

# Strategy for Promotion of HDTV Service and for Implementation of Digital Broadcasting in Japan

By Takehiro Izumi

*Years of experiments have led to the successful broadcasting of high-definition television (HDTV). Japan, which broadcasts 13 hours of HDTV per day, seeks ways to promote the new medium. This paper presents an overview of the key functions for the promotion of HDTV services and discusses the importance of introducing digital broadcasting as a possible renaissance for stations.*

In 1984, satellite broadcasting for standard-definition television (SDTV) service began in Japan and the number of home receivers reached 10 million by March 1996. Using one of the broadcasting satellite (BS) channels, high-definition television (HDTV) service started in 1994, after eight years of experiments, and the number of receivers that can receive HDTV programs now exceeds 550,000. Among these, 210,000 are HDTV receivers with full decoding capabilities and the rest are wide-screen TV sets with multiple sub-Nyquist subsampling encoding/

National Television System Committee (MUSE/NTSC) signal converters.

The general aim of the BS was to provide "high-quality service." This concept could be represented by saying that satellite channels should be differentiated from the existing terrestrial services. Otherwise the new service could not become a major broadcast medium. Based on this concept, BS service now has the capability of reaching one-fourth the total households in Japan, and HDTV service seems to have taken off.

Digital broadcasting systems are now on the verge of introduction. Therefore the environment surrounding Japanese broadcasters and viewers regarding digital satellite broadcasting is unique, because older analog SDTV

and HDTV services already co-exist with emerging digital services through communications satellites.

## Promotion of HDTV Service

### Current Status of HDTV Broadcasting in Japan

In November 1994, after three years of experimental broadcasting by Hi-Vision Promotion Association, a consortium for experimental HDTV broadcasting, Nippon Hoso Kyokai (Japan Broadcasting Corp., NHK) and commercial broadcasters jointly commenced regular HDTV broadcasting by time-sharing one of the BS channels. Japanese viewers can now enjoy 13 hours of HDTV broadcasting every day.

Figure 1 shows the gradual increase of satellite receivers for both SDTV and HDTV. The number of HDTV receivers purchased by consumers increased due to HDTV coverage of various events such as the Olympic Games, World Soccer Games, and the Royal Wedding in Japan. At the end of July 1996, when the Summer Olympic Games were held in Atlanta, the num-

Presented at the International Workshop on HDTV '96 (paper no. H96-41) in Los Angeles, Calif., October 8 to 9, 1996. T. Izumi is with NHK Science and Technical Research Laboratories, Tokyo, 157 Japan. Copyright © 1998 by SMPTE.

