Lessons from the Cutting Edge

The HDTV Experience

Cynthia A. Beltz

President Clinton has argued that it is both appropriate and necessary for government "to directly support" and "accelerate the development of technologies critical for long-term economic growth," giving "special attention" to those industries that "are going to explode in the twenty-first century." For those key industries, Laura D'Andrea Tyson, head of the President's Council of Economic Advisers, suggests the government should get into the business of evaluating the likely course of development; compare those baseline projections with visions of what a prosperous national economy should produce; promote domestic development; and monitor the activities of foreign governments and firms.

Such plans have been used to promote American military interests. But improving the competitive performance of American firms is a fundamentally different task. Commercial success depends not on linear projections of tangible factors such as foreign tank strength, but on such intangible and unmanageable factors as consumer taste for products that don't yet exist, the erratic pace of technological change, and corporate development strategies that often transcend national borders and government control.

To understand how poorly industrial planning performs in this environment, consider the Japanese and European experience with high-definition television (HDTV)—an emerging, multidisciplinary industry that has defied the predictions of experts and the guiding hand of bureaucrats.

HDTV Technology

Technically, HDTV represents the next generation of television. It will replace a 40-year-old standard with crisper, cinema-quality pictures and CD sound. By the nature of its widescreen size, HDTV will make watching television in your living room more like watching a movie in the theater. Much of the technical work has focused on learning how to compress the HDTV signal into small spaces so that the vast amount of information needed to create the sharper images can be sent over the air to consumer sets.

As one of the bridges between television and computers on the information highway, HDTV also represents a new era in consumer electronics. The digital version of HDTV that the United States is pursuing, for example, will transmit pictures using the computer language of ones and zeros. This merging of technologies presents dramatic new opportunities to bring the interactive information age full force into

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America's living rooms. Over the long term, HDTV might become a vehicle for new services such as telecommuting, home video conferences, and on-line reference libraries of video recordings.

But by blurring the traditional industry lines, technologies like HDTV magnify the complexity of the planning matrix. To chart out the likely course for HDTV and to design programs to encourage domestic production, for example, planners would need to speculate about user demand and input supply conditions not only in television, but also in computers and telecommunications.

At the height of the debate in 1989, there were seven HDTV bills before Congress, over 10 different committees were holding hearings, and countless reports from special interest groups and blue-ribbon commissions were circulating in Washington.

The Choice

Unlike most innovations, HDTV has led an active, controversial public life. From its beginning HDTV was held up in Washington as one of those rare "industries that have the potential to dominate the twenty-first century." Government direct support was held to be necessary and vital to American economic interests. At the height of the debate in 1989, there were seven HDTV bills before Congress, over 10 different committees were holding hearings, and countless reports from special interest groups and blue-ribbon commissions were circulating in Washington.

Much more than a technical issue, in the words of then-Senator Albert Gore (D-Tenn.), "HDTV has become a political dividing line, where opposing conceptions of government meet." On one side are those who put their faith in coordinated plans, supported by public funds and the advice of experts, to develop critical technologies that they believe should not be left to an imperfect market to develop. On the other side are those who believe that such plans are inherently imperfect and out of step with the emerging high-tech order, and that government support is more effective when focused on creating an environment that promotes the competitive forces of the market.

The Japanese and European HDTV strategies provide instructive examples of the planning mentality. Indeed, both were held up in the late 1980s as models for what an American competitiveness policy should emphasize: strategic long-term planning at the national level, coordinated and collaborative precompetitive R&D, and strong public support through the commercialization stage.

HDTV thus became an important test case. For Japan, HDTV represented an opportunity to transform its image from a follower to an innovator in high technology. For the European Community (EC), HDTV was the flagship of its new technology policy under the 1986 Single Market Act. For the United States, HDTV represented the policy of the Bush administration to emphasize the market.

The American debate was often heated, driven by the fear that this country would lose its competitive edge unless it kept pace with the spending and planning programs of its trading partners. Back in 1989 a parade of industry "experts" testified on the dire need for America to wake up and match the efforts of Japan and Europe in HDTV. Because both regions had already set their HDTV standards and were spending millions to commercialize it, such industry heavyweights as Zenith and the American Electronics Association (AEA) argued that without a comparable program the United States would be left behind in the global high-tech race.

