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dissertation entitled

SPEED AND THE INTERNET:
FACTORS INFLUENCING CHOICE OF ACCESS CAPACITY
AND SUBSEQUENT EFFECTS ON MEDIA CONSUMPTION

presented by

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has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Mass Media

Major professor

Date 7/3/97

SPEED AND THE INTERNET:
FACTORS INFLUENCING CHOICE OF ACCESS CAPACITY AND SUBSEQUENT EFFECTS ON MEDIA CONSUMPTION

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

College of Communication Arts and Sciences
Mass Media Ph.D. Program

1997

ABSTRACT

SPEED AND THE INTERNET:
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The general objective of this dissertation is to extend the current understanding of the factors influencing media choice, media functions and media consumption, now that the Internet is part of the mix. The specific focus of this project is on Internet speed or access capacity, and its influence. The factors that influence consumer choice of Internet access speeds and in turn, the relationship between speed and media consumption are modeled in this study using perspectives of diffusion of innovation, micro-economic theory, uses and gratifications and a conceptualization of interactivity.

The model was tested in a market situation where high speed cable modems have been available for over two years. Two surveys of U. S. cable subscribers with Internet access were conducted; the first survey was analyzed qualitatively (n=35) and the second (n=256) provided data for quantitative analysis. About half of respondents used cable modems. Results indicate that users with high speed access may perceive the Internet to be more interactive, more compatible with their lifestyles and needs and less complex than do Internet users with slower dial-up modem access. Cable modem adopters tend to be more frequent users of data-intense applications such as FTP and the Web. They tend to have information-related occupations but there is no relationship with education or age.

As to the relationship between high speed Internet access and consumption of media, high speed access is positively related to time spent on-line and negatively related to television viewing. The high speed users do not spend more time overall with the mass media and communication technologies (including the Internet) nor do they appear to spend more on the media though they spend substantially more for Internet access itself. High speed Internet users are more satisfied with a variety of Internet facets, use more "parts" of the Internet, use it to satisfy more needs and tasks.

The conclusion is that speed makes a difference. These early findings suggest there is theoretical and practical value in conducting further research on speed and interactivity, the relationship between satisfaction and consumption, and the modeling of diffusion of innovation and the uses and gratifications of the Internet.

For Paul, Chuck and Harriet

ACKNOWLEDGMENTS

Now that it is finished, I truly hope this dissertation is worthy of the care and energy my husband and family, teachers and friends have invested in the process. In particular, I should like to acknowledge my teachers, Tom Baldwin, Johannes Bauer, Howard Bossen and Barry Litman, for their sage advice and rather too gentle but constructive criticism. The study itself was possible because of the generous and unusual access I was given to TCI company records; for this I thank John Liskey and Sandy Weicher.

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INTRODUCTION

A recurring theme in the research of mass communication is the challenge of the classic assumption that audiences are passive. This is accompanied by the assertion that to understand media effects, we must first understand what the media are; that is, why audience members choose among media and the functions for which they use the media. During the decades that saw the proliferation and diffusion of a vast array of mass media and communication technologies, research produced a body of theory and evidence providing description and sometimes prediction of 1) when and why people are likely to adopt a communication technology or mass medium, 2) the economic, policy and social factors that can lead to their broad diffusion, and 3) the functions and consumption of media.

Now the Internet has been added to this media mix. The general objective of this dissertation is to extend our current understanding of the factors influencing media choice, media functions and media consumption, now that the Internet is part of the mix. The specific focus of this project is on a particular variable in Internet access, bandwidth or speed, and its influence in relation to media choice, functions and consumption.

Media Choice, Media Functions and The Internet

By the 1990s, the rapid pace of communication technology diffusion and the digitization of video, voice and data had begun to give way to the convergence of communication industries and media product markets. Formerly clear distinctions between media blurred as traditional distribution mechanisms such as radio frequencies for broadcasting, paper for newspapers and telephone networks for interpersonal communication, were challenged by the alternative offered by the Internet and other computer networks.

The growth of the Internet since the 1970s was slow at first and then expanded rapidly during the 1990s. In the 1970s there was only a club of a few hundred academics and Defense Department employees. By 1991, the number of users had grown to around two million. Within just six years, there were estimated to be 25 times that many adopters in the U.S. and Canada alone (Nielsen, 1996; Nielsen, 1997)[1]. At this accelerating growth rate, we can begin to imagine Internet ubiquity in the near future.

The growth in users is accompanied by the proliferation of Internet service providers, the volume of information available on-line, shopping and electronic commerce. The number of Internet Service Providers (ISPs) increases daily with the

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[1] Nielsen's March, 1997 estimate of 50 million Internet users as well as their methods for measuring Internet adoption could be disputed. In 1995, The American Internet User Survey by Find/SVP estimated the number at nine-and-a-half million users while in the same year, Nielsen's estimate was 24 million in the U.S. and Canada, later revised downward to 19 million. Donna Hoffman, Vanderbilt University, estimated 16 million adopters in April 1996 (Hill & Baker, 1996). Suffice it to say that the true figure is large and growing fast.

current count at about 2,500 in the U.S. (IDC, 1996) compared to four in 1969, at the Internet's ancestor, ARPANET (Hart, Reed & Bar, 1992). On-line shopping revenues will reach 500 million dollars in 1996, a market forecasted to exceed six billion dollars by 2000 (Sandberg, 1996).

The arrival of the Internet is recent compared to that of other mass media and communication technologies. It is too recent to have signaled its true long term impact on individuals and society. From a few published survey research reports and anecdotal evidence, we know some things about the Internet's current impact. Millions of users, both among the business/organizational and personal/household categories, have come to rely on it for a vast array of applications -- from telecommuting to entertainment, from shopping and research to keeping in touch with friends. There is some evidence that Internet use can be addictive; Internet use can reduce isolation and loneliness. Use of the Internet may influence the consumption of other media. The list of social influences and effects goes on.

The current descriptions of the impact of the Internet are a reflection of the state of the Internet today. That is to say, its impact is tied to its current capabilities which are limited by its design, operation, funding and so on. And many would say that the Internet has constrained capabilities — it suffers from security weaknesses, its organization is clumsy and most of all, it is too slow and too crowded.

The principle problem is bandwidth, or rather a lack thereof. Bandwidth refers to the size of the pipe or to use Negroponte's analogy, the speed of the ski lift on which packets of digital data are transmitted (Negroponte, 1995). With demand for bandwidth

often outstripping supply, users and providers suffer frustrating delays. While bandwidth is today so precious it is called the new gold (Newhagen & Rafaeli, 1996), over time the shortage will diminish. As with most innovations, it is possible that market demands may lead to responses of improved bandwidth supply.

This possibility raises the need for additional justification for this study. If market forces are going to relieve the unserved demand for bandwidth and high speed Internet access will be available for all, why study speed? There are several reasons. First of all, it is likely to take years before universal high speed service is feasible. The good news, then is that this lead time gives policy makers opportunity to shape the ownership and investment in infrastructure and to make policy that otherwise advances the public interest. This dissertation can help determine whether there is a public interest, for example whether universal high speed service is desirable. Because of this "lead time," industry has a similar opportunity but it, too, needs to understand the likely effects of speed.

Finally, after high speed access does become widely available, interest in the subject will not fade. Beyond speed, technology advances that alter the way humans and computers interact will continue to emerge, for example keyboardless or even telepathic interaction. Likewise, the variety of media may continue to proliferate as the pattern of the last century has shown. Therefore research such as this project that explores both technology advances and the effects of the emergence of new media has an important role.

Returning to the discussion of today's limited bandwidth situation, there is a

problem in studying today's Internet to forecast its future, long term effects. It would be the same problem early mass communication researchers faced in studying broadcast television during the 1960s to forecast TV's effects in a 500 channel environment — the system one has available to study will evolve into something else.

Increased traffic has made bandwidth an issue in the diffusion of the Internet and in users' media choices. As mentioned earlier, one of the worsening problems with the Internet is suggested by this recent headline in *The Wall Street Journal*, "Massive Amounts of Data Clog System Studded with Roadblocks"(Ziegler, 1996). Much of the attraction of the Internet is in the World Wide Web (the Web), and its sites using graphic, video and audio content made of very large data files. This combined with the explosion in the number of users has resulted in a frustratingly slow network. Bottlenecks exist at various locations in the Internet's topology. First, the backbone itself can get clogged when national and international traffic levels are great. Next, the interfaces at any destination or end point on the system can be underpowered. Finally, the access "pipe" from a user's computer to the gateway can be too narrow (i.e., a POTS voice line). Of course, the network's current design was never intended accommodate such volume.

Internet Access Capacity and Cable Modems

While a number of solutions are in the works, a new entrant in the Internet business, the cable industry, has a technology to relieve at least one of these bottlenecks; it is the cable modem. The cable modem greatly increases bandwidth from a user or provider to the gateway. In 1997, the proven modems and shared access network

configurations provided throughput capacity of anywhere from ten million bits per second (mbps) to 30 mbps in a single six megahertz (MHZ) channel, the conventional size of an analog video channel (CableLabs, 1996). A "shared access network" means a configuration similar to a local area network (LAN) where several users share the same "pipe." Even when there are multiple users, Internet access via cable television systems can be almost 1,000 times faster than access over a telephone network's twisted pair copper plant, even with the fastest telephone modem of 56,000 bits per second, and 100 times faster than ISDN. Of course, the more users, the lower the throughput and the slower the network. However, since cable systems can allocate additional six MHZ channels to its high speed data service, high throughputs can be maintained as the number of shared users grows.

Cable television systems were originally designed to carry analog video. However, these networks are quite capable of carrying data and connecting to the Internet. Data is carried on the cable system along with conventional video over radio frequency (RF) carrier signals. The cable modem, connected to the user's home or office computer, is in turn plugged into the cable system as his TV would be. The modem device, however, converts digital information into a modulated RF signal and RF back into digital information that the computer understands. Back at the cable system headend, the data is again made digital and sent out over the Internet. Some cable modems are two-way and others are just intended to provide downstream high speed connectivity over the cable system; the upstream is handled by a slower telephone line.

Bandwidth is a crucial variable yet its effects have not been studied extensively.

Speed removes some of the barriers to satisfaction with Internet usage. More than that, it is likely to usher in a host of differences in the way the Internet is perceived and used. If the bottleneck created by insufficient bandwidth is opened, the Internet could become a ready substitute for other forms of mass media and interpersonal communication. When a user has high speed access to the Internet, the medium becomes comparable to other mass media — easy and less frustrating to use. As a media appliance, the home computer with a high speed connection is like any other: the television, the VCR, the telephone, the radio, the newspaper.

In 1997, it was estimated that 20,000 computers have high speed cable modem connections to the Internet (Breznick, 1997). This number was projected to grow to 1.8 million in 1999 and seven million by 2001. It was not clear how many of these computers are or will be in households, as opposed to businesses and institutions.

Still in test markets in many systems around the country, it is available commercially in just a handful. TCI Cablevision of Mid-Michigan which serves East Lansing and Meridian Township has quietly expanded its offering of such high speed Internet access since the summer of 1994 making the small market perhaps the one with the most and longest experience with this type of access. At the time of this study, about 200 homes, one percent of all cable subscribers, had subscribed with about 30 adding the service each month.

Compared to the rest of the nation's adoption and use of the Internet, the East Lansing/Meridian Township area is more advanced in other respects. National home computer penetration grows slowly and today hovers between 30 and 35 percent.

However in East Lansing/Meridian Township, because of the significant student population and higher than average household income and education levels, penetration is thought to exceed 50 percent. Moreover, household Internet adoption is also thought to be higher because of the preponderance of residents who have ready access from their university, government or information sector jobs. Therefore, the East Lansing conditions represent a window on the future when more households will adopt the Internet and some will have high speed access. This makes it an ideal location to investigate the adoption of the Internet and the use of the medium in relation to other media.

Research Questions

The circumstances present an opportunity to investigate the broad questions: Why is the Internet adopted and how do audience members choose among the Internet and other mass media and communication technologies?

The specific speed-related questions derived from this general one are:

How is the Internet perceived differently by those individuals who have a high speed cable TV connection compared to those with a conventional one? And do these perceptions explain adoption?

How does high speed access to the Internet affect its use in households as compared to conventional speed access? In other words, what is it used for, when

is it used, how is it used?

How does the household consumption and use of other mass media and communication technologies change under varying Internet access conditions?

The answers to these questions will serve a variety of objectives. First, as one of the early mass communication research investigations on the Internet, it will contribute to the existing body of knowledge by expanding our understanding of the Internet as a mass medium and communication technology. Currently, there are a variety of theoretical perspectives which attempt to explain media choice and adoption. This study will make a specific contribution by setting up various theories in competition to offer the best explanations. Secondly, policymakers and the communications industry at large will have a picture of the likely impact of the Internet on overall media use. For policy,.the implications of this study could be significant; it is easy to imagine how those concerned with, for example, the information gap, spectrum allocation and education could be informed by the study's results. Likewise, for an industry searching for new business opportunities, the results could inform decisions about competitive strategies, capital investment and product development.

The study is organized as follows. In the next chapter, the relevant literature on diffusion of new technologies and the uses of media is reviewed. From this, a model and hypotheses are developed to propose answers to the research questions given above. Next, in Chapter Three, the methodology for testing the model is described. Chapter

Four reports results of the tests; this is followed by a chapter in which results are interpreted and discussed. Finally, Chapter Six summarizes the impact of this study and offers suggestions for future research.

Chapter 2

LITERATURE REVIEW

Introduction

The Internet, its adoption by and impact on casual users, not just scientists, computer experts and serious hobbyists, is a rich topic for study by communication researchers. Added to that, the issue of bandwidth and its direct effect on Internet users, casts it as an even more fertile study subject. Scientific inquiry here involves building on the large extant body of theory and evidence concerning the adoption and use of mass media and communication technologies.

Answers to the specific research questions discussed in the previous chapter can be modeled with the aid of at least four mass media, communication and micro-economic theoretical perspectives: diffusion of innovation, the conceptual work on interactivity, uses and gratifications and the economic concept of consumer indifference to utility trade-offs. Questions like the first one which is concerned with perceptions about the Internet can be informed by diffusion of innovations theory, particularly with respect to characteristics of the innovation and of the adopters of a rather new medium. The nature of this inquiry into the effects of bandwidth lends itself to a framing in the theoretical work on the dimensions of interactivity. When questions about the uses of media emerge, as with the second and third questions, the uses and gratifications tradition offers

ample ideas and evidence to describe and, to an extent, explain use and choice. Finally, consumption of media and how they compete for an audience can be addressed in economic terms by theory on consumer economic behavior.

This section reviews the relevant literature and body of empirical evidence with the goal of articulating a model that answers the central research questions. The explication will link theory to the phenomena of interest and present testable hypotheses for empirical verification. Figures 1 and 2 depict the conceptual framework which is developed in this chapter.

Diffusion of Innovation

When new media and communication technologies are studied, research is approached often from the diffusion of innovations perspective to learn how those technologies are adopted and used. The diffusion of innovations theory (Rogers, 1995) presents a comprehensive model for explaining and predicting the adoption of an innovation, that is a new idea, technology, product or process.

The classic formulation of the theory relates the main elements in the diffusion of (1) an innovation, (2) that is communicated through certain channels, often mass media channels, (3) over time, (4) among the members of a social system (Rogers, 1995, p. 5). The innovation and its adopters can be described by their attributes which influence adoption.

Innovation Attributes

The perceived characteristics of an innovation are often significant predictors of rates of adoption. Rogers (1995) says that between 49 and 87 percent of the variance in rate of adoption is explained by five perceived attributes (relative advantage, compatibility, complexity, observability and trialability). Others would argue that innovation attributes play a somewhat less dramatic role but promote their study as useful nevertheless (Downs & Mohr, 1976; Tornatzky & Fleischer, 1990; Tornatzky & Klein, 1982). Yet for their importance, relatively few innovation attribute studies have been undertaken (Rogers, 1995; Tornatzky & Klein, 1982). In this section, the most commonly studied innovation attributes are explored for their potential value in explaining adoption and the differences in how the Internet is perceived according to access speed.

The innovation in question, the Internet, is likely to be perceived differently when access conditions vary. The first research question, "What difference does speed make in the perception and adoption of the Internet?" may be answered by asking how perceptions about Internet attributes vary by users' access capacity, a high speed cable modem or a slower dial-up telephone modem.

Many innovation attribute studies test some or all of the model's classic list of five: Relative advantage, compatibility, complexity, observability and trialability (Rogers, 1995). Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. Often this dimension is split and expressed in terms of economic benefit and non-economic effectiveness (Dearing, Meyer &

Kazmierczak, 1994). Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. A technology can be perceived along a continuum of value compatibility, familiar ideas, and existing needs. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. Trialability, sometimes called divisibility, is the degree to which a innovation may be experimented with on a limited basis. Finally, observability is the degree to which the results of an innovation are visible to others.

Overall, these and any other attributes that may be specific to a class of ideas or technologies comprise an attribute matrix, that is a "composite perception of an innovation's advantages and disadvantages for solving a problem, relative to other means of solving a problem (Dearing et al., 1994)." The distinction to make clear is that perceptions are important because people assess a technology using familiar concepts -- what they know, own, use. Each person has a different set of experiences so each views a new idea or technology through a unique filter.

The challenge is to choose the elements that make the attribute matrix for the Internet. In a meta-analysis of 75 studies of innovation attributes, Tornatzky and Klein (Tornatzky & Klein, 1982) listed as many as 30 attributes that have been conceptualized and tested in their ability to predict adoption of an innovation. One of the objectives of diffusion research into innovation attributes is to refine the conceptual discreteness of attributes and arrive at a parsimonious set that is generalizable across a range of new ideas, products, technologies and processes. If there are as many as 30 perceived attributes, there is bound to be overlap in concepts. For example, in their complete list of

30 "concepts" found to influence adoption, Tornatzky and Klein (1982) noted relative advantage, cost, continuing cost, initial cost, payoff and saving of time. It could be easily argued that relative advantage here is the underlying concept while the remaining attributes are variables that operationalize it.

The challenge in studying innovation characteristics is to optimize two potentially opposed goals. The first objective is to deduce the set of attributes which fully represents all dimensions of the innovation. However, in the interest of advancing theory, parsimony is just as vital. The tension is resolved here by choosing to develop diffusion theory with respect to communication and mass media innovations and not all innovations.

In that spirit, selection focuses on those attributes that are likely to best explain and predict choice of Internet access capacity, mindful of the Internet's link to other media. Of the five classic attributes, relative advantage, complexity and compatibility have been most consistent in their relationship with adoption behavior (Tornatzky & Klein, 1982). Relative advantage has often been shown to be influential. However the construct is so often operationalized in varying ways, there is little consistency across studies. For the remaining two attributes, the results of prior diffusion studies of communication technologies and mass media are mixed. For example, in its power to predict adoption of audiotext, compatibility was found to be significant (LaRose & Atkin, 1992) but no other perceived attributes of audiotext were tested for comparison. Likewise, in Lin's (1994) modeling of factors influencing home videotex adoption, variables representing relative advantage were found to be associated with the likelihood

of adoption, but again, this was the only innovation attribute that was investigated.

In an extensive meta-analysis of research on the adoption of new media (Dutton, Rogers & Jun, 1987), relative advantage, compatibility and complexity were significantly linked with adoption, however, they were apparently the only innovation attributes considered in more than 23 studies of the diffusion of home computers and of cable television. In the cable studies, relative advantage, expressed as "need for better reception" and "variety of channels" was positively associated with cable television subscription. As factors that predicted home computer adoption, all three attributes were found by one or another study to be significant.

With more direct respect to the innovation in question, the Internet, compatibility was a significant discriminator between Internet adopter and non-adopter organizations and relative advantage was not (LaRose & Hoag, 1996). However, in the same study, complexity was not a significant discriminator, contrary to the Tornatzky and Klein meta-analysis. In another Internet diffusion study, two innovation attributes of home computers, complexity and relative advantage, were set up to explain differences between Internet adopters and non-adopters (Lin, 1996). Among the conclusions of this study, complexity of computers was not significantly related to Internet adoption nor was relative advantage.

In all of the above noted studies, the role of innovation attributes was not the only element shown to influence adoption. In fact, numerous studies of new media adoption do not consider innovation attributes at all (for examples see Atkin, 1995 on computer-mediated information services; Reagan, 1989 on personal computers, cable television and

news use and LaRose & Bates, 1990 on interactive telecommunication technologies). As these researchers reported, other factors influence adoption: innovator characteristics including demographics, user needs and gratifications, and technology apprehension, to name a few. At a later point in this review, this issue will be taken up again.

The inconsistency in findings concerning the impact of innovation attributes on adoption and use requires further attention. One reason for the conflicting findings is that the five classic innovation attributes have been insufficiently explicated for purposes of finding adoption links for new media. The ideal "attribute matrix" for new media, including the Internet includes understudied attributes; the following discussion addresses this possibility.

Communication Technology Attributes

Innovations that are mass media or communication technologies possess special properties not shared by non-communication innovations. In this section, two attributes, interactivity, and radicalness are developed to complement or extend the attributes of complexity and compatibility and to explain more of the variance in Internet access capacity choice. Further, the attribute of compatibility is broken down to isolate a particular feature of communication technology adoption: innovation clusters.

Interactivity. Interactivity is one of the defining qualities of communication on the Internet according to Rafaeli (Newhagen & Rafaeli, 1996). Of course, it not unique to the Internet; it is the prime example (p. 116, Rogers, 1986) often cited as the thing that makes all new media innovations unique. It is a popular and intuitively appealing term

used synonymously with new media technologies. Pay-per-view television, VCRs, video games and email systems are all said to be "interactive." As a special property of some types of mass and interpersonal communication, interactivity embodies a concept not represented in heretofore discussed attributes of innovations.

However, interactivity, per se, cannot precisely be called a medium attribute, as Rafaeli (1988) notes in his explication of the concept. The definition of interactivity is founded on the notion of responsiveness; it occurs when "later states in a message sequence depend on the reaction in earlier transactions as well as on the content exchanged (p. 119)." Durlak (1987) would say that an interactive design is one that 1) simulates face-to-face communication; 2), maintains the illusion, that is, possesses immediacy and allows the user to be free from technology distractions and 3) permits mind amplification, that it offers new possibilities for communication. The design of a medium or communication technology may enable or preclude interactivity, but even if the potential exists, it does not mean interactivity will follow with each instance of communication.

Yet the potential for interactivity is great with high speed Internet access. This potential, called here interactiveness, is cast in this study as an innovation attribute of new media, to compete with better known concepts as relative advantage, complexity, compatibility and the rest. The faster the experienced response time, the more capable the medium is in enabling interactivity. The attribute is perhaps a special case of the classic relative advantage attribute. Higher degrees of a perceived ability to enable interactivity should be linked with higher speed adoption.

Various "dimensions of interactivity" have been proposed in a revised model of mass communication (Heeter, 1989). Those six dimensions are 1) responsiveness to the user, 2) ease of adding information, 3) facilitation of interpersonal communication, 4) complexity of choice available, 5) effort users must exert and 6) monitoring information use. Of these, the first four play particular roles as Internet attributes that vary with access capacity.

The first dimension, the degree to which a medium acts responsively to the user, goes to the core of Rafaeli's conditions necessary for interactivity to occur. The more humanlike (if humanlike equates with quick) the "discourse" with a media system, the more familiar and less frustrating its use would be. High speed Internet access is more responsive than slower speeds.

The second dimension of interactivity is the ease with which a user can add information to the system that a mass, undifferentiated audience can access. At low access speeds, any Internet user can add text-based content to newsgroups, listservs and the like. However, it is not so easy to become a Web content provider with slow access speed. Those with greater capacity should perceive that the Internet possesses a high degree of ease of adding.

The third relevant dimension of interactivity is the degree to which a media system facilitates interpersonal communication between two specific users. Like the ease of adding information for a mass audience, greater degrees of this dimension are likely to be perceived among higher access speed users.