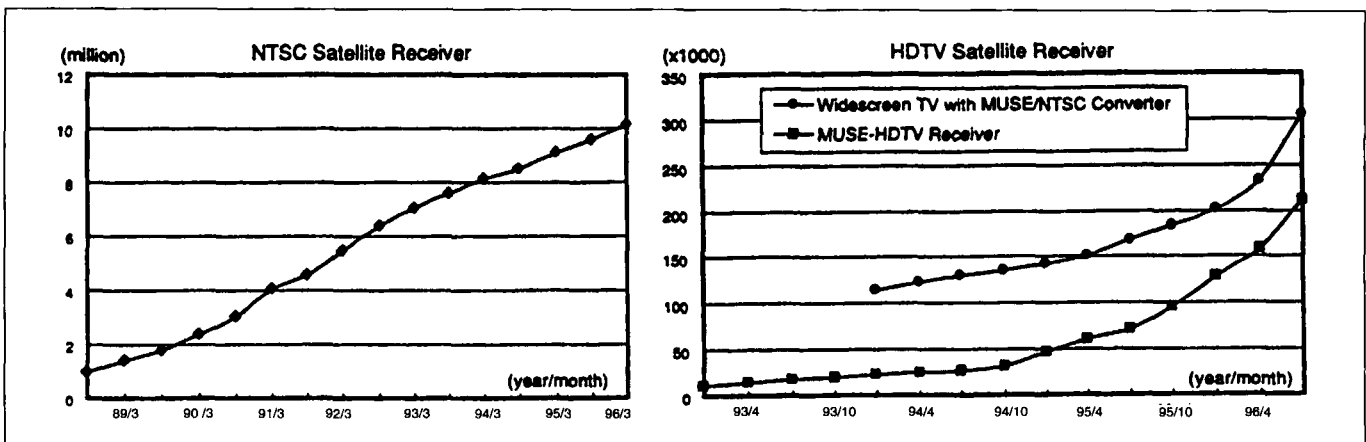


Figure 1. Number of satellite receivers for SDTV and HDTV in Japan.

## STRATEGY FOR PROMOTION OF HDTV SERVICE AND FOR IMPLEMENTATION OF DIGITAL BROADCASTING IN JAPAN

ber of HDTV receivers exceeded 210,000. It took a long time for HDTV service to penetrate the market, but now we believe HDTV service has finally taken off. In addition to the HDTV receivers, widescreen conventional TV sets with a built-in MUSE/NTSC converter and a MUSE/NTSC converter box have increased to 340,000, resulting in a total of 550,000 receivers that can receive HDTV programs.

### Strategy for Penetration of HDTV Service

The key factors for the promotion of HDTV service are high-quality program content, the price of HDTV receivers, and the number of channels that provide HDTV services. Promotion of the applications of the HDTV technology to the nonbroadcast media such as cinema production, printing, education, and museums is also an important means of stimulating penetration of HDTV broadcasting.

### Toward High-Quality Program Production

At the introduction of the new service, it is very important for broadcasters to establish a production environment. In this case, NHK has broadened its HDTV production, step by step, to produce daily programs and cover various events. Figure 2 shows the increase in the number of NHK's HDTV cameras over the last nine years.

One of the ways to increase the productivity of HDTV equipment is to conduct simul-production of HDTV and NTSC programs. For a broadcaster providing both NTSC and HDTV programs, simul-production is an excellent means to save both time and money without sacrificing the quality of programs. Seven of 24 studios in NHK's broadcasting center have been renovated to accommodate simul-production.

To provide diverse high-quality programs, co-production with other

broadcasters is highly desirable. During the Olympic Games in Atlanta, NHK and Zweites Deutsches Fernsehen (ZDF) of Germany jointly produced HDTV programs covering the opening and closing ceremonies and 11 sporting events. Figure 3 shows a block diagram of the co-production: NHK used the 1125/60 format, and ZDF utilized the 1250/50 format. The two broadcasters exchanged programs through standards converters.

In addition to programs produced in the HDTV format, up-converted images from NTSC were also used for some programs. In the coverage of the marathon, up-converted NTSC images and related data such as runners' statistics were displayed simultaneously like multimedia-type services. This was a trial to confirm the potential of an HDTV display for multimedia-type services for the future service. It proved that an HDTV display is appropriate for showing images and text at the same time because of its high resolution. As a result, NHK and commercial broadcasters provided 17 hours of HDTV Olympic Games programs per day. A total of 217 hours were covered during the Games.

With the increase of broadcast hours of HDTV programs, the price of HDTV equipment has decreased dramatically. For example, the price of an HDTV/NTSC camera is approximately 1.2 times that of a conventional NTSC camera. Also, the size and the functionality of HDTV equipment has been improved, resulting in a variety of HDTV programs. Various new

