Winky Dink To Stargazer: Five Decades Of Interactive Television

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Introduction

Treatments of interactive television (ITV) in the popular press could easily lead readers to think that it is an entirely new phenomenon or, indeed, that it has yet to arrive on the scene (1). However, ITV has been tested in the marketplace under various guises in each decade since the 1950s. Our lack of historical perspective is unfortunate because there are many clues in the history of interactive television trials and services about what consumers want from ITV along with many lessons about how to overcome technological and marketplace obstacles.

The lack of an historical perspective is related in part to weak institutional memories: many ITV projects have not succeeded and their institutional sponsors have chosen to let the bodies remain buried. However, there is also a significant definitional issue. What does interactive television include and not include? There is no consensus. So, a telephone company that is planning to build a state-of-the-art switched video service over fiber optic cables can argue that theirs is the first true ITV service since nothing in the past could provide what their new system will offer. In fact, most planned new services are likely to have been tested before, albeit on an earlier generation of technology.

This paper addresses the definitional issue without resolving it, then takes the reader on a brief tour of ITV projects and service beginning in 1953. It provides an annotated history, drawing lessons about content, pricing, consumer appeal and user interfaces. Greater attention is given to U.S. experiences with ITV, based upon the author's knowledge and access to documents. However, some European and Asian experiences with ITV are also reviewed.

The author welcomes comments about the paper as well as information about ITV trials or services not treated here. He may be reached at JTCarey@AOL.Com

Defining Interactive TV

What does it mean to "interact" with television? There is a broad spectrum of perspectives from much greater selection of programming on hundreds of channels, to more control over and customization of television content, to on-demand delivery of specific programs or movies, to real time interaction between people in different households via game playing and communication. Some argue that ITV must include video; others believe that interactive text displayed on a TV set, e.g., accessing the Internet on TV, also qualifies as ITV.

A comprehensive treatment of interactive television might also include interactive formats within regular television programming, e.g., when two hosts for a nightly newscast are in separate cities and the program switches back and forth between the two studios. Similarly, viewer call-in programs and opinion gathering on TV news programs through special telephone numbers that viewers can call to register an opinion might be classified as forms of interactive television (2).

There is no generally agreed upon definition of interactive television. Under this condition of many differing perspectives, it may be better to wait and let time as well as the marketplace sort out the definitional problem. As a near-term alternative, it may be more useful to outline a taxonomy of characteristics and then to classify different systems by the number and types of characteristics they meet. These would include media characteristics of an ITV service such as text, still photographs or video (at different levels of resolution); whether each household can interact with the system and receive individual responses or if the system is limited to collective voting by all households watching at any given time; types of input such as multiple choice or alphanumeric entries; types of input devices such as keyboard, remote control unit or touch screen; real time or asychronous interaction; whether interaction takes place on the TV screen or on a separate display device; and, services offered, e.g., information, games, entertainment programming, and communication; among other features and characteristics.

There is also disagreement about the core technology(ies) that will be used to provide interactive television. This involves both the network architecture for transmitting ITV and the household terminal. Will the household terminal be a standard television set, a personal computer, a videogame player and/or a video telephone?

Content visions for ITV are also broad. They include: access on-demand to any title from a library with hundreds or thousands of movies; selection from 500 channels of programming; storage of the last 24 hours of programming, thereby eliminating schedules; control over the camera angles in sports coverage; menu-driven interactive news that permits control over the order of news segments, access to supplementary news coverage and voting in real-time opinion polls; participation in game shows; competition with other households through interactive games; access to multi-media databases over the Web for display on TV sets or PCs; and communication with other households via text messaging, voice telephony, and video phone calls.

Under these conditions of uncertainty and disagreements about the future of ITV, it may an appropriate time to step back and review what has happened to date with interactive television. What has been learned from earlier ITV efforts and what lessons can be applied today? In the review that follows, the definition of ITV is broad. It includes some interactive text systems that used regular television sets as the display terminal, video telephones, and some institutional applications for two-way video. However, the large subject of interactive video for the personal computer will be left for others to review.

A Brief History Of Interactive Television

1950s

In the 1950s, a simple but clever form of interactive television was created in the CBS children's series Winky Dink And You (1953-1957)(3). The interaction was created through the use of a special plastic sheet that children could purchase at local stores or through the mail and then attach to the household TV set. The plastic screen was held onto the screen by friction created when a child rubbed the screen with a special cloth.

