

INTERNET EVOLUTION AND SOCIAL IMPACT

SARA KIESLER
ROBERT KRAUT
JONATHON CUMMINGS
BONKA BONEVA
VICKI HELGESON
ANNE CRAWFORD

ABSTRACT

Earlier HomeNet publications reported small but reliable negative effects of using the Internet on measures of social involvement and psychological well-being among new Internet users in a sample of Pittsburgh families in 1995–1996. The effects were called a "paradox" because participants in the sample used the Internet heavily for communication, which typically has positive effects on well-being. Since that first study, the Internet changed markedly, giving people much greater choice of contacts, activities, and information.

In a three-year follow-up of the original sample, these negative effects are no longer evident. A new longitudinal 1998–1999 study of new computer and television purchasers (who used the Internet for communication and for information) found that they generally experienced overall positive effects of using the Internet on communication with friends and family, community involvement, and psychological well-being. Using the Internet generally predicted better outcomes for extraverts and those with more social support—but worse outcomes for introverts and those with less support. The studies suggest that many people, especially those with good social resources, have integrated the Internet into their ordinary lives to their advantage.

Sara Kiesler is a professor of Human Computer Interaction at Carnegie Mellon University, whose research examines social aspects of technology and technological change.

Robert Kraut is the Herbert Simon Professor of Human Computer Interaction at Carnegie Mellon University, who has broad interests in the design and impact of information technology.

Jonathon N. Cummings is a postdoctoral fellow in the Human Computer Interaction Institute at Carnegie Mellon University, who is currently interested in the social impact of Internet use in households and the workplace.

Bonka Boneva is a postdoctoral fellow in the Human Computer Interaction Institute at Carnegie Mellon University, who has been studying the impact of gender in computer-mediated communication.

Vicki Helgeson is an Associate Professor of Psychology at Carnegie Mellon University, whose research interests focus on the intersections of gender, relationships and health.

Anne M. Crawford is a postdoctoral fellow in the Human Computer Interaction Institute at Carnegie Mellon University, involved with longitudinal research on the impact of computers, Internet, and other technologies on social relationships and family interaction.

This article is adapted from "Internet Paradox Revisited", an article in the Journal of Social Issues, 58, 49–74 (2002). It was originally published in The E-Business Handbook (pp. 189–201), CRC Press (2002).¹

With the rapidly expanding reach of the Internet into most aspects of everyday life, one needs to understand its social impact and the behaviors leading to this impact. Since 1995, HomeNet studies have consistently pointed to communication as a principal reason people use the Internet. From the early days of networked mainframe computers to the present, interpersonal communication has been the technology's most frequent use (Sproull and Kiesler 1991; Price *et al.* 1999). More than 90 percent of people who used the Internet in a typical day during 2000 sent or received email (Pew Internet Report 2001). Using email leads people to spend more time online, encourages their use of the Internet for information, entertainment and shopping, and discourages them from dropping Internet service (Kraut *et al.* 2000). As new Internet communication services arise—instant messaging, chat rooms, multiple-person games, auctions, and myriad support groups—they become instantly popular.

If communication is so important to Internet users, there is good reason to expect that the Internet will have a positive social impact. Communication, including contact with neighbors, friends, and family, and participation in social groups, improves people's level of social support, their probability of having fulfilling personal relationships, their sense of meaning in life, their commitment to social norms and to their communities, and their psychological and physical well-being (Cohen and Wills 1985; Diener *et al.* 1999; Gove and Geerken 1977; Mirowsky and Ross 1989; Thoits 1983; Williams *et al.* 1981).

Through its use for communication, the Internet could have important positive social effects on individuals (Katz and Aspden 1997; McKenna and Bargh 2000), groups, organizations (Sproull and Kiesler 1991), communities (Hampton and Wellman 2000), and society at large (Dertouzos 1997; Hilts and Turoff 1978). Broad social access could increase people's social involvement, as the telephone did (Fischer 1992; Wellman 1996). It also could facilitate the formation of new relationships (Katz and Aspden 1997) social identity and commitment among otherwise isolated persons (McKenna and Bargh 1998), participation in groups and organizations by distant or marginal members (Sproull and Kiesler 1991), and political mobilization (Bonchek 1997).

Whether the Internet has positive or negative social impact, however, may depend upon the quality of people's online activities and what they give up to spend time online. Stronger social ties generally lead to better social outcomes than do weaker ties (Neuling and Winefield 1988; Wellman and Wortley 1990). Many writers have worried that the ease of Internet communication might encourage people to spend more time alone, talking online with strangers, or forming superficial "drive-by" relationships, at the expense of deeper face-to-face discussion and companionship with friends and family (Putnam 2000). Further, even if people use the Internet to talk with close ties, these online discussions might displace higher quality face-to-face and telephone conversation (Cummings *et al.* in press).

Research has not yet led to consensus on either the nature of social

interaction online or its effects on social involvement and personal well-being. Some survey research indicates that online social relationships are weaker than offline relationships (Parks and Roberts 1998), that people who use email regard it as less valuable than other modes of communication for maintaining social relationships (Cummings *et al.* in press; Kraut and Attewell 1997), that people who use email heavily have weaker social relationships than those who do not (Riphagen and Kanfer 1997), and that people who use the Internet heavily report spending less time communicating with their families (Cole 2000; Nie and Erbring 2000). In contrast, other survey research shows that people who use the Internet heavily report more social support and more in-person visits with family and friends than those who use it less (Pew Internet Report 2001), and that people use the Internet to bolster existing community (Hamman 1999). Because this research has been conducted with different samples in different years, it is difficult to identify central tendencies and changes in these tendencies with time. Further, the cross-sectional nature of the research makes it impossible to distinguish self-selection (in which socially engaged and disengaged people use the Internet differently) from causation (in which use of the Internet encourages or discourages social engagement).

