

Chapter 8

The Transition to Digital TV: A Case Study of HDTV

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Introduction

High-definition television (HDTV) has been widely accepted in the United States. For many, the path to implementation of HDTV by the television industry and broad acceptance by the public has been perceived to be relatively smooth. From this unexamined perspective, the FCC and the television industry supported a transition to HDTV in the 1990s, manufacturers quickly began to manufacture the sets once a standard was adopted, the mass public began to purchase HDTVs in large numbers as the price declined, and the transition moved ahead at a rapid pace. However, the story of how HDTV was adopted in the United States is far more complex and nuanced with many twists in the road to acceptance. The formation of an HDTV standard was a major battle with international fallout; some thought that HDTV would fail; the press was frequently negative about HDTV in its early years; many in the television industry viewed HDTV as a sinkhole of costs with little opportunity for profit; and the public, if they knew anything at all about early HDTV, was confused about what it represented and the myriad types of HDTVs being offered.

The introduction of HDTV is also a fascinating story with many lessons for policy makers, technologists, the television industry, and those who manufacture and market electronic equipment. And it is a tale that illuminates fundamental aspects of the transition to digital media that is at the core of this book. As we move forward with many new digital media, it is useful to draw from the lessons of HDTV implementation and adoption.

What is HDTV? It is a digital standard for television production, transmission, and display with much higher resolution than the analog NTSC standard that launched television in the 1940s. Generally, HDTV provides 720–1,080 lines of resolution versus the early standard with 525 lines of resolution (486 visible lines) and it has a different aspect ratio, 16:9, which is more like the shape of a movie screen, compared to the older 4:3 aspect ratio of earlier TV screens. It utilizes

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the digital 0s and 1s of computer code and merges computing and television technologies. Open up an HDTV set and the inside looks very much like the guts of a computer. However, it did not begin as a digital standard (delays in adopting a standard allowed digital technology to catch up and surpass analog technology) and was almost hijacked by those who wanted to use the extra capacity created by digital compression solely to provide more channels of standard definition (SD) television, not HDTV.

This chapter focuses on the development of HDTV in the United States though its origin in Japan is highlighted. Through the first decade of the 21st century, Europe showed less interest in HDTV in part because its PAL standard (625 lines of resolution; 576 visible) has higher resolution than America's NTSC standard, making HDTV less attractive to European television industries. Europe has moved to a digital standard for TV but it has utilized the standard for other applications such as interactive TV. The chapter treats the early history of HDTV in Japan, the development of a US standard, early (and weak) marketing of HDTV sets, obstacles to broad adoption of HDTV by the general public, a middle period in which HDTV began to take off, applications of HDTV and the behavior of those who began to watch it, and some long-term impacts. It draws on industry research and a series of studies conducted by the author beginning in the late 1990s and through the first decade of the new century.

The Japanese Take the Lead

The planning for HDTV began in Japan during the 1960s. Following World War II, Japan became a manufacturer of inexpensive electronic equipment. By the 1960s, the country wanted to move beyond this niche and develop high-end electronic products that would demonstrate its technological prowess to the world. A higher resolution television standard seemed to be a good target. Table 8.1 shows the highlights of the developments. In the mid-1960s, NHK, Japan's national public broadcasting organization, began a study of a next-generation TV standard. This led to the development of the MUSE system, an analog HDTV standard. The first experimental broadcasts began in the mid-1980s and by the late 1980s regular test broadcasts were begun (Brinkley, 1997).

Table 8.1 HDTV development in Japan

1964	NHK launches study of next-generation TV
1970	HDTV development begins
1984	Japanese scientists create the MUSE HDTV system
1985	First experimental broadcast of MUSE
1989	Regular test broadcasting of HDTV begins
1991	An HDTV set costs the equivalent of \$25 K US
1996	Live coverage of Atlanta Olympics
2000	HDTV broadcasts from Shuttle Atlantis
2001	Start of digital Hi-Vision broadcasting

By the early 1990s, Japanese consumers could purchase HDTVs but they were very expensive – the equivalent of \$25 thousand US dollars. The market was very slow to develop. All during this period, NHK was actively demonstrating the Japanese system in other countries, hoping that it would become the world standard. However, it was clear by the mid-1990s that other countries, notably the United States and several countries in Europe, wanted a digital standard. The Japanese conceded that an analog standard was not acceptable and in 1997 announced that they would convert to a digital standard by 2000.