In the program, a cartoon character - Winky Dink - encountered many problems. For example, a tiger might chase Winky Dink to the edge of a cliff. Children were asked to help Winky Dink by using a special crayon to draw a bridge on the plastic screen so that he could escape from the tiger. While the technology was crude, children experienced a form of interaction with television content and were able to see actions on the screen that (seemingly) were in response to their

drawings. One problem with this format, however, was that some children did not purchase the special plastic sheet and simply drew with crayons directly on the glass TV screen.

1960s

The modern era of interactive media is often traced to 1964 when AT&T demonstrated a picture telephone at the New York World's Fair. Over the next decade, the picture telephone was tested in a number of market trials and some limited services. It was not widely adopted for a few reasons: the quality of the image was poor; cost of the service was high; users could communicate only with a limited network of individuals who also had a picture telephone; and there was little need or demand to see other people in most of the situations where it was tested (4). Nonetheless, picture telephones did eventually find some practical applications. For example, they were adopted in some criminal justice settings. Further, a group-to-group version of the picture telephone (videoconferencing) has been adopted in many business settings (5).

1970s

The 1970s was a decade rich in trials and tests for interactive television. The U.S. National Science Foundation sponsored three major trials utilizing interactive cable television for education, community services and worker training (6); the U.S. Department of Health, Education and Welfare (DHEW) supported several tests of interactive television for health care (7); a large commercial test of interactive cable TV (Warner Amex's Qube system in Columbus, Ohio) received considerable attention (8); and in the U.K., an interactive text service that could be displayed on TV sets, Viewdata, was developed, tested and marketed under the commercial name Prestel (9).

A number of the NSF and DHEW projects provided useful lessons. In these early tests, there were many technical problems. Often, equipment was in a prototype stage of development and not reliable. In addition, equipment was generally expensive and many user groups could not afford to continue their projects after the federal aid ran out. Most importantly, these projects demonstrated that technological innovations are also social innovations. They require significant organizational changes and often meet resistance by entrenched or harried workers (10). Nonetheless, some services did emerge as success stories, e.g., one NSF-sponsored project in Reading, Pennsylvania began in 1975 and utilized two-way cable to create programming for and

by senior citizens. It was broadly accepted in the community, expanded to include students and social service organizations, and continues to this day (11).

Warner Amex's Qube system received a great deal of press attention during this period. It encountered a number of obstacles but was also a showcase of what was possible and an important source of learning about ITV. The first obstacle was the cost of Qube technology - it was very expensive. The Qube terminal in homes cost approximately $200, which was more than four times the cost of a regular cable box, and Qube equipment at the cable headend added approximately $2-3 million in plant costs. Further, there were reliability problems with the equipment, especially in the upstream data transmission from homes to the cable headend.

Second, production costs and interactive program design presented challenges. Budgets for Qube programs were very low compared to broadcast network programming budgets. "Interactivity" with low production values could not compete with network programming. Those producing interactive programs were also working from a blank slate: there was little previous experience in designing interactive programs.

Many households subscribed to Qube but actual use of Qube programming was generally low. However, there were a few exceptions. Some game format programs achieved moderate viewership and strong interactive participation from those watching. Further, major events attracted large audience participation, e.g., when Qube subscribers were able to choose the next play in a live amateur football game.

Qube also demonstrated that pay-per-view programming was potentially viable - if the cost of promoting and processing pay-per-view orders could be reduced. And, Qube introduced a number of interactive formats that have since evolved and been adopted as components in cable and broadcast programming. MTV and Nickelodeon - two popular cable services in the U.S. - were both developed from models that originated on Qube. In this sense, Qube was an important programming laboratory.

Cost of the technology, low production values and problems in maintaining the upstream data path were not the only challenges facing Qube. The technology was no longer a valuable marketing tool for its parent company. Qube had served as a franchising showcase for Warner Amex: the promise of interactive programming helped them to win many franchises. After the

franchising battles for major cities ended, the marketing value of Qube for Warner Amex was eliminated and the service was withdrawn.

It may be argued that the principal lesson of the Qube experiment is not that interactive media can't compete with traditional one-way mass media. Rather, interactive media must be developed in a viable economic and technical context. Even with these elements in place, producers must learn to create with the new medium and audiences should not be expected to change their media habits overnight.

