. This extended PAL combined with a system designed by Britain's Independent Television Authority, called MAC (multiplexed analog components). Together they form a system which requires a bandwidth of 10 to 12 MHz, Iversen (1982) stated. Mowrer (1984) suggested that this MAC system is equivalent to a 925 line system and has been rejected by the French and Germans.

Currently it looks like everybody is going their own way, trying to come up with the system that will be the trend setter. While many of these systems have their strong points, Japan's 1,125 line system has been researched and experimented with the longest and seems to be above and beyond their competition. If Japan does have the HDTV

system of the future like many experts (e.g., Iversen, 1982) feel the consumers may have the final say of whether or not HDTV will be here to stay.

HDTV's Social Impact

It may seem that once researchers solve the compatibility barriers that HDTV faces, the problems will be over. The public that will be watching television may be the last barrier for HDTV to overcome. In the past 30 years people haven't been too concerned about resolution.

Since 1941 we have viewed the same television system. Until recently, television was only used for entertainment purposes. People really didn't need a system that provided the resolution that HDTV provides. Many things have changed in television and programming has expanded rapidly. With the emergence of cable we have a great variety of programming to choose from. The need for better resolution is becoming apparent, because of programs that may not entertain but instruct, advise, and require a more detailed picture.

Very few people are familiar with HDTV. Many people do not know it exists or even if there can possibly be a system that can be projected similar to film and achieve the same quality picture. When will these people awaken from their low resolution world? As HDTV begins to be transmitted by satellites in the near future, things may take a drastic change.

Like many other new technologies, there will be the skeptics (Hubbard, 1982) that will say that HDTV will never improve television. These skeptics will have to go along with the change or get left behind. Consumers have been putting up with the existing television system in the United States for a long time, and the television industry will soon be ready for a change. I feel that once HDTV does arrive and when it's possible to receive signals into our homes, the prices will fall and this new system will emerge as the standard, similar to how color television appeared several years ago.

HDTV has been compared to FM radio. In radio FM has much better quality than AM radio. In television HDTV's resolution is a great deal better than the standard 525 line system. Since many people made the transition from AM to FM, HDTV may be what television viewers have been waiting for.

Viewers Demand Better Quality

Through the history of television many technological advances have taken place. In almost every period in history when a new technology appeared in television, there were people who feared any new develoment. But soon, people realized that the advantages were abundant and change occurred. If history repeats itself, HDTV should be no different than other technologies. I feel that people will be fairly skeptical of HDTV at first but when they realize the

advantages of HDTV over standard television, they will be ready for a change.

I don't think people today realize that our current 525 line system has poor resolution compared to other systems around the world. People have viewed our current system in the United States for over 30 years, and they have been ignorant concerning the quality of the television picture. I feel that it is time for a change and it will be very interesting to see how HDTV will develop over the next few years.

CHAPTER III

SUMMARY

Future of HDTV

The future of High-Definition Television (HDTV) is becoming a very large issue and many experts (e.g., Fox, 1983) are discussing what they feel will happen to HDTV. "High-Definition television may not be broadcast terrestrially until the 21st century, but consumer demand for better-resolution video images will insure that 'HDTV is going to be the normal kind of TV signal eventually'" (Broadcasting, 1982, p. 55).

Sandbank (1983) explains that there is interest in HDTV, even though there is confusion on an existing standard. "For the broadcaster, the possibility of a new standard presents a greater challenge. If future developments suggest further changes in standards, these could be introduced fairly readily, for example, into the process of electronic cinematography" (Sandbank, 1983, p. 552). Cinematography may just be one area that will benefit from HDTV. Other areas such as satellites and film production may take advantage of this advanced television system.

Since Japan has been experimenting with HDTV for several years, they are most likely to broadcast the first HDTV signals. In the United States, CBS should follow with their 1,050 line system soon after Japan. As for Europe, they seem to be undecided and immobile in their development of HDTV.

Kindel (1983) states that once a standard is developed in the future, "cable television operators could steal a march on broadcasters. 'HDTV is almost ideally suited for the cable industry,' but even the cable operators may be beaten to the punch" (p. 139).