Finally, with complexity of choice available, also called selectivity, the more

choice a user is offered, the more he must interact with the medium to choose. With the Internet, the greater the bandwidth, the more feasible choices a user may "enjoy," and the more kinds of content he has to choose from. Low speed users may find that only certain small-byte applications are feasible — email, newsgroups and other text-based forums. In many cases, Web graphic and audio files are just not available to this audience; choice is limited. Low modem speed Internet users should perceive the Internet to be lower in this dimension than high speed users.

In sum, the perceptions of four dimensions of interactivity would be positively associated with higher access capacity. Overall, the greater the perceived interactiveness, the greater the associated bandwidth.

Radicalness. The diffusion literature has questioned how much something must be different to be an innovation. Most innovations are in fact just adaptations or improvements on existing ones. For example, cable television as a new idea was created to improve broadcast television. Internet news services are still text, like a newspaper. Even the invention of the Kinetoscope in the 1890s was just one in a series of improvements in motion photography that started in the 1830s with persistence of vision toys (Mast & Kawin, 1996).

From even these examples, one can identify varying degrees of differentness. In the vocabulary of diffusion research, this is known as the issue of radical versus incremental innovation (Tornatzky & Fleischer, 1990). An innovation is radical if its adoption requires the development of completely new routines. On the opposite end of the dimension's scale, an innovation is incremental if its adoption needs only a small

change in existing routines.

Radicalness provides competition for the complexity and compatibility attributes as predictors of adoption. For example, the personal computer and the VCR were introduced at roughly the same time. We know today that the VCR diffused as rapidly as any communication innovation in history and the PC, while successful, has diffused much more sluggishly. One could reason that this circumstance is due to the PC being perceived as more complex and less compatible with existing values, past experiences and needs. However, this is not a satisfying explanation for the vast difference in adoption rates; many PC users would counter that the skills required to program a VCR are more complicated than those required to operate, say, a word processing program. The difference in cost notwithstanding, it is more convincing to argue that VCR use fit into existing television routines and the personal computer had virtually no place in household routines. It is likely that its perceived radicalness stunted diffusion.

This continuum from radical to incremental has been explored in communication technology diffusion literature, though its name is different. The construct is described in ordered terms from dynamically discontinuous, requiring a most extreme change in consumer behavior to discontinuous to dynamically continuous to continuous which causes little disruption in behavior (Atkin & LaRose, 1994; Robertson, 1971). Television-related innovations, including cable and VCRs, are conceived as being relatively continuous while interactive two-way information services are more discontinuous (Krugman, 1985).

Locating the Internet in terms of its perceived radicalness presents an interesting

twist. With the attributes discussed to this point, higher access capacity is proposed to elicit perceptions that the Internet possesses more of every one: more complexity, more compatibility, more interactivity. But in this case, higher speeds are likely to evoke perceptions that it is less radical, more "incremental" or "continuous." After all, at higher speeds, the Internet is more responsive and it acts more like other media appliances; it can be incorporated into existing media use routines.

On the other hand, while it may be more incremental in its use, it could be thought of as more radical to adopt. The high speed access that is the focus of this study is provided by the local cable company. People associate television news and entertainment with cable; they associate data delivery services with telephone companies. The persistence of this association is not the only reason adopters would consider Internet access from their cable company to be more radical.

The results of a recent large sample survey on brand image of cable and telephone providers implies reputation problems for a cable company wishing to sell Internet access. In the survey, people were more likely to agree that their telephone company is innovative and their cable company is not (Forkan, 1996). Similarly, they believed their telephone company was more dependable, easier to deal with, more trustworthy and was better in offering a good value than their cable company was. These are national data and there is evidence that the local TCI franchise would score better in such a survey (Meridian Township, 1996). Still and all, it seems likely that the decision to adopt high speed access from a cable company would be perceived as more radical than incremental.

Innovation Clusters. An innovation cluster is a set of distinguishable technologies that are perceived as being interrelated (Rogers, 1995). It is possible that the adoption of one idea or technology may trigger the adoption of others that are related in some way. It can be considered an aspect of compatibility in that the prior adoption of one trigger innovation may provide the prior experience needed to perceive subsequent innovations as compatible.

With regard to communication technologies, Rogers (1986) surmised that innovation clusters could play a particularly influential role in adoption and use. He recounted the phenomenon of a "hot market" or group of individuals who had adopted home computers, VCRs, videodisc, and sophisticated stereo equipment but had not adopted similarly high-end goods and services such as health clubs, cash management accounts or wood burning stoves (apparently a luxury good in Japan, where the study was conducted). The curious finding that the adopted cluster of innovations shared a media technology element led him to call for further research.

A few studies have taken on the challenge of further explicating the role of innovation clusters. LaRose and Atkin (1992) found some support for the proposition that innovation clusters influence adoption of a functionally similar communication technology. In that case, audiotext services were used significantly more by users of ATMs, videotext and 800 numbers yet use was unrelated to use of other media such as cable television, computer modems, pagers or fax machines. The related innovations all shared the quality of providing information on demand. The conclusion was that innovation clusters must be narrowly tailored and functionally similar to the innovation in

question to be good predictors.

The audiotext-innovation cluster study did not compare the power of clusters with other innovation attributes to see which were better predictors of adoption. In a study of organizational adoption of the Internet, stronger support for the innovation cluster/compatibility dimension was found (LaRose & Hoag, 1996). In that study, traditional innovation attributes including relative advantage, compatibility and complexity, adopter characteristics and innovation clusters were set up to compete for best discriminator between adopter and non-adopter organizations. Indeed the presence of innovation clusters similar to perceived attributes of the Internet (computer and telecommunication equipment and services) were the most powerful discriminators, more significant than firm size which is usually positive and very significant in the amount of variance it explains when it comes to sophisticated technology adoption. In that study, perceptions of complexity and relative advantage were not significant while compatibility perceptions were.

Synchronous and Asynchronous Communication. As technology clusters are conceptualized as another way to measure compatibility, the "new" innovation attribute of interactiveness might be measured similarly. Innovation attributes are traditionally measured with adopter perceptions while technology clusters are based on a subject's objective report of the technologies she has adopted. Interactiveness is measured by perceptions of how interactive the Internet is; responsiveness and the ability to facilitate interpersonal communication are considered two of the key facets of this construct. Objectively speaking, some "parts" of the Internet are more responsive and interpersonal,

and therefore more interactive, than others. For example, IRCs, MUDs, Internet telephony and videoconferencing are synchronous forms of communication on the Internet. If the Internet is more interactive at higher speeds, then synchronous communication, should be seen more frequently among high speed access users.

Another facet of interactivity according to Durlak's typology (1987) is a technology's ability to "maintain the illusion," that is how free the user is from technology distractions and how well "flow" (Csikszentmihalyi, 1990) is achieved. Distinguished from real time synchronous communication with other people, here we target asynchronous communication on the Internet: the Web, email, the Usenet and FTP applications all permit asynchronous communication. At slower speeds, email and text-based newsgroups are likely to be just as interactive as they would be at higher speeds. However, the Web and FTP applications often involve the transfer of very large amounts of data. At higher modem speeds, when more bandwidth is available, these "parts" of the Internet would be more interactive. Therefore, it is expected that high speed modem users would be more likely to use the Web and FTP applications and would use them more intensely.

Adopter and Non-adopter Characteristics

As was briefly discussed, there are certainly other factors that influence adoption and use of new media technologies. The preponderance of empirical evidence, for example, indicates that the characteristics of adopters and non-adopters of new media like the Internet play a vital role. Prior research implies that socio-economic status (+),

education (+), age (+) and sex (male) are related. To provide context for the results of the innovation attribute inquiry, these characteristics will be measured.

For the reasoning developed thus far, a set of proposed relationships can be stated in the following testable hypotheses:

H1: Perceived Internet attributes are significantly related to choice of Internet access capacity.

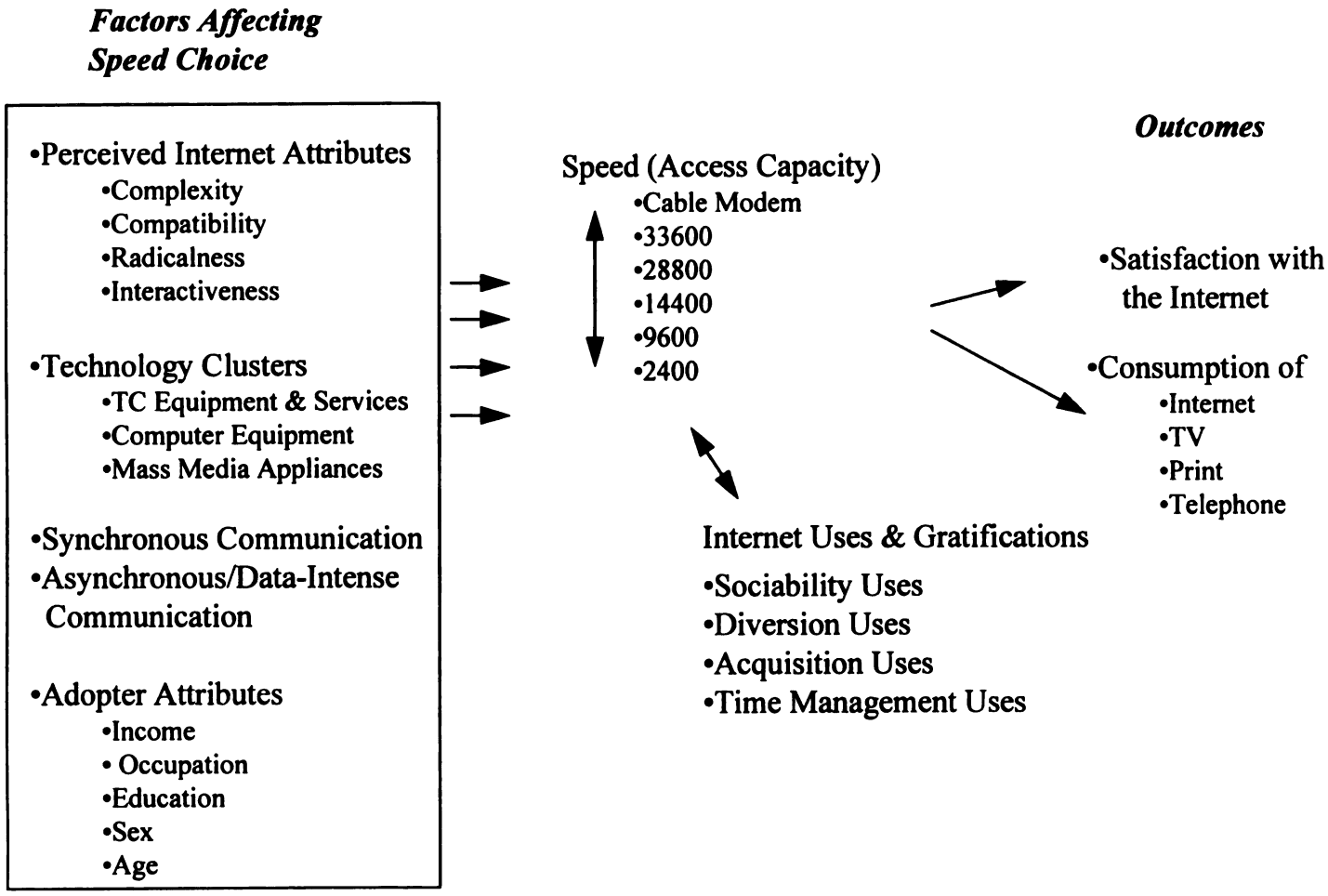
H2: Perceived levels of compatibility, interactiveness and radicalness in adoption are positively linked to choice of capacity; complexity and radicalness in use are negatively associated.

H3: The prior adoption of related clusters of telecommunication equipment and services, computer equipment and mass media appliances are positively associated with access capacity choice. Likewise, use of synchronous forms of communication and asynchronous forms involving large data files are positively related to access capacity choice.

H4: Adopters of higher speeds will be more likely to be male, older, better educated and have higher incomes.

These first four relationships are visually depicted in Figure 1.

Figure 1
Factors Related to Internet Access Capacity



Media Uses and Gratifications

Too few diffusion studies go on to consider the consequences of innovation adoption. In reflecting on the accumulated body of diffusion research, Rogers (pp. 409-412, 1995) continued to lament the lack of attention given to the study of the consequences of an innovation's adoption. In the case of Internet access capacity, there is as much interest in knowing the factors influencing adoption as there is in understanding the impact of adoption. There is some evidence that the Internet is altering media use patterns (Simmons, 1996). The line of research which focuses on what people do with the media is the uses and gratifications perspective.

Uses and gratifications research asks "not what media do to people, but asks what people do with media. (Blumler & Katz, 1974)." Implied here is the central tenet of the theory, that audiences are active -- they select, they are intentional and involved when it comes to media choices. The paradigm's objective has traditionally been to explain how people use media to gratify their needs, to understand motives for media behavior, and to identify functions or consequences that follow from needs, motives and behavior (Rubin, 1994). It focuses on:

> (1) the social and psychological origins of (2) needs, which generate (3) expectations of (4) the mass media or other sources, which lead to (5) differential patterns of media exposure (or engagement in other activities) resulting in (6) need gratification and (7) other consequences, perhaps mostly unintended ones (Katz, Blumler & Gurevitch, 1974, p. 20).

One thread of uses and gratifications research has produced typologies of uses for a variety of media and content types to learn whether they change with the medium. Another investigates the empirical association between gratifications sought and medium

or content choice to see if there is competition among media sources. Both of these strains are of particular interest because they focus on the issues in the second and third research questions presently under study, namely how bandwidth may affect Internet use and in turn, how that affects use of other media.

Choice of medium/technology and content are conceptualized as separate considerations that users think about when making a media choice (Palmgreen, Wenner & Rosengren, 1985). People may have affinity with particular forms of content and with specific media technologies. For example, if a person wants to satisfy a need for diversion by checking sports scores, she may be more inclined to use a newspaper than a Web site which has the same content. Similarly, a person may engage in a kind of communication task but choose different media technologies to do it as in the case of someone choosing to send an email rather than make a phone call. Much of the content on the Internet or the communication tasks it permits are duplicated in other mass media and communication technologies. For that reason, this project focuses on the uses and gratifications of the medium.

Typologies

The view that media are best defined by knowing how they are used has guided a host of typologies studies. The goal is to explain media consumption patterns. The basic categorization of media uses is surveillance, diversion, personal relationships, and personal identity (cited in Rubin, 1994). Surveillance uses generally refer to seeking news and information. Diversion uses are generally for entertainment to escape or for

emotional release. By personal relationships, what is meant is that media and content can satisfy companionship and social utility needs. Personal identity refers to value reenforcement, personal reference and reality exploration. This variety of typology was generally applied to television but others have attempted to refine and expand the list for new media and telecommunications technologies.

Uses and gratifications research has generally focused on television, where the type of communication is one-to-many. Internet communications can be grouped into four categories (Morris & Ogan, 1996): (1) one-to-one asynchronous communication (e.g. email), (2) many-to-many asynchronous communication (e.g., Usenet, listservs), (3) synchronous communication as either one-to-one or one-to-many and organized around a theme. Examples are Internet relay chats (IRC) and multi-user dungeons (MUDs). Finally, (4) this kind of communication includes the Web and FTP sites:

> "asynchronous communication characterized by the receiver's need to seek out the site in order to access information, which may involve many-to-one, one-to-one, or one-to-many source-receiver relationships (pp. 42-43)."

With such flexibility and the ability to engage in or attend to so many kinds of communication, there is an obvious question, whether the "classic" typologies of gratifications apply to the Internet. Moreover, do uses associated with other media migrate to the Internet? And more to the point, if speed puts the medium on a perceived equal footing with other media as discussed in the last section, are the uses and gratifications of the Internet even more different? Are the conventional uses of other media in competition even more?

Both through theory development and empirical investigation, researchers have attempted to bring new media and uses and gratifications together. An early study of cable television use revealed two gratifications, (variety, control over viewing) not previously elicited (Shaver, 1983 discussed in Palmgreen, 1984). Findings such as these led Palmgreen (1984) to note a major challenge that "confronts uses and gratifications researchers is the adaptation and molding of the current conceptual framework to deal with new communication technologies (p. 49)."

Rising to the challenge, Williams, Phillips and Lum. (1985) worked through the conceptual elements of new media that would extend existing gratifications typologies. "New media" in the case of this conceptual analysis included VCRs, cable television, new telephone services, home computers, videotext and audiotext services and distribution technologies such as digital switching, satellite transmission and broadband telecommunication networks (p. 241). They explicated qualities of these new media that should be considered in gratifications research: expanded choice, interactivity and personalness. By this scheme, the Internet can be classified as "new media."

Some empirical investigations have sought to test whether existing uses and gratifications typologies hold for new and re-invented communication technologies. For example, O'Keefe and Sulanowski (1995) developed a list of 80 (later reduced to 23 for manageability) sought media and interpersonal gratifications in their study of the telephone as a mass and interpersonal medium. The gratifications were categorized by the researchers into existing categories of surveillance, information gain, arousal, escape/relaxation, affection, inclusion, personal/social control, purchasing and

scheduling. Through statistical factor analysis, they subsequently discovered that all the tested gratifications attached themselves to one of four broad categories: sociability, entertainment, acquisition and time management.

These four factors, in turn, can be said to apply generally to the Internet. For instance, sociability gratifications can be satisfied by email and newsgroups and those categorized as entertainment by amusing Web sites. Anecdotally, it is known that thousands of workers now telecommute from home via the Internet. Even gratifications associated with work -- purchasing and selling, conducting meetings, even assembly line-style production (when the good, such as a report or graphic artwork, can be transmitted electronically) could fit into these categories.

Using a similar method to O'Keefe and Sulanowski, Rubin and Bantz (1989) elicited eight factors to VCR utility. They were, in order of their ability to explain variance: 1) library storage, the desire to retain copies of programs and to use the VCR for alternative scheduling; 2) music videos, entertaining and economical VCR use for music videos; 3) exercise tapes, using such tapes to exercise at home for convenience; 4) movie rental, the convenience and choice associated with this activity; 5) child viewing, the ability to have content available for children to watch; 6) time-shifting, the convenience and choice in viewing and ability to zap commercials; 7) socializing, renting movies to entertain guests and 8) critical viewing, the analytic viewing of a tape. Among their conclusions, they determined that VCR use complemented, rather than competed with, other forms of communication.

The names of these factors do not transfer easily from VCR utility to Internet utility. However, the Rubin and Bantz results confirm the notions that new media provide uses and gratifications not captured in studies of conventional media and that established uses of media are not driven away by competition from new media.

The Internet possesses a unique combination of several previously discussed qualities that is likely to create an even greater number of possible gratifications. In an examination of this possibility, Do (1995) found an array of four factors representing Internet utility: excitement, information seeking, interpersonal utility and communication. Excitement motives were found to be the strongest explanation for Internet use by a college student sample.

The typology of uses of the Internet in the broader population could look a little different. A recent dissertation on electronic communities and mature consumers measured six general categories of Internet uses and gratifications (Dixon, 1993). They were knowledge, communication utility, filling time, escape from boredom, diversion and advice. This typology, however, is not likely to replicate itself in a general population; the researcher's intent was to study a unique population and was not to provide generalizable results.

Another recent empirical work developed reliable use factors from a random survey sample from a more general population, an ethnically diverse Midwest metropolitan area (Lin, 1996). In this study, three use categories emerged: interaction (fun, excitement, entertainment, chat line, exchange ideas, make friends), surveillance (local news, national news, world news) and escape (solve problems, forget problems,

tune out problems). While this study provides some needed empirical data on Internet uses and gratifications, typologies might be improved by broadening and extending the list of possible uses.

In October, 1995, a national random survey was carried out on a final sample of 2,500 U.S. households with the specific goal of learning people's motivations for using the Internet (Katz & Aspden, 1996). While not specifically designed as a uses and gratifications study, the findings do inform this research tradition. The study found that important reasons for using the Internet were to gain information, to communicate with others, curiosity, job-required, for fun, to get software, for business contacts and for educational purposes. The Lin and Katz and Aspden Internet inquiries taken together provide a sound foundation on which to build Internet uses and gratifications typologies research since they include a broad array of possible Internet uses.

But there are other possible uses and gratifications of the Internet at high speeds. By consulting press accounts, a prominent Internet users' guide (Wiggins, 1994), considering anecdotes, and using prior research, a long list of uses could be devised that would fit into the following typology: sociability (interpersonal communication, personal relationships), diversion (entertainment), acquisition (information seeking, shopping, surveillance), and time management (saving time, improving efficiency, reducing travel, leaving and receiving messages asynchronously).

Established media and technologies, from the telephone to television, provide means to satisfy all the above gratifications. On the other hand, the Internet can handle these uses but not all equally well, depending on access capacity. For instance, email, a

low-byte, asynchronous communication format, probably is perceived to gratify a need for sociability as well at any speed. However, participating in real-time communication, such as in an IRC or MUD (also to satisfy a sociability need) may not be perceived as just as satisfying at slow speeds. Social interaction is smoother when response times are quick. Most sociability uses are some form of interpersonal communication. A similar line of reasoning applied to diversionary, social and acquisition uses. The proposition advanced here is that sociability, time management, diversion and acquisition uses that involve synchronous communication are perceived to be more satisfying at higher access speeds. Expressed in terms of a testable hypothesis:

> H5: Uses of the Internet that involve synchronous communication are better satisfied at higher access speeds and will be more common than at slower speeds.

Another kind of Internet communication that is affected by speed is the request or transmission of large files. Use of the Web, FTP sites, multimedia Usenet and even gopher sites involve such large transmissions. As previously discussed, some such applications are just not feasible at slower speeds; in other cases, they are just too frustrating to use. One thinks immediately of diversion uses as being large-byte uses; entertaining Web sites and newsgroups with graphic, audio and video files are especially huge. But acquisition and time management uses could also involve large files. The proposition is that high-byte applications are more satisfying at higher speeds.

H6: Uses of the Internet that require sending or receiving large amounts of data are better satisfied at higher access speeds and will be more common than at lower speeds.

If some kinds of Internet uses are more satisfying at higher speeds, it would follow that users with such access may use the Internet to accomplish more tasks and to satisfy more needs. On the other hand, merely measuring time spent on the Internet conflicts with the premise assumed here: If you have high access speed, you can satisfy your needs more quickly. However, another way to put it would be, if the Internet "works better" at higher speeds, you would be more inclined to increase the variety of needs you satisfy with the Internet. You could entertain yourself on the Web, manage your time better by attending a meeting via a voice Internet application, gather information for research, download some software, buy a book, email your baby's photo to your family listserv, call a friend with a voice Internet application -- all common instances of the uses/gratifications typology developed earlier. But if they work better at higher speeds, you will use the Internet to satisfy more of them.

H7: Higher access speeds are associated with a greater variety of and more intense sociability, diversion, acquisition and time management uses.

Finally, if the Internet is used to satisfy more uses at higher speeds, does it replace other media as the preferred means to satisfy some need or does it complement them? No

one is predicting that the Internet will totally eliminate the use of other media but there could be some displacement. Established media can satisfy most any of the above needs. Sociability, time management and acquisition needs can be satisfied by the telephone. Television, home video and radio can satisfy acquisition and diversion needs. Newspapers and magazines may satisfy all those needs — sociability (getting things to talk about), acquisition of news and information, diversion and time management. Returning to the discussion above, speed as a variable would make the Internet better able to replace other media in cases where communication is synchronous and where the use requires transmission of lots of data. For the former, those uses are associated with the telephone. For the latter, those uses are associated with diversionary television and home video use.