"If the United States does not choose to reenter consumer electronics via HDTV," warned the AEA, "the country as a whole is likely to continue to experience a declining world market share in automated manufacturing equipment, personal computers, and semiconductors. Loss of these markets will contribute to the erosion and eventual loss of a U.S. manufacturing base." To avoid this catastrophe, industry representatives called for a "well-coordinated" $1.3 billion HDTV program that included public-private consortia, federal grants, loan guarantees, nurturing of infant industries, and guaranteed procurement contracts to promote prototype development and domestic production.

The Bush administration rejected the plan. The

Department of Commerce study, which had contemplated spending billions to accelerate HDTV technology, was abandoned and never completed. Craig Fields, who had promoted a national program for HDTV before Congress, was cut out of policy discussions and then later lost his job as Defense Advance Research Project Agency (DARPA) director. Other ideas for special government-created enterprises (like the Consumer Electronics Capital Consortium) were either shelved or listed as dead on arrival at the White House.

The respective decisions of Japan, Europe, and the United States thus put into motion a unique test of opposing views of government's role in promoting high technology. Four years later, the consequences provide a revealing commentary on how planning failed and even an imperfect marketplace can triumph.

The Consequences

Contrary to the forecasts of the doomsayers, American firms were neither left behind nor out of the HDTV race. Instead, in 1992 the United States surpassed Japan in semiconductors and Intel dethroned NEC to become the world's largest chipmaker. In 1992 Japanese electronic makers watched output fall by over 10 percent as U.S. computer manufacturers watched output climb by over 8 percent. For the four top Japanese computer makers (Hitachi, Toshiba, NEC, and Fujitsu), sales and profits continued to fall in 1993 while Intel and Microsoft moved to the forefront as the two most powerful companies in the computer business that are shaping how video will be displayed on future computer screens.

And despite Japan's head start and Europe's deep pockets, American companies now lead in several key areas of HDTV. Ironically, the United States may be the one exporting an HDTV standard to its trading partners. Headlines and press accounts these days proclaim "U.S. Edge in HDTV," "U.S. Passes Japan in HDTV Race," and "Europe Must Now Follow the U.S. in HDTV."

Reasons for U.S. Success, Europe and Japan's Failure

Why this reversal of fortunes? There are many reasons.

No Competition in Standards. What hurt Japan and Europe was their faith in the power of industrial targeting and coordinated plans. Both decided that HDTV was too important to be left to market forces and substituted the judgment of industry experts. Since the Bush administration opposed this type of substitution, U.S.-based firms had to fight for position in the marketplace and for Federal Communications Commission (FCC) approval of an industry standard.

The significance of this role in establishing a competitive environment is too often discounted by those who want government to play a more direct and visible role in commercial affairs.

Yet work by the McKinsey Global Institute suggests that America's secret productivity weapon is not new technology or bigger companies but rather Washington's reluctance to protect companies from the rigors of competition—domestic or foreign. Or, as Michael Porter recently put it in *The Competitive Advantage of Nations*, "few roles of government are more important to the upgrading of an economy than ensuring vigorous domestic rivalry" that fosters not only innovation and other determinants of national advantage but also "checks against forms of government intervention that stifle innovation or blunt competition."

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The HDTV standards contest provides a case in point. In sharp contrast to the American HDTV standards race that involved over 20 different contenders, Japan and Europe each developed a single system (Hi-Vision and HD MAC, respectively) that then was promoted as the industry standard. Competition was actively managed in the early stages in Japan by NHK, the public broadcasting company, and actively discouraged in Europe by a series of EC directives. Isolated from the pressures of competition, engineers were not forced to develop supe-

rior or commercially viable systems before the standard was selected. This missed opportunity left both regions particularly vulnerable to shifts in technology that ultimately proved to be fatal to their HDTV plans.

In the United States, the environment was altogether different: the aim was to shift the technology and the strategy was to rely on competition rather than planning to do so. Five years ago the FCC shot the gun that started the race. Would-be standard bearers were told their proposals must not make the existing stock of consumer sets obsolete and, if possible, to aim for a digital solution. Constant competitive pressure kept the heat on American firms to stretch the bounds of possibility with engineers often disappearing from their families for weeks and then months as they scurried to keep pace with the advances made in rival labs. The result was a continual restructuring of their R&D strategies, culminating in four different digital HDTV proposals.