Viewdata in the U.K. began in 1976 as a trial service and was launched in 1979 under the name Prestel. It is widely acknowledged as the first videotex service in the world and the precursor for the modern generation of online services. However, it belongs in a review of ITV because many of its early users displayed the service on their television sets. This was made possible by a special adaptor that linked the telephone handset to the Viewdata terminal and the household TV set.

One of the goals in developing Prestel was to link two technologies that were already in homes - the telephone and the TV. However, there were two limitations associated with this model. First, TV sets (especially older TVs) were not good display devices for text. Second, the telephone in many U.K. households was in a different room than the TV and was hard-wired to the wall outlet, making installation of Prestel difficult.

Experiences with Prestel provide a few additional lessons. Initially, Prestel did not have electronic mail. It was envisaged as an information service. The strong appeal of communications was not apparent at the beginning. Further, Prestel had a complex pricing scheme with a few layers of charges, including per page fees that varied by the type of information provided. Prestel was also burdened by a common carrier model in which virtually any group could become an information provider and set the prices for its service (12).
The poor quality of some information along with high prices was a deterrent to users.

Over time, the Prestel managers learned these lessons and adapted the service to overcome earlier obstacles. They changed Prestel so that it could be accessed by personal computers, developed simpler pricing and emphasized communication services. Prestel eventually achieved

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moderate usage in businesses but it was never widely adopted in households. The changes were too little, too late. The marketplace moved onto other models for online services.

1980s

During the 1980s in the U.S., companies and public service organizations steered clear of high-end ITV services like Qube and experimented with simpler, less expensive services like interactive text on TV, interactive games over cable and opinion polling during regular TV programs via special 900 number telephone services. Many of these services were videotex precursors to online services for the personal computer. However, since few homes had a personal computer, the television set was used as a display device for interactive services.

Cox Cable created the Indax service in the early 1980s to compete with Qube as a franchising tool. Indax was really a videotex service (or, an online service in today's terms) over two-way cable. It offered home banking, shopping, information services and education content but it contained no video - only text and simple graphics. Indax was tested in Omaha and San Diego with mixed results and never entered the broad marketplace.

During this same period, Time Inc. developed Time Teletext for cable TV systems and tested it in Orlando and San Diego. Time Teletext was a one-way teletext service that used an entire cable channel for transmission. In this way, it could transmit several thousand frames of information in several seconds and simulate interactivity, e.g., for games and quizzes. Time Teletext was praised in the industry for its high quality and attractive design but it experienced the same fate as Indax. After more than a year of field testing, Time Inc. pulled the plug on the service. Users indicated that they liked Time Teletext but would pay only $5-7 per month for both the service and the box (13). In this sense, Time Teletext was an attractive service for many consumers but it was not a viable business.

In the telephone environment during the 1980s, there were two prominent videotex trials that utilized TV sets (as well as PCs) to display content: Knight Ridder's Viewtron service; and Times Mirror's Gateway service. Both required a dedicated box that linked the phone line to the TV set, at a retail cost of $900 (later reduced to $600), along with monthly usage charges of $20-30. This price was well above what the market would bear. Further, to please advertisers, both

services used extensive graphics which slowed down the 1200 baud service significantly. Neither service achieved a large number of subscribers and they were withdrawn. However, their research provided some important hints about services and features that customers wanted, especially games and many forms of communication. Frequent updating of information and maintaining quality control over content were also found to be essential (14).

Viewtron, Time Teletext, Indax and other commercial services received a great deal of attention in the popular press during the 1980s. During the same period, some very simple interactive television services were emerging quietly in education, offered by such groups as The Satellite Educational Resources Consortium, Public Broadcasting Service, National Technology University and several state education networks. In some instances, the ITV services utilized full two-way video between teachers and students who were at a distance. However, in most cases, they utilized one-way video instruction via satellite, cable or ITFS (Instructional Television Fixed Service, a microwave frequency) with return audio via a regular telephone call. Later, electronic mail, fax and dedicated data terminals were added as return paths to the instructor. These services reached thousands of students in the 1980s at primary, secondary and university levels. Typically, they provided courses that would not otherwise be available in rural areas or small school districts, e.g., advanced mathematics or foreign languages such as Russian or Japanese.