If high speed Internet use improves the medium's ability to satisfy these needs, it could lead to either greater use of all media because it complements other media. On the other hand, it could become a substitute for other media. Already, time spent with media is high, several hours per day. There is additional evidence that many groups of adults feel increased pressure from work and experience a decrease in discretionary time. These constraints on time make it unlikely that generally, people will be able to increase their time budgets to spend more time with the media. Based on this reasoning and the discussion of synchronous communications and high-byte applications, it is proposed then that higher access speed would negatively affect the amount of television, home video and telephone use. Predicting this substitution, it is also proposed that total time spent with mass media and communication technologies does not expand with greater

Internet access capacity.

H8: Higher access speeds are associated with lower use of telephone, television and home video.

H9: Higher access speeds are not associated with expanded overall time spent with media.

A Micro-economic Model of Consumer Choice

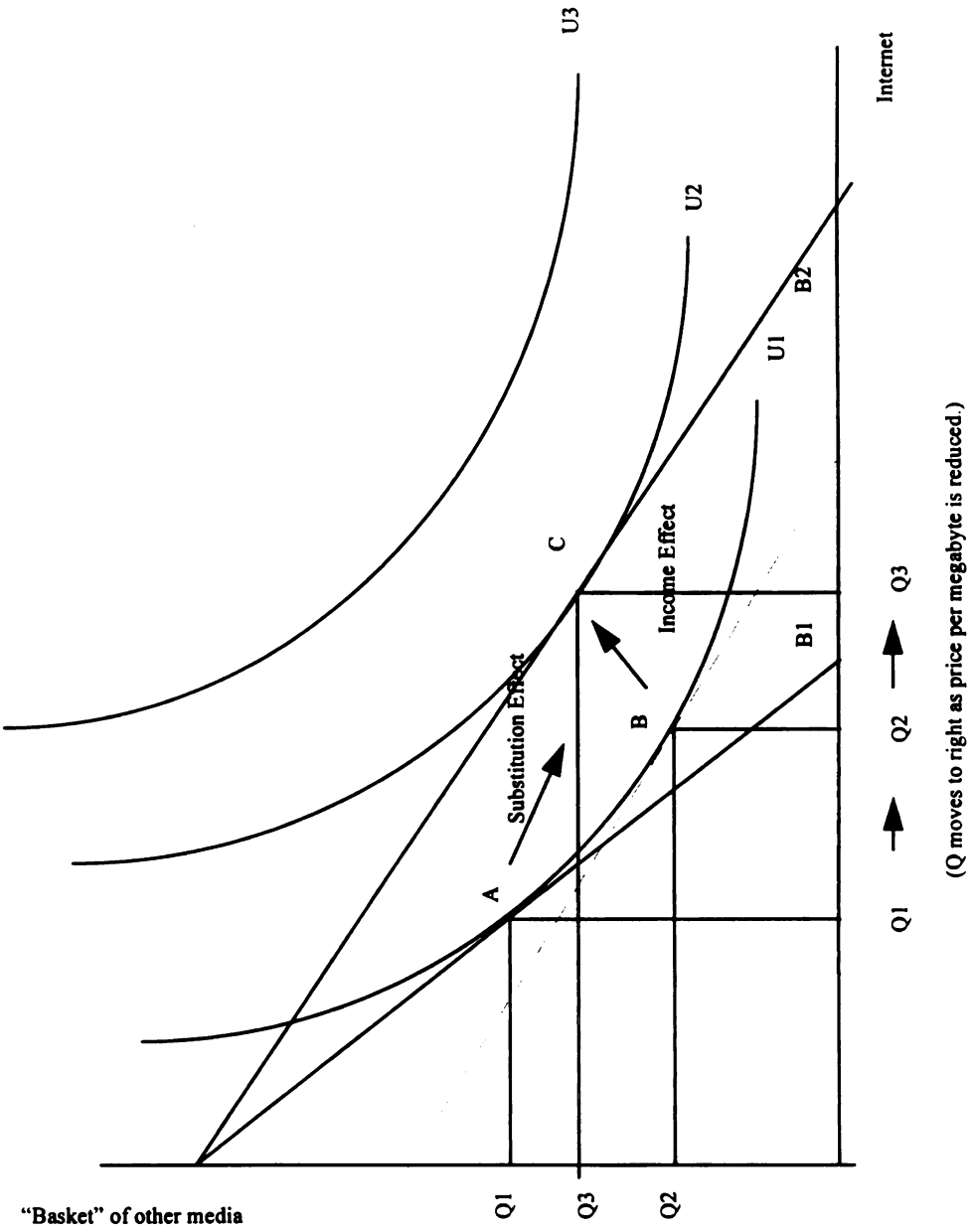
Until this point, the explanations developed for Internet access speed choice and subsequent effects on the use of other media have derived their focus from the mass media and communication technology literatures. The diffusion, interactivity and gratifications approaches all consider the technology's efficacy toward achieving some consumer/user/viewer goal. A pre-supposition to these perspectives is that consumers have to make media choices in the first place because of cost constraints.

Consumers make media decisions to maximize overall utility given a budget and a set of media choices. Consumers will assess a medium based on its cost and perceived value. Each medium may be perceived as having better or worse value than another. If media are substitutes for one another, a consumer may be willing to trade off some of one for more of another. He will spend his "budget" on the best combination based on the relative prices of the media.

This notion of indifference is represented in Figure 2. On the vertical axis is the "basket" of all goods and services bought by the consumer including all media except the Internet. On the horizontal axis is the quantity of Intenet services expressed as megabits of information consumed, as an additional choice. The consumer's budget, B1, is a line which represents all the combinations of the "basket" and the Internet the consumer can afford. At B1, Internet access is priced on a per megabit basis for a user of a conventional modem. The consumer's utility curve, U1, represents his indifference to combinations of the "basket" and the Internet to satisfy his media needs. At the point where B1 and U1 are tangent, the consumer's utility is maximized subject to his budget.

When high speed access becomes available, the picture changes. At the speeds cable modems allow, the price of Internet access per megabit goes down considerably, increasing the consumer's real income. The new budget line is B2. With this expanded purchasing power, he will seek to maximize value along a new, higher utility curve. But the point where this curve is tangent to the new budget constraint depends on the perceived substitutability of the Internet to satisfy needs sought from other media as well. Micro-economic theory would suggest that Internet consumption would increase, to Q3 on the horizontal axis, the new equilibrium given the changed relative prices. This total effect can analytically be divided into a substitution effect (movement from Q1 to Q1, measuring the impact of changed relative prices assuming the consumer maintains his original level of utility on indifference curve U1) and an income effect (Q2 to Q3, measuring the impact of the reduced price for Internet services on the real income of the consumer). The strength of these effects will depend on the degree of substitutability

Figure 2
Micro-economic Theory Explanation of Media Choice



between the existing basket of goods and services and the Internet.

A special case of this indifference scenario has been described as the principle of relative constancy. The idea has its origins in the observations of Charles E. Scripps of Scripps-Howard Newspapers. In 1972, he advanced the generalization that despite the increasing variety of media outlets available to audience members, the total consumption of media, in terms of consumer spending, remained relatively constant and was influenced primarily by general economic conditions (p. 5, McCombs, 1972). In reasoning why this occurs, one observes that the consumption pattern is similar for necessities like food and housing.

The proposition has been tested with mixed results through the years. When decades of spending history are examined, the principle tends to hold. Overall spending varies with the condition of the economy and the spending attracted to a rising medium comes from spending that would otherwise have gone to another medium, not by attracting new dollars from non-media expenditures. For example, McCombs and Eyal (1980) found that the rise of audio/visual media in the 1960s and 1970s corresponded very neatly with a decline in spending on print. Generally, this fits the situation where the budget for media is constrained but consumers substitute one medium for because their utility curve has moved, the substitution effect at work.

However, exceptions have begun to manifest themselves in recent years. Between 1979 and 1988, when consumers were adopting VCRs and cable penetration was growing, new money was attracted to expand the mass media "pie" (Wood & O'Hare, 1991). However, in attempts to determine whether this and other similar results were just

temporary blips, Son and McCombs (1993) focused on media spending including VCRs, print, cable TV and audio media. The results partially support the principle, overall spending levels were constant under one measure. Framed as a time trend model, however, the principle was not supported. Perhaps the relative cost of one medium or another (expressed differently, its value changed) and the budget line moved outward allowing a higher utility curve to be satisfied -- the income effect.

Now the Internet enters the media marketplace. Spending on Internet access can be costly, very costly for high speed access in actual terms but in terms of the "opportunity cost" of time, it is drastically cheaper. Cable modem subscribers pay 70 dollars per month for unlimited Internet access at a maximum throughput of ten mbps. By comparison, an America On-line (AOL) subscriber with a 28.8 kbps modem may pay 20 dollars for a month of unlimited access. Consider two such subscribers who use the Web once a month to download a ten megabit file. Each would obtain the same quantity of information but the AOL user would pay substantially less. However, the AOL user would spend about six minutes (under the best conditions) receiving the file while the cable modem adopter could (theoretically) receive it in one second. If the opportunity cost of those six minutes is high, that is, if the cost of foregoing another six minute activity is high, then the cable modem adopter may be getting the better deal. If this is the case, the budget line moves to a point on the right on the horizontal axis meaning consumers have more income. But how do they allocate it? If the Internet at high speeds is a very good substitute for the basket of other media, the utility curve will look like U2 and they will consume at Q3 levels. If it is not, it looks more like U1 and consumers will

buy the Q2 quantities.

The argument arises, however, that people consume media based on their actual budget constraints, not on the kind of "opportunity cost" or "time is money" consideration of megabits per second. The counter argument is that those consumers who may seem to think in terms of actual dollars, may just really perceive very low value for the Internet and consequently low substitutability for other media. Theory here then would indicate that people who perceive high substitutability purchase high speed Internet access and spend more on media in actual terms.

H10: Higher access speed adoption is associated with greater spending overall on media and communication technologies.

Summary of Propositions

Figure 1 provides a description of the relationships described in this chapter and articulated in ten hypotheses. In sum, to respond to the three research questions, it is hypothesized that:

1) Perceptions about the Internet are different depending on access speed. Namely that it is more compatible, interactive and radical to adopt and that it is less complex and radical to use. Adoption of high speed access is influenced by these perceived attribute, prior experience with similar technologies (technology clusters), uses sought from the Internet and adopter characteristics.

2) At higher access speeds, Internet use is different. It is used more frequently for

synchronous communication and applications involving large files. Further, it is used to satisfy a greater variety of media uses -- needs for sociability, diversion, acquisition and time management.

3) Use of the Internet at higher speeds does affect the use of other media. Consumption of TV, home video and telephone goes down and is replaced by Internet use leading to no net increase in overall media use. However, overall spending on media does increase with Internet access speed.

Chapter 3

METHODS

Introduction

In a model with many concepts and predicted relationships, the research design and methods for testing would necessarily be complex. In general terms, the overall testing strategy was to 1) employ a research design that would provide opportunity for comparison (a "control" sample of dial-up access Internet users and a sample of cable modem adopters) and a survey method rather than experiment to taken advantage of a real market situation; 2) use both qualitative and quantitative analysis techniques, relying more heavily on the numbers to tell the story and 3) use a variety of univariate and multivariate techniques to extract the greatest amount of information from the data.

This chapter first describes the overall research design from operationalization of concepts and survey development and execution to sampling procedures and results. The second part describes how each hypothesis will be tested including some background on quantitative analysis procedures.

Research Design

The research design was conceived to answer the original research questions posed in the first chapter. This is done by gathering empirical data to test the hypotheses

in the model presented in the previous chapter. The plan presented here outlines the survey research methods: data collection and the sampling of the target population.

The Survey Instruments

World Wide Web Survey of Cable Modem Users. For purposes of both survey development and qualitative data collection, a kind of an "electronic focus group" was conducted of cable modem users in the TCI service area of East Lansing and Meridian Township, Michigan. The electronic focus group concept was adapted from more conventional notions of focus group research (Morgan, 1988). There were five open-ended questions (see Appendix for printout of Web site). The objective was to learn 1) why users adopted cable modem Internet access; 2) how the Internet was different with a cable modem and 3) specific examples of how they used the Internet before and after they got their cable modems. Any insights from the before-and-after questions would provide the closest thing to causal evidence, as the general survey method only permitted comparisons across cases, not within cases before and after the subject adopted a cable modem.

A letter was mailed to the entire population of household cable modem subscribers, 217 homes (see Appendix for letter). The letter explained the purpose of the investigation and asked subjects to visit a Web site within a two week period in early November, 1996. They were to respond to five open-ended questions. Thirty-six cable modem users, or 17 percent, responded with usable answers. Thirty-two went to the Web site, two mailed their paper responses, one telephoned and another faxed. A handful of

additional responses were received but were unusable because of technical glitches in the Web server or because they were from people apparently not in targeted population.

The findings of this pilot study informed the survey instrument used in the large sample telephone survey. Based on respondent input, the list of uses and gratifications obtained from the Internet was expanded. The results section of this dissertation will present additional qualitative analysis of the cable modem users' comments.

Telephone Survey. The telephone survey was comprised of 122 items. The complete survey instrument is in the Appendix. The items were devised to capture measures for most of the variables in the model, with some information from the TCI database for measures of the rest. Figure 1 identifies the general categories of variables. The Adopter Attributes were measured by asking directly the respondents' age, income, occupation and education (items 112-114, 116). Gender was determined by the interviewer. Survey questions were designed to induce as much accuracy as possible; the published advice of survey experts (Fowler, 1995; Sudman & Bradburn, 1982) was used to construct properly worded questions that reduced social desirability response-bias, properly measure subjective states (perceptions) and so on.

Speed was determined by asking respondents their modem speed (item 58). Cable modem subscribers were identified in advance and the interviewer, therefore, did not ask this question. Not surprisingly, a few people (21, 8%) did not know their modem speed, but it was known that these respondents did not have cable modems and thus had dial-up telephone modems.

Satisfaction with the Internet was gauged using a variety of measures. One

overall satisfaction item (item 111) was posed. In addition, there were several items measuring satisfaction with a variety of uses (items 99-107), satisfaction with speed, reliability, cost and service (items 107-110) and finally, repeated measures for each of the parts of the Internet the subject had stated he or she used, electronic mail, WWW, Usenet, IRCs and MUDS, and FTP (items 94-98).

Consumption of the Internet, television, print and telephone were measured by asking questions about the amount of time spent with each medium and the quantity consumed (items 59-67). For example, in question 59, subjects were asked how many videos they had rented in the previous week and in another, item 64, how many hours they had spent watching TV the previous day. Data on spending was also gathered (items 16, 59, 62, 115 and TCI database).

Where possible, previously tested scale items were used for the Internet Attributes, Technology Clusters and Internet Uses categories. Unfortunately, since few of these concepts have been studied in relation to the Internet, most items had to be developed from scratch. For constructs based on respondent opinions and evaluations, at least five items were designed from which valid and reliable scales could be created. The computer-assisted telephone interview (CATI) system randomized the ordering of these questions to avoid response bias due to fatigue, annoyance and the like. Referring to Figure 1 and the Internet Attribute category, there are four attributes, complexity, compatibility, radicalness and interactiveness. Five items each were devoted to tapping complexity (items 69-73) and compatibility (74-78), six to radicalness (88-93) and nine to interactiveness (79-87).

The survey asked for responses to 33 items intended to measure factors for each of the modeled Internet Uses, sociability (items 19-22,26), diversion (25,27-31), acquisition (32-38,47-49) and time management (23-24, 39-46) as well as for synchronous vs. asynchronous communication (3-14).

To obtain measures of the latent variables called Technology Clusters, respondents identified the mass media, telecommunications and computer equipment and services they had adopted from a list of 23 (see items 55 through 57). To these, adoption of three other "technologies" (use of Pay-per-View in the previous 6 months, The Sega Channel and DMX digital audio) were counted from TCI records.

Scale Development

Theoretical reasoning was used to develop three categories of variables, the innovation attributes, the underlying commonalities that cause technologies to cluster and the categories of Internet use. These sets of constructs are not directly observable as variables since they are intangible; they cannot be directly measured. For this reason, survey items were developed to measure levels of these theoretical constructs by measuring their effects. By asking respondents to reveal the more tangible effects of these constructs, scales can be developed. Bollen (1989, pp. 64-65) calls scale items "effect indicators" which when taken together, provide a proxy measure for the latent or underlying variable that "caused" the survey responses. Latent or underlying variables are such things here as respondent perceptions about the complexity of the Internet (a diffusion attribute), or underlying commonalities among a set of communication

technologies (technology clusters) or in the example of an "Internet Use," the root cause for its use in a particular way. From these items, reliable scales representing the concepts are then created.

For these three kinds of latent variables and the asynchronous/synchronous Internet Use category, the same general scale development approach was used. To measure one single latent variable, the common approach is to ask subjects to give their perceptions on a Likert-type scale for several items that all measure that same underlying attribute. The survey items for the scales were developed in the following way: First, the literature was searched to locate existing valid and reliable scales or individual scale items. Secondly, objective resources, printed news reports and the like, were used as the foundation for extending the list of scale items. Third, open-ended questions on the cable modem user Web site survey were used to elicit ideas for additional items. Fourth, the lists were pretested on twelve Internet users who provided additional feedback. The final decision on what items were included in the final version of the survey was based a desire to balance three things: known reliability of established scales (when available), the valuable opinions of experienced Internet users and feasible survey length. After data collection, survey results were analyzed with FA. As long as FA results dovetailed with *a priori* notions of what items should hang together theoretically, the items were then tested for reliability and combined into scales, one for each variable in the model. The balance of this section describes the specifics for each scale's development.

Internet Attributes. Perceived attributes of innovations have been measured countless times over the history of diffusion of innovation research. Since two of the

attributes, complexity and compatibility, are very common, there was a hope that existing, valid and reliable scales might exist. Unfortunately, because Internet research is new, there were none that were entirely appropriate. Some items were adopted from a 1995 Internet survey (Lin, 1996) but most were generated by the author based on ideas from colleagues and from printed news stories and refined by feedback from pre-test subjects.

Innovation Clusters. There has been some previous work which measured the kinds of communication technologies adopted by an Internet-using organization (LaRose & Hoag, 1996) or individual Internet user (Lin, 1996). The goal of the present study is to find technology clusters that would predict choice of Internet speed in households; this objective is somewhat different from any previous research involving technology clusters. Therefore a long list of innovations that would bear on the unique dependent variable was created: innovations that permit interactivity and synchronous versus asynchronous communication, those which are cutting edge and others in a mature-category product, technologies that stimulate visual versus aural senses and finally, mass media versus interpersonal media innovations.

The list included video and mass media appliances and services (big screen TV, camcorder, CD player, DAT machine, digital camera, Pay-Per-View service, The Sega Channel, DMX digital music service), personal communication tools (pager, fax machine, cordless phone, cellular phone, answering machine), telephone services (call waiting, caller ID, call forwarding, ISDN, switched 56k service, a second phone line, an 800 number), and computer equipment (CD-ROM drive, color printer, scanner, audio

speakers, Zip or Jaz drive, Pentium processor).

One logical approach to creating scales of interrelated technologies is to run the survey responses through factor analysis and test scale reliability (Cronbach's alpha). From this, we can see whether those conceptualized clusters developed in advance actually do hang together. The particular problem here is that the data is dichotomous, either the subject has the innovation or he doesn't. Although this approach was used successfully by LaRose & Hoag (1996), it may be difficult to find solid factors when the correlations on which they are based would be, even where real relationships exist, weak because the values will vary only between "0" and "1."

Internet Uses. Because the research questions here are driven by the well-established uses and gratifications tradition, there are many previously tested scales of uses of the media. For the present study, some were adapted from a variety of U&G media gratifications studies: media gratifications in general (Greenberg & Hnilo, 1996), a television news study by Palmgreen, Wenner & Rayburn, (1980) in (Rubin, Palmgreen & Sypher, 1994), a telephone study (O'Keefe, 1995), from Lin's (Lin, 1996) recent personal computer and Internet adoption study and still others from a survey used by Katz and Aspden (1996). Additional items were generated and pre-tested to round out the conceptualized uses categories that would be unique to the Internet and not a traditional part of U&G research. For example, shopping on the Internet and downloading software, files and games are conceptualized as facets of the "Acquisition" category. "Meeting new people" would be in the "Sociability" category. "Playing games with others" would be a "Diversion" use.

Survey Execution and Management

The survey was conducted by four paid interviewers and two volunteers in a computer-assisted telephone interview (CATI) lab over three weeks in November, 1996. Interviewers screened respondents to make sure they were over eighteen years of age. A minimum of four and a maximum of seven attempts was made to contact each lead in the sample. Surprisingly, every single respondent who began the survey completed it, even though the survey required fifteen minutes on average to administer; the recorded duration of some interviews ran to 40 minutes. To increase response rates, subjects were offered a copy of the final report and a handful of respondents asked for this.

Special measures were taken to ensure quality data collection and high response rates. Some published advice on survey supervision was consulted as well (Lavrakas, 1993). First, the interviewers were recruited from the local cable company and had extensive telephone work experience. Secondly, all interviewers received extensive training -- on the goals of the research, on the CATI system and on the Internet. Next, all workers were strictly supervised at all times to provide support and to eliminate any opportunities for "inventing" survey respondents; a sample of interviewees were re-contacted to confirm their participation. Finally, and possibly most importantly, the compensation scheme was lucrative and designed to motivate interviewers[2].

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[2]Interviewers were paid for training and a base hourly rate of $6. In addition, there were three bonuses that permitted a successful interviewer to boost this hourly rate to $21 per hour. The first bonus was for working through the end of the project; this ensured a stable and experienced staff of interviewers. A second bonus was paid for completing a minimum number of surveys which ensured that the requisite "n" would be attained. These first two bonuses also meant that the data collection would not drag out so long that the sample would get "stale" and become unusable. The third was for meeting a high "closing" rate which ensured the desired high response rate. This management scheme was very successful. Interviewers

Sampling and Sample Characteristics

The research design calls for the ability to compare cable modem Internet at-home users and those householders who have a dial-up connection and slower telephone modem. Since all cable modem users are by definition cable television subscribers, it was appropriate to control for the effects of cable subscription by drawing the sample of dial-up access users from among cable households in the same cable service area, East Lansing and Meridian Township, Michigan.

For the telephone survey, two samples were drawn separately to obtain a pool of respondents roughly equally split between dial-up modem at-home Internet users and cable modem at-home Internet users. A sample of 171 cable modem subscribers was randomly selected from a population of 219. A random sample of 593 cable television subscribers from a population of 21,505 (those subscribers who did not have cable modems), was drawn. Since it was not known *a priori* who among non-cable modem subscribers had Internet access, a larger sample was required to allow for a high number of non-Internet homes. Post-survey analysis revealed that 26.6 percent (156) of non-cable modem households had Internet access, a penetration rate that compares to Nielsen's CommerceNet findings (1997) that 23 percent of people in the U.S. and Canada have used the Internet in the last month. However, Nielsen measured individual use which is not conditional on having access from home; users could have access at work or school. Therefore, Internet penetration in the East Lansing/Meridian township sample is

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were motivated to continue working even when the job became very tedious. They were likewise motivated to be flexible and cooperative with respondents. As an aside, regular infusions of pizza, chocolate and soda were found to improve morale.

probably much higher than the national average.

Response rates for the two samples were high, 78.3 percent overall. The response rate for the cable modem sample was 72.9 percent (n=121) and 85.4 percent (n=135) for the dial-up modem sample. The calculation of response rates is based on contact figures presented in Table 1[3].

The demographic characteristics of these samples were compared to those of the general population for the same geographic area (see Table 2). The source of the general population statistics is the 1990 Census. There are some differences, notably for the Cable Modem category. However, the demographic differences between the general population and those of cable television subscribers tell a very similar story; perhaps the differences have more to do with cable subscription than Internet adoption. Education levels were nearly the same for all three groups.