Projection HDTV may be the most popular application of HDTV in the future. The ability of projection HDTV to project a very large image without losing any detail is important according to Kindel (1983). "Projection HDTV using taped or closed-circuit programming could make possible an entirely new entertainment form - a hybrid of movie theatres and TV that already has a name: cineplex" (p. 139).

Projection HDTV is only one direction that HDTV may take in the future. Southworth (1983) stated that the costs of HDTV were very high and these costs may be tolerated if programming was delivered by satellites. The cost of the transmission of HDTV signals to theater audiences would be just a fraction of the cost that air-freighting cans of film would cost.

CBS's two channel system is an alternative that we may see as early as 1986. Since this system uses existing broadcast channels, there is no compatibility problem. In order for this 1,050 line system to advance in the future, the Federal Communications Commission will have to support CBS in developing HDTV.

Since HDTV does have a few sensible alternatives it can use in the future, I feel that HDTV will be our future television system. However, I am very skeptical of a worldwide standard taking place. While this is very unfortunate, there is little chance of countries agreeing on one system that is vastly different from the current standards. I feel with the emergence of direct-broadcast-satellites, that transmissions of HDTV signals will be the first application of HDTV in the United States.

Summary

High-Definition Television (HDTV) is a relatively new concept that has been experimented with for over 10 years. Japan's Broadcasting Corporation (NHK) introduced a HDTV system that scans 1,125 lines. A few years later in the United States, CBS developed a 1,050 line HDTV system. For the past few years these two countries have led the way in the development of HDTV.

The current television system in the United States scans 525 lines compared to Japan's 625 lines. The greater number of lines that are scanned, the better the resolution will be. The aspect ratio is greater with HDTV also. While the standard system has a ratio of 4:3, HDTV enjoys a 5:3 aspect ratio.

While HDTV has many attractive qualities, it has its share of problems also. There is no worldwide standard for HDTV. Countries can't agree on a compatible system and

they may never will. But this is not the main problem with HDTV. Standardization of television receivers is a problem that confronts HDTV. In order for HDTV to transmit signals into the homes, different television sets must be purchased. They would cost more than two times current television sets. This reason alone sets HDTV back years.

Another problem HDTV faces is its wide bandwidth requirements. Jurgen (1983) explained that one channel of HDTV could require as much bandwidth as five of today's television channels. Alternatives to these problems may give hope to HDTV. The use of satellites to transmit HDTV signals is a possibility. By direct-broadcast-satellites signals could be transmitted to a dish antenna, bringing the HDTV signal to your home.

In the United States, CBS has made a great deal of progress with HDTV. They propose to solve the compatibility problem, by developing a two channel system. Using the existing 525 line equipment, two channels can make up 1,050 lines, which has very high resolution. CBS hopes to put this system into operation as early as 1986. CBS has applied for more channels but there is a limited amount of space on the broadcast spectrum.

The Motion Picture Film Industry will be affected by HDTV the greatest. Gross (1983) cited that HDTV has a good as or better resolution that 35mm film. If HDTV equipment replaces film equipment, many people in the film industry

will have to look for other work. While HDTV may seem to threaten the film industry, HDTV is still in its early development and film should be safe for awhile.

Not all filmmakers feel threatened by this new technology. Francis Ford Coppola has already experimented with HDTV and he has found that HDTV can cut his costs by 10%. Laser beam technology also supports the film industry. A laser beam recorder can transfer HDTV signals onto 35mm film. This can be done without losing any picture quality.

While the United States continues to experiment with HDTV, there is no doubt that Japan leads the way in the development of HDTV. The Japan Broadcasting Corporation continues to develop HDTV products and are very enthusiastic in this new technology. Japan's 1,125 line system plans to be broadcasting signals as early as this year. Japan, assisted by CBS, worked with HDTV in 1982. A football game and the Rose Bowl Parade were shot with HDTV prototype equipment and the results were amazing. Japan's HDTV system looked great. Since then CBS has been concentrating on their own 1,050 line system, but Japan seems to be ahead of the United States right now.

