

Integrated Broadband
Networks:
The Market for New
Residential Services

by Nicholas Economides

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Columbia Institute for Tele-Information
Graduate School of Business
Columbia University
809 Uris Hall
New York, NY 10027
(212)854-4222

INTEGRATED BROADBAND NETWORKS:
THE MARKET FOR NEW RESIDENTIAL SERVICES

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Prepared By

JOHN CAREY
GREYSTONE COMMUNICATIONS

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1.0 INTRODUCTION

This paper addresses the market for new residential services that will utilize integrated broadband networks (IBNs) for the delivery of those services. The integrated networks may include Broadband Integrated Services Digital Networks (B-ISDN) and switched optical fiber cable television systems, among other alternatives.

It should be noted, first, that the technology for delivering a service has far less meaning to an ordinary consumer than the service itself. Therefore, it is important to place an emphasis upon the services that may be delivered by integrated broadband networks. These services include high definition television (HDTV), picture telephones, high fidelity telephones, video-on-demand, and pictographic videotex, among others. Such services may be used for the delivery of entertainment, education, home shopping, services for telecommuters and general information.

Second, it is not clear whether consumers distinguish services in terms of the bandwidth required for the delivery of the service. Surely, a consumer can distinguish a dial-it sports score service from a televised sports score segment on the evening news. However, the characteristics that distinguish these services for a consumer, e.g., convenient access, timeliness of information, fun in watching video clips of games, etc. are not necessarily linked in the consumer's mind to the bandwidth of the distribution channel.

Third, it is important to try to come to grips with the potential utility and attractiveness of residential services for the end user. So many discussions of B-ISDN and other broadband networks have focused upon engineering benefits or economic advantages for suppliers of services. The end user, in this instance a residential customer, is often taken for granted in the initial stages of developing new services.

1.1 Identifying Services

A review of the literature on future broadband services reveals surprisingly few applications that are new. In some cases, it is argued that consumers will adopt older services, e.g., picture telephones, that failed when they were introduced previously. Presumably, lower cost for the service or a new appetite for video to accompany telephone conversations will lead to adoption. In other cases, the suggested new services would provide qualitative enhancements to services that currently exist, e.g., videotex with photographic quality graphics or higher definition television.

Perhaps there are many bold new services in secret planning documents at major corporate laboratories. However, it is equally likely that radical new services have not yet emerged in the gleam of planners' eyes. Moreover, qualitative enhancements to existing services may provide a reasonable path for the development of many new services. Consumers have demonstrated an appetite, in many instances, for genuine enhancements to services they currently utilize, e.g., color enhancement to black & white television and higher fidelity

enhancements to audio. Consumers have also rejected many pseudo-enhancements, e.g., quadraphonic sound, which did not qualitatively improve existing services.

1.2 Timetable For Service Development

There is much disagreement about the timetable for the introduction of integrated broadband networks into the residential marketplace. Optimistic scenarios would place new broadband services in some households by the middle of the 1990s (Bocker, in Elton et al., 1987; Snelling, 1988). Others (e.g., Michael Gutin, cited in Brody, 1988; and Rosner, 1988) argue that B-ISDN and fiber optic cable systems will not achieve significant market penetration in households until the first or second decade of the next century.

1.3 Forecasting Growth

With such a long timetable for the development of residential IBNs, it would be risky to try to forecast the growth of specific services. Many attempts to forecast the growth of new telecommunication services have been inaccurate (Dimiru, 1985). Even when the service existed in some form and consumer trial results were available, telecommunications market forecasters have enjoyed no better track record than stock market forecasters. For example, Table 1 presents the forecasts of several firms for the penetration of videotex in 1990.

Table 1. Projections For The Market Penetration
of Videotex in 1990

<u>Group</u>	<u>Projected Penetration in 1990 (millions of subscribers)</u>
Advertising Age	6.6
AT&T	8.0
International Resource Development	9.8
IFTF	11.0
Strategic Inc.	4.0 - 12.0
<u>Southam</u>	<u>20.0 - 25.0</u>

Source: Thomson and Bowie, 1986

1.4 Addressing The Problem

With such uncertainties about the scope of services that may be provided by IBNs and the timetable for introducing services, as well as a demonstrated weakness in forecasting consumer acceptance of new services, how can we approach the problem of understanding what the future market for residential IBN services might be?

One way to approach the problem is to examine what we know about the current residential market for telecommunication services and try to identify factors that may influence the market for future services. The goal in such an examination is not to predict what will happen in the future but to create an agenda of issues or 'differences that may make a difference' in the acceptance of new residential services delivered through integrated broadband networks.