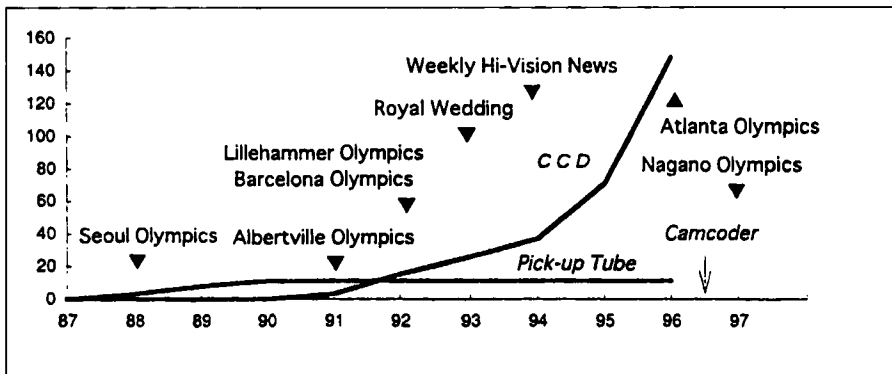


Figure 2. Increase in NHK's HDTV camera productions.

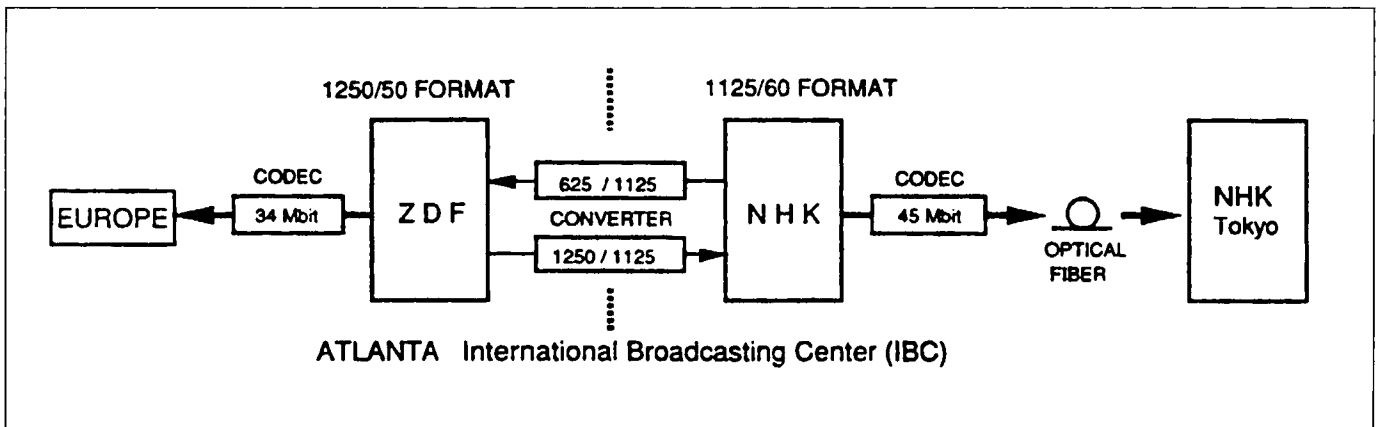


Figure 3. HDTV co-production at Atlanta Olympic Games.

## STRATEGY FOR PROMOTION OF HDTV SERVICE AND FOR IMPLEMENTATION OF DIGITAL BROADCASTING IN JAPAN

equipment is being developed for the Nagano Olympic Games in 1998, including a one-piece camera, digital videocassette recorder (VCR), and transmission equipment, which will help produce HDTV programs in a manner similar to NTSC production.

### HDTV Receiver

The price of an HDTV receiver declined to one-tenth of its original cost during the last six years. It was approximately \$40,000 U.S. when we started one-hr-per-day experimental HDTV broadcasting in 1989. Due to the high price of the receiver and the lack of attractive programs, the popularity of HDTV receivers was low. However, the price of the receiver decreased rapidly, and was approximately \$4,000 U.S. in 1996. Figure 4 shows the changes in HDTV receiver prices over the last eight years.

A flat panel display for HDTV receivers is under development. NHK and 25 other manufacturers created a consortium for the development of a plasma display panel (PDP). The consortium is working to complete the development of consumer-type PDP suitable for video representation by 1998. A 40-in. PDP with 2 million pixels, as shown in Fig. 5, was demonstrated in 1996, and it is expected that a prototype consumer receiver will be available soon.

