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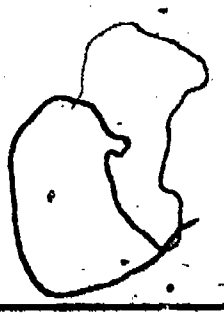
ABSTRACT

This basic, entry-level guidebook introduces public broadcasters to videotext or teletext technology and the range of services it can provide. Following an explanation of basic terms and a review of the early history of videotext, a summary of research findings from commercial and public trials of teletext addresses such topics as consumer purchase of decoders, teletext viewing patterns, popular content areas, graphics and waiting time, teletext and education, business data services, and videogame downloading. Current teletext activities in the United States are reviewed, and four levels of involvement are assessed as options for a public broadcasting station: vertical blanking interval (VBI) leasing; VBI leasing plus retransmission of a teletext signal; VBI leasing and retransmission of a national or regional teletext signal, plus local origination of a small teletext service; and VBI leasing plus operating a major teletext service. Final chapters summarize the Federal Communications Commission's rules governing teletext, and offer suggestions for station planning and making decisions about teletext services. Appendices contain a 13-item bibliography and a list of equipment, information, and service resources. (LMM)



Teletext Guidebook

CORPORATION FOR PUBLIC BROADCASTING

Teletext Guidebook

A Report for

Office of Policy Development and Planning
Corporation for Public Broadcasting

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PREFACE

The purpose of this guidebook is to introduce public broadcasters to teletext technology and the range of services it can provide. The guidebook is an entry-level primer and assumes no technical knowledge on the part of a reader.

Teletext can be confusing to a person who casually follows new telecommunication technologies since it is not a single entity but a group of diverse services that can be transmitted in a variety of ways. These range from public service application for home viewers such as a small electronic magazine of local news, weather and educational materials to commercial applications such as the transmission of financial data to banks and stock brokers. These broad teletext options are in turn related to an even larger group of electronic text services that are grouped under the label videotext. This guidebook attempts to sort out the many pieces in the universe of services. It also tries to help readers assess the value of teletext for their particular public broadcasting group and provides suggestions for those who plan to implement a service. No firm recommendations about teletext are offered but options for public broadcasting stations are outlined along with some strengths and weaknesses associated with each application.

The guidebook is organized in a straightforward manner. Chapter 1 explains basic terms and reviews the early history of teletext. Chapter 2 summarizes research findings from commercial and public trials of teletext. Chapter 3 reviews current teletext

activities in the US, while Chapter 4 assesses the various options for a public broadcasting station. The FCC rules governing teletext are summarized in Chapter 5 and Chapter 6 concludes with some suggestions for station planning and decisions about teletext services.

All opinions and judgments in the guidebook are those of the author and not necessarily those of Corporation for Public Broadcasting. The guidebook represents one in a continuing series of efforts by the Office of Policy Development and Planning at CPB to help the public broadcasting community keep abreast of developments in new telecommunications technologies. However, a decision to develop services by individual stations or groups of stations, alone or in a joint venture with commercial groups, must take place in the broader context of public broadcasting's mission and policy objectives. This guidebook is simply one resource that may assist in the broader decisionmaking process.

Richard Grefe, Director
Policy Development and Planning
Corporation for Public Broadcasting
October, 1984

1. TELETEXT BASICS AND EARLY HISTORY

A. System Characteristics

Teletext provides a way to transmit print and graphical information in piggyback fashion on a normal broadcast signal without disrupting the regular television programming. The pages or frames of information are transmitted in the vertical blanking interval (VBI) of the broadcast signal. The VBI is an "extra space" in the broadcast transmission that is currently used for closed captioning and engineering test signals. Each television station is capable of transmitting a teletext service.

In a typical teletext system, frames of information are created on special terminals at a television station and stored in a host computer. Each frame may contain 50 to 80 words, or, the amount of words and graphics that can fit on a TV screen. The teletext service is created from these frames of information. Typically, 100 frames of information are organized into a package and inserted into the VBI of the broadcast signal. The package of frames is transmitted in a continuous cycle, eg, every 10 to 15 seconds.

A person who wants to receive teletext requires a special decoder and keypad as well as a television set. In most instances, each teletext frame has a number. A person selects a specific frame by switching from regular programming to a teletext mode, then pressing the number of a desired frame on the keypad. This instructs the decoder to pull that frame from the continuous

cycle of frames that is being transmitted and display it on the TV screen. Since the cycle requires 10 to 15 seconds for transmission, a person may have to wait several seconds before the information is displayed.

B. Related Services

In order to understand what teletext can and cannot provide, it is helpful to examine some related services. For more than two decades research scientists, business people and students have made use of databases: information stored in large computers, transmitted over telephone lines or wires connected directly to the computer, and accessed through small computer terminals. Many of these databases hold very large amounts of information and they are generally expensive to use, eg, $ 75 to 150 per hour. In the mid 1970s, efforts were begun to adapt database technology for wider audiences. General news, games and entertainment information were added to some databases. The new systems enabled a greater variety of terminals to access the database; use of telephone lines for transmission of data increased; and costs of usage were reduced somewhat, eg, $ 5 to 25 per hour. The new systems, commonly called videotext, retain an important characteristic of earlier databases - each user's terminal is connected directly or through telephone lines to the host computer and can interact with the database.

Teletext shares a few characteristics with earlier database technology and the more recent videotext services, while differing in many important ways. A teletext service stores information

in a host computer but the volume of information that can be transmitted is very limited. For example, a teletext service may transmit a total of 4,000 to 6,000 words. Rather than use telephone lines to transmit the information, teletext uses a broadcast television signal or in some cases cable television. With teletext, a user has no direct interaction with the host computer. He or she simply selects individual frames of information from the cycle of frames that is being transmitted. In these ways, teletext is much more limited than videotext. However, teletext is generally less costly for a user and there is no limit to the nurber of people who can use teletext simultaneously. Thus, teletext is a small, relatively inexpensive service that can potentially serve very large audiences. Table 1 outlines some of the more important characteristics of teletext.