2.0 SELECTED CHARACTERISTICS OF THE RESIDENTIAL MARKET

The residential market is not a single entity but rather a dynamic set of markets. Among the relevant elements that help to shape these markets are demographic characteristics such as age, sex, income and household size; lifestyle characteristics such as use of leisure time and work patterns; and, consumer appetites for information and entertainment.

2.1 Demographic Characteristics and Trends

The adoption and use of many recent communication services in the home, e.g., prerecorded videocassettes, chat lines, videogames, videotex and personal computers have been associated with age. Though patterns of use vary among these services, older consumers (e.g., 50 years of age or older) generally use new services less than younger individuals. An important question arises from this pattern: are such differences an age or a generational issue? That is, can we expect older consumers to continue to avoid these and related services because of their age, or is it a generational issue in which a younger generation has adopted a broad range of new services and will continue to use them as they age. Bogart (1981) argues that preferences for newspaper content are related to age: young readers prefer lighter content such as cartoons and sports; as young readers grow older their appetite for news grows. Further, this pattern continues with each succeeding generation. There appears to be some evidence to support the hypothesis that preferences for computer-based services such as videotex by younger household

members is a generational issue and, further, that a new 'computer generation' may be emerging just as a television generation emerged from the 1950s. If this is correct, it would be reasonable to expect a growing appetite for these services over time, as the new computer generation grows to maturity.

There is also evidence of important sex differences in the adoption of some services, e.g., videotex and personal computers in households. In the case of videotex, usage has been overwhelmingly by males. More than 90 percent of the subscribers to one service, The Source, are reported to be males*. However, there are some counter examples in which usage by females has been reported to be very high (e.g., Smith, 1985; Carey and Dozier, 1985). Personal computer usage by males has also been greater than usage by females, though reported differences are not so large as in the case of videotex. The reasons for these differences are not well understood.

A third demographic characteristic that appears to be related to the adoption of new telecommunication services is household size. There is greater use of many new services in households with 3 or more individuals present. If the long-term trend of shrinking household size continues, this characteristic of usage may provide a negative signal for the adoption of new broadband services.

* Reported in Direct Marketing Magazine, June, 1986, p. 42.

A fourth demographic characteristic associated with the adoption of new services is household income. It is hardly surprising that households with greater income tend to purchase and use more communication technologies. However, within this group of high income households, there is a large proportion with two working spouses. This is a very important group for the future of IBNs, first because it has been growing rapidly as a proportion of all households and second because it has considerable disposable income. In addition, the two working spouse household is pressed for time, as will be discussed in section 2.2.

Table 2 presents data on the use of some existing broadband services by income level, household size and age. The data suggest that households with three or four people, an income of \$25,000 or greater and a head-of-household age between 30 and 49 are prime consumers of broadband services. Single-person households, lower income households (i.e., under \$15,000) and households headed by person 60 years of age or older are under represented in the consumption of broadband services.

Table 2. Selected Demographic Characteristics
of Broadband Service Users, 1984.

<u>Demographic Characteristic</u>	<u>All U.S. Households</u>	<u>VCR Hshlds</u>	<u>Basic Cable Household</u>	<u>Pay Cable Household</u>
<u>Household Size</u>				
1 person	23%	17%	20%	16%
2	32	29	32	28
3	18	21	19	21
4	16	20	18	21
5+	12	13	12	14
<u>Income</u>				
\$ 0 - 10,000	24%	9%	15%	9%
10 - 14,999	14	8	13	9
15 - 24,999	24	21	25	24
25 - 39,999	23	31	27	30
40,000+	16	31	20	27
<u>Age (Head of Hshld)</u>				
Under 30	21	20	17	20
30 - 39	22	32	26	34
40 - 49	16	20	18	21
50 - 59	15	16	17	15
60+	26	11	22	10

Source: Electronic Industries Association, 1985.

In addition, it is useful to examine how some of these demographic patterns may change. Table 3 presents an estimated change in the age distribution for the head of household between 1985 and the turn of the century.

Table 3 suggests that by the year 2,000 there will be a large group in prime income years who 'should' have an appetite for new technology services. At the same time, there will be a growing population of senior citizens. Here, the issue of age versus generation (i.e., as a factor influencing the adoption

Table 3. Estimated Changes in The Age of Heads of Households, 1985 and 2,000.