### Number of HDTV Channels

The number of channels that provide HDTV programs is one of the key factors in promoting HDTV service to consumers. Currently, only one HDTV channel is used. It is the broadcaster's desire to increase the number of channels using the BS, which is expected to be launched in the year 2000. By assigning transponders to NHK and commercial broadcasters for HDTV service, it is possible to create a competitive environment for HDTV service. The competition among broadcasters will offer a wide range of selection for consumers, which in turn will help penetration of the market.

Digital broadcasting from a communications satellite, which occupies a different orbital position and uses a different frequency band from a broadcasting satellite, aims at multi-

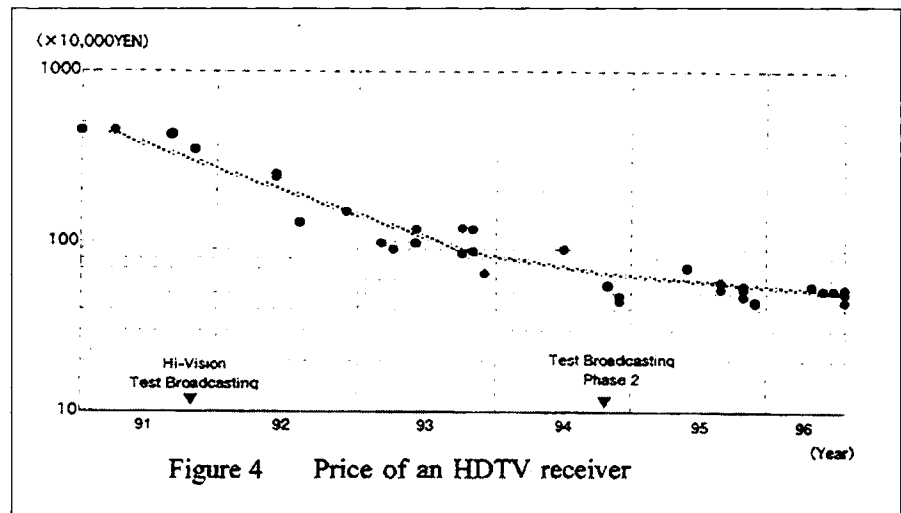


Figure 4. Changes in the cost of an HDTV receiver.

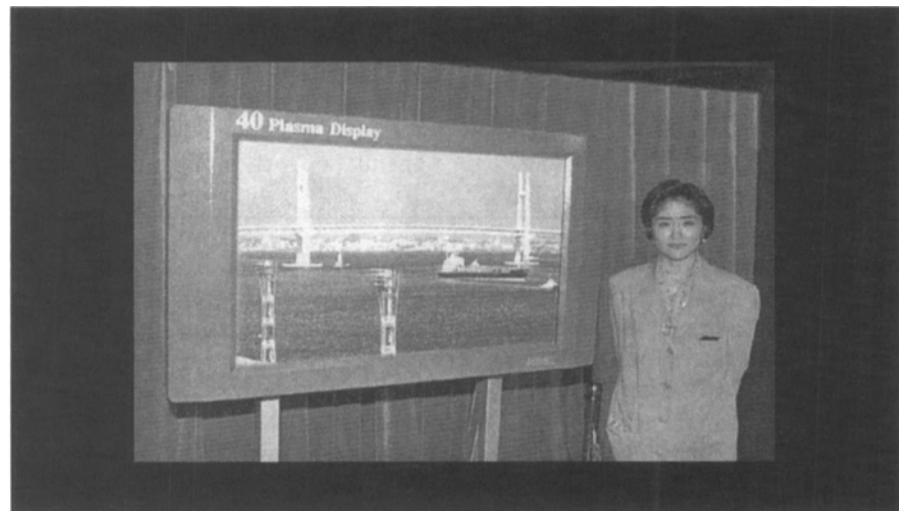


Figure 5. Example of 40-in. flat panel display.

channel service. Broadcasters should and will stress the high-picture-quality from a broadcast satellite to differentiate themselves from new entrants to this business. We also have strong requests to increase the number of HDTV channels from consumers.