Sample demographics were also compared to those from other recent Internet user surveys. In March, 1997, Nielsen made updated figures available (Nielsen, 1997) . Twenty-three percent people in the U.S. and Canada over 16 years of age had used the Internet in the last month. More than 40 percent are women. Nearly half had incomes of $50,000 or more. In terms of education, nearly 44 percent had a college degree or better. Almost four tenths had professional or managerial occupations (25% in the general population). The Nielsen typical user profile more or less fits the profile of a typical user

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[3] Response rate = "Completed Surveys" divided by "Total Leads" less "Unusable" and "No Internet at home." For example, 135 completed dial-up surveys divided by 593 total leads less 7 unusable, 379 "No Internet at home" and 49 estimated "no internet at home" equals 85.4%. The calculation for the cable modem group is 121completed surveys divided by 171 total leads less 5 unusables equals 72.9%.

Table 1
Telephone Survey Contact Figures

	Cable Modem Sample	Cable Sub Sample
Total Leads	171	593
Unusable (bad number)	5	7
No Internet at home	0	379
Refused	40	43(est. 30 no Internet)
Not finalized (answering machines, busy signals, no answers)	5	26 (est. 19 no Internet)
Completed surveys	121	135

Table 2
Comparison of Samples and General Local Population

	Population	Cable Modem	Dial-up Modem
Mean Age	29.4	35.1	33.7
Males as Percentage of Pop.	48%	79%	54%
Average Household Income	$33,331	$47,000	$33,000
Average of Highest Level of Education Attained[4]	3.49*	4.03**	3.95**

*Approximately half way between "some college" and "bachelor's degree"
** "Bachelor's degree"

[4]The survey item was coded as follows: 1=some high school; 2=high school diploma or GED; 3=some college; 4=bachelors degree; 5=masters or professional degree; 6=doctorate degree

in the present study if both the dial-up and cable modem samples were combined.

Analysis Procedures

All statistical procedures were performed using SPSS 7.0 for Windows (SPSS, 1995).

Data Screening Prior to Analysis

The data set was thoroughly screened. A handful of data entry problems were found and corrected. Missing data was handled in the following way. For some variables, missing data is actually data; for example when a subject reported he did not use FTP capabilities of the Internet. In other cases, subjects simply failed to provide answers as with "household income," and "What speed is your modem?", the survey items with the most missing data. In these instances, there were two different approaches. First of all, if there were very few cases, the mean of the respondents' modem group was assigned (In all cases, it was known whether the subject had a cable modem or not.). However, for the modem question, too many subjects did not know their dial-up telephone modem speed (21 out of 135 or 8%). For this and another reason discussed below, the "speed" construct was converted to a dichotomous variable, "cable modem" or "dial-up telephone modem."

Data Transformation and Assumptions of Statistical Tests

Most univariate and multivariate analysis techniques require that certain assumptions are not violated when inference is the goal. The three most common

assumptions are normality, linearity and homoskedasticity. Another is the absence of multicollinearity, the condition that exists when independent variables are too highly correlated. Normality, the assumption with the least tolerance for violation, is assessed by examining the sampling distribution of means, not the distribution of scores. The central limit theorem predicts normality with large samples, which was part of the design of this project.

The data collected for this project sometimes cause a violation of assumptions. Often, accordance with assumptions can be restored by "correcting" the data. For example normality can be accomplished sometimes by merely eliminating outlier cases. Unfortunately, data screening of the samples rendered no clear-cut decision rule for eliminating any cases. A common way to identify outliers is to look at combinations of demographic characteristics that do not go together. For example, since cable modems are expensive, it seemed logical to look for cases of low income people who were modem subscribers. Surprisingly, there were several such cases, indicating that such a combination of characteristics does not create an outlier in *this* study. Another technique is to look at residuals from a procedure like regression and eliminate cases that create large errors, more than two standard deviations from the mean. However, attempts here yielded similar results — there were lots of "outliers" and eliminating them would create the problem of a smaller and unrepresentative sample. It seems in many ways, this is a study of outliers!

Yet another technique is to keep all cases but transform a variable with high kurtosis by taking its inverse or one with skewness with logarithms. Such

transformations create other problems, mostly that it becomes difficult to interpret a transformed variable's effect (Tabachnick & Fidell, 1996). A final technique of last resort is to take a continuous (in this case ordinal) variable and convert it to one that is dichotomous. The distribution of the "speed" variable is a candidate for this procedure because of its non-normal distribution and because of the missing data problem mentioned earlier. This is unfortunate because a good deal of information is lost but as this is the single most important variable in the study, it was vital that this vector of data be free from flaws.

The data set, after "cleaning" would still, in a strict sense, violate some assumptions but this does not pose a hazard to the testing of the model. First of all, there are a variety of nonparametric tests (that do not use a distribution as a basis) appropriate for testing the propositions of this study. And secondly, violations of certain assumptions are not fatal even to some parametric procedures. For example, the t-test is not particularly sensitive to minor departures from normality with large samples (Norusis, 1990, p. B-9). Heteroskedasticity, the violation of the assumption of homoskedasticity, in mild forms is not a problem (Tabachnick & Fidell, 1996, p. 80). Even linearity is not a requirement for logistic regression (Tabachnick & Fidell, 1996 p. 575). Multicollinearity, that is very high intercorrelation, causes identification problems, and near multicollinearity leads to imprecise estimates (Greene, 1990, pp. 277-278). Perhaps controversial, at least one researcher states that multicollinearity violates no assumptions of regression (Achen, 1982, p. 82) though it does result in estimates with large standard errors. The intercorrelation of independent variables in this study is generally not an

issue though individual instances will be discussed later.

Since nonparametric tests do not rely on the distributions of samples or variables, they were run but only reported when the t-test was not reliable because of serious departures from normality. For the most part, parametric tests are the only reported test statistics as they are robust, that is relatively immune to violations of assumptions.

Factor Analysis

Factor analysis (FA, principal components, varimax rotation) will be used to confirm the existence of unobservable variables, called factors. The factors or latent variables are 1) the Internet Attributes of complexity, compatibility, radicalness and interactiveness; 2) Technology Clusters; 3) Internet Uses and Gratifications and 4) Synchronous and Asynchronous uses of the Internet. There are no explicit hypotheses regarding these underlying constructs but the model depends on the construction of valid and reliable measures of these variables. Factor analysis is appropriate as a means of uncovering a smaller number of factors from the commonalities of a larger set of measurable variables (Long, 1983). It reveals what measures belong together and advances the scientific goal of elegance or parsimony. The basis for factor analysis is the correlation and covariance among related measures (Kerlinger, 1986, p. 579).

Cronbach's Alpha

Even if the survey items that were devised to represent a latent variable do "load" on common factors as intended, this does not always mean there is internal consistency or

reliability in the measure. Reliability here refers to the proportion of the variance that matches the true score of the underlying construct (DeVellis, 1991), that is, whether the scale measures the variable of interest. For the scales that will be constructed to represent factors, Cronbach's alpha will be calculated as a measure of reliability. If it does, then the alpha will be high, as close to one as possible. Nunnally and Bernstein suggest that an alpha of .70 or higher indicates a reliable scale for "the early stages of predictive or construct validation research (1994, pp. 264-265)."

Logistic Regression

For a variety of reasons, the best statistical procedure for the first four hypotheses is logistic regression. To recap those propositions:

H1: Perceived Internet attributes are significantly related to choice of Internet access capacity.

H2: Perceived levels of compatibility, interactiveness and radicalness in adoption are positively linked to choice of capacity; complexity and radicalness in use are negatively associated.

H3: The prior adoption of related clusters of telecommunication equipment and services, computer equipment and mass media appliances are positively associated with access capacity choice. Likewise, use of synchronous forms of communication and asynchronous forms involving large data files are positively related to speed choice.

H4: Adopters of higher speeds will be more likely to be male, older, better educated and have higher incomes.

Logistic Regression, like other forms of multiple regression, can be used to predict an outcome, in this case the choice of Internet access speed, from a set of independent predictor variables, here cast as Internet and Adopter Attributes, synchronous and asynchronous communication and Technology Clusters. Multiple regression in this case is feasible but not optimal because of the decision to make the dependent variable dichotomous. Often, discriminant analysis is substituted for regression when the goal is to predict a discrete outcome as in this case. This too, is feasible in this case but not ideal because of some mild violations of assumptions in the independent variables. Logistic Regression, on the other hand, is ideally suited to this model and data set because it is very flexible and in fact has no assumptions about the distribution of the independent variables (Tabachnick & Fidell, 1996, p. 575).

The goal of logistic regression is to predict group membership for individual cases. Like multiple regression, it uses a linear equation with the predicted score of a case on the LHS and a constant and a series of coefficients multiplied by observations on the RHS. The difference is that logistic regression goes on to find the odds of being in one group or another. The results of running the test in SPSS yield statistics from which the model and individual variables can be tested. As a multivariate technique it offers the advantage over univariate techniques in that it allows correlated independent variables to demonstrate their effects in conjunction with and independent of others.

Univariate Procedures:
Chi Square, Independent Sample T-Tests and Mann-Whitney Tests

The balance of the hypotheses described in Figure 1 can be adequately tested using chi square crosstabular analysis of frequencies, t-tests and supplementing this with the Mann-Whitney test which is nonparametric and not sensitive to violations.

To recap:

H5: Uses of the Internet that involve synchronous communication are better satisfied at higher access speeds and will be more common than at slower speeds..

H6: Uses of the Internet that require sending or receiving large amounts of data are better satisfied at higher access speeds and will be more common than at lower speeds.

H7: Higher access speeds are associated with a greater variety of and more intense sociability, diversion, acquisition and time management uses.

H8: Higher access speeds are associated with lower use of telephone, television and home video.

H9: Higher access speeds are not associated with expanded overall time spent with media.

H10: Higher access speed adoption is associated with greater spending overall on media and communication technologies.

For all these hypotheses, the means of each of the two groups of Internet uses were compared with independent sample t-tests. The Mann-Whitney procedure tests whether the two distributions are the same by ranking cases and using the ranks, not actual observed scores. All things being equal, t-tests are more powerful since they use more information from the data (Norusis, 1990, p. B-51). Results from both procedures were be run to avoid drawing erroneous conclusions.

The fifth and sixth propositions posit that certain uses of the Internet will be more common at higher Internet access speeds. This calls for analysis of frequencies which was tested with chi square in a two-by-two format: cable modems or dial-up access by use of each "part" of the Internet or not.

Summary

This chapter outlined the methods for investigating the model and hypotheses developed in Chapter 2. The methods include a large sample survey research design, systematic operationalization of concepts for data collection, qualitative analysis of "electronic focus group" narrative data and quantitative data analysis of survey data. The next chapter provides the results of the execution of this plan.

Chapter 4

RESULTS

In this chapter, the results of data analysis are presented. First, the results of statistical procedures used to construct scales and test their reliability are given. Where necessary for further model and hypothesis testing, scales were modified and these modifications are described. Next, the first four hypotheses, those driven by diffusion of innovation theory are tested with logistic regression; all four are supported in full or in part. The remaining six propositions are presented in order along with the respective univariate tests that were performed for each. Of the propositions based on the uses and gratifications perspective, H5 was not supported, H6 was, and H7 and H8 received partial support. As for consumption-related hypotheses, neither H9 nor H10 were supported.

Scale Construction and Reliability

As presented in the earlier methods discussion, factor analysis was used to confirm underlying concepts. Survey items were then combined into scales to represent the variables. Reliability was measured with Cronbach's alpha.

Innovation Attributes

Table 3 presents the results of the procedure used to construct scales for Innovation attributes. The first column labels the variable, the second lists the items which loaded on the factor, the third gives the alpha and the right hand column shows the percentage of variance explained by that factor in factor analysis. Items which did not load as predicted were discarded and are not represented in the table. For a complete list of all items, see the survey instrument in the Appendix. All survey items intended to measure the four perceived Internet attributes were entered together in factor analysis. FA extracted six factors, meaning that the four variables had decomposed in some way.

Complexity. The survey included five items to measure perceived complexity of the Internet. All five and only those five loaded on a single factor confirming their relation to one another. The scale was reliable (Cronbach's alpha = .79).

Compatibility. There were five items targeted at measuring this construct. In factor analysis, three of them and only three items loaded together. The two that did not were "The Internet is different from other computer uses" and "The Internet is similar to other media (which was reversed so the likert scale was consistent with higher scores possessing more of the perceived attribute)." The alpha for this three-item scale is .72.

Radicalness. There were five items for perceived radicalness as well. Four of the five loaded alone on a single factor which indicated the attribute exists. This was important to establish since it is not one commonly seen in diffusion research. However, the alpha reliability for this four item factor was .61, not considered reliable enough and this variable was not used in subsequent model and hypothesis testing.

Table 3
Variable Operationalization Summary: Innovation Attributes

Variable	Operationalization	alpha	% of var. explained
Complexity	The Internet is easy to use. I don't understand how it works (reversed). Finding what you want on-line is difficult (reversed). It is intimidating to use (reversed). It is frustrating to use (reversed).	.79	26.0
Compatibility	It is compatible with my lifestyle (reversed). The Internet satisfies my needs (reversed). The way you use the Internet matches the way I like to do things (reversed).	.72	8.0
Radicalness	I use the Internet for the same reasons I use the phone. I use the Internet for the same reasons I read newspapers. I use the Internet for the same reasons I watch TV. I use the Internet for the same reasons I shop by catalog.	.61	4.9
Interactiveness	The Internet has almost unlimited uses (reversed). It has limited uses. I can find just about anything on the Internet (reversed).	.69	5.6

Interactiveness. There were a total of ten items to measure perceived interactiveness. Three items loaded on one factor (alpha = .58) which was not easily interpretable, a key requirement of factor analysis. The items which loaded on this factor were, "It is really difficult to send files to others," "Putting up my own Web site would be really hard to do," and "The only thing it's good for is email." Another four items did not load solidly in any factor. They were items 79 through 82, with 79 and 81 reversed for accordance. However, the final three items loaded uniquely on a single factor (alpha = .69) which was interpretable. All three items shared the common idea that the Internet is very flexible ("...has unlimited uses (reversed)," "has limited uses," "I can find anything...(reversed)").

In sum, three of the four constructs were successfully operationalized and all four were distinct from one another according to factor analysis.

Innovation Clusters

Table 4 presents the scale created for this variable. The survey asked respondents to indicate which among a long list of communication innovations they had adopted at home; other adopted innovations were added from information in the TCI database (Sega, DMX, PPV use). The final list contained 26 items. The data, therefore was dichotomous. A correlation matrix was used to identify those innovations which were only weakly related to the others and they were eliminated; they were The Sega Channel, PPV use, DMX, and DAT machine. When the remaining were entered in factor analysis, others were identified as too ubiquitous and they loaded no where; these were answering

machine, cordless phone and fax. Adoption of ISDN and switched 56k service was very rare, only five instances total, and they were eliminated. The final set of 17 innovations were entered in FA which extracted four factors interpreted as "multimedia computer equipment" (CD-Rom, audio speakers, Pentium chip), (alpha = .57), "conspicuous toys" (pager, big screen TV, digital camera, cellular phone), (alpha = .55), "voice services" (call waiting, ID and forwarding), (alpha = .51) and "data-intense communications" (scanner, Zip/Jaz drive, 2nd phone line and an 800 number), (alpha = .49).

Although the factors were interpretable, none of these alphas were high enough to consider their scales reliable. It was suspected that the dichotomous nature of the data foiled FA's ability to extract good factors. Therefore another technique designed for dichotomous data was used, HOMALS (University of Leiden) in SPSS 7.0 for Windows (1995). HOMALS uses a similar iterative process to let dimensions emerge, similar to FA's factors. This procedure rendered a dimension built from 11 items with an alpha of .66. The dimension is interpreted simply as "related media technologies" and is comprised of color printer, scanner, zip drive, pager, big screen TV, camcorder, digital camera, cellular phone, caller ID, call forwarding and a second telephone line. They all share the quality of being either new or conspicuous innovations compared to those which did not emerge in this same dimension. This is consistent with the innovation cluster concept for a cable modem. Cable modems have a status-conferring ability — they're faster, better, newer and can be conspicuous. Comments from several electronic focus group respondents bear this out: "i [sic] do this just to act cool," "show my modem to friends," "am eager to show-off," "to tell my customers I have one," "my friends had one," "for me

to (ahem) show off," "everyone I tell...is incredibly jealous." A half dozen also cited the status associated with having a fixed IP address that comes with a cable modem.

The variable which emerged from this process is face-valid and reliable as the "cluster" concept was explicated. However, unlike previous empirical work on technology clusters, there emerged only one solid cluster. Though the concept did not survive as was expected, it seems unlikely that this is because of a measurement problem since the list of innovations was long and comprehensive. The revised variable, "related media technologies" was tested as the only Innovation Cluster.

Table 4
Variable Operationalization Summary: Innovation Cluster

Innovation Cluster	Technology	alpha
"Related Media Technologies"	color printer scanner Zip/Jaz drive pager big screen TV camcorder digital camera cellular phone caller ID call forwarding second phone line	.66
Technologies which did not cluster	CD-ROM drive, computer audio speakers, Pentium processor, CD player, DAT machine, cordless phone, ISDN, switched 56k service, call waiting, answering machine, fax machine, 800 number, The Sega Channel, DMX digital music, PPV service	

Uses and Gratifications

Figure 1 shows four modeled uses and gratifications of the Internet, sociability, diversion, acquisition and time management. The survey included 31 items to capture the four separate concepts. Instead of the expected four, FA extracted seven factors. All seven, after further analysis turned out to be interpretable, reliable and actually consistent extensions of the uses and gratifications theory. Table 5 shows the results of scale construction.

Sociability Uses. Four items intended to measure sociability decomposed into two factors interpreted as "sociability with friends and family" and "sociability with strangers." Each factor is weak because there are only two items in each, alphas of .53 and .66 respectively. The sociability construct did manifest itself, however, since no other items loaded significantly on the two sociability factors.

Diversion Uses. This category of Internet use survived as explicated. There were seven items in the survey, six of which loaded definitively on a single factor with a high alpha of .85.

Acquisition Uses. While it was theorized that all kinds of acquisition activity on the Internet would be related, it turns out they are not. Even better, there are two and they are very distinct. There were nine items in the survey designed around the acquisition construct. They loaded very discretely onto two factors interpreted as "acquisition of goods" (alpha = .81) and "acquisition of information" (alpha = .73).

Table 5
Variable Operationalization Summary: Internet Uses & Gratifications

Variable	Operationalization	alpha	% of var. explained
Sociability/Strangers	meeting new people having interesting conversations	.66	4.0
Sociability/Friends & Family	communicating with family communicating with friends	.53	3.5
Diversion	playing games with others to have something to do when there's nothing else to do passing the time for playing to have fun to relax	.85	14.4
Acquisition/ Information	consumer or personal research learning new things getting news	.72	4.8
Acquisition/ Goods	downloading software for work downloading software or games for play shopping downloading music or other audio downloading image files downloading video clips	.81	6.6
Work/Time Management	communicating with co-workers communicating with colleagues outside my company work-related research to save time to help you be more efficient working at home efficiently working with others	.86	24.2
Work/Internet Business	publishing your own work selling products or services to make money	.65	4.4

Time Management Uses. The survey asked respondents how often they used the Internet to accomplish 11 different time management-related activities. Ten of these items loaded neatly onto two distinct factors interpreted as "work/time management uses," (alpha = .86) and "Internet business/time management" (alpha = .65). The seven items which loaded onto "work" were "communicate with co-workers," "communicate with colleagues outside my company," "work-related research," "save time," "be more efficient, " "work at home," and "work with others." The three "Internet business" items all were related to running an Internet-related business at home: "publishing your own work," "selling products or services," "to make money."

Two items from the uses and gratifications portion of the survey did not load definitively anywhere. They were both added based on input from the Cable Modem Web Survey: "helping other people" and "saving money." It was supposed that the former would be related to sociability and the latter to time management.

The outcome of this analysis supports the proposition that the four explicated use categories are a comprehensive and reliable typology for Internet uses and gratifications research. The added value of this undertaking is a refined understanding of the more specific gratifications obtained within each of the four explicated categories.

Synchronous and Asynchronous Uses of the Internet

The survey asked people whether and how much they used several different "parts" of the Internet. There are "parts" that permit synchronous communication: Internet Relay Chats (IRCs), Multi-user Domains (MUDs), Internet telephony and

videoconferencing. And there are "parts" that permit asynchronous communication: electronic mail, the World Wide Web, file transfer protocol (FTP), and the Usenet. Through FA, this distinction manifests itself. The survey items were entered and two factors (and only two) emerged as Table 6 shows.

Table 6
Variable Operationalization Summary: Synchronous & Asynchronous

Variable	Operationalization	alpha	% of var. explained
Synchronous	Intensity of IRC/MUD use Intensity of telephony & videoconferencing use	.48	18.9
Asynchronous	Intensity of FTP use Intensity of e-mail use Intensity of Usenet use Intensity of Web use	.68	38.0

It was useful to establish that Internet use patterns follow this division. However, the theoretically interesting issue is whether there is a relation between the conceptualized notion of perceived interactiveness and actual use of the interactive parts of the Internet. An interactiveness scale was developed by measuring respondents *perceptions* of how interactive the Internet is. A means of triangulating this concept is to measure interactive use *objectively.* Here speed was theorized to make the synchronous parts of the Internet more so and the data-intense, asynchronous parts more interactive. FTP and the Web often involve data-intense communication which high speed access noticeably improves. Email and text-based Usenet are believed to be un-improved by speed. Therefore the

asynchronous factor for the purposes of the overall model is not useful. The alpha on the synchronous factor is not sufficient (. 48). For these two reasons, in model testing, four separate measures will be entered: Intensity of FTP use, of Web use, of IRC/MUD use and of telephony/videoconferencing use.

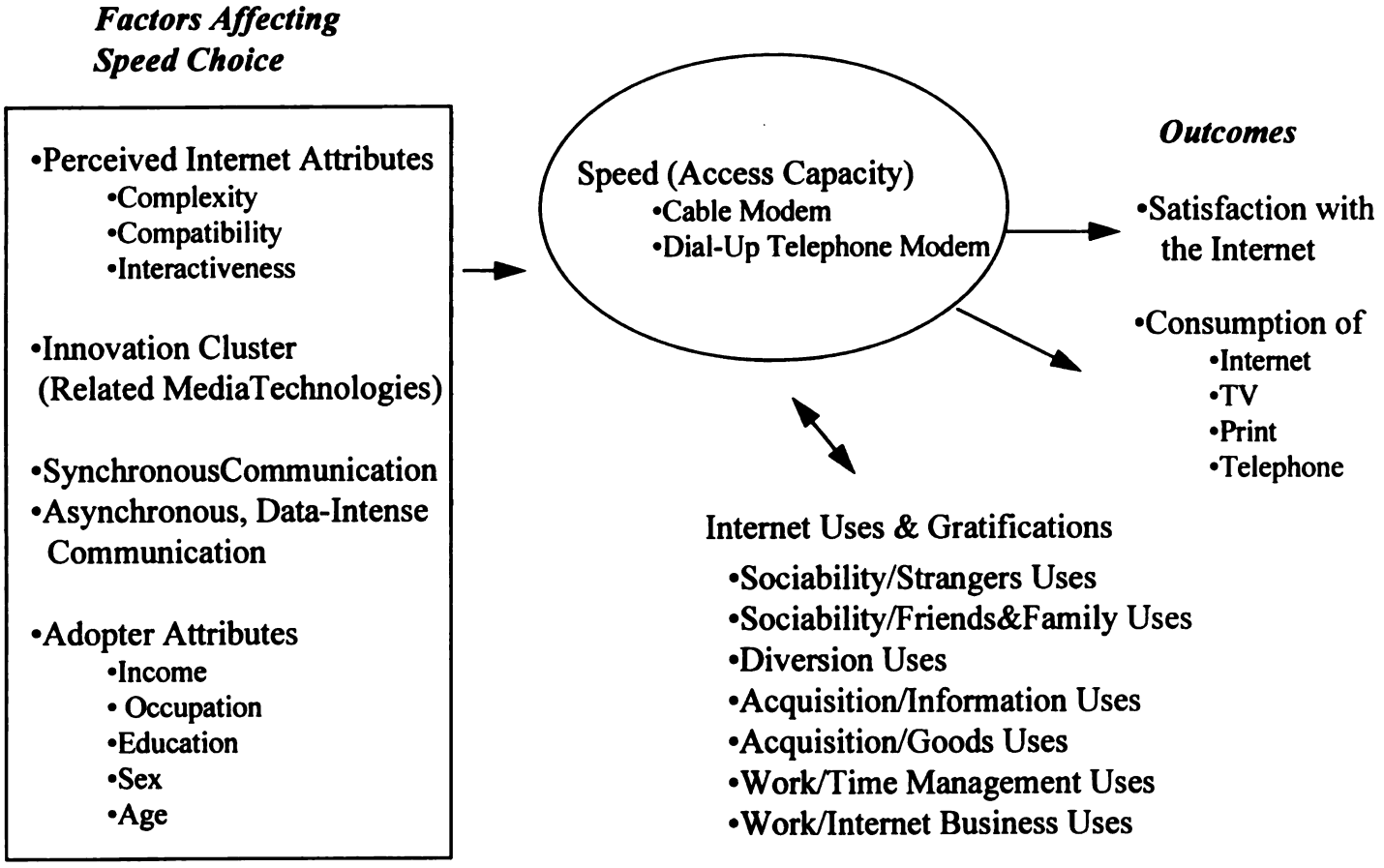
Model and Hypothesis Testing

After scale development and testing, the model in Figure 1 was revised, Figure 3. Moving from the left hand column to the right, the differences are that 1) radicalness has been dropped; 2) there is only one technology cluster; 3) Speed was collapsed into a dichotomous variable from an ordinal one and 4) the uses and gratifications categories were expanded from four to seven.