The Standards Battle in the United States

In the United States, broadcasters, electronics firms, the computer industry, and policy makers followed developments in Japan closely. In the early 1980s, it seemed that an analog standard was the only choice, as digital technology seemed out of reach in terms of cost. However, industry groups could not agree on an analog standard and as the debate dragged on over a period of years, a digital standard seemed more and more feasible.

There were a number of subplots in the development of a standard. Some in the United States and Europe were reluctant to adopt a standard developed outside their sphere. Mobile phone companies were anxious to acquire some of the broadcast spectrum that had been opened up and broadcasters were determined to find applications that would enable them to retain all of the broadcast spectrum. If nothing else, HDTV provided an argument that broadcasters needed more, not less, spectrum. At the same time, there was a rivalry between the television and computer industries. Microsoft, among others on the computer side, believed that computers and computing technology were more suited to provide next-generation television services. This rivalry erupted in ways large and small, e.g., broadcasters wanted the standard to embrace interlace scanning (a method of creating pictures by scanning alternate lines of a television picture which was used by the television industry since the 1940s) and the computer camp favored progressive scanning that is used in computer monitors and scans each line in succession.

By the late 1980s, a number of companies were proposing standards and the FCC had begun a formal proceeding to evaluate proposed standards (Brinkley, 1997). Table 8.2 outlines some of the major milestones in the development of HDTV in the United States. The FCC was active in the deliberations but showed little inclination to make a decision by itself. They encouraged industry groups who were competing against each other to work together and agree on a common standard. This led to the Grand Alliance, a consortium of several groups – AT&T, General Instruments, MIT, Philips, Sarnoff Research Center, Thompson, and Zenith. The Grand Alliance merged components from several proposals. At the same time, the Japanese remained very active and continued to promote their MUSE system.

In 1993, as the FCC continued to evaluate an HDTV standard, there were five proposals still on the table, four digital proposals and one analog – a “narrow” MUSE standard that used less spectrum and could be broadcast from a tower as

Table 8.2 HDTV development in the United States

1982	NHK demonstrates prototype HDTV system to the FCC
1987	Formal proceedings to develop an HDTV standard begin
1993	Grand Alliance is formed (AT&T, Zenith, GI and others)
1996	FCC adopts a digital HDTV standard
1998	First HDTV sets available and first broadcasts of HDTV
1999	Major broadcast networks offer some HDTV programs
2006	First deadline for conversion to all digital broadcasting passes
2009	(June) Digital conversion is completed

well as a satellite (Seel, 1999). In 1996, the FCC announced a new digital TV standard that included both HDTV and standard definition (SD) digital TV. The concept of a new standard had evolved from replacing the old NTSC standard that was developed in 1941 with a higher resolution standard to a broader concept of digital television with a range of resolutions. In this sense, it was more of a package or framework than a single standard, for example, it included 14 different scanning formats. Critics claimed that this drove up the cost of digital TV sets (Schreiber, 1999) but it was sufficiently inclusive to win wide support. The decision also gave each broadcaster of a full power TV station an additional 6 MHz of spectrum to be used for several years of simultaneous broadcasting in both NTSC analog and the new digital standard. After a period of years, the broadcasters would return the spectrum and transmit only in digital. The original target date for the transition to all-digital was 2006, later moved back to February 2009, and finally June 2009 when it was completed.

Digital Television Begins in the United States

Digital television was officially launched in the United States during 1998. In order to be successful, it had to overcome a number of challenges and put into place a number of elements. These included creating or converting enough content to the higher resolution digital format, finding early adopters who were willing to pay the high price of the first HDTV sets (typically, \$5 K or more), demonstrating the benefits of digital television to the public and program distributors, winning favorable press coverage that could generate “buzz” about the new service and making sure that the technology worked. It was a slow process. First, stations had to convert to all-digital operations. This was helped by a transition to digital editing and storage at stations during the 1990s before digital transmission was in place. However, it was slowed down by a reluctance of many broadcasters to build digital transmission systems before the public had purchased large numbers of digital sets – the proverbial chicken and egg problem. By 2002, only one in four broadcast stations were transmitting a digital signal. Cable systems had to convert their physical plant and distribution systems to digital and national satellite systems had to add more capacity to handle the extra digital channels. Both did so, but it was a process that took

several years. Cable systems had the added burden of convincing their analog customers of the advantages of digital service and replacing equipment in customers' homes.