Age of Hshld Head	Number of Household Heads (in millions)		Change
	1985	2000	
Under 25	5.4	4.4	- 18%
25 - 29	9.6	7.8	- 19
30 - 34	10.4	10.2	- 2
35 - 44	17.5	25.3	+ 45
45 - 54	12.6	21.6	+ 71
55 - 64	13.1	13.9	+ 6
65 - 74	10.9	11.5	+ 6
75 and over	7.3	11.1	+ 52

Source: U.S. Census Bureau

of new technology services) will be important. If indeed, age is a key factor influencing the adoption of new services, then a large proportion of the population may have little interest in new broadband services. However, if one's 'generation' has a greater influence upon adoption, then it is reasonable to assume that the current group of 40 to 50 year-olds who have a moderate interest in new telecommunication services will carry this appetite into their senior years. In addition, Table 3 suggests that it may be important to single-out seniors as a special target group, create special services for them and find new ways to encourage their use of new technology services.

2.2 Lifestyles

One anticipated use for new telecommunication services is to support the so-called 'telecommuter,' i.e., a person who works at home and uses telecommunications to stay in touch with

co-workers. While some full-time home workers exist, most are in blue collar jobs such as the knitting industry. Large numbers of full-time, white collar telecommuters have yet to emerge. Moreover, one broad survey of workers in a range of fields indicated that very few workers (only 3 to 8 percent) want to work exclusively at home*. At the same time, there has been an increase in the number of white collar workers who do some work at home. Further, the same survey cited above revealed a much stronger interest by workers if they could split work time between the office and home (24 to 46 percent of workers favor such an arrangement). If there is a need for services to support telecommuters in the future, it will likely be for professionals who do some work at home, not full-time work in their house.

A second important lifestyle issue concerns available leisure time for consumers and how people use this time. Consumers report that their available leisure time decreased steadily from the mid 1970s through the mid 1980s**. This relates, in part, to the growing number of households with two working spouses (discussed in section 2.1). These households are prime consumers of broadband communication services. Often, there are children in these households. Since both spouses work, considerable 'leisure' time must be devoted to household chores, school and day care commitments, and other tasks that

* The Wall Street Journal, April 20, 1987, p. 25.

** Philip Morris survey, reported in The Wall Street Journal, August 8, 1985, p. 39.

are not usually associated with leisure. Curiously, many of many of these households do participate in sports, aerobics and continuing education classes as well as buy new consumer electronic products. John Robinson, who has examined the lifestyles of this group closely, characterizes their activities as "harried leisure" (Robinson, 1986) and paints a picture of a couple who race home from work, pick the kids up from the day care center, stop along the way to rent a videocassette movie, jog 2 miles before eating a microwave dinner, then catch an aerobics class after dinner, race home to start the videocassette movie and prepare a last-minute office memo on the household personal computer. This may be a picture of one, important lifestyle environment in which new IBN services must find a place.

A third lifestyle issue that may affect the market for residential services is moving patterns. In 1984-85, moving by U.S. households reached an all time high: 1 in 5 households moved*. While most of the moves were within the same county, a large proportion were outside the county of residence and outside the state. Moving patterns are important for a few reasons. First, moving is associated with churn in services such as cable TV and changes in media usage (Bogart notes that moving to the suburbs may lead a person to stop reading a newspaper - an old habit is broken). In one sense, a person who moves may present an opportunity for a new media service

* American Demographics, May, 1988, p. 16.

provider to gain a user. Second, a household that moves frequently can experience a problem of maintaining a 'community' of relatives and friends who previously were available in face to face contexts. In this sense, new broadband services might be able to help a mobile society maintain community ties.

2.3 Consumer Needs and Wants

During the 1980s, a large group of telecommunication services (principally, videotex) were developed in order to provide consumers with vast amounts of information. Most of these services failed. The trials and services of the 1980s have demonstrated that consumer needs and wants from telecommunication services can be grouped under a few simple categories. In general, consumers want:

1. Communication with other individuals or organizations. Consumers have consistently demonstrated a strong desire for voice and text messaging to other individuals as well as organizations with whom they have a need to communicate.
2. Activities that entertain. Consumer appetites for specific entertainment services, e.g., videogames, can shift from year to year, but the desire for entertainment remains relatively constant.
3. Convenient access to brief information about topics that appeal to the consumer. Among the more popular topics for a broad range of consumers are weather, TV listings, sports scores and news headlines.
4. Functional tools. Consumers want technologies and services that help them to perform a necessary task.