Logistic Regression Results

The first four hypotheses are all related to the independent variables in the left hand column of Figure 3 and the dependent variable, speed, to its right. A direct logistic regression analysis was performed on Internet Access Speed as outcome and five categories of independent variables as predictors: Perceived Internet Attributes (3 variables), Innovation Cluster (1), Synchronous Communication (2), Asynchronous/Data-Intense Communication (2), and Adopter Attributes (5). Analysis was performed using SPSS Logistic Regression (SPSS, Inc. 1995). No cases were deleted for missing values so data from 256 cases were analyzed: 121 with cable modems and 135 with dial-up

Figure 3
Revised Model of Factors Related to Internet Access Capacity



access telephone modems. Results of the tests are presented in Table 7 including chi-square tests, classification results, regression coefficients, Wald statistics, partial correlations and odds ratios.

A test of the full model with all five categories of independent variables (13 variables) against a constant-only model was statistically reliable, Chi Square (13, n = 256) = 130.92, p. <.001, indicating that the predictors, as a set, were able to distinguish well between high-speed cable modem Internet users and those with slower dial-up modems. The model successfully classified 82 percent of all cases, an impressive result. According to the Wald criterion, four independent variables of the 13 were significant in predicting outcome: an information-related occupation ($W = 3.12$, $p < .05$), intensity of FTP use ($W = 12.47$, $p < .001$) and intensity of Web use, ($W = 13.11$, $p < .001$). Household income was marginally significant ($W = 3.12$, $p < .08$).

Odds ratios show that cable modem subscribers were 170 percent more likely to have an information-related occupation and in terms of their Internet usage patterns, 38 percent more likely to be FTP-use intense and 48 percent more likely to be Web-use intense. They were only 19 percent more likely to have higher incomes.

In conclusion, these statistics show that these three or four variables are the only reliable predictors of modem speed for the full model.

To reveal the relative importance of the predictors which were non-significant in the full model, smaller versions of the model were run as well. Results of these procedures are presented in Table 8. First the model was run without the asynchronous (FTP and WWW) and synchronous (IRC/MUD and phone/videoconference) variables.

Table 7
Summary of Logistic Regression Results

Chi-Square	df	Significance
130.92	13	.0000

Classification Table for CBLMDM

	Predicted		
	.00	1.00	Percent Correct
Observed			
.00	111	24	82.22%
1.00	22	99	81.82%
		Overall	82.03%

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
FTP	.32	.09	12.47	1	.0004	.17	1.38
WWW	.39	.11	13.11	1	.0003	.18	1.48
IRC/MUD	-.06	.12	.27	1	.61	.00	.94
Tel/Vid	-.07	.14	.21	1	.65	.00	.90
Age	.01	.02	.09	1	.76	.00	1.01
Education	-.15	.21	.57	1	.45	.00	.86
Income	.18	.10	3.11	1	.08	.06	1.19
Info Job	.99	.46	4.73	1	.03	.09	2.69
Sex	.05	.41	.02	1	.90	.00	1.05
Compatibility	.08	.11	.56	1	.45	.00	1.08
Complexity	-.03	.07	.21	1	.65	.00	.97
Interactiveness	.08	.06	2.09	1	.15	.00	1.08
TC	.05	.09	.31	1	.58	.00	1.05
Constant	-7.43	2.91	6.54	1	.01		

Table 8
Summary of Results of Logistic Regression: Reduced Versions of Full Model

With synchronous and asynchronous variables removed:

Chi-Square	df	Significance
94.278	9	.0000

Classification Table for CBLMDM

Observed		Predicted .00	Predicted 1.00	% Correct
.00	0	106	29	78.52%
1.00	1	36	85	70.25%
			Overall	74.61%

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
Age	.01	.02	.22	1	.64	.00	1.01
Education	.01	.18	.01	1	.97	.00	1.01
HH Income	.11	.09	1.79	1	.18	.00	1.12
Info Job	1.49	.40	14.11	1	.00	.19	4.42
Sex	.81	34	5.56	1	.02	.10	2.25
Compatibility	.17	.11	2.55	1	.11	.04	1.18
Complexity	-.06	.06	.84	1	.36	.00	.94
Interactiveness	.12	.05	5.49	1	.02	.10	1.13
TC	.18	.08	5.10	1	.02	.09	1.20
Constant	-9.91	2.60	14.50	1	.00		

With technology cluster, asynchronous and sychronous communication removed:

Chi-Square	df	Significance
89.055	8	.0000

Classification Table for CBLMDM

Observed	Predicted .00	Predicted 1.00	% Correct
.00	103	32	76.30%
1.00	38	83	68.60%
		Overall	72.66%

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
Age	.01	.02	.12	1	.73	.00	1.01
Education	-.05	.18	.07	1	.80	.00	.96
Income	.19	.08	6.39	1	.01	.11	1.21
Info Job	1.43	.39	13.51	1	.00	.18	4.16
Sex	.74	.34	4.78	1	.03	.09	2.10
Compatibility	.16	.10	2.28	1	.13	.03	1.17
Complexity	-.06	.06	1.05	1	.3	.00	.94
Interactiveness	.13	.05	7.38	1	.01	.12	1.14
Constant	-7.75	2.37	10.67	1	.00		

Table 8 (cont'd)

With Interactiveness, cluster and synch/asynch removed:

Chi-Square	df	Significance
81.260	7	.0000

Classification Table for CBLMDM

	Predicted .00	Predicted 1.00	%Correct
Observed .00	101	34	74.81%
1.00	41	80	66.12%
		Overall	70.70%

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
Age	.01	.02	.19	1	.66	.00	1.01
Education	-.03	.17	.03	1	.85	.00	.97
Income	.17	.08	5.26	1	.02	.10	1.19
Info Job	1.45	.38	14.56	1	.00	.19	4.27
Sex	.77	.33	5.16	1	.02	.09	2.13
Compatibility	.26	.10	6.73	1	.01	.16	1.29
Complexity	-.15	.05	7.15	1	.01	-.12	.86
Constant	-3.12	1.58	3.91	1	.05		

With demographic (adopter attributes) factors only:

Chi-Square	df	Significance
52.335	5	.0000

Classification Table for CBLMDM

	Predicted .00	Predicted 1.00	% Correct
Observed .00	100	35	74.07%
1.00	51	70	57.85%
		Overall	66.41%

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
Age	-.01	.02	.38	1	.54	.00	.99
Education	.04	.16	.05	1	.82	.00	1.04
Income	.17	.07	5.62	1	.02	.10	1.19
Info Job	1.70	.37	21.53	1	.00	.24	5.47
Sex	.88	.31	8.16	1	.00	.13	2.40
Constant	-1.60	.58	7.73	1	.01		

That model had three Internet attribute variables, one technology cluster and five adopter attribute variables. This partial model was run against a constant-only model and the results were significant: Chi-Square (9, n = 256) = 94.28, p< .001. This model correctly classified 75 percent of all cases, still modestly successful but not as predictive as the full model. Of the Internet Attributes, Perceived Interactiveness was significant (W = 5.49, p< .05). An information occupation (W = 14.1, p<.001), male sex (W=5.56, p<.01), and adoption of related media technologies (W = 5.10, p<.05) were also significant predictors of outcome.

When the technology cluster is also removed, the same three variables remain significant (information occupation, sex and interactiveness) but compatibility becomes significant for the first time. If interactiveness is then removed, both compatibility and complexity become significant, along with the same three adopter attributes. Finally, when the model is run with only the adopter attributes, the same three attributes, income, sex and occupation continue to be the only significant predictors of speed. No matter how the model is reduced, age and education are never factors.

Correlations among the predictors and with speed, not surprisingly, bear out this story (see Table 9 for Spearman's rho coefficients[5]). When each item is evaluated separately, all Internet Attribute variables are significantly correlated with speed as are

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[5]Spearman's rho is presented rather than the more common Pearson correlation because "rho" is not sensitive to non-normal distributions. As an aside, pearson "r"s were also run and there were no differences in significance levels nor in direction of effect. However, there were some important differences in the size of the correlations. Alternatively, point bi-serial correlation could have been used; this is an appropriate statistic when one of the variables is dichotomous as with the cable modem variable. However, Tabachnick and Fidell (p. 814, 1996) suggest that Pearson, point bi-serial and the phi coefficient are all identical.

Table 9
Spearman's rho Correlation Coefficients

	CM	Age	Ed	HH	Job	Sex	Compat.
Age	.11						
Education	.04	.63**					
HH Income	.2**	.52**	.35**				
Info-Intense Job	.36**	.10	.0	.12*			
Sex	.27**	.03	.05	.11	.22**		
Compat. Scale	.33**	.0	.02	.0	.17**	.07	
Complex. Scale	-.4**	.15*	.09	.03	.2**	-.26**	-.45**
Interact. Scale	.4**	.0	.0	.0	.23**	.21**	.54**
Techno Cluster	.27**	.07	.0	.34**	.04	.03	.09
WWW Use Intensity	.5**	.08	.06	.13*	.25**	.35**	.37**
Tel/Vid Use Intensity	.13*	.0	.0	.05	.03	.1	.1
IRC/MUD Use Intensity	.05	-.2*	-.2**	.0	.03	.0	.09
FTP Use Intensity	.52**	.12	.13*	.05	.41**	.38**	.37**

** Correlation is significant at the .01 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).

Table 9 (cont'd)

	Comp	Interact	TC	WWW	Tel/Vid	IRC/MUD
Age						
Education						
HH Income						
Info-Intense Job						
Sex						
Compat. Scale						
Complex. Scale						
Interact. Scale	-.66**					
Techno Cluster	-.19**	.19**				
WWW Use Intensity	-.41**	.43**	.28**			
Tel/Vid Use Intensity	-.14*	.14*	.30**	.14*		
IRC/MUD Use Intensity	-.10	.18**	.21**	.09	.27**	
FTP Use Intensity	-.41**	.45**	.21**	.52**	.30**	.10

** Correlation is significant at the .01 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).

both more intense use of all forms of Internet communication except IRC/MUD use. The same adopter attributes are significantly correlated with speed ("cable modem"); neither age nor education are related to speed in a meaningful way. There are a number of large and significant correlations among the 13 independent variables; this is not surprising nor is it a problem for logistic regression. Of particular interest is the lack of correlation between the technology cluster and compatibility (rho = .09, sig = .140). It was supposed that perceived compatibility with the Internet and the prior adoption of a variety of related status-conferring technologies would measure a similar underlying construct. By contrast, the synchronous and data-intensive asynchronous uses of the Internet were, as expected, significantly related to perceived interactiveness. The strength and direction of the relationships of the data-intensive uses are particularly high: WWW use (rho = .43, $p < .01$), FTP use (rho = .45, $p < .01$).

These results in part support the first four hypotheses:

H1: Perceived Internet attributes are significantly related to choice of Internet access capacity.

With the exception of radicalness which was dropped and never tested, the remaining three are related as the logistic regression and the Spearman's correlations show. There was no qualitative focus group data to further explain this.

H2: Perceived levels of compatibility, interactiveness and radicalness in adoption are positively linked to choice of capacity; complexity and radicalness in use are negatively associated.

Perceived interactiveness is positively related to choice of Internet access capacity and

was in fact the best predictor of cable modem adoption of the three Internet Attributes that were tested. In the focus group, there were a handful of comments to support this: "Graphical sites are much more accessible." "Speed makes the Internet transparent." A small number offered comments implying that Internet sex content was more realistic after cable modem adoption: "The most awesome page in all the net is an escort service in Hong Kong. Until TCI-Met, we were just casual, frustrated users."

The coefficients for complexity are negative which is actually correct — the more complex the Internet is perceived to be, the less likely would be cable modem adoption. Compatibility is positively related to higher speed access. No qualitative data bear on these independent variables.

> H3: The prior adoption of related clusters of telecommunication equipment and services, computer equipment and mass media appliances are positively associated with access capacity choice. Likewise, use of synchronous forms of communication and asynchronous forms involving large data files are positively related to access capacity choice.

The single surviving technology cluster was a significant positive predictor of cable modem adoption in a reduced model; it is positively related to speed according to the correlation coefficient. And the nature of the cluster, that the adoption of these innovations may have a status-conferring quality goes with the several comments of focus group participants discussed earlier.

The synchronous forms of Internet communication were not significant predictors of speed and were only weakly correlated with speed -- this facet of the hypothesis is not

supported. However, the strongest predictors of speed were the asynchronous data-intensive Internet uses, FTP and the Web. This was the case both in terms of their large Wald statistics which were also highly significant, the odds ratios and in terms of their large and significant correlation coefficients. As for the qualitative data, almost every single participant specifically stated that before they got their cable modems, they used the Internet from home primarily for email, Usenet and other text-based and non-data-intensive applications. Then after they got their cable modems, they used highly data-intensive applications — the Web, leaving the image downloader switch on, uploading and downloading software ("I downloaded thousands of free software files"), FTP'd files which previously were Fed Ex'd on disks, played RealAudio music, listened to sports games and played video clips. One respondent had even engaged in speed experiments, "I sent an 800K file to my brother-in--law in Texas, the transfer took 6 seconds on my side, and 7 minutes for him to retrieve with his 28.8 modem." As for synchronous uses there, were a half dozen reports that synchronous use increased post-cable modem adoption. The few such references actually involved data-intensive applications, "we can play games against each other," "conferencing [and] multi-player games," "[started] using Iphone." These qualitative data offer causal evidence for the notion that the Internet is more interactive at higher speeds.

H4: Adopters of higher speeds will be more likely to be male, older, better educated and have higher incomes.

Age and education have no significant relationship to cable modem adoption but income and gender (male) are somewhat related. In addition, having an occupation that is

information-intensive is significantly related to cable modem adoption; in fact, it was the strongest single predictor in the full model in Table 7. There was no qualitative data to provide further insights.

Univariate Procedure Results

The fifth through tenth hypothesis were tested with univariate procedures. Tables 10 through 16 display the results of parametric testing (mean scores, their standard deviations, t-statistics, significance levels and confidence intervals) and that for non-parametric testing (chi square, mean ranks, Mann-Whitney "U," Wilcoxon "Z" and significance levels). The mean ranks and Mann-Whitney statistics are only be reported in those instances where the t-statistic is not reliable because of extreme deviations from normality.

Satisfaction and Internet Use. Satisfaction levels for 18 satisfaction measures are given in Table 10. Cable modem users are more satisfied with asynchronous uses of the Internet (email, Web and FTP) with significant t-statistics ($p < .01$ or .05). For several other measures of satisfaction, cable modem users were significantly more satisfied with the Internet. High-speed access subscribers were more satisfied with the Internet as a general way to communicate, to learn new things, to be more efficient, to get information, to shop and to work from home. They were more satisfied with on-line speed and customer service as well. Slow-modem users were more satisfied with the Internet as a way to socialize and with cost of service. Results for several items were inconclusive: satisfaction with Usenet, IRC/MUD, as a way to be entertained and reliability.

Again turning to the qualitative data, the quantitative evidence is triangulated. Almost every respondent praised the greater speed of the Internet once they got their cable modems. Unprompted, several said they would not be willing to give up the service. From other comments, it seems satisfaction with speed is very high: "Wow! Awesome! Breathtaking! ...the most incredible thing that has happened to our household in years," "I give it a 10," "I have been evangelizing the cable modem from day one," "..worth its weight in gold." However, about half also complained about reliability ("When she's good, she's very, very good, And when she's bad...I use phone lines," "quite maddening," "very frustrating"). There were equal and small numbers who alternately praised and complained about TCI customer service.

Table 11 gives the non-parametric equivalent tests for differences in means, the Mann-Whitney test statistics. The mean ranks indicate the same results as with the means discussed above. In terms of statistical significance however, there is one satisfaction item that is not a reliable indicator, satisfaction with the Internet as a general way to communicate is non-significant.

Table 12 displays the results of chi square analysis of whether the use of a "part" of the Internet is related to modem speed. The table compares the expected frequency of adoption of a "part" of the Internet (Email, Web, Usenet, FTP, IRC/MUD, Internet telephony/ videoconferencing) to the observed frequency by modem speed. Two-by-two tables are given for each of the six "parts." Cable modem subscribers are more likely to use FTP, the Web, Usenet and Internet tel/vid. The differences are statistically significant as well. There are not distinguishable differences between cable modem subs and slower

speed Internet access for e-mail and IRC/MUD use.

These results relate to Hypotheses 5 and 6 as follows:

H5: Uses of the Internet that involve synchronous communication are better satisfied at higher access speeds and will be more common than at slower speeds.

This proposition is only weakly supported. Means tests do not indicate that users of synchronous IRC/MUD communications are more satisfied. Chi square analysis indicates that cable modem users are no more likely to use IRCs and MUDs. However, they are statistically and significantly more likely to use Internet telephony or videoconferencing according to crosstabs.

H6: Uses of the Internet that require sending or receiving large amounts of data are better satisfied at higher access speeds and will be more common than at lower speeds.

This hypothesis is supported. Both means and Mann-Whitney tests indicate that users of asynchronous, data-intensive "parts" of the Internet (FTP and Web) are significantly more satisfied than dial-up access users. Likewise, cable modem subs are more likely to have adopted FTP and the Web, according to crosstabs and significant chi square statistics.

Uses and Gratifications of the Internet in Relation to Speed. Table 13 displays the means for each of the seven intensity of use categories, sociability (2 types), acquisition (2 types), time management, marketing/work and diversion. The reader should recall that the survey items used to construct these scales measured intensity of use, that is how often the Internet was used for each of these "gratifications." Therefore, higher means equate to more frequent and intense use. In all cases the means for the

cable modem group are higher but only the two acquisition categories and time management and marketing/work are significant. The statistics make it impossible to reliably distinguish between high speed and low speed access for diversion and sociability uses.

In terms of the variety of uses, Table 14 provide statistics from which it can be determined whether high speed Internet access subscribers are more likely to use more "parts" of the Internet. On average, cable modem subs use 3.78 of six "parts" of the Internet while dial-up access users use 2.48. This difference is statistically significant ($p<.0001$).

The implications for Hypothesis 7 is:

H7: Higher access speeds are associated with a greater variety of and more intense sociability, diversion, acquisition and time management uses.

This proposition is partially supported. Higher access speeds are associated with a greater variety of Internet uses and with acquisition and time management/work uses. There is not support for the proposition that speed is positively related to intensity of sociability and diversion uses. Cable modem users who participated in the focus group told a different story. Several said they used the Internet to serve a greater variety of social, work, play and acquisition gratifications after they got their cable modems. For example, one respondent offered these comments on how his family's use of the Internet changed after getting a cable modem (brand name TCI-MET); unprompted, he described examples of every explicated gratification of the Internet use. Personal identifiers have been removed:

> Enter TCI-Met...we use Internet Gaming to play Hearts with new friends all over the world. [family members] leave today for Germany...and a fellow cardplayer, a 26 years old soldier...is meeting [them] for a beer...a 24 year old Egyptian lad in Cairo is helping [family member] with a paper on Thebes...We each have an e-mail address...[family member] uses telnet to upload files to her BBS...I download Intellicast radarimage...and whip out a color print for my work...[when downloading software,] I set up four independent download streams for the four zipped files and downloaded a total of 15 megabytes in a little less than 5 minutes...we use Infoseek...faster than Encarta! This week we researched an ancestor [famous 18th century fur trader]...downloaded a picture of the Rafflesia flower...from the Malaysia Home Page...downloaded a weather forecast for Frankfort, got the phone number and fax number of the hotel in Ludwigshaven, downloaded spec sheets...received an emailed updated 300k file...ordered a larger hard drive...downloaded the latest scanner driver [to help a friend] and these are only the uses I can remember so far this week...

Consumption. Consumption was measured both in terms of time spent with various media and money spent on media. In Table 15, the mean scores for individual consumption measures are given. They are the number of newspaper subscriptions and videos rented in the last week, subscription to DMX and The Sega Channel, the number of PPV orders in the last six months, expenditures on Internet/on-line access, all forms of telephone service (local, long distance, cellular), the number of newspapers read yesterday and magazines last week, and time spent at home on-line, with a computer, on the phone and watching television on the previous day.

By mean scores, cable modem subscribers consume more by these measures except for watching television and talking on the telephone. However, once significance levels are imposed, the only reliable differences are in time spent on-line, with the home PC, with television and on monthly Internet access expense.

In connection to Hypothesis 8:

H8: Higher access speeds are associated with lower use of telephone, television and home video.

This is only partially supported. There are no statistically reliable differences between the two groups for use of telephone and home video; for television, this is supported in that cable modem users spent less time watching television the previous day, under one-and-a-half hours compared to over two hours.

When a variety of media are considered in sum, Table 16 implies that cable modem subscribers spend more time with media. "Total Time with Media" is an index of time spent on the phone, watching TV, on-line and reading newspapers and magazines. The means are an index, not hours per se. Modem users had a mean score of 10.21 and dial-up users scored 8.54 on average; this difference is statistically significant ($p<.05$).

In relation to Hypothesis 9:

H9: Higher access speeds are not associated with expanded overall time spent with media.

This hypothesis is not supported. In fact, it may be that higher access speeds ARE associated with expanded overall time spent with media. Several comments from the focus group offer a mix of insights. Four respondents indicated the speed of a cable modem led to spending less time online. On the other hand, many made comments implying they spent MORE time on the Internet after they got their cable modems. On the matter of consumption of other media, no comments were offered.

Consumption measured by spending on the media is rather less conclusive. "Total Spending on the Media" (Table 16) is an index of the number of monthly Internet and

telephone expense, the number of newspaper subscriptions, last week's video rentals, subscription to DMX, Sega and use of PPV. While the mean (121.53 vs. 113.5) for cable modem subscribers are higher, implying higher spending, the actual differences are quite small and significance levels indicate meaningless differences. Narrative data from the focus group, however, implies a refinement of this story. More than half of the participants spontaneously cited an economic advantage in cable modems over a second phone line, ISDN, a T1 line, AOL[6] and other ISPs, and ESPECIALLY the perception that on a price-per-bit basis, cable modems are cheaper because they are faster ("waiting for a response is time and in turn money lost," "cost-effective balancing test," "price/performance..unmatched," "cheap alternative."