### MUSE/HDTV vs. Digital HDTV

Stable and continuous service based on mutual trust between viewers and broadcasters is critical for the success of the broadcast business. Based on NHK's 70 years of experience in broadcast service, we might conclude that it usually takes ten years for a new service to take off. As mentioned previously, HDTV service has just taken off—eight years after the start of

experimental broadcasting.

Based on these experiences, I am confident that changing MUSE/HDTV into digital HDTV will cause a negative impact on the penetration of future digital HDTV service. The best way to promote HDTV is to continue current service and prepare for digital broadcasting in parallel with HDTV promotion.

It is also important to let viewers know that the HDTV receiver can be used as an ideal display for digital broadcasting by adding a set-top box, because its high-resolution is suitable for future multimedia-type services. Consumers will never lose anything by buying HDTV receivers, because a display device accounts for approxi-

## STRATEGY FOR PROMOTION OF HDTV SERVICE AND FOR IMPLEMENTATION OF DIGITAL BROADCASTING IN JAPAN

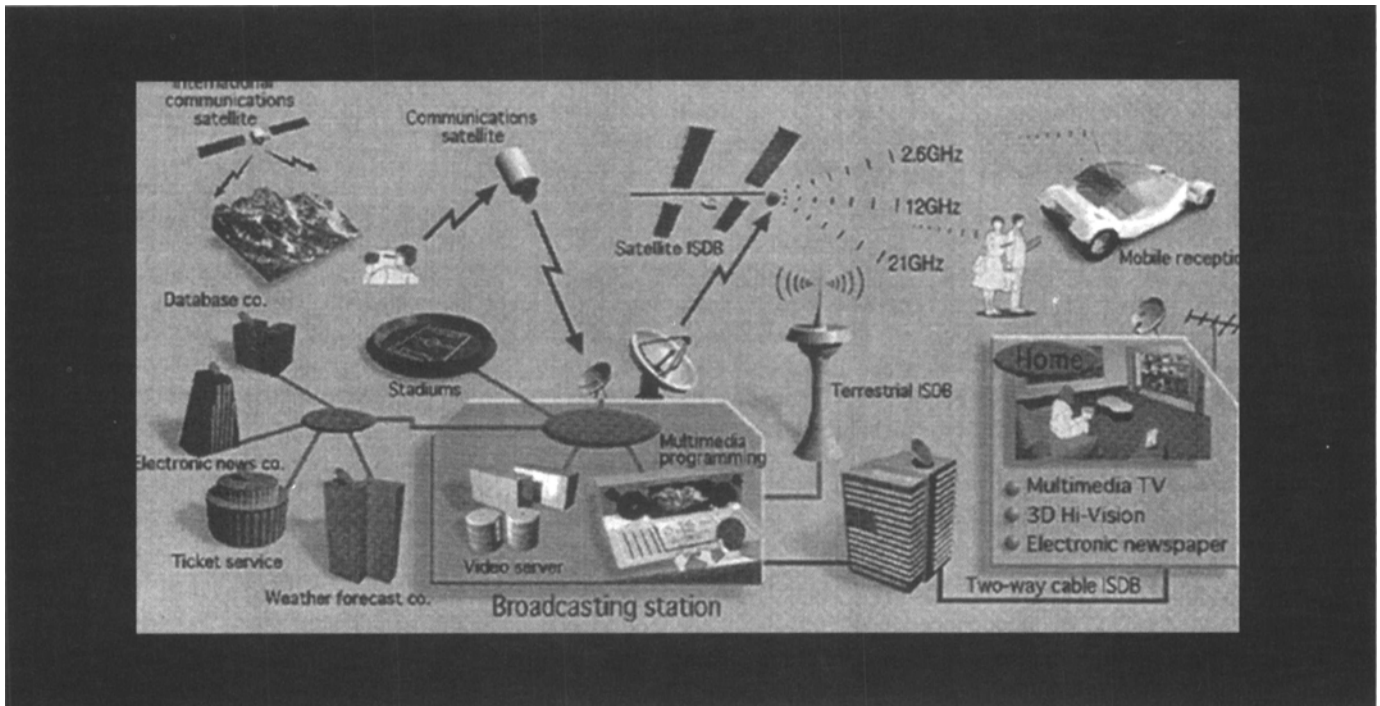


Figure 6. System concept of ISDB.