Other countries are having their problems as they can't decide on a standard for HDTV. While development on HDTV is taking place, progress looks very dim for many countries in Europe. It seems like everyone is going their own way and not much is getting accomplished. If the European

countries would share their discoveries and work together, progress could be made in HDTV.

There is some doubt of whether viewers want a better quality picture. Many people don't realize that they have been watching a fairly low resolution picture for the past 30 years. When people realize that they could be watching an image that is equal to or better than what they see at the theater, they may pay attention to just what HDTV has to offer. Like many other new technologies, people may fear HDTV at first but after awhile they will realize the advantages HDTV provides.

Just what does the future hold for HDTV? If HDTV progresses as planned, transmission of HDTV signals will take place in this decade in Japan and the United States. For HDTV to become the standard television system, many changes must take place and HDTV could be seen throughout the world after the turn of the 21st century.

References

Berney, K. (1984). CBS bares scheme for 1,050 line TV. Electronics, 56(20), 52.

Coming: Picture-perfect TV. (1984). Changing Times, 38(5), 73-74.

FCC's Lukasik shares his technical visions. (1982). Broadcasting, 103(10, 55.

Fox, B. (1983). Japan beats the world to high-definition television. New Scientist, 95, 834.

Freeman, J. (1984). The evolution of high-definition television. Society of Motion Picture and Television Journal, 93, 492-501.

Galluzzo, T. (1982). High-definition TV: It's possible, but where does it really stand right now? Modern Photography, 46(1), 51-69.

Green, R. R., & Morss, D. F. (1984). Production experience with high-definition television. Society of Motion Picture and Television Journal, 93, 169-174.

Gross, L. S. (1983). High density TV. In L. S. Gross (Ed.), The New Television Technology (pp. 149-167). Dubuque, IA: Wm. C. Brown.

HDTV alternatives. (1982). Broadcasting, 103(20), 41.

Hayashi, K. (1981). Research and development on high-definition television in Japan. Society of Motion Picture and Television Journal, 90, 178-186.

High-definition TV fits on one channel with interpolation of missing pixels. (1984). Electronics, 57(4), 74.

International (Japan). (1984). Society of Motion Picture and Television Journal, 93, 642-651.

Ishida, T., Hayashi, K., Taneda, T., Motoki, T., & Sugiura, Y. (1983). A 70mm film telecine for high-definition television. Society of Motion Picture and Television Journal, 92, 629-635.

Iversen, W. R. (1982). High-definition TV is still on hold. Electronics, 55(26), 51-52.

Jurgen, R. K. (1983). The problems and promises of high-definition television. IEEE Spectrum, 20(12), 46-51.

Kindel, S. (1983). Pictures at an exhibition. Forbes, 132(3), 137-139.

Kriss, M. A. & Liang, J. (1983). Today's photographic imaging technology for tomorrow's HDTV system. Society Of Motion Picture and Television Journal, 92, 804-805.

Marbach, W. D., Conant, J., & Ukai, N. (1984). TV's higher tech future. Newsweek, 103(1), 70.

Mowrer, W. (1984). Hi-fi for your eyes. High Fidelity, 34(5), 41-44.

Sandbank, C. P., & Moffat, M. B. (1983). High-definition television and compatibility with existing standards. Society of Motion Picture and Television Journal, 92, 552-561.

Society of Motion Picture and Television Conference. (1982). Tomorrow's Television. Scarsdale, NY: Society of Motion Picture Engineers.

Society of Motion Picture and Television Conference. (1984). Synopses of papers presented at the 125th technical conference. Society of Motion Picture and Television Journal, 93, 117-119.

Southworth, G. R. (1983). A high-definition still-frame television system. Society of Motion Picture and Television Journal, 92, 834-842.

Sugiura, Y., Nojiri, Y., & Okada, K. (1984). HDTV laser-beam recording on 35mm color film and its application to electro-cinematography. (1984). Society of Motion Picture and Television Journal, 93, 642-651.

Survey Politics of HDTV via DBS. (1982). Broadcasting, 102 (20), 72.

Trying to bring HDTV down to earth. (1982). Broadcasting, 102(15), 40.