Table 1. Teletext Features

Characteristic	Description
Size of service	Small, approximately 100 frames in a typical service, containing 4,000 to 6,000 words.
Interactivity	A user can select frames but cannot communicate with the host computer.
Cost to users	Generally free after a one-time purchase of a decoder.
Transmission	Uses the vertical blanking interval of a broadcast signal or, in some cases, cable television.

C. Teletext Uses and Applications

In this section, teletext uses and applications for public broadcasters will be described in simple terms. Chapter 4 describes the options for a station in more detail.

1. Public Service And Commercial Uses. Teletext may be used by a station to provide information for home viewers, students and teachers in a school setting or workers at a state agency. Alternatively, a station can lease a portion of its VBI to an outside group who in turn may provide commercial data services to businesses.

2. Local and National Teletext. A teletext service may be created locally by a public television station or received from a national satellite feed and inserted in the local station's VBI. Alternatively, a teletext service can mix some frames from a national satellite feed with information frames that are created locally.

3. Specific Services. There are at least four general options for a teletext service. First, a station can offer a form of electronic magazine with news, weather, sports scores and other content that will likely appeal to a broad audience. Second, the teletext service can be used to provide information for a special target audience, eg, educational content that supplements a telecourse broadcast. Third, business information such as stock prices can be offered to companies and individuals who subscribe to a teletext service. Fourth, teletext technology can be used to transmit or download computer programming to terminals, eg, videogames or educational software for personal computers.

While it is possible for a station to provide more than one form of teletext service, the technical capacity of a VBI has limitations. Some stations may choose to offer different teletext services at different times of the day, eg, educational teletext services for schools during the day and a general consumer teletext service in the evening. In addition, a station can divide available VBI space, eg, leasing part of the VBI to an outside group who will offer business data services, while retaining part of the VBI for a station-created teletext service

directed towards the general public.

D. Early History

Teletext service began in Britain during 1976 with only a handful of decoders in the marketplace. By fall 1984, each of Britain's four television stations was offering a teletext service and more than 1.5 million homes were equipped to receive it, or, just over ten percent of their TV households. Operational teletext services are also available in Sweden, Finland, Austria and France, among other countries.

In the US, teletext has been offered on a limited basis since 1979. However, until 1983 all of the US teletext activities were experimental or trial services. A large percentage of these trials and tests has been conducted by public broadcasting stations.

1. US Commercial Teletext Activity.

Commercial exptrimentation with teletext began in 1979 at KSL TV in Salt Lake City, Utah. Major network experimentation with teletext was conducted by CBS, first at KMOX TV in St. Louis then at KNXT TV in Los Angeles. NBC also participated in the Los Angeles trial through their affiliate KNBC TV, but ABC has remained on the sidelines. In addition, Time Inc., Field Enterprises, Taft Broadcasting and Metromedia have conducted teletext trials.

In 1983, both CBS and NBC began national teletext services. However, very few decoders were available for purchase and these prototype units priced at more than $ 1,000 each. Similarly, in Cincinnati began a regular teletext service in 1983 but only a small number of decoders were available for purchase.

In 1984, decoder availability remains limited though the price of some decoders has dropped to $ 300. It appears that 1985 or possibly 1986 will mark the first year when fully operational teletext services are transmitted nationally and decoders are widely available.

2. US Public Broadcasting Teletext Activity.

Within the family of teletext and teletext-related activities in the US, the largest operational service has been Line 21 captioning for the hearing impaired. This national service has been available for several years and is now viewed in more than 100,000 households. The National Captioning Institute and the WGBH Caption Center are two major suppliers of captioning.

Line 21 captioning, as the name implies, uses line 21 of the vertical blanking interval to transmit captions. Users must purchase a special decoder in order to view the service. The decoder grabs the captioning from the VBI and superimposes it over the broadcast picture. Typically, Line 21 captioning is transmitted via the national PBS satellite feed along with the programming and then broadcast by the local station. The commercial networks and some cable services also transmit Line 21 captioning. And more recently, some prerecorded videocassettes and videodiscs have begun to offer Line 21 captioning.

In addition to captioning, the Line 21 system can send textual information. More than 20 public television stations have offered Line 21 text information. Most of these trials and services have involved information for farmers, eg, commodity prices and detailed weather information. In some instances,

a national feed has been sent to local stations for retransmission, eg, a Line 21 text trial conducted by PBS, US Department of Agriculture and several public broadcasting stations. In other instances, eg, WHA TV in Madison, Wisconsin and KBIN TV in Des Moine, Iowa, the local station has assembled its own text service for farmers.

Teletext technology is similar to Line 21 captioning technology. However, teletext uses 2 to 8 lines of the VBI rather than one and teletext transmits data at a faster rate. Further, teletext decoders and Line 21 decoders are not compatible. Public broadcasting's involvement with teletext began in 1979 with technical tests at KCET TV. In 1981, KCET and WETA began teletext trials. WGBH followed shortly thereafter, while WHA began a trial in 1984. Each of these tests has involved a relatively small number of homes, schools and public locations such as libraries. Collectively, the four stations have tested general teletext services for homes and specialized services for education as well as information services for libraries, community centers and unemployment offices. These activities have yielded valuable research findings and helped to develop teletext expertise within the public broadcasting community. However, public broadcasting stations like their commercial counterparts cannot offer a teletext service to all TV households until decoders become widely available.

In addition to Line 21 captioning and text services and the teletext trials at KCET, WETA, WGBH and WHA, public broadcasting

has been very active in videotext and cable text applications. For example, KPBS TV and San Diego State University along with KUON TV and the University of Nebraska have developed videotext courses, while WUFT TV and the University of Florida have developed a series of open channel information services for cable television. The latter application displays text as normal video on a full cable channel and therefore does not require a special decoder. All cable households can view it.