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Unfortunately, more often than not, this lesson is lost in the debate over critical industries and technologies in Washington. Here it is assumed if Japan and Europe are spending millions in a high-profile joint industry-government R&D program, then they must be ahead of Americans who are "not even in the ball game." It doesn't seem to matter that research has demonstrated that R&D is more cost-effective when financed with private funds rather than with public funds.

Indeed, the point of cost-effective R&D—when investment translates into more benefits than costs—seems to have been lost altogether. Why Washington planners want, for example, to engage in an R&D race with our trading partners to see who can spend the most defies explanation. In business, getting ahead often involves devising systems that spend less—not more—to match or pass beyond your competitors' goals.

Too Much Coordination. Japan and Europe also learned the hard way about the hazards of trying to both chart the "likely course" and accelerate the commercialization of an emerging industry. Japan started developing HDTV over 20 years ago through NHK, which assigned research and production tasks to participating firms. Pushed by the French and Dutch, the European Commission jumped on board in 1986 with their version of high-definition mercantilism, an HDTV plan designed to keep the Japanese out and domestic equipment manufacturers in business.

With industry assistance, government bureaucrats in both regions tried to coordinate all the actors and variables in the HDTV transmission chain so that an attractive product would be available to entice consumers into the market. The range of activities included not only coordinating R&D through public-private consortia, but also developing and testing a transmission system, subsidizing purchases of production equipment and program production, getting an HDTV satellite up and running to deliver the programs, getting sets into the stores, and organizing public demonstrations to spark consumer demand.

At first, government coordination appeared to pay off. Japan registered a series of technical triumphs. Japan was the first to transmit HDTV signals (1979), the first to have its HDTV standard accepted by industry (1984), the first to market with HDTV receivers (1990), and the first to offer HDTV programming in prime time (1991), which the president of Matsushita Electric Industrial Company hailed as "a curtain raiser for the Hi Vision era." HDTV proponents in Europe were also quick to boast about their

technical accomplishments. The European Association of Consumer Electronic Manufacturers claimed that with its MAC system Europe had a five-year lead on its foreign HDTV rivals and was on the verge of having the world's finest television system. Unfortunately, European taxpayers soon discovered that commercial success requires much more than a working prototype.

The industrial planners in Japan and Europe underestimated the complexity of the high-tech food chain and overestimated their ability to coordinate producers and to play the role of consumers. In Europe, for example, equipment manufacturers complained they were unable to provide consumers with MAC receivers because the downstream chip industry was too slow in developing the components. Whereas in Japan, HDTV sets were available but consumers were not. For an average consumer, it is easy to understand why. The selection of HDTV programs is limited, only eight hours of programming is available each day, and sets are selling for between $7,000 and $10,000.

Once cheap, lightweight, large flat-panel screens arrive, consumer interest could pick up dramatically. But the necessary advances in flat-panel displays and manufacturing technologies have been disappointingly slow. Meanwhile, to the exasperation of engineers and bureaucrats, consumers seem to be more interested in program quality and choice than high definition. Consumer interest in HDTV may be further diluted by a growing list of home entertainment and computing options that includes digital, widescreen services with up to 500 possible TV channels promised by 1995; cable radio with CD sound; and interactive video services delivered by a growing web of multimedia providers (cable and software firms, regional Bell companies, and so forth).

Japan and Europe were also surprised by the digital revolution and the pace of technological advance in transmission technologies. Rather than tackle the problem of squeezing the HDTV signal into the narrow band needed for over the air delivery, both tried to rush to the marketplace by relying instead on direct-to-home-satellite broadcasts and the analog-based technology of conventional television. Both were stopped in their tracks by supply-side problems. First, because of a series of launch failures and mechanical problems, they had trouble getting the necessary satellites in place. Then there was the problem of getting the broadcasting community to fall in line.