Many consumers in these early years were confused by the wide variety of digital TVs in the showrooms of electronics stores – LCD, plasma, rear projection, and DLP among others. To add to the confusion, some were fully integrated HDTV sets, some were “HD Ready” and required a separate tuner, and some were non-HD digital TVs. The marketing of HDTVs was also poor. If you walked into an electronics store in 2000–2004, it would have HDTVs but chances were that the signal on display was a regular, non-HD cable or satellite channel, which often looked worse on an HD set compared to an earlier generation analog set. As is so often the case, those trying to market the new technology did not know the history of the introduction of the first generation of analog TVs in the late 1940s. Back then, TV set manufacturers built extra-large sets and sold them at a discounted price to bars. People came into the bars, often to watch sporting events, saw television for the first time, were dazzled by the new technology and saved up to buy a TV for their household. It was the era of “Tavern TV” (Bogart, 1972). Nothing like it happened in the early years of HDTV.

During this early period, there was much confusion and skepticism about the business model for HDTV (Schreiber, 1999). Would advertisers pay more for commercials transmitted in HD? Probably not. If not, how could a station make money on HDTV? Some saw it as a sinkhole of costs with little added revenue opportunity. Against this background of uncertainty, a number of alternative uses for digital TV were proposed. Some believed that instead of transmitting one HDTV signal, stations should transmit four or five standard definition signals (called multicasting) and benefit from the extra ad revenue or form a consortium with other broadcasters and provide an over-the-air wireless cable service that would charge for the extra channels and compete with existing cable systems (Davidson, 2004). One problem with these proposals was that very few people bought over-the-air antennas to pick up the digital signals. If they could not charge end users directly, perhaps the multicast SD channels could be carried on local cable systems. However, cable operators, who had their own plans for new digital services and had already begun to multicast cable channel content, were reluctant to carry the extra channels (they were required to carry the main channel of local broadcasters but not the extra digital signals). Some in the computer industry proposed using the extra spectrum to transmit high-speed Web services over-the-air to computers (this was before broadband was widely available) but this proposal never gained steam (Wingfield, 1998). Collectively, these proposed alternatives for digital TV posed a threat to the original intent of the FCC and the television industry to replace standard definition NTSC with a higher resolution service.

One potential problem for the deployment of HDTV – available content in high resolution – was not an obstacle. Nearly all Hollywood movies since the 1930s were shot in 35 mm film and had higher resolution than 1080 HD, so they could be converted easily to HD. Most TV programs in the 1990s were shot in 35 mm film or high-resolution video and were available for HD conversion. Live action sports

required new HD cameras and processing equipment but this was a manageable upgrade. A trickier issue was how much resolution to provide in an HD broadcast or on HD cable or satellite channels. As noted earlier, the digital standard was more of a package or framework than a true standard. In the early days of HD transmission, signals varied from 480 lines of resolution to full 1080 and all could be called HD. Lower resolution transmissions, especially in sports, confused consumers who did not see a great deal of difference between the so-called HD program and regular non-HD programming. Over time, networks moved towards a minimum of 720 lines of resolution in HD programming and most provided 1080.

During these early years, consumers experienced a moderate and sometimes high level of technical problems or obstacles. Many HDTVs required professional installation. Consumers who tried to adjust the complex settings could make the picture worse. Some early HD digital cable boxes had latency problems – they required a longer time to change channels. Broadcast HD did not reach as far as earlier analog NTSC transmission, so the effective audience for a digital broadcast was reduced. In addition, a momentary loss of a signal in cable or satellite transmission could lead to pixelation (i.e., when the picture breaks up into boxes). Though a minor nuisance, the signal in a digital tier of a cable system was often out of sync with the signal from the same channel on an analog tier, so a person watching a program on channel four (analog) in the kitchen would hear the sound from the same channel (e.g., on channel 704 in the digital tier) drifting in from the living room two seconds later. None of these were enough to deter enthusiastic early adopters of HDTV, but they made others cautious about purchasing an HDTV set until all the bugs were worked out.