Kraemer (in Elton et al., 1987) notes that some early studies on why consumers purchase personal computers indicated many non-instrumental reasons such as 'I wanted to learn about computers.' However, over time functionality has emerged as a key reason for consumer adoption of personal computers, i.e., to accomplish specific tasks such as writing reports and memos.

Many other needs and wants exist for specific groups of consumers. Further, a new service may attempt to develop needs and wants that are not pre-existing when the service is introduced. However, the core needs and wants outlined above are likely to play an important role in consumer acceptance or rejection of new IBN services.

3.0 ADOPTION OF NEW TECHNOLOGIES IN THE RESIDENTIAL MARKET

There are several lessons to be derived from an examination of consumer adoption patterns for earlier telecommunication technologies and services. In deriving these lessons, it is useful to review growth patterns for selected technologies; obstacles to adoption; and models that can help to explain why consumers adopt technologies.

3.1 Growth Patterns

During the past two decades, patterns of growth and decline for new technology services have become complex. During this period, many more technologies were introduced into the marketplace than in previous decades; more technologies have developed rapidly; and, more technologies have declined rapidly

or failed outright. I will not attempt to provide a comprehensive classification of these patterns, but only to outline three common patterns:

- Step Progression. The growth of many technologies may be classified as a step progression, much like climbing a stairway. Different types of users (or a different mix among user-types) may adopt the technology at each step. For example, the VCR was purchased initially by those with a strong interest in time shift viewing, pornography and/or the latest hi-status electronic device. These individuals were able and willing to pay a premium for the technology, which in turn helped to bring down the price for the next step of users. The next group shared some of the same interests as the first group, but they included more movie buffs and those who were not willing to pay a very high premium for the technology.

Many other technologies, e.g., personal computers, have included a high proportion of business users on the first step of adoption. Here too, business users were willing to pay a premium for the technology and their interest in the technology did not closely match the interests of consumers on the second step of adoption.

One important lesson to be derived from the step model is that the first wave of users may be different from the second and third wave. In addition, if the first step of users does not adopt the technology, a second or third group (who want different applications at a lower price) may never have the opportunity to adopt it.

The business to consumer step progression may be

important to an understanding of future IBN adoption, since most analysts believe that B-ISDN will enter the business market first. For example, what are the likely advantages and disadvantages if B-ISDN enters the business market first? Advantages may include: business can absorb some costs of developing both hardware and the network, costs that consumers could not or would not absorb; businesses will develop some new services or applications that may be relevant to consumers; consumers will gain experience with the service at work and bring these skills home; and, consumers may develop an appetite for the new services at work which influence their appetite for consumer services (the MIT Audience Research Project calls this "increasing consumer discrimination"). Disadvantages may include the following: business usage patterns can create false assumptions about the consumer market, i.e., assume that they are the same; suppliers may dump business applications on the home market and turn-off consumer interest; business acceptance at a given price level may create false assumptions about consumer willingness to pay; and, suppliers may concentrate on business innovation and put off the development of consumer innovations.

- Growth spurts As the Context Changes. From the early 1950s through the mid 1970s cable entered 10 percent of U.S. households. From the mid 1970s until the late 1980s, cable grew from 10 percent penetration to over 50 percent. The accelerated growth of a service after some time in the marketplace is often characterized as the second phase in an S-curve of development. However, this may not account sufficiently for the changes in the marketplace context that allow a technology to accelerate its penetration in the marketplace. For cable, the mid

1970's context included several important factors: satellite technology became available to distribute signals more efficiently; a favorable economic climate for cable in large cities appeared imminent; and, new cable channels emerged to supplement off-air signals. In a similar manner, the rapid development of VCRs during the mid 1980s was aided by a fortuitous change in the marketplace context: the emergence of 'mom and pop' videocassette rental shops.

For IBN, the question arises: what contextual elements in the marketplace might lead to a spurt in growth after IBN enters a small percentage of households?

- Cyclical and Fad Patterns. We are familiar with fads and cyclical patterns of growth, decline and growth at a later point in time with leisure products such as hula hoops and yo-yos. Similarly, broadband service content may be adopted as a brief fad or return in cyclical waves (e.g., cowboy-based TV programs). However, it appears that these patterns affect some technologies as well. Examples include 3-D movies, CB radio and videogames. For IBN, the question arises: are telecommunication services becoming more like toys, leisure products and other consumer services that are highly volatile year to year? If so, what are the implications for the development of IBN services?