Public broadcasting has also conducted technical tests in which the VBI is used to transmit or download computer software to personal computers and financial data to terminals in business offices. PBS and Merrill Lynch as well as WNET TV and Satellite Network Delivery have conducted such tests. The services emerging from these tests are described in Chapter 3.

2. RESEARCH FINDINGS AND TECHNICAL CONCERNS

There has been a good deal of research about teletext technology, consumer appetite for teletext services and usage patterns in homes. In general, the research suggests (1) the technology works but reception problems are more troublesome than for regular broadcast programming, (2) a wide range of services have appeal to specific audience segments but the limited capacity of teletext will restrict the number of content areas a station can offer, and (3) many consumers will use teletext each day but viewing sessions are likely to be short, eg, 10 to 15 minutes.[1]

A. Consumer Purchase of Decoders

An analysis of decoder purchasing and leasing patterns in Britain, where a regular teletext service has been in place for more than five years, as well as research results from US teletext trials in Los Angeles and Washington, D.C., suggests that a large potential market may exist for teletext services once decoders become widely available at a price under $ 200. For example, in Britain where decoders cost approximately $ 150 over the normal price of a TV, a majority of those who purchase or lease a color TV now choose a set with teletext.

1. This chapter draws from many sources, including Carey 1984, CBS Broadcast Group 1983, Connelly 1983, Elton and Carey 1983, Goldman et al 1982 and Hooper 1983. Any attempt to synthesize a large body of research findings must necessarily rely on selection and interpretation. Others will undoubtedly disagree with some of the analyses presented here. A bibliography in the Appendix provides a list of original sources for interested readers.

B. Teletext Viewing Patterns

There are some indicators that teletext will likely have more appeal to those under fifty years of age. It appears to be very popular among teenagers and there is evidence that males are likely to view teletext somewhat more than females. The group that is most likely to purchase teletext decoders during the first five years of availability may be characterized as above average in income level, strongly interested in other new technologies such as videocassette recorders and personal computers, and heavy consumers of all types of information.

Results from teletext trials suggest that usage will be heaviest from 5 to 11 pm, with peak usage near 6 pm. Most viewers seem to use teletext just before or just after watching regular television programming. However, many do switch into teletext during commercials or at program breaks. The average teletext home is likely to view the service once a day for 10 to 15 minutes after a 2 to 3 month novelty period during which usage may be higher.

C. Popular Content Areas

The teletext services offered by the commercial broadcast networks are likely to emphasize news headlines, weather, sports scores, business news and games since research from their trials indicates that these are among the most desired content areas by the broad public. However, other broadcast groups may place emphasis on education, business or community information since these areas appeal to select, target audiences.

Several studies indicate that timely information, eg, the latest weather report or tonight's TV listings, has strong appeal to teletext viewers. In addition, local information has been popular in trial homes.

D. Graphics and Waiting Time

Since teletext is broadcast in a cycle, there is often some waiting time from the moment a person presses the desired frame number on the keypad until the frame is displayed on the screen. There are strong indicators that people do not like to wait a long time for requested frames to appear on the screen. If the transmission cycle is no more than 15 seconds the average waiting time will be 7.5 seconds or less. Under these conditions, teletext viewers are reasonably tolerant. However, a teletext service with a much longer transmission cycle, eg, 25 to 30 seconds, runs the risk of irritating many potential viewers.

Waiting time is influenced by several factors including the total number of frames in a cycle, the data rate or speed at which the teletext service is transmitted, and the number as well as complexity of graphics in the cycle. There are a few ways to reduce the effective waiting time in a teletext service other than reducing the total number of frames or graphics. For example, very frequently accessed frames can be transmitted twice per cycle, selected frames can be excluded from the cycle during time periods when the target audience for the information is not likely to be viewing, and in some instances frames can stored in a viewer's decoder and therefore available immediately when

requested. These and other issues related to the management of a teletext transmission cycle are critically important.

The importance of graphics is a more controversial topic owing in part to differences in the graphics capabilities of competing teletext systems. There is evidence that people like high quality graphics and that such graphics can help to sell decoders. Further, specific applications such as advertising or educational illustrations can benefit from sophisticated graphics capabilities. At the same time, there are costs associated with graphics. The equipment necessary to create and receive sophisticated graphics costs more than low level graphics systems. Also, a designer's time and the lengthening of a transmission cycle because of sophisticated graphics are elements that must be weighed by a teletext system operator. Thus, proponents of sophisticated graphics systems and cheaper, low level graphics systems can find evidence to support their arguments.

E. Teletext and Education

There are many indicators that teletext can provide valuable educational services and, further, that an audience exists for these services. Educational teletext services provided by KCET and WGBH received strong positive responses from the general public as well as school audiences. In addition, consumer education frames on the commercial teletext services of CBS and NBC received moderate usage. However, a few qualifications must be noted. First, educational teletext services do not rank at the very top of a preference list among the broad public. This

means that commercial teletext operators are not likely to emphasize educational services. Second, broadcast teletext on the VBI has a limited capacity. Therefore, teletext cannot readily provide large amounts of educational content. Third, teletext has limited interactive capabilities. While it can offer simple quizzes in which answers are revealed by pressing a special key, teletext does not lend itself to formal testing of students.

With these qualifications stated, a number of useful applications for educational teletext may be described. Teletext can provide reading lists and referal information that supplement educational broadcast programming. It can also offer guidance information, school bulletin board notices and self-quizzes for telecourses. WGBH in its teletext trial tested a number of these applications, with an emphasis on timely information and frames related to school curricula. In addition, they allowed high school students to write for the teletext service. KCET in its teletext trial placed heavy emphasis on educational applications including interactive games and instructional exercises. Student and teacher reactions to these services were very positive, with high marks awarded for ease of use, attractive frame design and conciseness. Further, KCET reports that when teletext was used in a classroom setting it served a catalytic function by promoting group discussion and helping to motivate students.