For the final hypothesis,

H10: Higher access speed adoption is associated with greater spending overall on media and communication technologies.

This hypothesis is not supported by quantitative analysis of data.

Summary

This chapter described the results of the investigation — the research design, qualitative and quantitative data and their analysis. The results provide evidence for the existence of the constructs of perceived Internet attributes, technology clusters, uses and gratifications and synchronous/asynchronous communication. As for the specific

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[6]The reader should recall that the survey was conducted a few weeks before AOL adopted its unlimited access policy.

propositions of this thesis, there is full support for one hypothesis, number six and partial support for H1 through H5, H7 and H8. Propositions nine and ten are not supported. In the next chapter, these results, alone and in a broader context, are discussed.

Table 10
Satisfaction with the Internet: Sample Means

Group Statistics

	Cable Modem Dummy	N	Mean	Std. Deviation	Std. Error Mean
Satisfaction with E-mail	.00	131	4.3359	.6277	5.484E-02
	1.00	118	4.5000	.7010	6.454E-02
World Wide Web	.00	90	3.9222	.8242	8.688E-02
	1.00	120	4.2500	.7130	6.509E-02
Usenet	.00	24	3.7917	.7211	.1472
	1.00	75	3.6933	.9996	.1154
IRC/MUD	.00	27	3.3704	1.0057	.1935
	1.00	27	3.6296	.9260	.1782
FTP	.00	55	3.7818	.9755	.1315
	1.00	99	4.1414	.8331	8.373E-02
..as a way to communicate in general	.00	135	4.0667	.8656	7.450E-02
	1.00	121	4.2810	.6858	6.235E-02
..as a way to socialize	.00	135	3.4000	.9479	8.158E-02
	1.00	121	3.1653	.7783	7.076E-02
..as a way to be entertained	.00	135	3.6370	.8776	7.554E-02
	1.00	121	3.7107	.7685	6.987E-02
as a way to learn new things	.00	135	4.0741	.7292	6.276E-02
	1.00	121	4.3802	.5952	5.411E-02
..be more efficient	.00	135	3.7852	.9255	7.965E-02
	1.00	121	4.2066	.6180	5.618E-02
to get information	.00	135	4.2074	.7441	6.404E-02
	1.00	121	4.5041	.5791	5.265E-02
as a way to shop	.00	135	3.0222	.6961	5.991E-02
	1.00	121	3.2397	.7074	6.431E-02
way to work from home	.00	135	3.6741	.7995	6.881E-02
	1.00	121	4.1488	.8130	7.391E-02
Satisfaction with on-line speed	.00	135	3.0963	1.1837	.1019
	1.00	121	4.0496	1.0476	9.524E-02
with reliability	.00	135	3.5407	.9041	7.781E-02
	1.00	121	3.7107	.8892	8.083E-02
cost of service	.00	135	4.0148	.9383	8.075E-02
	1.00	121	3.4380	.9738	8.852E-02
customer service	.00	134	3.1940	.9377	8.101E-02
	1.00	121	3.5785	.9895	8.996E-02
Overall Satisfaction with Internet	.00	134	6.75	2.10	.18
	1.00	121	7.10	2.31	.21

Table 10 continued

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Satisfaction with E-mail	Equal variances assumed	1.587	.209	-1.949	247	.052	-.1641	8.420E-02	-.3300	1.727E-03
	Equal variances not assumed			-1.938	236.159	.054	-.1641	8.469E-02	-.3310	2.724E-03
World Wide Web	Equal variances assumed	.452	.502	-3.082	208	.002	-.3278	.1063	-.5374	-.1181
	Equal variances not assumed			-3.019	175.583	.003	-.3278	.1086	-.5420	-.1135
Usenet	Equal variances assumed	3.754	.056	.446	97	.657	9.833E-02	.2207	-.3397	.5364
	Equal variances not assumed			.526	53.680	.601	9.833E-02	.1870	-.2767	.4734
IRC/MUD	Equal variances assumed	.313	.578	-.985	52	.329	-.2593	.2631	-.7872	.2687
	Equal variances not assumed			-.985	51.650	.329	-.2593	.2631	-.7873	.2688
FTP	Equal variances assumed	2.065	.153	-2.413	152	.017	-.3596	.1491	-.6541	-6.51E-02
	Equal variances not assumed			-2.306	97.786	.023	-.3596	.1559	-.6690	-5.02E-02

Table 10 cont

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
..as a way to communicate in general	Equal variances assumed	.666	.415	-2.179	254	.030	-.2143	9.837E-02	-.4081	-2.06E-02
	Equal variances not assumed			-2.206	250.321	.028	-.2143	9.715E-02	-.4057	-2.30E-02
..as a way to socialize	Equal variances assumed	12.483	.000	2.150	254	.032	.2347	.1092	1.975E-02	.4497
	Equal variances not assumed			2.173	252.117	.031	.2347	.1080	2.203E-02	.4474
..as a way to be entertained	Equal variances assumed	2.416	.121	-.711	254	.478	-7.37E-02	.1036	-.2778	.1304
	Equal variances not assumed			-.716	253.868	.474	-7.37E-02	.1029	-.2763	.1289
as a way to learn new things	Equal variances assumed	2.008	.158	-3.653	254	.000	-.3061	8.378E-02	-.4711	-.1411
	Equal variances not assumed			-3.694	251.855	.000	-.3061	8.287E-02	-.4693	-.1429
..be more efficient	Equal variances assumed	12.206	.001	-4.233	254	.000	-.4214	9.955E-02	-.6175	-.2254
	Equal variances not assumed			-4.323	235.433	.000	-.4214	9.747E-02	-.6135	-.2294
to get information	Equal variances assumed	.415	.520	-3.531	254	.000	-.2967	8.403E-02	-.4622	-.1312
	Equal variances not assumed			-3.579	249.219	.000	-.2967	8.290E-02	-.4600	-.1334
as a way to shop	Equal variances assumed	6.315	.013	-2.476	254	.014	-.2174	8.782E-02	-.3904	-4.45E-02
	Equal variances not assumed			-2.474	250.030	.014	-.2174	8.789E-02	-.3906	-4.43E-02
way to work from home	Equal variances assumed	.041	.841	-4.705	254	.000	-.4747	.1009	-.6734	-.2760
	Equal variances not assumed			-4.701	249.988	.000	-.4747	.1010	-.6736	-.2758

Table 10 continued
Satisfaction with the Internet: T-tests for Equality of Means

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Satisfaction with on-line speed	Equal variances assumed	13.868	.000	-6.790	254	.000	-.9533	.1404	-1.2298	-.6768
	Equal variances not assumed			-6.836	253.962	.000	-.9533	.1395	-1.2279	-.6786
with reliability	Equal variances assumed	.486	.486	-1.514	254	.131	-.1700	.1123	-.3912	5.116E-02
	Equal variances not assumed			-1.515	251.805	.131	-.1700	.1122	-.3910	5.097E-02
cost of service	Equal variances assumed	5.576	.019	4.824	254	.000	.5768	.1196	.3413	.8123
	Equal variances not assumed			4.814	248.632	.000	.5768	.1198	.3408	.8128
customer service	Equal variances assumed	1.729	.190	-3.185	253	.002	-.3845	.1207	-.6222	-.1467
	Equal variances not assumed			-3.176	246.989	.002	-.3845	.1211	-.6229	-.1460
Overall Satisfaction with Internet	Equal variances assumed	.002	.960	-1.250	253	.212	-.35	.28	-.89	.20
	Equal variances not assumed			-1.244	243.249	.215	-.35	.28	-.89	.20

Table 11
Non-parametric Mann-Whitney Test
Mean Ranks
Satisfaction with the Internet

Ranks

	Cable Modem	N	Mean Rank	Sum of Ranks
Satisfaction with E-mail	.00	131	115.06	15073.50
	1.00	118	136.03	16051.50
	Total	249		
World Wide Web	.00	90	92.47	8322.50
	1.00	120	115.27	13832.50
	Total	210		
Usenet	.00	24	50.77	1218.50
	1.00	75	49.75	3731.50
	Total	99		
IRC/MUD	.00	27	25.50	688.50
	1.00	27	29.50	796.50
	Total	54		
FTP	.00	55	67.45	3710.00
	1.00	99	83.08	8225.00
	Total	154		
..as a way to communicate in general	.00	135	121.20	16362.50
	1.00	121	136.64	16533.50
	Total	256		
..as a way to socialize	.00	135	138.75	18731.50
	1.00	121	117.06	14164.50
	Total	256		
..as a way to be entertained	.00	135	126.89	17129.50
	1.00	121	130.30	15766.50
	Total	256		
as a way to learn new things	.00	135	115.03	15529.50
	1.00	121	143.52	17366.50
	Total	256		
..be more efficient	.00	135	113.92	15379.50
	1.00	121	144.76	17516.50
	Total	256		
to get information	.00	135	115.56	15600.50
	1.00	121	142.94	17295.50
	Total	256		
as a way to shop	.00	135	118.02	15932.50
	1.00	121	140.19	16963.50
	Total	256		
way to work from home	.00	135	109.62	14798.50
	1.00	121	149.57	18097.50
	Total	256		
Satisfaction with on-line speed	.00	135	101.19	13660.00
	1.00	121	158.98	19236.00
	Total	256		
with reliability	.00	135	122.49	16536.50
	1.00	121	135.20	16359.50
	Total	256		
cost of service	.00	135	148.54	20053.50
	1.00	121	106.14	12842.50
	Total	256		
customer service	.00	134	113.66	15230.00
	1.00	121	143.88	17410.00
	Total	255		
Overall Satisfaction with Internet	.00	134	116.81	15653.00
	1.00	121	140.39	16987.00
	Total	255		

*0 = dial-up access
1 = cable modem

Table 11 continued
Satisfaction with the Internet
Mann-Whitney Test Statistics

Test Statistics[a]

	Satisfaction with E-mail	World Wide Web	Usenet	IRC/MUD	FTP	as a way to communicate in general	as a way to socialize	as a way to be entertained	as a way to learn new things	be more efficient	to get information	as a way to shop	way to work from home	Satisfaction with on-line speed	with reliability	cost of service	customer service	Overall Satisfaction with Internet
Mann-Whitney U	6427.500	4227.500	881.500	310.500	2170.000	7182.500	6783.500	7949.500	6349.500	6199.500	6420.500	6752.500	5618.500	4480.000	7356.500	5461.500	6185.000	6608.000
Wilcoxon W	15073.500	8322.500	3731.500	688.500	3710.000	16362.500	14164.500	17129.500	15529.500	15379.500	15600.500	15932.500	14798.500	13660.000	16536.500	12842.500	15230.000	15653.000
Z	-2.590	-3.004	-.162	-.976	-2.231	-1.820	-2.516	-.402	-3.521	-3.654	-3.313	-2.729	-4.582	-6.513	-1.538	-4.811	-3.454	-2.655
Asymp. Sig. (2-tailed)	.010	.003	.871	.329	.026	.069	.012	.687	.000	.000	.001	.006	.000	.000	.124	.000	.001	.008

[a] Grouping Variable: Cable Modem Dummy

Table 12
Internet Uses
Chi Square Crosstabs

Crosstab

			Cable Modem Dummy		Total
			.00	1.00	
Uses E-Mail	0	Count	5	4	9
		Expected Count	4.7	4.3	9.0
	1	Count	130	117	247
		Expected Count	130.3	116.7	247.0
Total		Count	135	121	256
		Expected Count	135.0	121.0	256.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	.030[b]	1	.863		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.030	1	.863		
Fisher's Exact Test				1.000	.568
Linear-by-Linear Association	.030	1	.863		
N of Valid Cases	256				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.25.

Table 12 continued
Chi Square Crosstabs

Crosstab

			Cable Modem Dummy		
			.00	1.00	Total
Uses Web	0	Count	45	2	47
		Expected Count	24.8	22.2	47.0
	1	Count	90	119	209
		Expected Count	110.2	98.8	209.0
Total		Count	135	121	256
		Expected Count	135.0	121.0	256.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	42.727[b]	1	.000		
Continuity Correction[a]	40.639	1	.000		
Likelihood Ratio	51.885	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	42.560	1	.000		
N of Valid Cases	256				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.21.

Table 12 continued
Crosstabs Chi Square

Crosstab

			Cable Modem Dummy		
			.00	1.00	Total
Uses Usenet	0	Count	112	47	159
		Expected Count	83.8	75.2	159.0
	1	Count	23	74	97
		Expected Count	51.2	45.8	97.0
Total		Count	135	121	256
		Expected Count	135.0	121.0	256.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	52.779[b]	1	.000		
Continuity Correction[a]	50.921	1	.000		
Likelihood Ratio	54.812	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	52.573	1	.000		
N of Valid Cases	256				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 45.85.

Table 12 continued
Crosstabs Chi Square

Crosstab

			Cable Modem Dummy		
			.00	1.00	Total
Uses FTP	0	Count	82	22	104
		Expected Count	54.8	49.2	104.0
	1	Count	53	99	152
		Expected Count	80.2	71.8	152.0
Total		Count	135	121	256
		Expected Count	135.0	121.0	256.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	47.914[b]	1	.000		
Continuity Correction[a]	46.166	1	.000		
Likelihood Ratio	50.225	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	47.727	1	.000		
N of Valid Cases	256				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 49.16.

Table 12 continued
Crosstabs Chi Square

Crosstab

			Cable Modem Dummy		
			.00	1.00	Total
Uses IRC/MUD	0	Count	108	94	202
		Expected Count	106.5	95.5	202.0
	1	Count	27	27	54
		Expected Count	28.5	25.5	54.0
Total		Count	135	121	256
		Expected Count	135.0	121.0	256.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	.205[b]	1	.650		
Continuity Correction[a]	.090	1	.764		
Likelihood Ratio	.205	1	.651		
Fisher's Exact Test				.759	.382
Linear-by-Linear Association	.204	1	.651		
N of Valid Cases	256				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.52.

Table 12 continued
Crosstabs Chi Square

Crosstab

			Cable Modem Dummy		
			.00	1.00	Total
Uses Inet Tel/Vidconferencing	0	Count	123	100	223
		Expected Count	117.6	105.4	223.0
	1	Count	12	21	33
		Expected Count	17.4	15.6	33.0
Total		Count	135	121	256
		Expected Count	135.0	121.0	256.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	4.073[b]	1	.044		
Continuity Correction[a]	3.354	1	.067		
Likelihood Ratio	4.096	1	.043		
Fisher's Exact Test				.061	.033
Linear-by-Linear Association	4.057	1	.044		
N of Valid Cases	256				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.60.

Table 13
Uses & Gratifications: Sample Means

Group Statistics

	Cable Modem Dummy	N	Mean	Std. Deviation	Std. Error Mean
Acquisition of Info Uses	.00	135	6.2074	1.6531	.1423
	1.00	121	7.4793	1.3546	.1231
Acquisition of Things Uses	.00	135	8.1778	2.4153	.2079
	1.00	121	11.5207	2.9724	.2702
Diversion Uses	.00	135	10.8519	3.1682	.2727
	1.00	121	11.4132	3.2728	.2975
Marketing/Work Uses	.00	135	3.6148	1.0147	8.733E-02
	1.00	121	4.6694	1.7291	.1572
Sociability with Friends & Family Uses	.00	135	4.2370	1.1983	.1031
	1.00	121	4.3967	1.0605	9.641E-02
Sociability with Strangers Uses	.00	135	2.9481	1.1350	9.769E-02
	1.00	121	2.9752	1.1065	.1006
Time Management/Work Uses	.00	134	13.9403	3.8638	.3338
	1.00	121	16.5868	3.7051	.3368

Table 13 continued
Uses & Gratifications:
T-Tests for Equality of Means

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig	t	df	Sig (2-tailed)	Mean Difference	Std Error Difference	Lower	Upper
Acquisition of Info Uses	Equal variances assumed	2.341	.127	-6.687	254	.000	-1.2719	.1902	-1.6465	-.8973
	Equal variances not assumed			-6.759	252.030	.000	-1.2719	.1882	-1.6425	-.9013
Acquisition of Things Uses	Equal variances assumed	5.810	.017	-9.916	254	.000	-3.3429	.3371	-4.0068	-2.6790
	Equal variances not assumed			-9.805	231.467	.000	-3.3429	.3409	-4.0146	-2.6712
Diversion Uses	Equal variances assumed	.996	.319	-1.393	254	.165	-.5614	.4029	-1.3547	.2320
	Equal variances not assumed			-1.391	248.957	.165	-.5614	.4036	-1.3562	.2335
Marketing/Work Uses	Equal variances assumed	32.142	.000	-6.024	254	.000	-1.0546	.1751	-1.3994	-.7098
	Equal variances not assumed			-5.865	189.357	.000	-1.0546	.1798	-1.4093	-.6999
Sociability with Friends & Family Uses	Equal variances assumed	1.470	.226	-1.123	254	.262	-.1597	.1421	-.4395	.1202
	Equal variances not assumed			-1.131	253.962	.259	-.1597	.1412	-.4377	.1184
Sociability with Strangers Uses	Equal variances assumed	.002	.965	-.193	254	.847	-2.71E-02	.1404	-.3036	.2495
	Equal variances not assumed			-.193	252.198	.847	-2.71E-02	.1402	-.3032	.2491
Time Management/Work Uses	Equal variances assumed	.002	.966	-5.569	253	.000	-2.6465	.4752	-3.5824	-1.7106
	Equal variances not assumed			-5.581	252.076	.000	-2.6465	.4742	-3.5804	-1.7126

Table 14

"Parts" of the Internet Used
Sample Means and T-Tests for Equality of Means

Group Statistics

	Cable Modem Dummy	N	Mean	Std. Deviation	Std. Error Mean
# of Internet Parts Used	.00	135	2.4815	1.1580	9.967E-02
	1.00	121	3.7769	1.1510	.1046

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
# of Internet Parts Used	Equal variances assumed	.161	.689	-8.961	254	.000	-1.2954	.1446	-1.5801	-1.0107
	Equal variances not assumed			-8.964	251.289	.000	-1.2954	.1445	-1.5800	-1.0108

Table 15

Consumption of Media
Sample Means

Group Statistics

	Cable Modem Dummy	N	Mean	Std. Deviation	Std. Error Mean
# of NP Subscriptions	.00	135	.7259	.9653	8.308E-02
	1.00	121	.8843	.9237	8.397E-02
DMX Sub	.00	135	2.222E-02	.1480	1.273E-02
	1.00	121	5.785E-02	.2344	2.131E-02
# PPV Orders in Last 6 Months	.00	135	.43	1.62	.14
	1.00	121	.48	1.47	.13
Monthly Internet Expense	.00	125	1.65	.89	7.97E-02
	1.00	118	4.55	.93	8.56E-02
# Magazines Read Last Week	.00	135	3.26	4.09	.35
	1.00	121	4.10	4.08	.37
# of NP Read Yesterday	.00	135	1.10	1.11	9.51E-02
	1.00	120	1.22	1.15	.11
Sega Sub	.00	135	7.407E-03	8.607E-02	7.407E-03
	1.00	121	4.132E-02	.1999	1.817E-02
Time Spend On-line Yesterday	.00	135	.75	1.41	.12
	1.00	121	2.22	2.60	.24
Time Spend with Home PC Yesterday	.00	135	1.90	2.70	.23
	1.00	120	3.33	3.53	.32
Time Spent on Phone Yesterday	.00	135	1.27	1.65	.14
	1.00	120	1.20	1.95	.18
Time Spent with TV Yesterday	.00	135	2.17	2.91	.25
	1.00	120	1.48	1.64	.15
# Video Rentals Last Week	.00	134	.96	1.50	.13
	1.00	121	1.13	1.72	.16
Monthly Phone Expense	.00	128	109.60	94.43	8.35
	1.00	119	114.43	126.01	11.55

Table 15 continued
Media Consumption
T-Tests of Equality of Means

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Time Spend On-line Yesterday	Equal variances assumed	41.816	.000	-5.712	254	.000	-1.47	.26	-1.98	-.96
	Equal variances not assumed			-5.544	180.685	.000	-1.47	.27	-2.00	-.95
Time Spend with Home PC Yesterday	Equal variances assumed	7.451	.007	-3.643	253	.000	-1.42	.39	-2.19	-.65
	Equal variances not assumed			-3.587	221.677	.000	-1.42	.40	-2.21	-.64
Time Spent on Phone Yesterday	Equal variances assumed	.138	.711	.311	253	.756	7.01E-02	.23	-.37	.51
	Equal variances not assumed			.308	234.244	.759	7.01E-02	.23	-.38	.52
Time Spent with TV Yesterday	Equal variances assumed	4.823	.029	2.289	253	.023	.69	.30	9.61E-02	1.28
	Equal variances not assumed			2.360	216.031	.019	.69	.29	.11	1.26

Table 15 continued

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig	t	df	Sig (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
# of NP Subscriptions	Equal variances assumed	.802	.371	-1.337	254	.182	-.1584	.1184	-.3916	7.482E-02
	Equal variances not assumed			-1.341	252.902	.181	-.1584	.1181	-.3910	7.426E-02
DMX Sub	Equal variances assumed	8.888	.003	-1.469	254	.143	-3.56E-02	2.425E-02	-8.34E-02	1.212E-02
	Equal variances not assumed			-1.435	198.338	.153	-3.56E-02	2.483E-02	-8.46E-02	1.333E-02
# PPV Orders in Last 6 Months	Equal variances assumed	.052	.820	-.256	254	.798	-4.97E-02	.19	-.43	.33
	Equal variances not assumed			-.257	253.981	.797	-4.97E-02	.19	-.43	.33
Monthly Internet Expense	Equal variances assumed	.384	.536	-24.844	241	.000	-2.90	.12	-3.13	-2.67
	Equal variances not assumed			-24.814	238.601	.000	-2.90	.12	-3.13	-2.67
# Magazines Read Last Week	Equal variances assumed	1.908	.168	-1.635	254	.103	-.84	.51	-1.84	.17
	Equal variances not assumed			-1.635	251.096	.103	-.84	.51	-1.84	.17
# of NP Read Yesterday	Equal variances assumed	.478	.490	-.850	253	.396	-.12	.14	-.40	.16
	Equal variances not assumed			-.848	246.626	.397	-.12	.14	-.40	.16
Sega Sub	Equal variances assumed	13.503	.000	-1.795	254	.074	-3.39E-02	1.889E-02	-7.11E-02	3.295E-03
	Equal variances not assumed			-1.728	159.265	.086	-3.39E-02	1.962E-02	-7.27E-02	4.836E-03
# Video Rentals Last Week	Equal variances assumed	3.966	.048	-.842	253	.401	-.17	.20	-.57	.23
	Equal variances not assumed			-.836	239.591	.404	-.17	.20	-.57	.23
Monthly Phone Expense	Equal variances assumed	.848	.358	-.342	245	.732	-4.83	14.11	-32.61	22.96
	Equal variances not assumed			-.339	218.137	.735	-4.83	14.25	-32.91	23.26

Table 16

Overall Media Consumption Sample Means and T-Tests of Equality of Means

Group Statistics

	Cable Modem Dummy	N	Mean	Std. Deviation	Std. Error Mean
Total Spending on Media	.00	135	113.5030	92.1497	7.9310
	1.00	121	121.5257	124.9462	11.3587
Total Time with Media	.00	135	8.5393	6.2925	.5416
	1.00	121	10.2112	6.1189	.5563

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total Spending on Media	Equal variances assumed	1.314	.253	-.589	254	.557	-8.0226	13.6307	-34.8662	18.8209
	Equal variances not assumed			-.579	218.928	.563	-8.0226	13.8536	-35.3261	19.2808
Total Time with Media	Equal variances assumed	1.414	.236	-2.150	254	.032	-1.6719	.7776	-3.2032	-.1406
	Equal variances not assumed			-2.154	252.303	.032	-1.6719	.7764	-3.2009	-.1429

Chapter 5

DISCUSSION

Introduction

This chapter discusses the results of model and hypothesis testing. Each hypothesis is taken and reviewed in order. For both propositions that were supported and those which were not, the result is considered in terms of possible strengths and weaknesses in the method (operationalization, sampling, measurement) and how it may advance or refine the theoretical perspective which drove it. When appropriate, analysis of additional data not specifically related to the formal propositions is provided to broaden the context.