mately 85% of the cost of a receiver, and the price of a set-top box will be small compared with the display cost. Therefore, the promotion of HDTV receivers helps not only the promotion of HDTV service itself but also the construction of the infrastructure for future digital broadcasting.

### Introduction of Digital Broadcasting

#### Characteristics of Digital Broadcasting

The advantages of digital broadcasting over analog broadcasting are summarized by terms such as high-quality, multichannel, high-functionality, and flexibility. By taking advantage of these characteristics, broadcasters can provide various contents in formats we cannot even imagine at this moment. In this sense, digital broadcasting could be a renaissance for broadcasters.

However, it is difficult to pursue high quality and multichannel at the same time, because high quality is always a trade-off with multichannel and vice versa. Therefore, sooner or later, broadcasters will be forced to decide which characteristics to stress when they move to digital service. I

believe that broadcasters should pursue high-quality service and should avoid multichannel service merely to compete with service providers that use communication satellites for the multichannel services. The digital service provided should be flexible and diverse based on the high-quality HDTV image.

#### Concept of ISDB

In Japan, ISDB (Integrated Service Digital Broadcasting) is proposed where various information such as video, audio, and program related/unrelated data are multiplexed into a single bit-stream. At the receiving end, viewers can select any information they want at any time with the help of a home server.

In the future, ISDB programs with indexes will be broadcast so receivers equipped with a personal filtering function can receive and store necessary information automatically. At the same time, each cut of a video image or each piece of information will be labeled so that viewers can browse programs and information on the receiver terminal. ISDB also features two kinds of interactive services, one-way interactive and two-way interac-

tive. One-way interactive means each piece of information is broadcast and stored in a home server, and viewers access interactively a service composed of these pieces. Two-way interactive is a real interactive service where receivers are connected to a communication network. Figure 6 shows the system concept of ISDB, and Fig. 7 shows an example of an ISDB menu screen.

ISDB should contain digital HDTV service, data service, and a flexible combination of various contents. At the start of digital broadcasting, it is essential to include all these elements in order to provide a completely new service which would attract viewers' interest, compared with current services. ISDB will evolve further when a home server becomes available that can provide program contents to fully utilize the capability of a home server.

### Introduction of Digital Broadcasting in Japan

Digital multichannel service using a communications satellite will start this fall in Japan. Similar services such as SDTV are also under consideration. There is no plan for digital HDTV service at this moment.