In addition, it should be noted that many of our expectations for the development of new residential, telecommunication services are based upon the growth of radio, television and telephones, which have achieved near-universal penetration. Many assume that cable television and VCRs will also grow to near-universal penetration. However, this may not

be correct. Cable rarely achieves a penetration level greater than 70 percent of homes passed. VCR penetration is likely to be very high, but will it approach near-universal penetration? The future landscape of telecommunication services may be like the landscape of household products such as vacuum cleaners, typewriters and lawn mowers, i.e., a broad range in penetration levels. Are IBN services likely to follow a path like radio, television and the telephone? Or, are they likely to fall far short of near-universal penetration?

3.2 Obstacles To The Growth of Residential Services.

Among the potential obstacles to the development of integrated broadband networks, three are noteworthy in relation to residential markets.

1. Price of Services. McCombs (see McCombs and Eyal, 1980) has demonstrated that consumer spending on entertainment and information is a relatively constant proportion of income. While there have been some periods when consumers have spent a higher or lower proportion (see Wood, 1986), spending is remarkably constant. The proliferation of consumer electronic products, in an environment of relatively constant spending, is due in large part to a drop in the price of many electronic products and services vis a vis income. It is risky to assume that consumers will vary from this pattern in order to adopt a new product or service. Yet, it appears that some groups are adopting such a stance in relation to IBN services. Rosner (1988) cites a Bell Communications Research study which indicates that consumers will pay two to four times their current cable television bill for video-on-demand.

2. Standards. From a consumer perspective, standards issues are important to the degree that they affect the price and availability of hardware and software. Recent U.S. experience provides examples where the absence of a single standard both hurt and did not affect the development of a service. In the case of U.S. teletext, it may be argued that the failure of the FCC to adopt a single standard inhibited TV set manufacturers from placing decoders in sets. The few stand-alone units that became available were expensive. Under these conditions, teletext has not achieved a significant market penetration. However, in the case of VCRs, the absence of a single standard does not appear to have had a significant impact on growth.

In the case of IBN, standards issues are complex in that they involve both standards for the network or networks as well as the location and standardization of intelligence that controls applications. For the residential market, the general question is, how will the presence or absence of standards affect: cost of residential terminals; cost and ease of replicating content in more than one standard; cost and ease of distributing content (i.e., interconnecting networks); and, the timetable for realizing price reductions due to broad adoption of the technology?

3. Availability of Content. During the past decade, there has been a sharp increase in the number of channels available for the distribution of content. However, there has been only a modest increase in content to fill those distribution channels. Integrated broadband networks will once again increase the pipeline for distributing content. However, it is not clear where the content to fill

the pipeline will come from. Will the promised video-on-demand services offer new content or Leave It To Beaver episodes?

3.3 Adoption Models.

Why do consumers adopt new technology services? What models or metaphors can help us to understand consumer behavior that leads to adoption of new services? Below, a few orthodox and unorthodox models are reviewed. Some deal explicitly with motivating forces for adoption while others provide an analogue for the adoption process that does not necessarily capture underlying motivations.

- Strong Need. Need is an orthodox and straightforward reason for the adoption of a new service: a consumer has an existing, unmet need in his or her daily life and a new service meets the need at an acceptable cost; and the consumer adopts it. There are many examples of new technology adoption based upon need. For example, home satellite dishes have been adopted more readily in western states such as Montana and Idaho where there are few off-air signals or cable TV systems. Conversely, 'need' can help to explain the failure of many new technologies, i.e., a new service did not meet any need or met a need that was served adequately by a pre-existing service.
- Substitution Based Upon Comparative Product Advantage Substitution is another orthodox model and one that is used often by market researchers. It assumes that a new product or service has a competitive advantage in relation to an existing one. The new product or service is adopted as a substitute for the old. Groups planning a new service often try to estimate the market share

they will capture based upon the percentage of consumers who will substitute the new for the old. In recent market research practice, this model has not always been accurate in predicting adoption. There are a few reasons for this. First, there is a tendency for suppliers of services to assume that their perceptions of product advantages are synchronous with consumer perceptions. Second, the difficulty of changing consumer habits, even when a product advantage exists, is often underestimated. Third, as Elton argues (1986), change in utilization of services may not be captured by a simple substitution model. In adopting a new service, A, users may not abandon the old service, B. Rather, a new mix of A and B may emerge.