In Britain, another educational application for teletext is currently undergoing tests. This involves the downloading of

educational software to a student's personal computer via teletext transmission. This teletext application is undergoing tests in the US as well through the Electronic Text Consortium, an Annenberg/CPB Project involving KPBS, WHA, KUON and WGBH.

In summary, research to date suggests that educational teletext for the general public can appeal to a moderate size audience. As in the case of educational broadcast programming, the audience for educational teletext is not likely to be sufficient for the commercial networks to take a strong interest. This form of narrow audience service is more appropriate to the mission of public broadcasting. In addition, teletext applications directed towards on-campus and extension learners appear to be appropriate and feasible. However, the development of specific applications is still at an early stage.

F. Business Data Services and Videogame Downloading

During 1983 and 1984 there have been several technical tests in which the VBI has been used to transmit business data as regular teletext for display on a TV screen as well as to transmit data files for storage in a computer. Similarly, groups have tested the use of the VBI to transmit videogame software to homes. In the latter case, VBI transmission of videogame software is envisaged as an alternative to the purchase of videogame cartridges in retail outlets. The groups who have tested these business data and consumer software applications have reported that they are feasible from a technical point of view. Further, some are moving forward with market planning.

These business and videogame downloading applications will compete directly with alternative means of delivering data, eg telephone lines, and purchase of a videogame cartridge at a retail store. Little research is available about the competitive strength of VBI data transmission measured against alternative means of data delivery. From a public broadcasting perspective, these applications are likely to involve the leasing of a portion of a station's VBI to a third party who will operate the service. The competitive strength and marketplace appeal of VBI business data and game downloading services are relevant, however, since a station's contract with the leaseholder may specify a sharing of revenues based on the number of subscribers to the service.

G. Technical Concerns

A number of technical problems emerged during US teletext trials. It appears that solutions have been found for some of these problems while others have been placed under control through the FCC teletext rules of operation.

The first and largest of these problems has been signal reception. Teletext signals can be disrupted by short-term ghosting, eg when a primary signal is followed a millisecond later by a reflection of that signal bouncing off a nearby building. To deal with this, manufacturers are building adaptive equalizers into teletext decoders. These devices are intended to cancel short-term ghosting signals. While this engineering solution has worked under laboratory conditions and limited field tests, no one will know if the problem is completely solved until

decoders are in homes with a wide variety of reception conditions. Even with improved engineering, decoder manufacturers recommend that a home have an outdoor antenna in order to receive a clear teletext signal.

A second problem encountered in a few trials has been a buzzing sound on regular broadcast program audio when teletext signals were transmitted. It appears that this problem was related to the signal level of the teletext transmission along with previously undetected problems in the station's transmitter. In each case, the station was able to eliminate the problem. If a station adheres to the FCC guidelines on teletext signal levels and is prepared to make necessary adjustments in the operation of its transmitter, the possibility of an audio buzz problem will be strongly reduced.[2]

In addition, technical tests by KCET and CBS revealed that teletext transmission on lower lines of the VBI (10 through 14) can cause interference to the regular broadcast picture on some older TV sets. The FCC technical rules of operation manage this problem by restricting the use of some VBI lines. Over time, as older TV sets are phased out of the market, the FCC will allow more lines to be used for teletext.

A public broadcast station transmitting teletext must also be concerned about the carriage of the station's teletext signals on a local cable system. Some cable systems have failed

2. See FCC Teletext Rules, BC Docket No. 81-741, p 9, May 20, 1983

to pass acceptable teletext signals though they do pass acceptable video programming signals. This problem relates to the state of repair of a particular cable system, not an inherent problem in cable transmission of teletext. This problem is important to note since under current FCC rules cable operators appear to have no obligation to pass acceptable VBI teletext signals. Within this regulatory environment, a broadcast station may have to rely on good will by the cable operator or pressure from cable customers who want teletext services to bring about any necessary repairs in the cable system.

3. TELETEXT AND RELATED ACTIVITIES IN 1984

During 1984 there has been a flurry of teletext activity. However, it is important to note that each service or trial is small in scale, involving 100 to 500 decoders placed in public locations or sold to upscale consumer homes. In addition, many teletext related activities cable are operational while teletext data services are in a planning phase.

A. Consumer Teletext

Both CBS and NBC are providing national teletext services. While these teletext signals are carried by over 300 affiliates, very few homes are equipped to view the services. This is due to the high cost and limited availability of decoders. In order to deal with this startup problem, CBS and NBC have engaged in a series of promotional activities while introducing decoders in a few select markets. Both networks provided special teletext services related to the Olympics and placed decoders in public locations throughout Los Angeles as a way of promoting teletext. In addition, both networks have worked with one or more affiliates, eg, CBS affiliate stations in Charlotte, North Carolina and Buffalo, New York, who are providing local teletext services. And, they are working with manufacturers to ensure that consumers in these areas can purchase the necessary decoders.

CBS and NBC activities are accompanied by other small scale services, including WKRC in Cincinnati, Metromedia station KTTV in Los Angeles, WHA in Madison and WGBH in Boston. These efforts

are complemented by many related activities. More than a dozen public broadcasting stations continue to provide text information for farmers using Line 21 frame creation equipment and decoders. In addition, KCET is participating in a commercial service that uses Line 21 technology to provide information and advertising at shopping malls.

B. Teletext Data Services

PBS and Merrill Lynch as well as WNET and Satellite Network Delivery have continued technical testing of data transmission using the vertical blanking interval. Both groups are soliciting public broadcast station participation in planned services. The PBS and Merrill Lynch plan calls for a pilot service to begin in early 1985. Initially, it will use a teletext signal to provide financial data services to Merrill Lynch account executives. If this proves successful, the plan calls for expansion of the customer base to include other stock brokers, banks and institutional investment groups. The WNET and Satellite Network Delivery plan calls for the establishment of a transmission service that can be leased to third parties for private data services. Both of these groups as well as other commercial firms have begun to negotiate the lease of VBI lines with public broadcasting stations. While the terms of such negotiations vary in relation to specific stations, the groups seeking to lease portions of the VBI may seek a commitment of two to five lines for a period of five to ten years. Financial terms vary as well but they generally involve a fixed fee per line per year, based on market size, plus an

additional fee based upon the number of subscribers to the service.