European planners thought, for example, that they had locked in their analog standard in 1986 when they required all high-powered TV satellite broadcasts to use MAC. They were wrong. Technical advances and the successful launch of the Astra satellite in 1988 made it possible to transmit TV signals from medium-power satellites which were not covered by the directive. Efforts to dissuade commercial broadcasters, who were all too eager to circumvent Brussels' regulatory reach, from exploiting this loophole failed. In 1989 media tycoon Rupert Murdoch passed over MAC to broadcast Sky Television, the first privately funded satellite service, in the conventional Pal format. He added insult to injury one year later when Sky took over the only commercial user of MAC, British Satellite Broadcasting, thereby crushing MAC hopes in the United Kingdom.

Most industry experts dismissed digital television as a distant possibility that posed no threat to analog-based HDTV systems. They were wrong.

Digital transmission, in contrast to the Hi-Vision and MAC systems, is compatible with terrestrial broadcasting. It promises to resolve the signal compression problem and to thereby reach more households: 80 percent of European homes receive their signals from terrestrial transmitters. Most industry experts, however, dismissed digital television as a distant possibility that posed no threat to analog-based HDTV systems. They were wrong.

Driven by market pressures, the American firm General Instrument shocked the experts and changed the rules of the game in 1990 when it presented its digital HDTV system for FCC testing. Not to be outdone, General Instrument's rivals hurried back to the labs, and within six months four digital HDTV systems were on the table for FCC consideration. Since then, investors and policymakers worldwide have been forced to confront the prospect of digital HDTV coming on stream at the same time as

analog-based systems.

As a result of those unforeseen market and technology developments, Japan's much-celebrated advantage in HDTV has proven to be at best a hollow victory for long-term strategic planning. The analog system that Japan spent 20 years developing has been a commercial failure. By 1993, only 10,000 sets have been sold; industry and government experts had predicted that consumers would buy over 1.3 million sets. Manufacturers have defected from the Hi-Vision system and dramatically scaled back their mass market dreams. Japanese manufacturers are also in the unexpected position of scrambling to catch up to the United States in digital transmission and processing technologies.

The European experience with HDTV was equally disappointing. Heavy subsidies succeeded only in producing an unpopular system that became obsolete before it was fully implemented.

An Inflexible Response. The failure to anticipate market and technology trends was, however, only one part of the problem. A rigid response to these trends when they became apparent was the other. Major technical and political reputations were staked on the success of the respective Japanese and European plans, making any retreat difficult. Both regions fell victim to the dilemma facing a bride and groom ready to walk down the aisle surrounded by their friends and business associates. Suddenly it becomes clear that they are not compatible. Do they continue the walk out of obligation and fear of embarrassment? Or do they acknowledge the change, cut their losses, and thereby limit the long-term damage?

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In Europe, equipment manufactures went for the first option. They wanted to protect their investments in analog HDTV and were unwilling to respond to the incompatible digital advances emerging from American and European laboratories (such as National Transcommunications and HD-Divine). Rather than suffer severe political embarrassment, the Commission for three years after the General Instruments breakthrough also resisted letting go of its incompatible approach to the marketplace. Through 1992 the Commission continued trying to marry its MAC strategy to an unwilling market with proposals to close the satellite loophole and a $1 billion dollar action plan.

Both proposals were beaten back by opponents in the United Kingdom, consumer groups, and commercial broadcasters like the French company Canal Plus. Andre Rouselet, the head of Canal Plus, humiliated planners in Paris and Brussels last fall when he announced that "MAC is dead" and digital is the way forward. The demonstration and slogan from the Scandinavian HD-Divine group, "digital terrestrial HDTV before the year 2000," also mocked the EC claim that digital would not be possible until the twenty-first century. EC officials finally conceded commercial and regulatory defeat last spring when they cut their losses and abandoned their seven-year-old MAC HDTV strategy.

Japan's strategic retreat was somewhat faster and almost silent by comparison. As one chip maker put it in 1992, "Officially, nobody can tell you the future is digital because we Japanese spent too much money to develop analog HDTV." The closest official pronouncement came in June 1992 when Kazuhiku Nishi, a member of an industry advisory group to the Ministry of Postal and Telecommunications (one of the major HDTV players in Japan), was permitted to tell an Massachusetts Institute of Technology symposium that consumer demand for "personalized television (remote theater and interactive services) requires a strategic retreat" from analog HDTV. Japanese firms are now openly focused on digital research and forming partnerships with foreign firms to develop an international standard.