Use of an ordinary telephone as the return path for interactivity was adopted by many television news organizations in their regular programming during the late 1980s. AT&T established a service in which households could call a special telephone number mentioned during a TV program and use their touchtone keypad to register an opinion. Tabulated votes could be displayed at the end of the program or the next day. Users were charged a fee (typically, 75 cents). The system could handle millions of calls and was adopted by many stations and networks (15).

In Europe and Japan, there were a number of interactive television projects during the 1980s. Two notable projects were Hi Ovis in Japan (16) and the Biaritz project (17) in France. Both were similar in design and outcomes. They started in the late 1970s and continued through the mid 1980s, using fiber optic cable to provide video phone calls, interactive text services, better TV reception and extra cable channels, including movies. For both Hi Ovis and the Biaritz

project, the strong appeal of the services was in providing better TV reception and extra cable channels; the videophones and other interactive services received low usage. However, in both cases much more effort and financial resources went into the development of the technology than in creating interactive programs. The projects were highly visible showcases for advanced technologies that each country was developing but consumers did not receive much original interactive programming.

During the 1980s, there was also a significant growth in the telecommunications infrastructure that could support interactive TV applications as well as increased penetration in businesses, homes, schools and libraries by a broad array of media that offered limited forms of interaction or greater control over media. The marketplace acceptance of these technologies was complex and dramatic: extraordinary successes (VCRs), extraordinary failures (interactive videodiscs for the consumer market during the 1980s) and a few technologies that seemed to ride waves of success and failure during the 1980s (videogames). If there is a lesson in this marketplace history, it may be that the interactive media industries are as volatile as the entertainment or toy businesses. Nonetheless, the overall trend was to create an environment where more interactive TV applications could be developed. Further, the adoption and use of these technologies fostered an appetite for interactivity and greater control by consumers over their media experiences.

The most important of the support technologies entering homes and businesses was undoubtedly the microcomputer which can serve as a terminal for many present and future interactive services. In addition, a very large share of the public gained experience in using interactive media and machines that require interactive responses. Personal computers, automated teller machines, VCR remote control keypads, microwave ovens, information kiosks at airports and other devices in the home and workplace taught many people important basic skills in using interactive technology.

This infrastructure buildup and the development of greater interactive skills by the general public prepared the way for the 1990s and more ambitious attempts to develop interactive television services.

1990s

There were a number of interactive television trials and a few actual services in the marketplace during the early 1990s. Most utilized a limited form of ITV or provided a limited array of services. Nonetheless, their experiences are informative.

AT&T and Bell Atlantic conducted interactive television trials with groups of employees (AT&T in Chicago and Bell Atlantic in a Virginia suburb of Washington D.C.). Their goals were to gain experience in operating ITV networks and to learn about the attractiveness of services. Both indicated that reactions to the services were positive, while acknowledging that these were preliminary steps intended to lead to larger trials in the future. AT&T reported strong interest by trial homes in interactive educational programs for children, sports, and games where households competed against each other (18).

TCI, AT&T and US West conducted a trial of movies-on-demand in Denver. The 300 test homes purchased 2.5 movies per month, much higher than the national average of 0.26 for pay-per-view homes. However, many homes dropped pay services such as HBO to pay for the movies-on-demand (19). This may be significant. It appears that people did not increase entertainment spending for interactive services. Rather, they moved spending from one category of the household's entertainment budget to another.

A large consumer test by Bell Atlantic of its Stargazer video-on-demand service yielded similar positive results. During a six-month trial in 1,000 homes, the buy rate was 3.3 movies per month. Here too, it appears that consumers shifted money within the household entertainment budget. In this case, they shifted money from video rentals to video-on-demand (20).

In Japan, a video-on-demand trial achieved similar results: a buy rate of 3.5 movies per month. However, a different set of conclusions was drawn from the data. This buy rate was judged too low to support the cost of providing video-on-demand infrastructure to homes (21).

In Cerritos, California, GTE conducted an ITV trial that appears to have been less successful. Their test service, Main Street, consisted of still video images and sound organized like a database with little updating. Services included access to the Mobil Travel Guide, Grolier's Encyclopedia, Money Manager software and other content that changed little day to day. Overall usage of Main Street was reported to have been low (22). Nontheless, the project generated some useful

research findings. GTE found that movies-on-demand were very attractive but consumers were willing to pay only a small increment ($1 extra) for a movie-on-demand over what they paid to rent a movie at a videocassette shop. Further, consumers balked at paying hundreds of dollars for an ITV set-top box and indicated that they would prefer to pay a small rental fee that is part of their cable bill (23).