C. Related Activities on Cable

There have been two types of teletext related activities on cable during 1984. KeyCom Electronic Publishing is providing a VBI teletext service on WTBS, an Atlanta-based station with national cable distribution. To receive the teletext service, a cable subscriber pays approximately $ 20 per month in addition to regular cable subscription fees. The $ 20 fee pays for the leasing of a decoder and a monthly subscription to the teletext service.

A second type of cable activity involves the transmission of text information as normal video on a full cable channel. In this instance, a cable subscriber does not need a teletext decoder. However, the user cannot control access to specific frames. The text information is displayed frame by frame under operator control or scrolls down the screen. More than 60 newspapers are providing an open channel text service on cable. Also, many local cable operators create their own open channel text service. Some of these groups use simple character generator equipment to create the text service while others, eg, Colony Communications in Providence, Rhode Island, and Newsday in Long Island, New York, have adapted teletext frame creation equipment for transmission as normal video on a full open channel. In addition, WUFT and the University of Florida have expanded their cable text services and operate a major training center for electronic journalism as well as an information service for the university and surrounding

community.

D. Equipment Availability

Two equipment issues are relevant to a station: teletext decoders that are needed by a consumer in order to receive teletext and equipment at the station to create teletext frames and insert them into the broadcast signal. Teletex decoders are available in 1984 but they are expensive and not widely distributed. Moreover, many of the available decoders can function only with a top-of-the-line TV monitor-receiver. By 1985 decoders should be more widely distributed and, further, many of these will be built into new color TV sets. While the price of decoders will undoubtedly drop, the actual retail prices for decoders in 1985 are unknown.

Equipment to create teletext frames and insert them in the broadcast signal is available in 1984. The cost of such equipment is discussed in Chapter 4 and a list of some equipment manufacturers is provided in the Appendix. However, the choice of equipment is complicated by the existence of more than one teletext standard.

E. Technical Standards

Just as there are different television standards, eg, US television and British television employ different technical standards, teletext has more than one technical standard. From a public broadcasting perspective there are three options. First, some uses of the VBI for data transmission may involve a special,

proprietary standard developed by the group who will offer the service. Since a station will likely serve as a VBI landlord under these circumstances and the leaseholder will control both the transmission and receiving equipment for a closed group of subscribers, the technical standard is relevant only to the degree that it is permitted under FCC rules and causes no interference to regular broadcast programming.

If a station decides to offer a general teletext service for the public, two technical standards are currently available: North American Broadcast Teletext Standard (NABTS) and World System Teletext (WST). NABTS is the standard chosen by CBS and NBC television networks. WST is used by Taft Broadcasting at WKRC in Cincinnati. In addition, Metromedia has used WST for its trial at the Los Angeles Olympics.

Station equipment is available for both NABTS and WST as are decoders. The proponents of the two systems offer the following arguments in support of their standard. WST proponents argue that their system is cheaper both in terms of station equipment and consumer decoders. Moreover, they say that WST, adapted from the British teletext system, has a proven record of technical feasibility. NABTS proponents argue that their standard has better graphics and that the price differential between the two systems will be reduced as more NABTS frame creation equipment and decoders are manufactured. Further, they argue that the selection of NABTS by two of the major commercial networks will make NABTS the de facto teletext standard for the US. The FCC teletext rules, discussed in Chapter 5, do not specify a standard. A station can use NABTS, WST or another standard as long as

FCC technical requirements regarding signal levels, permissible VBI lines and non-interference are met.

F. A Scenario For Teletext Market Growth

In trying to estimate how teletext might develop in consumer homes Table 2 assumes that decoders built into TV sets will be widely available in 1986 at a moderate price (less than $ 300 above the normal cost of the TV set). It further assumes that 1985 will be characterized by limited test market sales. The scenario draws upon research data from the Alternate Media Center/WETA teletext trial in Washington, D.C. This research suggested that approximately half of those purchasing a new color TV set might purchase a teletext option. However, sales in the first five years of decoder availability are likely to occur at a lower percentage rate.

Table 2. Scenario For US Teletext Market Growth, 1986-1990

Year	Estimated Color TV Sales (millions of units)	Percent of Sales with Teletext	Estimated Decoder Sales (units)
1985*	12.0	--	25,000
1986	12.0	5	600,000
1987	12.5	10	1,250,000
1988	12.5	25	3,125,000
1989	13.0	40	5,200,000
1990	13.0	45	5,850,000
Total			16,050,000**

Source: Carey and Moss 1984, p 40.

* This assumes that decoders will be available only in limited test markets during 1985.
** This would represent a penetration rate of 16 percent.

4. OPTIONS FOR A PUBLIC BROADCASTING STATION

The teletext options for a public broadcasting station may be approached in terms of three questions.

1. Should a station become involved with these new services?
2. If a station chooses to become involved, what form(s) of teletext service should be provided?
3. When should a station begin such services?

The conclusion to this report, Chapter 6, addresses the first question. This Chapter assumes that a station has decided to become involved and addresses teletext service options as well as timing of entry. In outlining service options, it is useful to distinguish levels of involvement along with equipment and staff needs, startup costs and operating budgets associated with each level.

A. Level 1: VBI Leasing

This represents the simplest level of involvement with teletext technology. A station leases a portion of its VBI to a third party who operates and manages a teletext related service for a closed user group such as stock brokers. Any equipment required at the station as well as installation costs are covered under the contract with the third party group. Operating costs are minimal, eg,a station will require a small amount of staff engineering time to monitor the signals being transmitted and ensure that no interference is created for regular broadcast programming.