- Insatiable Appetite. Many of the "Innovators" in Rogers' (1983) Diffusion of Innovation model (i.e. the first group to adopt an innovation) might be labeled "Insatiabables." They appear to have an insatiable appetite for new technology and will pay just about any price for the latest gadget. Moreover, according to Robinson (1986) they often add the new service or technology to their use of the old, rather than adopt the new as a substitute for the old.
- Pain. Many models of change are based upon positive motivations. However, painful experience with an existing service can provide an incentive to adopt new services. In planning new IBN services, it may be useful to ask, where are consumers experiencing pain in service delivery - that might be relieved by new IBN services. One current candidate is poor customer support by many cable television operators. A second candidate is low stock of popular movies in 'mom and pop' video rental stores. However, one problem in long range planning of new IBN services

for the residential market is that such assessments require an understanding of pain and problems in the marketplace of the mid 1990s or later.

- Supplier Pressure. In some instances, suppliers of services may have sufficient control over a market that they can force consumers to change behavior. For example, a bank that dominates a local market might increase the price of all teller-related services and thereby motivate consumers to make greater use of ATMs. It is not yet clear whether one group will dominate integrated broadband networks, but the debate about control of IBNs and fear by some of monopolistic practices is quite heated, particularly in Europe (see Carey and Elton, 1987).

These examples of motives for change and processes to help explain change are far from exhaustive. Further, more than one force may be at work in a specific situation. Cable television is a case in point. Beneath the relatively smooth growth rates of the past decade, there is a more complex picture of insatiable appetites for more programming by some consumers, painful experiences in customer service by others, and strong demand for basic cable service by those who did not have it available to them previously. In some cable systems, there is a turnover or churn rate of one third of the subscriber base each year. For IBN in the residential market, it would be prudent to assume that motivations or reasons to adopt will also be complex and that the customer base may be as volatile as that for cable television.

4.0 CONCLUSION AND DISCUSSION

When examined at face value, there is no apparent demand for IBN services in the residential market. As Noam notes, "...for residential users, the need (for ISDN) is less clear except as to create the proverbial egg (the network) for a future chicken (the applications)" (Noam, 1987). Presumably, investment in such networks does not hinge upon consumer acceptance of new services, but upon business applications for IBN.

In addition, it appears that residential IBN services are many years or, perhaps, decades away. If the timetable for development is this long, many intermediate events are likely to have an important impact upon residential IBN services. For example how will the struggle for audience between broadcast networks and cable services work itself out by the turn of the century? If cable wins the struggle, might broadcast networks look to IBN for distribution of new video services? Similarly, what lies ahead for the U.S. Postal Service, electronic home shopping and local videocassette rental shops? The fate of these and other services may lead to opportunities or closed doors for IBN services.

Under these conditions of uncertainty, it may be wise to adopt a 'learning' stance towards residential IBN rather than a 'predictive' stance. That is, rather than try to predict what will happen in the residential IBN market, we might use the next decade to conduct research and try to fill-in some of our

gaps in knowledge, while monitoring market developments. There should be no shortage of opportunities. Narrowband ISDN will precede IBN in both business and residential markets; many trials are planned for broadband network services; and business applications for IBN will provide some opportunities for developing potential services for the residential market.

In deriving lessons from existing research and market experience that may inform long range planning activities, a few generalizations may be helpful:

- There is a tendency to create complex and 'grand' applications for new technologies, but Noll (1982) reminds us that simple applications have had the biggest impact.
- Many important applications for a technology are unanticipated or discovered in the process of implementing the service, e.g., radio for mass audience entertainment. To nurture this process, the development of applications for a technology must be open to artists and entrepreneurs as well engineers and business planners.
- Many new services have drowned in the hyperbole of their promoters. They created exaggerated expectations which were not met. In turn, the press and the public quickly lost confidence. In this sense, the skepticism that has greeted B-ISDN may be productive, especially if it lowers the tone of promotional rhetoric.
- Research on the public's ability to use new technologies suggests that many experience problems (Carey, 1985; Neuman, 1985). The

term 'user friendly' has become a cliché for ease-of-use; it has lost meaning through repetitive and erroneous use in advertisements. 'Transparency' may be a better term and goal for the design of new services (Philips, 1987), i.e., a technology should be transparent to a user, who perceives only the service or content.

Finally, this review of issues associated with the development of residential IBN services has raised far more questions than it has answered. One of the principal questions concerns the emerging media habits of a generation of young people who have experienced personal computers, video games and VCRs as an accepted part of their everyday lives. This group may shape the residential market for IBN services. How will their experiences with repetitive playing of video games or on-demand movies from the local videocassette rental store affect their appetite for services in the future? This and other questions suggest that there is much work ahead for those who wish to understand the residential market for future broadband services.

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