It is noteworthy how early HDTVs were used. Most were not used to watch HDTV programs but instead to watch DVDs. In 2003, only 22% of HDTVs were picking up HD signals from a broadcast station, cable operator, or satellite system (Video Business, 2004). This was due in large part to the small number of HD channels that were available at the time. Nonetheless, it was a positive development for the long-term acceptance of HDTV. If early adopters were satisfied with watching DVDs on their HD sets (DVDs had much higher resolution than could be displayed on SD sets and looked spectacular on an HD set) it put more HDTV sets in homes, helped to bring down the price, and made it more attractive to program providers to make content available in HD.

The press was not kind to HDTV in the late 1990s and early 2000s. There were many stories about technical problems, weak consumer demand, and the scarcity of HD content. Some doubted that it would ever be adopted widely (Pope, 1999). This was a reaction in part to genuine problems in the launch of HDTV and in part to the hype that accompanied the launch. There were many predictions that HDTV would revolutionize TV overnight and forecasts that it would be in tens of millions of homes within a few years. One industry group predicted that 25% of US homes would have an HDTV set by 2000. When this did not materialize, many reporters took the industry to task for not meeting the forecasts.

HDTV Takes Off

The years 2005–2009 provided a breakthrough period for HDTV, as prices dropped, sales increased sharply, and millions of average consumers embraced the medium. Retailers also improved the way they demonstrated HDTVs. By the middle of the decade, a person walking into an electronics store was likely to see several HD TVs, each displaying HDTV programming. Consumers were still confused about the variety of models offered but they were more comfortable that the TVs worked and were attracted by the lower prices (by the middle of the decade, a consumer could buy an HDTV for under \$1,000).

During this period, the consumers buying HDTVs were more mainstream than the early adopters at the beginning of the decade. They had somewhat higher incomes and were more likely to be male, but the age distribution was relatively even. The typical consumers acquiring an HDTV were likely to already have much technology in their households, for example, DVD players, game consoles, personal computers, and DVRs. They also watched slightly more TV than the average household (Boncampagni, 2005).

There were many motivations for getting an HDTV. HDTV service was readily available on cable and satellite services, along with dozens of channels and premier content such as the Superbowl and the Olympics. Many had seen HDTV programs in the homes of friends and were motivated to get one now that the price was more reasonable. For others, the motivation was simply that an old set had stopped working and it seemed to be the norm to get an HDTV to replace it (Einav & Carey, 2009). By 2008, a person going into an electronics store saw only digital TVs. Another reason some purchased an HDTV was the mistaken belief that in 2009, after the digital conversion of broadcast stations, old analog TVs would not work (analog TVs receiving broadcast digital signals did work after June, 2009 but they needed a converter; those with cable or satellite service were unaffected). It was also becoming more common for households to purchase a second or third HDTV.

Obstacles remained for the widespread adoption of HDTVs, but they were more logistical and social. One obstacle was getting large HDTVs home. It was not as simple as putting an earlier 27 inch color TV in the trunk of a car. Setting up HDTVs and fine tuning the display was a hassle for many. In the author's research, it was not unusual to go into a home with an HDTV and see a distorted picture because the owner had gone into the menu and stretched a 4:3 picture to fill up the entire widescreen display. Many reported that they did not understand why there were black bars at the edge of the screen (because the TV show was a 4:3 non-HD program). This produced some bad word-of-mouth about HDTV. Generally, the elaborate menus on HDTV sets created more problems than they solved. Previously, most people rarely or never went into the menu of a TV set and, if they did, the worst thing they might do is set the brightness or contrast to the wrong level; it was then easy to correct because there were only a few things they could change. Menus

on HDTV sets sometimes had dozens of settings, many of which were beyond the understanding of ordinary consumers.

The social dynamics of new technology are often overlooked in studies of adoption and use (Rogers, 2003). In the case of HDTV, an important social obstacle was the size of early sets, in particular the depth of rear screen projection models. They took up a great deal of room and some people (mostly women) objected to having the TV take over the living room. Over time, the technology evolved and rear projection sets were replaced by flat screen models that took up much less space and could be mounted on a wall. One company even created a stand for flat screen HDTVs that could lower the TV into the bottom of the stand when it was not in use. In this position, the TV was not visible and the stand appeared to be a high-end wood cabinet.

HDTV Becomes Mainstream

Near the end of the first decade in the 21st century, HDTV had become mainstream – a common part of the media landscape. Nearly all TVs sold in the United States were digital and 80% of those were HD ready. Over 90% of US households had digital TV service and the percentage with HD service was approaching 50%. Regular HDTV service was complemented by a number of high-definition digital technologies and services, including HD DVRs, high-definition Blu-Ray DVDs, high-definition video projectors in movie theaters, and high-definition video streaming over the Web.