B. Level 2: VBI Leasing Plus Retransmission of a Teletext Signal

In this level of involvement, a station leases a portion of its VBI to a third party for a closed user group application and, in addition, retransmits a national or regional teletext signal for the general public. Equipment and staff needs for the VBI leasing are the same as Level 1. The retransmission of a national or regional teletext signal requires a databridge costing $ 5,000 to $ 10,000. Further, a small amount of staff engineering time is required to monitor the signal.

C. Level 3: VBI Leasing, Retransmission of a National or Regional Teletext Signal, Plus Local Origination of a Small Teletext Service

At this level, a station leases a portion of its VBI to a third party and retransmits a national or regional teletext service for the general public as in level 2 above. In addition, the station creates a small local teletext service and combines it with the national or regional teletext feed. The equipment requirements include a host computer and software, one or two teletext frame creation terminals and an insertion system to feed the service into the broadcast signal. Startup costs for equipment will range from $ 50,000 to $ 150,000 depending on the teletext standard and variations in prices among equipment manufacturers. Staff requirements for a small local teletext service range between one to three full time equivalents. Taft Broadcasting, which operates a local teletext service in Cincinnati, estimates that its annual operating budget is $ 135,000. This includes a somewhat larger staff than would be required by a public broadcast station, wire service fees, telephones and space.

A smaller service with 1.5 full time equivalents could operate for $ 50,000 to $ 75,000 annually.

D. Level 4: VBI Leasing Plus Operating a Major Teletext Service

At this level, a station decides to offer a complete teletext service for a local, regional or national audience. In addition, it might lease a small portion of its VBI to a third party. The equipment requirements for a large teletext service include a host computer and software, two to five frame creation terminals and a VBI insertion system. Startup costs for equipment range from $ 150,000 to $ 350,000 depending on the teletext standard and variations in prices among equipment manufacturers. Staff requirements for a large teletext service are likely to range from five to ten full time equivalents. A typical staff might include one senior editor, two full time and two part time writers, one full time and one part time artists, one full time administrative assistant and one part time engineer. Annual operating costs for such a service are likely to vary a good deal in relation to local, regional and national environments. However, it is reasonable to estimate a range from $ 250,000 to $ 600,000 per year.

E. Other Considerations

Staff size for a teletext service will vary in relation to several elements. These include: size of service; how frequently information is updated; number and complexity of graphics; the relative proportion of frames created locally and

frames provided by a national or regional feed; and how much reformating or rewriting is required of source information. In addition, many of the groups who have developed teletext services have described a learning curve in which staff become more efficient over time.

It is reasonable to expect that station equipment costs will decline moderately as more equipment is manufactured and complete equipment packages are offered to stations. The cost of software for host computers should decline as well. However, station planning groups should also be aware of potentially large and hidden software costs if the teletext operation requires special software to be written for its needs.

F. Timing of Entry

A station's level of involvement is critically related to judgments about the timing of teletext service development. That is, a station might decide to begin a level 1 involvement with teletext during 1985 and move to level 3 in 1988. In order to sort out some of these options related to timing of entry, a few scenarios are described below. These scenarios are by no means exhaustive. Further, the rationale associated with each scenario may provoke disagreement by some readers. The intention of this exercise is to outline some of the ways a station might come to a decision about level of teletext involvement based upon its judgment about how the market is likely to develop.

In reviewing the scenarios below, it is important to understand the capacity of a station's VBI and the FCC rules on use of the VBI. Currently, six lines of the VBI are available for teletext services. An additional four lines will become available for use in 1988 when many older TV sets will have been phased out of the market. A small 50 frame teletext service for the general public can be transmitted on two VBI lines. A 100 frame service requires four VBI lines if a viewer's waiting time for a requested frame is to be kept within an acceptable range.

Scenario 1

A station decides that teletext decoders will not penetrate a sufficient number of homes in this decade to warrant the development of a regular teletext service for the general public. Alternatively, a station feels that its resources can be better used than in providing a teletext service for the public. Based upon these judgments, the station leases large portions of its VBI to third parties under long term contracts. In this scenario, the VBI is treated as a valuable resource to generate income that will be used to support other station activities.

Scenario 2

A station decides that teletext services for the general public will merit serious attention in three to five years when a moderate number of decoders are likely to be in homes. In the immediate future, the VBI is a resource that can be used to generate income by leasing it to third parties. However, the station does not want to lose the opportunity to offer some form of teletext service later in the decade. Based upon this set of judgments, the station leases five lines of its VBI and reserves four lines that will become available for teletext use in 1988.

Scenario 3

A university-owned station decides that teletext services for education may be viable in the near future (1985 or 1986) while general audience teletext may be viable in three to five years. At the same time, the station would like to generate some income from VBI leasing in order to help pay for the development of educational and general audience teletext services. Under these circumstances, the station leases 3 VBI lines to a third party, reserves 3 VBI lines for educational teletext services in the near future, and plans the development of a general audience teletext service on the additional four VBI lines that will become available in 1988.

Scenario 4

A station decides that it wants to take a leadership role in developing general audience teletext services. It leases two VBI lines to a third party data service operator, reserving four VBI lines for the development of a general audience teletext service in 1985 or 1986. No immediate commitment is made for the additional four VBI lines that will become available in 1988. They will be used to expand the general audience teletext service or leased to a third party depending upon market developments in the next few years.

G. Content Options

Once a station decides to offer a teletext service, a series of content questions emerge. Some of these questions are familiar to public broadcasters, eg, should teletext try to appeal to the broadest audience or target narrow audience segments such as children? Other questions are more closely linked to teletext specifically, eg, should the service emphasize timely information? Table 3 outlines selected content characteristics along with a commentary based upon findings from teletext trials to date.

Table 3. Teletext Content Characteristics

Characteristic	Commentary
Writing Style	Many have drawn an analogy between writing for teletext and writing for radio in that the stylistic requirements are similar. In addition, clarity appears to be enhanced by writing for individual frames, eg one concept or point per frame. When a single thought is carried through several frames readers sometimes lose a sense of continuity.
Length	Teletext appears to be suited for brief treatments of a topic or story. Many readers drop off after the third or fourth frame of a multiframe story.
Timeliness	Much research suggests that timely information updated frequently, eg a list of special events on a university campus tomorrow, has more appeal to teletext viewers than static information, eg a directory of university department telephone numbers.
Interactivity and Gaming	While teletext is a one-way transmission service, writing style and frame design can give the reader a feeling of interactivity. This may be accomplished by the use of reveal frames and the organization of information into small games or quizzes.