To recap the general areas discussed here, some posited relationships were driven by diffusion of innovation and interactivity (factors influencing Internet access speed choice) and others by uses and gratifications and consumer economic behavior (effects of Internet speed on Internet usage and media consumption, effects of Internet speed on satisfaction with the Internet).

Hypothesis 1

Perceived Internet attributes are significantly related to choice of Internet access capacity. That three of the explicated innovation attributes were found to be related to

choice of speed generally supports a premise of diffusion theory, that perceptions of an innovation's attributes influence adoption. The research design in this case precludes drawing any conclusions about cause and effect. However, there is some anecdotal evidence of causation from the electronic focus group, particularly for interactivity. Of particular interest is the result that the "new" diffusion construct of interactiveness was a better predictor of high speed modem adoption than the time-honored innovation attributes of complexity and compatibility.

Perhaps the results would have been somewhat different if the sampling strategy had permitted one random sample instead of two. The point is moot since it would have been prohibitively expensive to obtain a sample of respondents of over 1,000, approximately the number necessary to get a sufficient number of cable modem subscribers from the general cable television subscriber population. The other obvious sampling issue relates to the choice of populations — residents of a university town. This point too is moot since cable modems have been introduced only in such communities of atypical demographics.

The other remaining innovation attribute, radicalness, did not survive to the hypothesis testing stage. It seems there was a measurement deficiency — the survey items held too little internal consistency. However, there is a possible explanation for this besides poor survey construction. In retrospect, perhaps the construct was not sufficiently explicated as being distinct from compatibility. If this were so, the survey items may not have been valid, let alone reliable. On the other hand, since no radicalness item loaded anywhere but where it was designed to, the concept is distinct; perhaps if the

scales were better, the hypothesized relationship might hold.

Hypothesis 2

Perceived levels of compatibility, interactiveness and radicalness in adoption are positively linked to choice of capacity; complexity and radicalness in use are negatively associated. The support for this hypothesis is in keeping with diffusion theory. The theory is perhaps even advanced by the introduction and successful testing of the new construct of interactiveness.

In its debut as a diffusion variable, this is a gratifying success. However, the research done here is only a preliminary treatment. Although there were several facets of interactiveness explicated and measured, the scale which resulted was face valid only for one of these facets. It would have been better to include a much longer list of interactiveness items in the survey. Given the length of the survey, however, this was not feasible.

As for complexity and compatibility, there do not appear to be weaknesses from inadequate measurement or sampling. It may very well be that for the Internet and speed, the ideal attribute "matrix" (see Dearing, 1994, and related discussion in the literature review chapter) does not include these concepts as they were operationalized. This possibility itself is interesting because it suggests a need to refine diffusion theory for the Internet and perhaps other new media innovations.

Analysis of the focus group data adds a certain amount of richness and demonstrates the value of such triangulation. As discussed earlier, the radicalness

construct was not treated and the negative sign on the complexity coefficients is consistent with diffusion theory (the less complex, the greater the likelihood of adoption).

Hypothesis 3

The prior adoption of related clusters of telecommunication equipment and services, computer equipment and mass media appliances are positively associated with access capacity choice. Likewise, use of synchronous forms of communication and asynchronous forms involving large data files are positively related to access capacity choice. There are at least three theoretical and methodological implications suggested by the partial support this hypothesis received. First, it seems that the innovation cluster concept has been well-served and advanced in this study. And secondly, the sheer power of the asynchronous, data-intensive communication predictors in relation to the other diffusion variables adds more evidence that the ideal attribute matrix for Internet speed is different from more conventional ones. Methodologically speaking, together with the relative importance of the innovation cluster, it suggests that *objective* measures of an innovation's attributes may be better predictors than *subjective* perceived measures, a.k.a. the innovation attributes of complexity and compatibility.

The innovation cluster concept, it will be remembered, posits that the prior adoption of related technologies will influence adoption of a similar innovation. Prior research suggests that it is the nature of the innovation and not necessarily its function which is the source of influence (recall the "on demand" nature of audiotext and its relationship to a cluster of innovations that shared this quality but not its information-

giving function). The results of the present study support this; the "nature" in this case was an ability to confer status. That there were NO other clusters which emerged from FA provides additional support for this notion that nature, not function is the distinguishing underlying issue.

Sampling should be considered a potential source of problems here, since the two samples taken together actually describe a single and atypical demographic which could be the source of this status-driven interest in the new, hip and conspicuous. However, there is no reason to believe that the measurement instrument caused some kind of problem. The comprehensive list of 26 communication innovations is fairly exhaustive; if a latent variable was there, it would have been tapped.

More frequent use of data-intensive communication applications (Web, FTP) on the Internet were the most powerful independent variables on the outcome of choice of speed (except for having an information-related occupation). That they beat out the better established diffusion of innovation attributes of complexity and compatibility is theoretically interesting. This result suggests that the Internet is better at this kind of communication at higher speeds. "Better" draws us back to the concept of relative advantage, the degree to which an innovation is perceived as being better than the technology it supersedes. The evidence on data-intense communications suggests a particular flavor of relative advantage.

Hypothesis 4

Adopters of higher speeds will be more likely to be male, older, better educated and have higher incomes. This hypothesis was included to draw out the likely influence of demographic factors, called "adopter attributes" by diffusion theory. For control purposes, occupation was measured as well; as it turns out, this is the most telling factor. Having an information-related job was the most powerful predictor of high speed Internet adoption. Hardly surprising but worth verifying nevertheless.

It is particularly interesting to see how some adopter attributes were confounded with other diffusion variables. Although most cable modem survey respondents were male, this adopter attribute was utterly confounded with asynchronous data-intense communication — as soon as this variable was removed from the logistic regression, the coefficient shot from .05 (not statistically significant) to .81 ($p<.02$). In other words, practically all male cable modem adopters used the Internet in this way but so did many females. So gender really did not matter. Likewise, household income seems to have been confounded with the technology cluster of status-conferring innovations. Once it was removed, income's coefficient moved from .11 (insignificant at $p<.18$) to .19 (but significant at $p<.01$). It makes sense that only people who can afford the technology would buy it. This may be true for big screen TVs, digital cameras and cellular phones but perhaps not for cable modems — a meaningful number of people whose incomes were less than $15,000 had cable modems and the resulting coefficient was smallish (.19). Also, focus group results show that for people who value speed, the price is cheap.

No matter how the model was arranged, age and education were never factors.

This is a fascinating result given the particular market, a place where the likelihood of having a Ph.D. is one of the highest in the nation. Similarly surprising was the lack of influence of age. At first blush, it seems that some revising of stereotypes is in order. However, the unique local population may explain this result. As would be expected, both samples were rather heavily populated with Ph.D.s because they have jobs or feel professional pressure that requires to be more computer-savvy than the general population. In addition, those with Ph.D. degrees tend to be older than average. Therefore, both samples had a higher than normal instance of highly educated, older respondents. On the other end of the education and age continuum, both samples may have had significant numbers of young people currently enrolled in college or who were the offspring of Ph.D.s — though they were adults, they had not yet had a chance to complete the highest level of education they will attain in their lives (For this reason, the U.S. Census only reports education levels for adults 25 years and older.). As a result, there were people reported as having "some college" whose consumer behavior profile would more closely match that of a college graduate or advanced degree holder.

In terms of measurement, there do not appear to be any problems, aside from the previously mentioned difficulty in inferring to a general population because of the uncommon characteristics of the local population. Missing data was a small problem. As often happens in survey research, asking for personal information like income leads to missing data. The fact that only eight percent of respondents declined to supply this was uncommon good luck.

Taken together, the results of the first four hypothesis tests form one more check

(among thousands) of the theory of diffusion of innovation. The value of the present study is its focus on innovation attributes as predictors of adoption; this is a less common frame for innovation adoption research. The investigation suggests first of all, that established innovation attributes should be made to compete with newly developed ones because the ideal attribute matrix may not be consistent across innovations. This argues against parsimony. A goal of diffusion research is to find the smallest, most parsimonious set of innovation attributes to describe all manner of innovations (whether hybrid seed corn, new teaching methods or communication technologies, for example). However, as prior researchers have found, the classic five (relative advantage, complexity, compatibility, observability and trialability) may simply be inadequate. A second suggestion is that diffusion research may be old hat, but that its application to new media, particularly the Internet, can still provide useful insights for advancing the theory. By way of current example, perhaps communication technologies are different from other kinds of innovations as the evidence on interactivity suggests.

Hypothesis 5

Uses of the Internet that involve synchronous communication are better satisfied at higher access speeds and will be more common than at slower speeds. Satisfaction with the Internet was measured in a number of ways not directly related to this proposition. This was done in order to provide a context for the results of hypothesis testing. As it turns out, this was a good strategy. For 11 of the 18 separate satisfaction measures, cable modem adopters were more satisfied than dial-up Internet users.

However, it was not good enough to find a relationship between synchronous communication and high speed access.

Satisfaction with synchronous forms of communication, IRC/MUD, was not positively linked to high access speeds. For this reason, the specific hypothesis was more or less rejected. In hindsight, it was a mistake to measure satisfaction with only this form of synchronous communication. In analysis of frequencies, it turned out that cable modem subs are statistically more likely to use tele- and videoconferencing on the Internet but satisfaction with this application was not measured. It would have been feasible to add one more item to the list of 18 in order to obtain this important measure.

Since intensity of use is often related to satisfaction, a significant relationship between video/teleconferencing on the Internet and speed would probably have been found and this hypothesis would not have been rejected. In fact, it is likely that satisfaction with conferencing applications would have garnered high satisfaction marks from cable modem users if the qualitative focus group data is anything to go by — one respondent noted that he planned to keep live video going from his home to office 24 hours a day and others mentioned the ease of using Iphone with a cable modem. It seems that IRCs and MUDs, with their low-rent connotation just don't amount to an appealing form of synchronous communication for some people.

Hypothesis 6

Uses of the Internet that require sending or receiving large amounts of data are better satisfied at higher access speeds and will be more common than at lower speeds.

This hypothesis received strong support. For both the applications of Web and FTP, cable modem users were overwhelmingly more likely to be satisfied than slower modem Internet users who used these "parts." Likewise, they were more likely to have adopted and used them than slow modem Internet users. The notion that drove this hypothesis to be included was that the Internet would be more interactive at higher speeds and that evidence for this would be more use and satisfaction.

One cannot conclude however that the Internet is more interactive just from these findings. It should be noted that cable modem adopters were significantly more likely to be satisfied with email as well. In other words, they are just more satisfied with asynchronous communication, data-intense or not. Email is not thought to be improved by greater bandwidth — it's a low-bit application that works well with a 2400 baud rate modem. There is no cable modem-related reason why this group should be more satisfied. What's more, cable modem adopters were more satisfied with a variety of facets of the service. In this broader context, it seems cable modem adopters may be more satisfied with the Internet for reasons beyond their speedy cable modem. For example, their propensity to have an information-related job may be the cause — they have chosen careers in the communication business and are therefore more interested in and satisfied with the Internet.

This is not to say, however, that high speed access adoption contributes nothing to satisfaction. The results provide more than a hint that it is positively related to higher satisfaction. Recalling the many and enthusiastic kudos the focus group participants provided without prompting, we can see that cable modems are the root cause of some

satisfaction (and a reminder to marketers that word-of-mouth advertising may be very effective for this product). An interesting artifact from the satisfaction items provides another clue. "Overall Satisfaction with the Internet," measured on a scale from 1 to 10, rendered meaningless results — both cable modem subs and dial-up access users responded with a "7" at roughly equal rates. Yet when asked about specific facets of Internet service (i.e., speed, reliability) and capabilities, cable modem users were often vastly more satisfied. The implication is that it is the cable modem that makes a difference; the cable modem may allow the adopter to be more discriminating.

In addition to the "overall satisfaction" measurement results, there emerged another interesting methods issue. From the nebulous responses to the "overall satisfaction" item, it would seem that it is necessary to measure satisfaction with specific facets of this service and never solely with a general, overall measure. Secondly, when FA was run to discover whether these 18 facets of Internet satisfaction were the "effects" of underlying categories of satisfaction, it became apparent that they were not — while some are correlated, there emerged no interpretable latent satisfaction variables. Again, the implication is that satisfaction with a service such as this has many sources.

Hypothesis 7

Higher access speeds are associated with greater variety of and more intense sociability, diversion, acquisition and time management uses. This proposition held for acquisition, time management and "marketing/work" uses only. A greater variety of uses was associated with speed as well.

Because the time management and marketing/work uses were found to be more intense at higher speeds, it again brings to mind the possibility that cable modem adoption is an occupation-driven phenomenon and not necessarily because speed "causes" these uses to be more intense or common. On the other hand, both the acquisition of information and tangible things was more common and intense at high speeds. These are not necessarily job-related gratifications — especially such uses as "personal research," "getting news," "downloading games for play," and obtaining music and video clips. Perhaps there is another explanation.

The averages for each group did not differ significantly for diversion and sociability uses; speed did not make a difference. A dichotomy therefore emerges in this investigation of the uses and gratifications of the Internet at high speeds. Perhaps it is related as much to a personal style issue or "human orientation" as the organizational behavior literature would phrase it. In this research tradition, human orientation is classified by task orientation and people orientation. Some people prefer to focus on the process and accomplishment of tasks while others prefer interaction with people. It is often represented on a continuum; a position in the middle represents a personal style that is equally comfortable with tasks and people. Acquisition, time management and work uses can be described as tasks while sociability uses are obviously people-oriented. Diversion uses can be people-oriented. It is possible that this human tendencies explanation fits the current results better. In this case, the "tendencies" are media habits for people and task orientation.

The proposition that a greater variety of gratifications are served by the Internet at

higher speeds and that their use is more intense was devised as an extension of the research paradigm of uses and gratifications of the media. The inquiry here offers some insights on this research paradigm. First, there is support for the notion that typologies of media uses and gratifications categories exist. Secondly, it is possible that the traditional categories as they have been applied to television, newspapers and telephone, may not hold for the Internet. Finally, it appears likely that there are other more powerful motivating influences for Internet use at high speeds besides obtaining gratification.

In the literature review chapter of this dissertation, it was proposed that uses and gratifications could be set up to compete with other perspectives to see whether one offered a better explanation of high speed Internet adoption and use. As it played out, that specific competition could not be arranged. A design which specifically addresses this question could prove informative.

Hypothesis 8

Higher access speeds are associated with lower use of telephone, television and home video. The proposition was a deduction from the idea that if the uses and gratifications obtained by one medium can also be satisfied with a new one, and that second medium "works better" in a world where time is scarce, the new one would be substituted. Either there is a flaw in the reasoning or a measurement deficiency — only in the case of television was there a meaningful relationship between decreased use and cable modem adoption.

As for the television result, the earlier explication appears to hold. Television is a

common tool for obtaining escape and diversion. It is likely there is more to it than this; the experience of watching TV provides "the immediate rewards of low intensity (Kubey and Czikszentmihalyi, 1990)." One can spend a great deal of time with television and receive a relatively small "reward," the cost-to-benefit ratio of time spent with television is high. As such, TV is perhaps the most obvious sacrifice in many Internet users' minds. Television is easily displaced by something as fascinating as the Internet at high speed.

The measurement items were phrased to induce the respondent to report media use for a specific time period ("yesterday" or "last week"). This means was chosen because asking about a specific time results in more accurate results. However, media consumption during these periods may not be typical for that respondent. Alternatively, the questions could have asked for how much he usually watches television, talks on the phone at home, etc. The problem with this is respondents will tend to provide socially desirable answers — they may under-report television viewing and inflate the time they spend reading. In a very large sample survey, the former strategy is best because "error" from reports of media use that are unusual for a particular subject will even out. This is the reason the "specific time" strategy was used. Perhaps this was a mistake; by power analysis, the sample may not have been large enough to smooth out this kind of error.

On the other hand, maybe the results are reliable and the proposition needs intellectual refinement. For example, if cable modem adopters do not necessarily spend less time with these other media, is it because they tend to communicate and use the mass media more in general? Is it as Reagan has suggested, "...it is not the technology that drives media habits but media habits that drive technology adoption (Reagan, 1989)?" In

other words, cable modem adopters may already have been heavy media users before they got their high speed Internet access. Or, considering the connoted sociability uses of the telephone and home video, is it that the Internet is simply not a good substituted for these media? The data set does not allow this kind of an inference but it does raise the question.

Hypothesis 9

Higher access speeds are not associated with expanded overall time spent with media. Analysis suggests the opposite may be true. Since cable modem adopters spent more time than slow speed Internet adopters with their home computers and on-line, and consumed apparently similar levels of other media, this boosted their overall consumption to a statistically significant and higher average.

But was the high speed group really spending more time with media at home or is this confounded with the possibility that cable modem users were merely working at home more often, telecommuting via the Internet. If this were true, it would mean that their media use was artificially inflated — time that used to be counted as time at work would now double counted in the category of time spent with media. For telecommuters, home uses of the media now include uses of the media that used to be associated with the workplace. As a check on this, survey item 67 which asked "What percentage of that time [spend on-line at home] was for work?" was analyzed. The result of chi square analysis are inconclusive. Thirty-nine percent of dial-up access users spent half or more of their on-line time working compared to 51 percent of the cable modem group. The chi

square statistic was 2.49; 3.84 would have been required for a statistically meaningful difference. If the telecommuting issue is confounded with overall media consumption, it is not manifesting itself.

Hypothesis 10

Higher access speed adoption is associated with greater spending overall on media and communication technologies. The rejection of this hypothesis is rather unexpected. Cable modem subscribers pay TCI either $44.95 or almost $70 per month, depending on the level of residential service (About two thirds of participants had the less expensive 4 mbps service, the remaining third, 10 mbps.). And since many of the dial-up access Internet users ostensibly had free Internet access through the local university (assumption based on the occupation — 56% of dial-up access had university-related occupations compared to 36% of the cable modem group), it was presumed that, at a minimum, this imbalance in Internet expense would affect the overall spending measure. Cable modem users do spend much more on Internet access and the difference is significant[7]. The source of the counter effect is unclear; most of the other differences were not statistically significant.

There are at least two possibilities to explain this observation. First, a measurement problem and secondly, cable modem users really do not spend more. On the measurement issue, this variable was an index of spending, and not a dollar amount

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[7]Average cable modem spending = 4.55 vs. 1.65 for dial-up group. The survey item was coded as follows: 1=$0; 2=up to $20; 3=$20-29; 4=$30-49; 5=$50-74; 6=$75-100; 7>$100.

per se. Some media may have been over-represented as a consequence. For example, only the number of newspaper subscriptions was counted and not the subscription expense. The Lansing daily newspaper is less expensive than the *Wall Street Journal.* In addition, the list of media expenditures hit the major categories but was not exhaustive. For example, spending on premium movie channels, movie theatre attendance and video games (other than Sega channel) were not measured; the last two for reasons of survey length.

But what of the possibility that cable modem users economize on media spending? It was suggested earlier that this group communicates more and uses the media more. That does not mean they spend more, however. For example, in analysis discussed earlier, it was concluded that high speed Internet users do not necessarily use the Internet for diversion more nor are they more likely to use it at all for this gratification. These are just the types of media uses that tend to be expensive — entertainment, gameplaying and so on. In addition, they are less likely to watch television, a chief tool for obtaining diversion gratifications. Based on these two observations, it seems a likely possibility that cable modem adopters, despite the high expense they incur for Internet access, may not spend more on the media overall.

Summary

The ten hypotheses, whether supported or not, all served to inform and refine our knowledge about the diffusion of new technologies, interactivity, uses and gratifications of the media and consumer economic behavior. In addition, the results of analysis raise a

number of interesting problems and possibilities. Methodologically, a variety of lessons were learned on research design issues; there were both successes and difficulties in variable operationalization, sampling and measurement. And finally, the tests of the propositions help to answer the original research questions. In the next chapter, this particular matter is addressed.

Chapter 6

SUMMARY AND CONCLUSIONS

Significance of Findings

This inquiry constitutes one of the early empirical investigations into the factors influencing adoption of high speed Internet home access and, in turn, the effects of high speed access on use and consumption of both the Internet and other media. As such, the results should be considered 1) early findings, subject to change as the innovation matures and 2) a rich source for suggested future research. In this final chapter, the original research questions are considered, the limitations of the study are discussed and directions for future related research are enumerated.

In the first chapter, justification for this dissertation's focus was presented. In this conclusion, it seems fitting to recall them in tandem with the significance of the present findings. First of all, it was suggested that the period before the Internet becomes truly high speed allowing communication in real-time, provides a "lead time" opportunity for both policy makers and industry and that a study of speed could inform these stakeholders and help them capitalize on this lead time. The findings suggest to policy makers that since speed apparently does make a difference, there may well be a public interest in appropriately motivating universal service. For industry, particularly the cable industry, the findings indicate there is a broad potential market for high speed, and

capitalizing on it depends on understanding users' needs and concerns. Secondly, to the question of whether a study of speed has only a short useful life, it seems the significance of these findings inform beyond the idea of speed alone. The Internet will not be the final medium or technology to emerge — one hundred years ago the motion picture, newspaper, telephone and telegraph had just begun to stake out their overlapping markets, yet, within a few decades, new media emerged and the technology that drove them all had advanced considerably. So it will continue into the next century.

Answers to Research Questions

The first chapter described the importance of studying high speed Internet access. In particular, three research questions were articulated:

> How is the Internet perceived differently by those individuals who have a high speed cable TV connection compared to those with a conventional one? And do these perceptions explain adoption?
>
> How does high speed access to the Internet affect its use in households as compared to conventional speed access? In other words, what is it used for, when is it used, how is it used?
>
> How does the household consumption and use of other mass media and communication technologies change under varying Internet access conditions?

The results of the study provide partial answers to these questions. First, as to the question of how the Internet is perceived, in terms of its attributes, there do appear to be differences between the subjective perceptions of high speed users and those of dial-up modem users who access the Internet at slower speeds. They perceive it to be more capable of a particular kind of interactiveness, a facet related to flexibility of the Internet. There is evidence as well that they perceive it to be less complex, that is, not as difficult to understand or use. Finally, they may perceive it as more compatible with their lifestyles, needs and the way they do things. As to whether these perceptions explain adoption, the study does not permit drawing causal inferences. However, there is a relationship between adoption and the adopters' perceptions. It may be that perceptions influence adoption. On the other hand, it is possible that the higher speed access leads to views that the Internet is less complex, more compatible and more interactive.

As to how the Internet is used in homes once high speed access is introduced, it can be said that use is different but we must stop short of inferring that the cable modem is the cause. First, the evidence suggests that Internet use at high speeds is generally more intense. They spend more time on-line, are more satisfied with a variety of facets, use more "parts" of the Internet, use it to satisfy more needs and for a greater variety of tasks. However, there is only anecdotal evidence to suggest that the cable modem is the cause for such magnified use. It may also be some characteristic of the cable modem adopter that explains this phenomenon. Still, this investigation revealed some very distinct differences that are in themselves useful and interesting.

Finally, for the question of whether high speed access leads to differences in the

way all media are consumed, the answer is less conclusive. The primary difference discovered in this inquiry is in television viewing. Cable modem users may watch less TV. They also seem to use their home computers more and spend more time on-line than their counterparts with slower home Internet access. They spend more on Internet access, too, but it seems they may not spend more overall on the media. In short, speed is related to more Internet use and less television use but not more media use overall.