Two interactive television services that were introduced into the marketplace during the early 1990s provided different types of ITV services but ultimately experienced the same outcome: Interactive Network (in California and Illinois) and Videoway (in Montreal and Quebec City). Interactive Network required a special terminal costing a few hundred dollars. It also had high monthly charges and the interaction took place not on the TV screen but on a small display attached to the terminal. Services consisted of playing along with TV game shows and trying to anticipate the next play in sporting events. It utilized a multiple choice format and there was no original content. The number of subscribers was modest but this group was reported to be quite enthusiastic about the service. Interactive Network struggled to increase its market reach and subscriber base. However, the death knell for the service came not from subscribers but marketing agreements that brought onboard new company overseers who decided to pull the plug on the service rather than support new marketing efforts (24).

Videoway had no hardware costs for the consumer and a low monthly fee (under $10). Interaction took place on the TV screen and there was much original content, including daily interactive news programming, games, interactive ads and original programming for children. The service utilized four channels on the cable system. Much of the interaction took place by switching from one channel to another where different program components were located. For example, Videoway allowed users to choose from four camera angles during coverage of sporting events. Each camera was located on a different channel. They developed a large subscriber base of more than 230,000 households or more than 20 percent of cable households in the markets where Videoway was available. Usage of Videoway was also reported to have been high: subscribing households used the service for 13 hours per week. Approximately half the usage was for games and half for interactive programming (25).

However, Videoway had an Achilles heel. It was bandwidth intensive, requiring four channels on an analog cable system. From a business perspective, the cable operator had to weigh the revenue from one interactive service against the potential revenue from four separate channels. In Spring 1996, the cable operator decided to scale Videoway back to one channel and eliminate the interactive video components. Some interactive text services were retained, although these were reduced in number. The Videoway service has also been implemented in the United Kingdom. A similar service, developed by ACTV, was tested in California during the mid 1990s and began a rollout in the U.S. during 1997. It appears that this form of ITV may be more viable in a digital cable or broadcast environment with greater channel capacity.

Collectively, these early experiences with interactive television in the 1990s suggest that the price of interactive television is important and users appear to be reluctant to pay for expensive terminals. Movies-on-demand, games, children's services and original interactive content are among the services that have been attractive to users. However, all of the interactive technologies tested or introduced in the early 1990s were much more limited than the services that were announced for trials and services in 1994 through 1996.

A large number of interactive television trials were announced for both cable and telephone environments in the 1994-1996 time frame. These involved a broad range of cable, telephone and computer companies and many different strategies for delivering services. A half dozen interactive cable TV trials were announced including AT&T and Viacom in Castro Valley; SW Bell and Cox Enterprises in Omaha;, IBM, Videotron and Hearst in Quebec; and Time Warner in Orlando. All of these trials were either cut back sharply from their original plans, delayed or cancelled. At the same time, more than 30 major tests of interactive television in a telephone environment were announced, including Ameritech in Chicago; Bell South in North Carolina; GTE in Virginia; US West in Omaha; and SNET in Connecticut. Similarly, each of these trials was either cut back sharply or cancelled.

In addition, an alliance of major telecommunications operators, Tele-TV, was formed to develop interactive television. A few hundred employees were hired and the consortium raided the broadcast networks and Hollywood studios for senior executives to lead the venture. The

consortium shifted its goals a number of times and eventually scaled back to a strategy of providing straightforward video services.

What led to such grand plans and subsequent abandonment of those plans? It appears that many groups were caught up in a frenzy of trying to corner the interactive television market. They did not carefully examine cost issues. These included very expensive set-top boxes that ranged between $ 2,000 and $ 5,000 for the planned trials (26) and the high cost per household to develop the infrastructure for the trials in a mid 1990s time frame. Costs for original interactive content were equally high and none existed.

As a more realistic picture emerged, a new strategy was born: evolution. Under this strategy, both cable and telephone companies would develop simpler services with less costly technology and wait for the necessary infrastructure upgrading to take place. This might occur through the natural process of replacing old plant with new equipment or through an accelerated process that would be paid for by demand for other services such as high speed data applications.