In addition, it is useful to review specific content categories that a station might provide in a teletext service. Tables 4,5 and 6 outline content categories for three types of teletext services: a full service aimed towards a general audience; a full service aimed towards a few target groups; and a small

local service that is added to a national feed. Undoubtedly, teletext content will evolve over time. The categories in Tables 4,5 and 6 represent some general areas that groups have provided or plan to provide.

Table 4. Content Categories For A General Audience Teletext Service

Content Category	Total Number of Frames
Main Index	1
Sub-indexes	8
National News	8
Local News	10
Business News	10
Sports Scores	10
Sports Trivia	4
National Weather	2
Local Weather	2
Entertainment & Gossip	8
Games	8
TV Listings	4
Community Events	5
Content Related to Broadcast Programming	20
Total	100

Table 5. Content Categories For A Narrow Audience Teletext Service

Content Category	Total Number of Frames
Main Index	1
Sub-indexes	4
Frames Reserved For Educational Content in Support of Specific Telecourses	50
Events on Campus Tomorrow	5
Job Listings	15
National Weather	1
Local Weather	2
Intramural Sports Scores	7
TV Listings	3
Content Related to General Broadcast Programming	12
Total	100

Table 6. Content Categories For A Local Teletext Service That Supplements A National Teletext Feed

Content Category	Total Number of Frames
Main Index	1
Sub-indexes	6
Community Events	3
Local News	6
Local Weather	2
High School Sports Scores	2
High School Sports Calendar	2
College Sports Scores	2
College Sports Calendar	2
TV Listings	4
Frames Reserved For Content in Support of Local Broadcast Programs	20
Total	50

5. SUMMARY OF FCC TELETEXT RULES[3]

The FCC has authorized teletext for full service and low power broadcast television stations. They have also adopted an open market regulatory environment for teletext. A station has wide latitude in choosing both the kind of service it will offer and the technical system for transmission. In addition, teletext is treated as an ancillary service of a broadcast licensee. As such, teletext must not interfere with the regular broadcast service of the originating station or other broadcast stations.

A. Types of Service

The FCC defines teletext as "a data system for the transmission of textual and graphic information intended for display on viewing screens." Teletext information may be related to television program content, a separate information service or a combination of the two. It may be offered to the general public, segments of the consumer or business markets, or individual persons. Further, teletext may be free to the user and noncommercial, free to the user and advertiser supported, or a pay subscription service for homes or businesses. And, teletext may be transmitted 24 hours a day, even if the station is not

3. This summary of the FCC rules governing teletext should not be taken as a substitute for legal counsel in relation to the rules. Further, the rules as outlined here emphasize issues that are most relevant to a public television station. Rules governing the manufacture of equipment are omitted. For a full treatment see BC Docket No. 81-741, May 20, 1983.

transmitting regular programming.

The use of teletext to transmit computer software such as a statistical spreadsheet or a video game as well as data that is not intended for direct viewing by a user, eg, commercial banking records, was not authorized under the May 20, 1983 FCC teletext authorization. The FCC set these uses of the VBI aside and began a separate inquiry to determine whether and how these uses of the VBI may be authorized.

B. Leasing

A station may lease space in its vertical blanking interval to others who seek to operate a teletext service. However, the station bears responsibility for content as well as any technical interference created by the leaseholder's service.

C. Content Rules

As an ancillary service, teletext is exempt from a station's public service, access and fairness doctrine requirements. Further, a station is not required to keep teletext program logs.

D. Public Broadcasting Station Status

Under the FCC teletext rules, a public broadcasting station is treated in the same manner as a commercial station. Thus, a public broadcasting station may engage in any teletext related activity that a commercial station may undertake, under the FCC rules. However, an individual public television station must assess whether certain teletext activities might be restricted by other federal, state or local regulations.

E. Teletext License

There is no teletext license as such. Any broadcast licensee may begin or terminate teletext service without notifying the FCC. One exception must be noted. If a station operates a teletext service as a common carrier or private carrier service, other rules come into play. These are discussed in the next paragraph.

F. Common Carrier and Private Carrier Teletext Services

If teletext is used as a common carrier, eg, to provide electronic mail, or a private carrier, eg, a company's daily work schedules transmitted to its branch offices, appropriate common carrier or private carrier rules will apply. These uses of teletext must be authorized by the FCC and are then governed by the same rules as other common carriers and private carriers.

A station bears the burden of assessing whether it will operate as a common carrier or private carrier and applying for authorization from the FCC, since there is no general review by the FCC of each station's intended teletext services.

A station that contemplates such uses for teletext should seek legal counsel in order to prepare the necessary FCC filings and, in some cases, state filings. In addition, a station that leases its VBI to third parties who intend to offer common carrier or private carrier services should be mindful that it (the station) still bears responsibility for any interference created by the service.

G. Transmission System

Following its open market approach to teletext, the FCC did not authorize one, exclusive transmission system. A station may use any teletext system as long as it conforms to the technical requirements described below.

The FCC has authorized VBI lines 14,15,16,17,18 and line 20 for immediate use. Lines 10 through 13 will be phased-in for use over a period of several years. This means that six VBI lines are currently available and four additional lines will become available in the future. It should be noted that the FCC has authorized these lines for teletext, not reserved them. Other uses for these lines are authorized currently and more uses will likely be authorized in the future. For example, Vertical Interval Test Signals (VITS) are currently transmitted by many stations on lines 17 and 18. Source Identification Code (SID) is transmitted on line 20. Thus, teletext shares the use of these VBI lines with other applications.