Limitations of Current Study

The results of this study, while useful and informative, should be considered exploratory findings. The broad scope of the study precluded in-depth consideration of a narrow aspect of high speed Internet adoption and use. Furthermore, the non-experimental design precludes causal determinations. Finally, the atypical population targeted for sampling and study prevents wholesale generalization to broad populations.

These limitations were calculated in advance and traded off in favor of a number of potentially valuable insights and lessons. The broader theoretical framework and survey research design allowed opportunities to evaluate a new innovation in the context of multiple theoretical perspectives and to study the early phase of diffusion to gain insight for both policymakers and industry. Most of all, the findings point to a number of important "next steps" for future research.

Recommended Future Research

The discussion chapter offers several questions raised by the findings of this study. They suggest a number ways future research could be directed to capitalize on the study of high speed Internet access in the home. First, this empirical work can be thought of as observations on which a meta-theory of speed and communication could be founded. This explication would pay particular attention to the concepts of speed and interactivity. The exercise would attempt to explain and predict the interaction among and combined influence of traditional diffusion and uses and gratifications concepts on media/technology adoption and use. In fact, this was an early objective of this dissertation but was set aside to first lay this important empirical groundwork.

Secondly, there are ideas for further investigating diffusion-related and uses and gratifications questions. Finally, the economic behavior of consumers suggests a study geared to traditional marketing science. All three of these threads can be modeled in ways that permit more sophisticated quantitative analysis; the application of structural equation modeling in particular may be effective.

Future study of the diffusion of high speed access to the Internet should continue to focus on innovation and adopter attributes as factors that influence adoption. The findings of the present study suggest that additional innovation attributes be explicated and studied in concert to find the best fit in terms of the attribute matrix, the series of attributes that fully describes the Internet at high speeds. Complexity and compatibility showed their value here. Additionally, radicalness and a new attribute called interactiveness need further development. The study results also suggest that carefully

explicated versions of relative advantage be reconsidered. Perhaps there are others.

The exhaustive typology of the uses and gratifications of the Internet has a start in this study. Further work is needed however, to reach the point of completeness. A total of seven separate gratifications categories emerged here but there may be more. For example, uses of tele- and videoconferencing appear to have more significance than the survey instrument was designed to capture. The uses and gratifications perspective may also prove a useful context for further study of how people choose among a variety of media to obtain satisfying gratifications.

While the concept of interactivity here was shaped to conform to the notion of an innovation attribute, there are other ways to conceptualize and study the construct. Worth consideration is the body of research on human-computer interaction and theory of "flow," called the psychology of optimal experience (Czikszentmihalyi, 1990). Flow considers "how consciousness works and how it is controlled... 'Flow' is the way people describe their state of mind when consciousness is harmoniously ordered (p. 6)." When people achieve a seamlessness between themselves and the activity they engage in, they can lose track of time and even lose the awareness they are doing something physical — it all becomes an existence in the mind. For example, the Internet could be truly interactive if it is responding as fast as the user's mind. Under these conditions, he might then become so engaged surfing the Web or communicating in real time with a friend, that he loses awareness of the technology, the computer itself. Once the Internet becomes so fast, people may often experience flow. An experiment could be designed to see whether high speed access actually enables this condition.

Next, the rather interesting satisfaction findings suggest a look toward marketing theories. One perspective that links satisfaction with attitude change and intent to purchase is known as the cognitive model of expectation/expectancy disconfirmation (Oliver, 1980). In this model, consumer satisfaction with a good is a function of both consumer expectations about the good and the disconfirmation of those expectations. In turn, the perceived expectations and the good or bad experience which leads to disconfirmation are additive. The total effect leads to a reformulation of attitude toward the product and finally, a change in purchase intention. This theory might be useful toward understanding how people's expectations and subsequent experience with a new product such as a cable modem might influence the decision to subscribe.

Finally the current data set, obtained at some expense, may still have some useful life. First of all, much of the data was analyzed using univariate procedures. For the most part, more sophisticated statistical techniques could not be used due to the ordinal or categorical nature of the data. However, for a few items, such as the 10-point satisfaction scale, higher level analysis could be done.

As was explained earlier, the speed variable was reduced to a dichotomous level — fast cable modem or slow dial-up access. As such all results have to be considered in terms of their relationship both to speed and to other qualities inherent in Internet access via cable or phone lines. For example, with cable modems, one does not have to dial up at all, one is always "on." There may be other qualities that influences results. This presents a second example of a way the current data set could be put to further use: Test for the influence of other "qualities." One could reconstitute the speed variable into a

"trichotomous" one. The distribution of this variable lends itself more or less to this suggestion: Among the dial up users, about one half had very slow modems (2400 to 14400 BAUD rates) and the other half had faster modems (28800 - 33600 BAUD rates). Another way to test this notion would be to look at frequencies by ISP — among dial up users, about 60 percent had access from a university, one third from AOL. In this way, the unmeasured influence of non-speed "qualities" could be identified.

The results of the study leave many questions about causality. To an extent, some of this ambiguity may be reduced by reconstituting the model and conducting "data snooping." Structural equation modeling (SEM) and testing may lend itself to this task. SEM is also known as causal analysis and simultaneous equation modeling. It is essentially a combination of exploratory factor analysis and multiple regression (Ullman, 1996)p. 709). One dependent measure is set against a series of independent predictors which may or may not be related themselves. SEM will determine whether factors exist how they may influence the dependent variable (although specific hypothesized relationships must be set up to make the procedure run). It is a technique then for testing hypotheses "about relations among observed and latent variables (Hoyle, 1995, p. 1)." Of course, the approach is rather more complicated than this. It is mentioned here as a tool for further investigation using the present data set.

Conclusion

As the tradition of mass communication research entered the late 20th century, the presupposition that the "media do things to" passive audiences gave way to view that it is individuals who choose among media and decide what to use them for. Certainly, the media may have effects on individuals and society. But the prior adoption of media technologies and the decisions people make about how to use them precede and affect the media effects equation. In this updated context, the present study sought to further the understanding we have sketched to date. In a modest way, this goal has been successfully accomplished. In the portion of total human experience with the mass media and communication technologies that is occupied by the Internet, a description of the multi-dimensional effects of speed is here offered as a contribution for further consideration and study.

APPENDIX

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF TELECOMMUNICATION
(517) 355-8372
FAX (517) 355-1292

EAST LANSING • MICHIGAN • 48824-1212

October 29, 1996

home address: P. O. Box 148
Webberville, MI 48892
517-521-4545

Dear Cable Modem User,

I am a PhD student at Michigan State University and I am writing to ask for your participation in a research project on cable modems. As you may know, cable modems have been commercially available in East Lansing/Meridian Township longer than anywhere else. That makes Internet users like you quite unique. In many ways, the patterns of Internet usage in this area are like a window on the future.

And this is why I am contacting you. I am trying to help policy makers and the communications industry understand the likely future needs of Internet users. To that end, I would like to ask a few questions about cable modems and the Internet. Later, there may be a telephone survey. Your participation is voluntary and responses you give will be kept completely confidential. **The survey will take only a few minutes at your convenience; please respond in the next seven days.** As a "thank you" for participating, I can send the results of this study if you like. You can participate in any of three ways:

a)Visit my Web site and simply follow directions: **<http://www.msu.edu/user/hoaganne>**
b)E-mail your responses to me at **<annehoag@msu.edu>**
c)Fax your responses to me at 355-1292.

Please answer in as many words as you care to give; long answers are especially welcome:

1. Why did you subscribe to a cable modem Internet access service?

2. In your opinion, how is using the Internet different (better and/or worse) with a cable modem than with a telephone line and regular modem?

3. Before you got a cable modem, what did you use the Internet for? As much as possible, please describe specific uses.

4. Did the way you use the Internet change when you got a cable modem? If so, how do you use the Internet now?

5. Do you have any additional comments that you think will inform this research at this preliminary stage?

If you have *any* questions, please contact me by any means given in this letter. Thank you for your time and participation!

Sincerely,
Anne Hoag

Cable Modem User Survey Phase I

Response Form

October 26, 1996

Thank you for visiting this site. If you've come, you must have received my letter about this research project on Internet usage. As my letter said, I am a PhD student at Michigan State University. As part of this research project, I am asking people who access the Internet via a cable modem to respond to a few questions. Your participation is voluntary and any responses you give will remain confidential. I hope you decide to participate -- as far as we know, this is the first formal research undertaken on the subject of cable modems and your answers will provide very important insight.

This is Phase I of the research project. In Phase II, a wider group of people will be surveyed by telephone to gather further information. If you have any questions at all, please contact me; all my addresses and numbers are in the letter. Thank you again!

Sincerely,
Anne Hoag
Department of Telecommunication
Mass Media PhD Program
Michigan State University

Please respond in as few or as many words as you like to the following questions. At the end, just click the "submit" button.

1. Why did you subscribe to a cable modem Internet access service?

2. In your opinion, how is using the Internet different (better and/or worse) with a cable modem than with a telephone line modem?

3. Before you got a cable modem, what did you use the Internet for? As much as possible, please describe specific uses.

4. Did the way you use the Internet change when you got a cable modem? If so, how do you use the Internet now?

5. Do you have any additional comments that you think will inform this research at this preliminary stage?

6. As a "thank you" for participating, would you like to receive the results of this study? If so, please enter your name and mailing address.

Send Answers

Submit

Erase Answers

Reset

Thank you for your time and participation! This site was created October 24, 1996.

Telephone Survey Instrument

1. Hello, my name is _____ and I am calling from Michigan State University. We are conducting a 15 minute random survey of Lansing-area cable subscribers. You may have received a postcard recently letting you know we would be calling. The purpose of this study is to gather information on how people use the mass media. Your participation is voluntary and you may discontinue the interview at any time. Answers you provide will remain anonymous and confidential.

2. We'd greatly appreciate your help. I'll start with the first question now; is that ok? Are you 18 years or older? [IF NO, THANK AND END INTERVIEW]. First of all, do you have a computer at home?

yes..... 1
no[THANK & END CALL; ENTER INFO ON SHEET].. 2

[IF THE ANSWER IS 2, THEN SKIP TO QUESTION 117]

3. Do you use electronic mail at home?

yes..1
no...2

[IF THE ANSWER IS 2, THEN SKIP TO QUESTION 5]

4. How often do you use it from your home?

more than once a day....1
several times a week....2
once a week.....3
2 or 3 times a week.....4
once a month.....5
less than once a month..6

5. Do you use the World Wide Web from your home?
   yes..... 1
   no [IF NO TO EMAIL & WWW Q, THANK & END].. 2

   [IF THE ANSWER IS 2, THEN SKIP TO QUESTION 7]

6. How often do you use it from your home?
   more than once a day....1
   several times a week....2
   once a week.....3
   2 or 3 times a month....4
   once a month.....5
   less than once a month..6

7. Do you use the Usenet, also called Newsgroups, from your home?
   yes..1
   no...2

   [IF THE ANSWER IS 2, THEN SKIP TO QUESTION 9]

8. How often do you use them from your home?
   more than once a day....1
   several times a week....2
   once a week.....3
   2 or 3 times a month....4
   once a month.....5
   less than once a month..6

9. Do you use on-line chats, Internet Relay Chats or Multi User Domains, also called MUDs?
   yes..1
   no...2

   [IF THE ANSWER IS 2, THEN SKIP TO QUESTION 11]

10. How often do you use them from your home?
   more than once a day....1
   several times a week....2
   once a week.....3
   2 or 3 times a week.....4
   once a month.....5
   less than once a month..6

11. Do you transfer files, for example with FTP, from your home?

yes..1
no...2

[IF THE ANSWER IS 2, THEN SKIP TO QUESTION 13]

12. How often do you do this from your home?

more than once a day....1
several times a week....2
once a week.....3
2 or 3 times a month....4
once a month.....5
less than once a month..6

13. Do you use your computer to make phone calls or videoconference from your home?

yes..1
no...2

[IF THE ANSWER IS 2, THEN SKIP TO QUESTION 15]

14. How often do you do this from your home?

more than once a day....1
several times a week....2
once a week.....3
2 or 3 times a month....4
once a month.....5
less than once a month..6

15. To do those things, you must subscribe to an on-line service or the Internet. Please tell me how you get this service at home. Is it from [IF MORE THAN 1 INDICATED, ASK THEM TO CHOOSE MOST USED] [IF TCI MODEM CUSTOMER, DO NOT ASK BUT ENTER "TCI"]

America On-line..... 1
a Univ. or school..... 2
your employer who has a gateway.. 3
Compuserve..... 4
Sojourn..... 5
Voyager..... 6
Prodigy..... 7
Another ISP..... 8
Don't Know..... 9

TCI..... 0

16. How much was your total expense for using the Internet or any on-line communication last month, including subscription and any per minute charges?

$0.....1
up to $20.....2
$20 to 29.....3
$30 to 49.....4
$50 to 74.....5
$75 to 100.....6
more than $100..7

17. Please rate the fairness of the cost of Internet and on-line communication on a scale from 1 to 10 with 1being too expensive and 10 being a real bargain.

1 too expensive.... 1
2..... 2
3..... 3
4..... 4
5..... 5
6..... 6
7..... 7
8..... 8
9..... 9
10 a real bargain.. 0

18. From now on, when I ask about the Internet, think of all the kinds of on-line Communication mentioned earlier. Which of the following do you use Internet for? You can just respond never, sometimes or often.

[ASK QUESTIONS 19 TO 54 IN RANDOM ORDER]

19. meeting new people
never.....1
sometimes..2
often.....3
20. having interesting conversations
never.....1
sometimes..2
often.....3
21. communicating with family
never.....1
sometimes..2
often.....3

22. communicating with friends
    never.....1
    sometimes..2
    often.....3

23. communicating with co-workers
    never.....1
    sometimes..2
    often.....3
24. communicating with colleagues or business contacts outside your work organization
    never.....1
    sometimes..2
    often.....3
25. playing games with others
    never.....1
    sometimes..2
    often.....3
26. helping people
    never.....1
    sometimes..2
    often.....3
27. to have something to do when there's nothing else to do.
    never.....1
    sometimes..2
    often.....3
28. passing the time
    never.....1
    sometimes..2
    often.....3
29. for playing
    never.....1
    sometimes..2
    often.....3
30. to have fun
    never.....1
    sometimes..2
    often.....3
31. to relax
    never.....1
    sometimes..2
    often.....3
32. work-related research
    never.....1
    sometimes..2
    often.....3

33. consumer or personal research
never.....1
sometimes..2
often.....3
34. downloading software for work
never.....1
sometimes..2
often.....3
35. downloading software or games for play
never.....1
sometimes..2
often.....3
36. learning new things
never.....1
sometimes..2
often.....3
37. getting news
never.....1
sometimes..2
often.....3
38. shopping
never.....1
sometimes..2
often.....3
39. publishing your own work
never.....1
sometimes..2
often.....3
40. selling products or services
never.....1
sometimes..2
often.....3
41. to make money
never.....1
sometimes..2
often.....3
42. to save money
never.....1
sometimes..2
often.....3

43. to save time
never.....1
sometimes..2
often.....3
44. to help you be more efficient
never.....1
sometimes..2
often.....3
45. working at home
never.....1
sometimes..2
often.....3
46. efficiently working with others
never.....1
sometimes..2
often.....3
47. downloading music or other audio
never.....1
sometimes..2
often.....3
48. downloading image files
never.....1
sometimes..2
often.....3
49. downloading video clips
never.....1
sometimes..2
often.....3
50. transmitting data files of more than 10 mb
never.....1
sometimes..2
often.....3
51. as a substitute for the telephone
never.....1
sometimes..2
often.....3
52. as a substitute for TV.
never.....1
sometimes..2
often.....3

53. as a substitute for newspapers and magazines.
never.....1
sometimes..2
often.....3

54. as a substitute for catalog shopping.
never.....1
sometimes..2
often.....3

55. Now I'm going to read alist of various telephone services people sometimes have at home. Please tell me if you have any of these at home. [ENTER ALL THAT APPLY]
call waiting.....1
caller ID.....2
call forwarding.....3
a second phone line..4
your own 800 number..5
ISDN.....6
a switched 56k line..7

56. Now I'm going to read a list of home electronics. Please tell me if you have any of these at home. [ENTER ALL THATAPPLY.]
a pager..... 1
a big screen TV (more than 30")..... 2
a camcorder..... 3
CD player..... 4
a DAT machine digital audio tape..... 5
a digital camera..... 6
a cordless phone..... 7
a cellular phone..... 8
an answering machine..... 9
a fax or fax capabil ity in your computer.. 0

57. For your computer, do you have [ENTER ALL THAT APPLY.]
a CD-ROM drive.....1
a color printer.....2
a scanner.....3
audio speakers.....4
a zip or jaz drive...5
a pentium processor..6

58. What speed or BAUD rate is your computer modem? [IF CABLE MODEM CUSTOMER, DO NOT ASK BUT ENTER "CABLE MODEM"]
2400.....1
9600.....2

14400.....3
28800.....4
33600.....5
CABLE MODEM..6
.....7
.....8
DON'T KNOW...9

59. Now I'd like to ask about your use of the media. How many videos did you rent last week? [DON'T KNOW=-9] NUMBER OF VIDEOS ____

60. How many magazines did you read last week? [-9=DON'T KNOW]
NUMBER OF MAGAZINES ____

61. How many newspapers did you read yesterday? [DON'T KNOW=-9]
number of newspapers ____

62. Do you subscribe to any of the following? [ENTER ALL THAT APPLY]
Lansing State Journl..1
Detroit Free Press....2
Detroit News.....3
Wall St. Journal.....4
New York Times.....5
USA Today.....6
Chicago Tribune.....7

63. About how many hours did you spend on the phone at home yesterday, including working at home? [-9=DON'T KNOW]
number of hours ____

64. About how many hours did you spend watching TV yesterday? [-9=DON'T KNOW]
number of hours ____

65. About how many hours did you spend at your home computer yesterday?[-9=DON'T KNOW] NUMBER OF HOURS ____

[IF THE ANSWER IS 0, THEN SKIP TO QUESTION 68]

66. Of that time, how much did you spend on-line? [-9=don't know]
NUMER OF HOURS ____

[IF THE ANSWER IS 0, THEN SKIP TO QUESTION 68]

67. What percentage of that time was for work? [-9=don't know] [COMPUTER WILL ONLY TAKE "99" AS HIGHEST NUMBER.]

% OF TOTAL TIME ____

68. Now think about all the things you use the Internet for. Remember that for this survey Internet means electronic mail & all the things you do on-line.

press 1..1

69. For each of the following statements, would you say you"strongly agree," "agree," "are neutral","disagree somewhat" or "strongly disagree?" The Internet is easy to use.

strongly agree.....1
agree.....2
are neutral.....3
disagree somewhat..4
strongly disagree..5

[ASK QUESTIONS 70 TO 93 IN RANDOM ORDER]

70. I don't understand how it works.

strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

71. Finding what you want on-line is difficult.

strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

72. It is intimidating to use.

strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

73. It is frustrating to use.

strongly agree.....1
agree.....2
are neutral.....3

disagree.....4
strongly disagree..5

74. It is compatible with my lifestyle.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

75. The Internet satisfies my needs.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

76. The way you use the Internet matches the way I like to do things.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

77. The Internet is different from other computer uses.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

78. The Internet is similar to other media.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

79. I can do what I want quickly on the Internet.
strongly agree.....1
agree.....2
are neutral.....3

disagree.....4
strongly disagree..5

80. It is too slow to be useful.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

81. It is easy to share information with others.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

82. It is really difficult to send files to others.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

83. Putting up my own Web site would be really hard to do.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

84. The Internet has almost unlimited uses.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

85. The only thing it's good for is electronic mail.
strongly agree.....1
agree.....2
are neutral.....3

disagree.....4
strongly disagree..5

86. It has limited uses.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

87. I can find just about anything on the Internet.

strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

88. You need a whole new routine to begin using the Internet.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

89. Because of the Internet, my life is different.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

90. I use the Internet for the same reasons I use the phone.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

91. I use the Internet for the same reasons I read newspapers.
strongly agree.....1
agree.....2
are neutral.....3

disagree.....4
strongly disagree..5

92. I use the Internet for the same reasons I watch TV.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

93. I use the Internet for the same reasons I shop by catalog.
strongly agree.....1
agree.....2
are neutral.....3
disagree.....4
strongly disagree..5

[IF THE ANSWER TO QUESTION 3 IS 2, THEN SKIP TO QUESTION 95]

94. Now I have some satisfaction questions. How satisfied are you with electronic mail? Would you say you are "very satisfied," "generally satisfied," "neutral," "dissatisfied," or "very dissatisfied?"
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

[IF THE ANSWER TO QUESTION 5 IS 2, THEN SKIP TO QUESTION 96]

95. How satisfied are you with the World Wide Web?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

[IF THE ANSWER TO QUESTION 7 IS 2, THEN SKIP TO QUESTION 97]

96. How satisfied are you with the Usenet or newsgroups?
very satisfied.....1
satisfied.....2
neutral.....3

dissatisfied.....4
very dissatisfied..5

[IF THE ANSWER TO QUESTION 9 IS 2, THEN SKIP TO QUESTION 98]

97. How satisfied are you with real time communication like chats, Internet Relay Chats and MUDs?

very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

[IF THE ANSWER TO QUESTION 11 IS 2, THEN SKIP TO QUESTION 99]

98. How satisfied are you with file transfer capabilities of the Internet?

very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

99. On the same scale, how satisfied are you with the Internet as a way to communicate in general?

very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

100. as a way to socialize?

very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

101. as a way to be entertained?

very satisfied.....1
satisfied.....2
neutral.....3

dissatisfied.....4
very dissatisfied..5

102. as a way to learn new things?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

103. as a way to help you be more efficient?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

104. as a way to get information?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

105. as a way to shop?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

106. as a way to work from home?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

107. How satisfied are you with on-line speed?
very satisfied.....1
satisfied.....2
neutral.....3

dissatisfied.....4
very dissatisfied..5

108. with system reliability?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

109. with cost of service?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

110. with customer service?
very satisfied.....1
satisfied.....2
neutral.....3
dissatisfied.....4
very dissatisfied..5

111. Considering everything about the Internet and on-line communication, what is your overall level of satisfaction on a scale from 1 to 10 with 10 being the highest?
1 extremely dissatisfied.. 1
2..... 2
3..... 3
4..... 4
5..... 5
6..... 6
7..... 7
8..... 8
9..... 9
10 extremely satisfied.... 0

112. Finally, I have a few background questions. What is your age? [-9=DON'T KNOW]
age in years _____

113. What is the highest level of education you completed?
some high school..... 1
high school diploma or GED..... 2
some college..... 3
bachelors degree..... 4
masters or professio nal degree (law).. 5
doctorate degree..... 6
DON'T KNOW/NO ANSWER..... 7

114. What is your occupation? [TYPE ACTUAL WORDS.]
_____

115. Approximately what was your total phone bill last month, including local, long distance and cellular? Round to nearest $ [-9=don't know/no answer] _____

116. This is the last question. Please indicate the range of your household income.
less than $15,000..... 1
$15,000 to 24,000..... 2
$25,000 to 34,000..... 3
35,000 to 49,000..... 4
50,000 to 74,000..... 5
75,000 to 99,000..... 6
100,000 to 124,000.... 7
125,000 to 150,000.... 8
more than 150,000..... 9
don't know/no answer.. 0

117. Thank you very much for your time. [END INTERVIEW. AFTER HANGING UP, ENTER INFO FROM CALL SHEET. Sex of respondent
male....1
female..2

118. Monthly rate (dollar amount next to phone number)
Round to nearest $ [-9=not available] _____

119. Enter install year. Example: "1/2/92" would be entered "92". ____

120. phone number (no dashes) _____

121. Wants study results?
yes..1
no...2

122. Does subject have

DMX.....1
Sega Channel..2

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