What the Europeans will do next is less clear. Stung by the failure of its HDTV strategy, the EC is going through an intensive internal review of its technology policies. The new EC commissioner in charge of HDTV, Martin Bangermann, is also pushing the EC to change course and

accept global (rather than idiosyncratic) standards, even if it requires accepting American digital technology as the basis for that family of standards.

But protectionist and regulatory tendencies die hard in Brussels. The EC has put together a European Launch Group for Digital Video Broadcasting that is led by the German Postal, Telegraph, and Telephone Administration. The goal is a European digital standard supported by an action (subsidy) plan. The approach follows the flawed MAC approach: first collaborate to get a politically acceptable standard, try to impose the standard on the market with another mandatory directive, and then develop the hardware. Competition and diversity are not high on the list of priorities.

Technology and market developments in pay TV and satellite services also seem likely to overtake whatever standard the group finally accepts. Canal Plus and Murdoch's News Corp are not waiting for the EC. Instead they are already working together and with American firms to introduce digital, multichannel services by the mid-1990s while bureaucrats in Bonn, Brussels, and Paris were still busy burying MAC. Ironically, the EC has demonstrated that gridlock can be good. Indeed, the EC's slow pace may be Europe's secret productivity weapon if it allows, as in the HD MAC case, the private sector time to develop rival strategies. Those strategies then may serve as ammunition to check the plans of Brussels' bureaucrats that threaten to stifle innovation or blunt competition.

The United States should also be wary about becoming inflexible. Though it took an indirect approach to the first major step of HDTV's commercial development, regulators are involved and there is the risk of the United States' becoming too attached to an HDTV vision that may not match the market's timeline. To its credit, the FCC has adjusted its original timeline for an HDTV terrestrial standard several times to take into account the need for participants to upgrade their systems after the first round of testing. Equal or more caution seems in order when implementing whatever system is selected so that the interaction of consumers and the broadcasting community (rather than regulators) determines whether the market is ready for HDTV. Like that of the EC, the influence of the FCC may be curbed by market developments in cable and satellite distribution that preempt its choice for a transmission standard.

Mozart writing the digital version of his symphony No. 38 in D major.

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HDTV Lessons for the United States

There is little indication that Washington has learned anything from the HDTV experiment in opposing conceptions of government. Japan and Europe are victims of their faith in industrial planning. Yet Bush's "just say no" stance to industrial targeting has been replaced by Clinton's "let's take a look." And a report on HDTV from the private Council on Competitiveness suggests, for instance, that more (not less) coordination and planning by

Selected HDTV and Information Technology Alliances

HDTV Chips

Motorola — Toshiba
Texas Instruments — Fujitsu, NHK, Sony, Hitachi
LSI Logic — Sanyo
LSI Logic, VLSI — 10 Japanese Companies including Matsushita Electric Industrial Co., NEC, Mitsubishi, Sharp, Pioneer, E1, and Victor

Flat Panel and HDTV Displays

Applied Materials — Toshiba, Sharp
IBM — Toshiba

Risc Chips

Sun Microsystems — Fujitsu, Toshiba
MIPS — NEC, Sony
HP — Hitachi, Oki

Other Semiconductors

Intel — Sharp (flash memories)
AT&T — NEC (DRAMS)
TI — Hitachi (DRAMS)
IBM — Toshiba, Siemens (DRAMS)

Consumer Electronics/Computers

Apple — Sharp (personal digital assistants)
AT&T — Matsushita, NEC, Toshiba
Apple, AT&T, Motorola — Sony, Matsushita, Philips (software standards)
Kaleida Labs — Mitsubishi, Hitachi, Toshiba

Interactive Media

Sega Enterprise — Time Warner and Telecommunications to deliver videogames via cable
Fujitsu — negotiating with RBOCs to provide advanced switching equipment for video-on-demand services
Toshiba — Scientific Atlanta to develop high capacity terminals for interactive system

experts will let the United States avoid the mistakes made abroad in HDTV. The apparent hope is that, by requiring consultations between industry and federal agencies, only the best plans for strategic industries will be supported with public funds.

Industrial policy advocates still don't get it: government targeting is not keeping pace with the high-tech marketplace. Predicting the future and which individual industries are going to "dominate the twenty-first century" has even industry experts confused. AT&T Chairman Robert Allen has remarked that "the industries—computer, communications, and entertainment—are all moving so fast that I can't be knowledgeable as to where they are all going or where they'll all converge." The range of digital possibilities is so puzzling that many, like AT&T, have abandoned efforts to focus on any one technology like HDTV. Would-be strategic planners in Washington should take note.