The FCC has withheld teletext authorization of line 21 for five years at which time it will reconsider authorization. The FCC has said that it will monitor the status of line 21 captioning and teletext captioning.

H. Other Technical Rules

There are relatively few technical rules governing teletext. The FCC's main concern, written explicitly into the rules, is that a teletext service should not cause interference to regular

programs of the station or other broadcast stations.

Teletext signal levels are restricted. Signal levels on lines 15 to 18 and 20 may not exceed 80 IRE. Line 14 signals may not exceed 40 IRE through 1987. After 1987, the signal level for line 14 will be increased gradually. Similarly, as lines 10 to 13 are phased-in and receive authorization, the signal levels will be kept low initially, then gradually increased. The purpose of these rules is to prevent teletext digital transmission from appearing on older TV sets. As these sets are phased out of use, more VBI lines can be authorized and signal levels for recently authorized lines can be increased. Table 7 outlines these technical rules and the timetable for introducing new VBI lines.

In addition, a teletext service which provides captioning must be able to switch to Emergency Messages, just as in the case of line 21 captioning services.

Table 7. FCC Authorization Schedule For VBI Lines

VBI Line	Year and Signal Level (IRE Units)							
	1984	1985	1986	1987	1988	1989	1990	1991
10	x	x	x	x	50	50	50	70
11	x	x	x	x	50	50	50	70
12	x	x	x	x	50	50	50	70
13	x	x	x	x	70	80	80	80
14	40	40	40	40	70	80	80	80
15	80	80	80	80	80	80	80	80
16	80	80	80	80	80	80	80	80
17*/**	80	80	80	80	80	80	80	80
18*/**	80	80	80	80	80	80	80	80
19***	x	x	x	x	x	x	x	x
20	80	80	80	80	80	80	80	80
21****	x	x	x	x	-	-	-	-

* Also authorized for Vertical Interval Test Signals (VITS)
** Also authorized for Source Identification Signals (SID)
*** Reserved for Vertical Interval Reference Signal (VIR)
**** Potential authorization for teletext to be reviewed in 1988.

Source: FCC, BC Docket No. 81-741, p 38, May 20, 1983

I. Cable Carriage of Teletext

The FCC does not require cable television systems to carry the teletext services of those stations whose regular video programming is carried by the cable operator. This means that a cable operator could strip a teletext service from the VBI of a station that is carried on the cable system, under FCC rules.

A station has a few options in dealing with cable operators. First, it is not clear that cable operators will strip off a teletext service of a broadcast station. Under these circumstances, no action need be taken. Second, a station that is carried by a cable operator under a contractual arrangement, eg, a pay movie channel, may include teletext carriage under the terms of the contract. Third, a public broadcasting station or a local commercial station might attempt to place teletext carriage under the terms of a cable operator's franchise agreement with the local municipality. Fourth, if a portion of the teletext service is integrally related to some broadcast programming content, a station may have some protection under copyright law. In WGN v. United Video, the Court of Appeals ruled that if teletext is integral to program video, it can be protected under one copyright. Under these circumstances, it appears that a cable operator cannot strip the teletext service.[4]

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4. See WGN Continental Broadcasting Co. v. United Video Inc. 523 F. Supp. 403 (1981), Rev'd and remanded, 685 F. 2d 218 (7th Cir. 1982), pet. for rehearing denied, 693 F. 2d 628 (7th Cir. 1982).

6. CONCLUSION

In the not-too-distant future, it may be commonplace for family members to begin an evening of television viewing by first switching to teletext for the latest news headlines, sports scores and TV listings. Similarly, students may switch to teletext after viewing a telecourse in order to receive their weekly reading assignments and special messages from the course instructor. These are examples of the promise of teletext. It does not offer a revolution in television but a simple and potentially valuable add-on to broadcast services.

However simple teletext may eventually become for consumers, its development and implementation in the US marketplace is complex and uncertain for planners. Television stations generally face choices in relation to teletext systems, services and timing of entry. Public broadcasters face these issues as well as questions that are critically linked to the mission and financial circumstances of public television.

A reasonable way to approach teletext choices is to focus on the vertical blanking interval as a technological resource. A question may then be posed about how best to manage this resource in the context of public broadcasting's production capabilities, mission, audience and financial means? A station cannot pursue all of the options outlined in this guidebook. The technological resource, the VBI, does not have sufficient capacity and most stations do not have the financial means to pursue all

of them. Given this environment of abundant choice and limited resources, a station can begin the planning process by allocating portions of the VBI for revenue generation and service delivery. A decision about how many VBI lines to allocate to each is linked to judgments about how quickly revenue generating opportunities may develop and when service delivery to homes, schools and other public television audiences will be feasible. It is important as well to consider short term and long term opportunities in developing a comprehensive allocation plan.

After making a decision on allocation of VBI lines, each of the avenues, revenue and service, may then be pursued separately. Revenue generating options are in some ways easier to plan since most of them involve a leasing of VBI lines to third parties who will operate the service. Station-operated teletext services to homes, schools and other audiences are more complex. They raise some familiar problems to a public broadcaster, eg, ascertainment of audience needs and wants, funding of services and development of production capabilities at the station. At the same time, the development of teletext services requires many new skills, eg using flow charts in production of content or training a staff to operate like a small newspaper. In these areas, a station may be helped by a large volume of reports and articles that have emerged from public broadcasting teletext trials. Some of these are listed in the Appendix to this guidebook.

It is also crucially important to examine teletext in terms of public broadcasting's unique mission. How can teletext serve

the educational, cultural and information needs of citizens? Can it benefit those who are currently underserved by the new information technologies or forge fundamentally new entertainment products that contribute to society? These questions are often obscured in commercial hyperbole about teletext and other new technologies. New gadgets and technological bandwagons come and go. However, if teletext is to find a place in public broadcasting it must serve real needs. The development of services that are both feasible and appropriate to the mission of public broadcasting represent a challenge and an opportunity to those innovators who decide to work with teletext.

APPENDIX .

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