There have been many variations on the evolutionary strategy. Some telephone companies decided to develop POCS (Plain Old Cable Service) first, then add interactive services. A number of other telephone companies began to explore so-called wireless cable or ADSL (Asymmetrical Digital Subscriber Line) as relatively inexpensive ways to enter the television service market, while waiting for their telephone plant to be upgraded at a more realistic pace.

In the cable environment, many companies decided to offer high-speed Internet services through cable modems and evolve over time to interactive video, e.g., At Home, a service offered by a consortium of cable operators. However, the services have been slow to roll out because many cable systems must be upgraded in order to provide the service. Others have begun to offer interactive program guides and other niche interactive services such as time shift viewing of TV programs (e.g., Your Choice TV) or interactive text that accompanies regular TV programs (e.g., Wink Communications) and still video images with sound (e.g., The Interactive Channel).

At the same time, a number of hardware and software companies, e.g., Microsoft, Sony and Philips, backed an Internet-on-TV product called WebTV. It has been marketed to the 60 percent of homes that do not have a personal computer but do have a TV. It features a low hardware cost ($375 for the terminal and a keyboard) and $20 per month for unlimited access. It is too

early to tell how the marketplace will respond to WebTV, although sales during the 1996 Christmas season were modest (approximately 50,000 units). A more advanced version of the WebTV unit is due out for the 1997 Christmas season.

Time Warner stood alone in offering a high-end interactive TV service with shopping, news, banking and games as well as video-on-demand movies in its Full Service Network trial in Orlando, Florida. The trial began in late 1994 and will conclude at the end of 1997. Curiously, the Time Warner trial has been cited in the press as a big disappointment or failure. Presumably, this relates to the high expectations that were set in early press coverage of the trial. While the trial did not grow into a national service, it was successfully implemented in a few thousand homes and served as a rich learning laboratory about ITV. Research from the trial indicated that movies-on-demand and selected shopping services were very popular. The general consensus, including the assessment of Time Warner management, is that the Full Service Network was ahead of its time and will not be commercially viable on a large scale for a few years. However, Time Warner used the trial to plan related services that it is launching on a larger scale: Pegasus, a movies-on-demand service; and Road Runner, a cable modem service.

In Europe, many companies watched the withdrawal of high-end interactive television trials in the U.S. and moved to implement more cost-effective ITV trials, principally offering video-on-demand. British Telecommunications conducted a robust 2,000-home trial with movies-on-demand, home shopping, electronic banking and games in Ipswich and Colchester during 1995 - 1996. The results were sufficiently positive to encourage them to move forward with an ITV service in London, using British Telecommunications' Westminster cable company. ITV trials have also been conducted in Sweden by Telia AB and in Italy by Telecom Italia. Telia announced a much larger trial for 1997 and plans to deliver interactive multimedia services to nearly all of Sweden by 2004. In Germany, Deutsche Telekom AG pulled back from its plan for a large scale 4,000-home ITV trial and replaced it with a smaller test of 50 homes in Berlin, to be followed by a modest scale trial in Stuttgart. The trial in Berlin offered video-on-demand movies, children's programs and other entertainment programming, along with tele-shopping and tele-learning services. France Telecom, which conducted an ITV trial in Biaritz during the 1980s, has adopted

a conservative wait-and-see attitude. At the same time, France Telecom has conducted a modest 200-home ITV trial in Paris.

The approach to ITV in Europe parallels efforts by cable and telephone companies in the U.S. Companies have been exploiting the existing telecommunications infrastructure, with modest upgrades, to support video-on-demand and other forms of ITV that do not require very expensive home terminals or major network overhauls. As the telecommunication, cable and satellite networks are upgraded over time, they will consider higher-end ITV services.

Content And Design Of ITV Services

In the mid 1960s, media theorist Marshall McLuhan noted that we tend to fill new media with content from earlier media (27). So, early radio was filled with vaudeville acts and early television was filled with radio shows that had been converted to a television format. Virtually every proposed service for interactive television is a modified version of content or a service that already exists: movies-on-demand is really a videocassette rental service directly to the home; most of the proposed interactive home shopping channels are variations on current television shopping channels or a video rendition of catalogue shopping; and interactive games between households will allow two people in different locations to play a game together instead of two people in the same room. These are enhancements to existing services and they may be very attractive. But they are not bold new applications for a new medium. If history repeats itself, genuinely new applications will not emerge until a few years after ITV systems are widely deployed and they will not be recognized as creative innovations for an even longer period of time.