## STRATEGY FOR PROMOTION OF HDTV SERVICE AND FOR IMPLEMENTATION OF DIGITAL BROADCASTING IN JAPAN

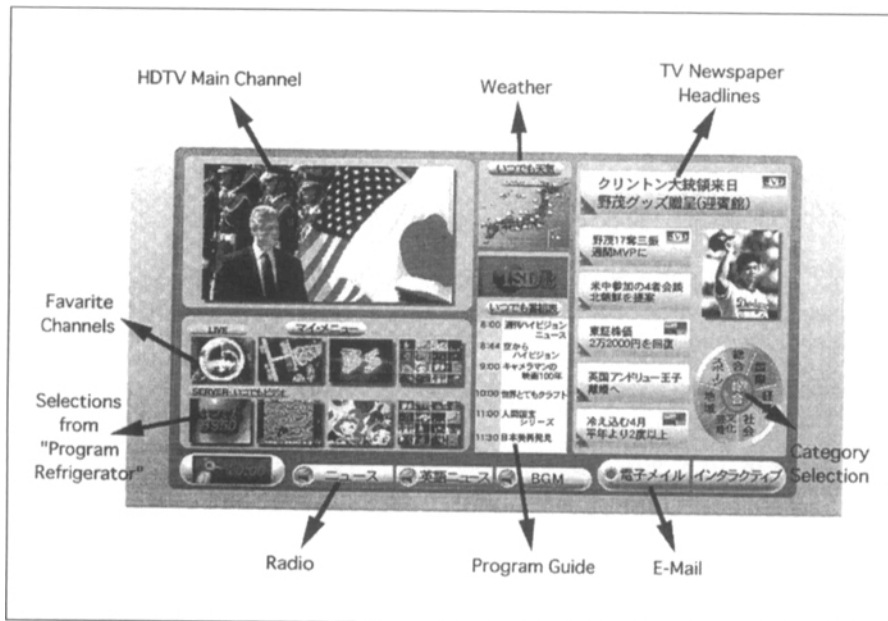


Figure 7. An example of a menu screen of ISDB.

These multichannel services as well as similar U.S. services started from a zero market share. Therefore, a service provider could design its service without any constraints. On the other hand, the situation for the broadcast satellite service in Japan is completely different from that for communications satellite service. There are ten million SDTV receivers and 550,000 HDTV receivers in Japan.

In such an environment, we have to pay attention to protecting the interests of existing viewers by keeping simulcast channels for a long period of time. It is the broadcaster's responsibility to work out a smooth migration path that enables viewers to receive maximum return from a new service with minimum investment.

### Implementation ISDB

Digital broadcasting should be introduced and its services should be upgraded gradually, because it is impossible to provide digital service with full capability from the beginning. As a first step, digital HDTV with program related/unrelated data such as electronic program guides and news will be provided as the first-generation ISDB. Then the service and contents can be upgraded, without modifications, to receivers when a home server becomes available and

broadcasters are ready to provide programs intended to store in home servers. To make it possible to upgrade the service, it is essential to standardize the signal format appropriately at the beginning of the service.

The key elements for the implementation of digital service is the same as the key factors for the promotion of MUSE/HDTV mentioned earlier. To produce attractive contents for a digital service, broadcasters must accumulate expertise for high-quality HDTV program production through the experience of MUSE/HDTV service. Broadcasters must also accumulate experience in creating new types of data services, and must prepare an appropriate production environment for the new data service.

It is also important to let consumers know that the MUSE receiver can be used as an ideal display for digital service by adding a set-top box.

We will continue to provide MUSE/HDTV and NTSC service to protect existing viewers' interests, and to build an infrastructure for the coming digital age. To do so, we believe that existing service should be provided with the current BS-3 satellites and its successor BS-4, and a digital service should be introduced through other satellites at different orbital positions or in different frequency bands.

### Conclusion

In general, it is usual practice to discuss digitization of transmission systems to convey programs to the viewers. I believe penetration of new services depends on their contents, so development of programs suitable for new services is a prerequisite. To support creative people effectively, it becomes very important to remodel or refine the infrastructure of information/program production/archives by fully exploiting the merits of digitalization within the broadcasting station. When we succeed in doing so, then we may enjoy a "renaissance in broadcasting."

### THE AUTHOR



Takehiro Izumi joined NHK (Japan Broadcasting Corp.) in 1960 and began developing an operational broadcasting satellite system at the Technical Research Laboratories. Izumi was at the Technical Planning Division of NHK Headquarters for 16 years, in charge of strategic technical planning of broadcasting and satellite networks. During this period, he introduced new services such as HDTV to the division and also worked on the frequency management of broadcasting satellites.

In 1991 Izumi became director-general of the Science and Technical Research Laboratories of NHK, a position he held for four years. He is currently the executive controller of research at NHK.

Izumi was involved in international organizations such as the CCIA, WARC, ABU, and EBU. He is a Fellow of the IEEE.