A number of changes in viewing behavior and attitudes about TV have accompanied the widespread adoption of HDTV. Households that have HDTV report that it restores the luster of television and makes it a central focus of the room it is in. This relates in part to its sharper images, but also to the size of the sets. Most people buy HDTV sets which are larger than their previous ones. From observations of them watching HDTV, they appear to do less multi-tasking than when watching regular television since HDTV holds their attention so strongly. However, this is countered to some degree by the growing presence of laptops near TVs, allowing viewers to surf the Web while watching HDTV. In turning on their HDTV sets, most viewers go first to channels that carry HDTV (these are generally grouped together in an HD tier) to see if there is something they would like. Only if they cannot find an appealing high-definition program do they then go to regular channels. HDTV sets have also brought back “TV parties” with friends invited to watch major sporting events or simply have a dinner party with high-resolution content playing in the background. Homes with an HDTV tend to watch more TV and there is more group viewing by the family in HD households (Einav & Carey, 2009). As in the early days of black-and-white television, this is probably a short-term phenomenon. When all TVs in the household are HD, family members will likely go back to personalized viewing of shows.

Viewers of HDTV report that shows with high production values look much better in high definition and shows that are produced with low production values generally look worse than on regular television. They also comment that certain types of visuals work very well in HDTV and are more likely to attract them.

Generally, these are ones with bright colors and physical movements such as a shot from a helicopter panning a city or a camera that can move along a cable and capture live action as the camera moves along with the action. For this reason, sports is a big draw for many HDTV households. Other genres that benefit from HDTV are movies, nature shows, and dramas. However, many HDTV programs do not take advantage of the wider format and sharper resolution. In addition, although most HDTV sets have very good sound capability and some households have added high-end home theater systems to their sets, people indicate in interviews that the sound in HDTV productions varies from spectacular to terrible and, as in the case of low video production values, poor-quality audio sounds worse on HDTV sets. The group that might be expected to take full advantage of HDTV, i.e., advertisers, has been slow to adapt to HD. Many commercials in HD programming are not in HD and even showcase programs like the Superbowl have many commercials that are not in HD. Like the electronics industry, the advertising community was late to realize the appeal of the new technology to viewers.

Observations of viewers of HDTV indicate that there are two problems in using HDTV. The first is finding programs. Channel lineups on most digital cable, satellite and telco services have hundreds of channels. Channel surfing across the entire lineup, which was common in the past, is time consuming and inefficient. It has been reduced sharply in the HD universe, though some people channel surf within a section of their digital service. In its place, most digital HD subscribers use an electronic program guide. They surf the guide to find programs and, often, to program their DVR with shows they want to watch off the schedule. However, even within electronic program guides, observations suggest that many people cluster around channels in the HD tier. This puts programs on non-HD channels at a distinct disadvantage. A second problem can be called the “mode dilemma.” Most HDTVs have a number of electronic devices attached to them, for example, a DVD player, game console, and, more recently, a computer. The HDTV is a multi-device entertainment center and display console. Each of these devices has an input mode and there are often remote controls for each. Interviews with HDTV owners have indicated that it is common for someone in the house to turn on the HDTV and find that it is in the wrong mode, for example, in a videogame mode when the person wants to watch television programs. Finding the right remote and the correct buttons on that remote to change modes is problematic for many. Generally, there is one person in the household who has mastered all the modes but that person may not be around when others encounter the mode dilemma.

Near-Term Effects and Long-Term Impacts

The near-term effects of HDTV are easier to measure than the long-term impacts. We know that viewers of HDTV are more positive about TV and more engaged when they watch HDTV (Einav & Carey, 2009). This is likely a result not just of HD but other digital services that complement HDTV such as HD DVRs that let people gather programs from anywhere in the schedule to watch anytime, greater capacity digital cable and satellite systems, and online digital TV that let's people

catch up with shows they missed. Some of the “wow” factor expressed by early adopters of HDTV has diminished but it has been replaced by a sense of necessity, much like color TV became a necessity a decade after it was introduced. There are also important side effects to adopting HDTV such as larger screen size and the capability for much better sound. Larger screen size makes picture-in-picture more appealing than on a 27 inch set and provides a broader canvass for promotions, advertisements, and extra content that might accompany the normal content in a program. High fidelity stereo sound makes it possible to enhance special effects in programs and provide a greater sense of space for the actions in a program.