New content also raises the question of cost. Original interactive programming will be expensive. In a start-up phase, program providers have been reluctant to invest heavily in original content that can be used by a relatively small number of viewers. At the same time, some programming can be adapted to interactive formats with only modest increases in production costs. These include news, sports and game shows. However, original content will be required to fully exploit the new medium. Who will provide this? Also, will experimentation lead to any radical new program formats?

There is also a large set of ITV design issues that has received scant attention in the popular or trade press. They do not attract readers as do announcements of large deals or the promise of dazzling new services. These design issues are associated with navigation, user interfaces and input devices. Further, they are critically important to the successful use of an ITV service and enjoyment of the experience.

First, what is the best input device: an enhanced remote control or a keyboard? Remote controls for some of the ITV trials had a large number of extra buttons (one remote had over 70 buttons), yet they did not support alphanumeric entry for messaging or shopping applications. A keyboard will meet these larger needs but do consumers want to watch TV in an easy chair with a keyboard on their laps? Some navigation options can be put on the screen instead of a remote control, but this takes up space on the screen and can make the TV look like a computer screen. There appears to be no ideal solution. One compromise is to have two input devices: a remote for most ITV usage; and a keyboard for messaging and other applications requiring alphanumeric entry.

Second, there is an important issue of navigation standards. Many trials and services to date have used different forms of navigation. However, program developers cannot be expected to create multiple versions of content, each adapted to a different navigation system. Making selections from a very large set of choices is also problematic. TV is an entertaining medium. If the experience is like searching through a database, entertainment satisfaction may be reduced. Icons have been used to make navigation and searching more fun. However, research shows that many people have trouble understanding icons (28). Geographic metaphors have also been suggested as an aid to navigation, e.g., a user can "drive" through a service to find a particular application (29). However, will such experiences become an obstacle to quick access to services that are used regularly?

Some recent applications of ITV, e.g., bringing the Internet to the TV screen, require the display of large amounts of text on TV sets. Past experiences in displaying large amounts of text on TV screens have been problematic, e.g., Viewdata and Viewtron. While WebTV and other services that offer the Internet over TV have been clever in adapting Internet text for TV sets, it remains unclear whether TV sets will be acceptable as text display terminals to mass audiences.

Latency is another challenge. Many ITV systems have inherent delays in responding to inputs by a user. The delays can be increased if many users are accessing services simultaneously. How much latency will consumers tolerate? There is much work ahead to overcome these challenges and provide a fast, easy-to-use, fun experience.

Conclusion

On March 26, 1928 an article in the <u>New York Times</u> proclaimed, "Television In Home Predicted In A Year" (30). This forecast proved to be overly optimistic. TV was subsequently launched in the U.S. during the mid 1930s in Philadelphia and again in 1939 at the New York World's Fair. More than 20 stations were operating by 1940. However, the high cost of TV sets and the intervention of World War II led to a false start for television (31). When television was re-launched after the war, it grew dramatically. False starts and overly optimistic forecasts are frequently associated with the introduction of new communication technologies. In this sense, ITV has followed a traditional path.

This review of interactive television has uncovered many positive indicators along with a number of challenges. It suggests that consumers' appetite for ITV has grown along with their ability to use interactive technologies. Further, much has been learned about how to create appealing content and market services. Step by step ITV has moved closer to becoming a viable service. The unanswered question is whether the next step in the process will lead to widespread market acceptance.

This paper was presented at the UnivEd Conference on Interactive Television in Edinburgh, Scotland.

Footnotes And References

1. Philip Elmer-Dewitt, "Take A Trip Into The future On The Electronic Superhighway," Time April 12, 1993, pp 50-54.

2. In the U.S., one of the earliest regular uses of this interactive format was Edward R. Murrow's Person To Person program on CBS (1953-1959). In the show, Murrow interviewed famous guests in their homes or offices from a studio in New York. Later, NBC's nightly news program, The Huntley-Brinkley Report, separated the two anchors in studios located in New York and Washington, DC. Other national programs that adopted this format included PBS's MacNeil-Lehrer Newshour (1976-1995) and ABC's Nightline (1979-).

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