An important lesson from HDTV, that one would have hoped would be obvious to the U.S. government, is that competition works. In HDTV, the case of even coordinated government plans made in the early 1980s failed. The United States showed that pushing competition over collaboration can advance technologies beyond the limits industry experts considered possible. The duplication of effort was more than offset by the exploration of different approaches that increased the rate of technological progress and the spillovers for a range of firms in digital information technologies.

The U.S. experience in HDTV provides a home-grown model and a practical strategy that could work for whatever technologies are deemed to be worthy of "special attention." It could also provide a needed dose of humility for Washington's aspiring industrial planners.

Congressional pressure to do more will no doubt continue. But the Clinton administration should heed a second warning in HDTV about the increasingly global nature of many high-technology industries and the difficulties of designing more active policies to foster national participation. Efforts like Europe's to use standards and subsidies to limit foreign competition are increasingly prone to failure as they collide with the unpleasant realities of global competition.

Economic nationalism is out of step with a world in which information, money, and technology can zip around the world with little regard for the tools of national economic management. There is nothing about a standard that would prevent a Sony, a Samsung, or a Hitachi from building boxes that are better than sets made by American or European firms. There is also no guarantee that government research support will translate into domestic production. There is no guarantee that the company or country that advances and owns a technology will do the manufacturing. There is also no guarantee against something better coming along before the technology reaches the commercial product market.

This world of HDTV and other advanced technology products will be marked not by national boundaries, but by a bewildering web of international research, trade, investment, and production relationships. Already in HDTV international alliances have formed between European, American, and Japanese firms in fields ranging from chips and displays to transmission technologies and information systems (see chart).

Driven by competitive imperatives (to pool risk, exploit complimentary strengths, and explore new markets), major corporations are developing global strategies and international alliances at an unprecedented pace—more than 900 reported since the mid-1980s. To make matters more confusing for would-be planners, a rising portion of foreign trade—over 50 percent by some estimates—is not international commerce in the traditional sense, but transfers across national borders within a single company such as IBM or Texas Instruments.

This system of complex interdependence doesn't lend itself to easy definitions of an American firm, an American technology, or even an American product. Like today's autos, tomorrow's HDTVs and other advanced technology products will include designs, software, and components from around the world—often themselves the result of an international alliance. As John Young of Hewlett Packard put it, "whatever the technology that is developed, in whatever country, we'll be going after it for our products."

Transfers of knowledge, investments, and engineers within firms and across borders are essential to technological advancement and are at odds with the nationalist notion of technology as a physical asset that should be grown and kept at home. Europe learned this lesson the hard way in HDTV. It is time for economic nationalists in the United States to learn from their mistakes. Outdated notions of high-tech planning should be given a rest.

In an imperfect world with few guarantees, a more pragmatic strategy is needed: focus on what you know works and what you have a chance of controlling. If advancing a technology is the objective, HDTV has proved the value of promoting competition. If boosting national prosperity is the objective, the high-tech arena growing up around HDTV and other critical technologies suggests that the success of an individual firm or technology is the wrong place for government to look. Both are internationally mobile and increasingly beyond federal control.

Let's stop daydreaming about industrial planning and wake up to the new realities (dare we say opportunities?) of high-tech competition. Perhaps then sensible, practical policies that can move the nation forward will have a fighting chance.

Selected Readings

Beltz, Cynthia. *High Tech Maneuvers: The Industrial Policy Lessons of HDTV.* Washington, D.C.: American Enterprise Institute, 1991.

Council on Competitiveness. *Road Map for Results: Trade Policy, Technology and American Competitiveness.* Washington, D.C., June 1993.

Moore, Thomas Gale. "The Promise of HDTV: The Hype and the Reality." *Cato Institute Policy Analysis,* No. 123 (August 30, 1989).

Noble, Gregory. "The Politics of HDTV in Japan." Paper presented at American Meeting of American Political Science Association, September 1992.

Nolan, Dermot. "HDTV and Industrial Policy: Are There Any Winning Strategies?", London: Coopers & Lybrand, November 1993.