Higher resolution images have also affected makeup, stage sets, and the width of shots in sports. HD shows blemishes and wrinkles more than SD and this has required different makeup techniques. Stage sets, for example, in news programs that were held together with gaffer’s tape, look shabby in HD. This has necessitated building new sets with a much higher standard of quality. In sports coverage, many directors use wider angle shots than in the past because HD can display details in a wide shot that would be fuzzy in SD.

In addition to effects on consumer attitudes and production, there have been many effects on viewing behavior and marketing of TV programs. HD viewers of large capacity digital service channel surf less and rely more on electronic program guides, checking out HD programs first. This has had a negative impact on channels that are not in the HD tier – HD viewers are less aware of non-HD channels and programs. It has also become tougher to market new or returning programs. It was difficult enough to communicate the name, channel, and time of a new or returning program in a 30-channel universe; it is much tougher in a 200 plus channel universe.

Gauging longer term impacts require some speculation. It is likely that there will be many more changes in television production techniques as directors, producers, and writers come to better understand the capabilities of HDTV. In particular, the large screen size of most HDTVs will enable multiple video windows to be displayed. These might provide extra content related to the show, advertising, or Web content. At some point, productions may fully exploit the sound capabilities of digital HDTV, for example, it might be possible to allow viewers to tune different elements in the sound of programming such as the relative volumes of announcers and game sounds in a sporting event.

Over the long term, HDTV is likely to have an impact on the types of actors and politicians who are successful. In the past, when silent movies changed to “talkies” and when radio programs added video (television) some actors made the transition, but many did not come across well in the new medium. The more realistic video in HDTV may have the same impact on politicians and their appeal to the public. Marshall McLuhan (1964) argued that the low resolution of NTSC television made it a “cool” medium and politicians such as John Kennedy came across very well in the medium. By his terms, HDTV is a hot medium like film. In the 2008 presidential race, approximately 25% of US households had an HDTV and many more saw the candidates in HD at a friend’s house, bar, office, or other public location. Did HDTV’s high-resolution video and wide dynamic range audio enhance the relatively unblemished and smooth skin tone of Obama as well as his deep resonant voice? Did

it accentuate in a negative way the aging skin and crackly voice of his opponent, John McCain? Was Barack Obama our first HD president?

Conclusion and Lessons

This case study of HDTV illustrates two general principles about technology adoption. The first, attributed to many different authors, is that we tend to overestimate the impact of a new technology in the short run and underestimate its impact in the long run. Clearly, those who predicted that HDTV would be adopted overnight and transform television before our eyes were overestimating the short-term impact. However, we may be underestimating its long-term impact. It has changed the television viewing experience for millions and begun to change production techniques. It may in the long term affect the mix of content on television (favoring content that benefits from HD), the actors who appeal to the public, and the politicians who are elected. The second principle is that technology determines what is possible for new media but it is a combination of regulation, investment, price, marketing, consumer needs and wants, and content that determine how the technology will be used. Each of these elements affected how HDTV actually developed in the United States.

There are also many lessons to be learned from HDTV deployment and growth. For regulators, the lesson is that for a technology like HDTV to succeed, a standard is essential and, moreover, a simple standard will reduce costs to consumers and minimize confusion about the technology. For marketers, HDTV illustrates the value of knowing the history of related technologies. For example, the marketing of black-and-white television in the late 1940s and early 1950s was helped strongly by putting TVs in public locations such as bars where people could experience television and become motivated to buy one. It is a lesson that was not applied in the early days of HDTV. For the electronics industry, a lesson from the introduction of HDTV is to take advantage of serendipity. Many early adoptors of HDTVs used them to watch DVDs exclusively. This was not anticipated but this serendipitous behavior helped to bring down the price of HDTVs. Other lessons include the danger of too much hype when a technology is first introduced. In the case of HDTV, too much hype in the 1990s set false expectations for journalists who then were negative about the prospects for HDTV when it did not live up to the expectations that were set. HDTV also illustrates that media adoption takes place in a social context which can help acceptance or create a barrier. For example, the early rear projection HDTVs took over the living room and many women objected to this. Fortunately, flat screen technology helped to overcome resistance to putting HDTVs in living rooms.

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