In a longitudinal study by Kraut *et al.* (1998) the authors attempted to assess causal direction. The HomeNet field trial followed 93 households in their first 12–18 months online. Although the sample as a whole reported high well-being at the start of the study, those participants who used the Internet more became reliably less socially involved and more lonely and showed an increase in depressive symptoms. These changes occurred even though participants' dominant use of the Internet was communication.

These findings were controversial. One problem in the original HomeNet study is the unknown generalizability of the results over people and time. The participants in the original study were an opportunity sample of families in Pittsburgh with high social involvement and strong social ties initially, compared with the population as a whole. In 1995 and 1996, when they began the study, few of their family and friends had Internet access. Using the Internet might have disrupted this group's existing social relationships. Had the study begun with a more socially deprived sample or when more of the population was online, their use of the Internet for social interaction might have led to more positive effects.

This article addresses these issues of generalizability through a follow-up of the original HomeNet sample and a new longitudinal study. It first examines the longer-term impact of Internet use on those in the original study. Although following the same participants over time does not allow one to distinguish the effects of changes in the sample (e.g., acquisition of more online experience) from effects of changes in the Internet (e.g., more of one's social circle being online), this analysis provides a second look at a group for whom initial Internet use had negative effects. One next follows a 1998 sample of people in the Pittsburgh area for a year. All had recently purchased a new computer or television set. This

study addresses the effects of Internet use in a more recent era. The sample was sufficiently large to permit an analysis of the impact of individual differences in extraversion, social support, and age on outcomes, and of the possible differences in use of the Internet that could explain different outcomes.

STUDY 1: FOLLOW-UP OF THE ORIGINAL HOMENET SAMPLE

This study examined data from 208 members of 93 Pittsburgh families, to whom a computer and access to the Internet was provided in 1995 or 1996. The families were recruited through four high school journalism programs and four community development organizations in eight Pittsburgh neighborhoods. The sample was more demographically diverse than was typical of Internet users at the time. Details of the sampling and research protocol are described in Kraut *et al.* (1996).

The analyses of social impact reported in Kraut *et al.* (1998) were drawn from Internet usage records, from surveys given just before participants began the study, and again in May 1997. Server software recorded participants' use of the Internet—hours online, email volume and Web sites visited per week. The surveys assessed demographic characteristics and measures of social involvement and psychological well-being.

In the reanalysis, the impact of the use of the Internet using a third survey administered in February 1998 is investigated. For about half the participants, the final survey came nearly three years after they first used the Internet; for the other half, it came two years later. Analysis was limited to the 208 participants who completed two out of three surveys.

This assessment of changes in social and psychological outcomes used a longitudinal panel design to evaluate changes in social involvement and psychological well-being from pretest to first posttest, and from first posttest to second posttest. The prior level of social involvement and psychological well-being was statistically controlled by including a lagged form of the dependent variable as an independent variable in the model. For example, when examining the effect of Internet use on loneliness at the second posttest, the lagged variable for loneliness was included at the first posttest to control for the affects of prior loneliness on Internet use.

Table 1 summarizes later findings and compares them with those reported by Kraut *et al.* (1998). Except for the increase in stress with more Internet use, the effects reported earlier were not maintained over the longer period. Two Internet use time period statistical interactions reflect different trends at different periods. Depressive symptoms significantly increased with Internet use during the first period but significantly declined with Internet use during the second period ($p < .05$). Loneliness significantly increased with Internet use during the first period but was not associated with Internet use during the second period ($p < .01$). When testing effects of age, the only effect

**TABLE 1: SUMMARY OF OUTCOMES OF INTERNET USE:
ORIGINAL STUDY VERSUS FOLLOW UP STUDY**

Outcome Variable	Original Study Report on First 12–18 months of Internet Use (N = 169)	Follow Up Study, Results over 2–3 Years (N = 208)
Local social circle	Declined with more Internet use.	No overall effect
Distant social circle	Declined with more Internet use.	No overall effect
Family communication	Declined with more Internet use.	No overall effect
Stress	Increased with more Internet use.	Increased with more Internet use.
Depressive symptoms	Increased with more Internet use.	Increased with Internet use in first 12–18 months, decreased with Internet use after 12–18 months.
Loneliness	Increased with more Internet use.	Increased with Internet use in first 12–18 months, no effect after 12-18 months.

of note was that adults' stress increased more than teens' stress with more Internet use ($p < .10$).

STUDY 2: A PANEL STUDY OF COMPUTER AND TELEVISION PURCHASERS

This study attempted to replicate the original HomeNet research design in a sample of households that had recently purchased a new personal computer or television set. Controls were added to the design and new measures, in an attempt to manipulate Internet use to create a true randomized experiment. Free Internet service was offered one random half of those households purchasing a computer, with arrangements made with the Internet service provider to monitor their usage of the Internet; households in the control condition received an equivalent amount of money (\$225) to participate. Unfortunately, by the end of 6 months, 84 percent of the control households obtained Internet access on their own (vs. 95 percent of the experimental group). Because of this failed attempt to conduct a true experiment, the groups were combined for analyses of the effects of using the Internet.

The addition of the television buyer comparison group (of whom 29 percent had Internet access after 6 months) helps to rule out explanations of changes over time based on sample selection. Previous research generally shows that heavy, as compared with light, television viewers stay at home more, are less socially involved, and experience poorer intellectual, physical, and psychological outcomes (Andersen *et al.* 1998; Canary and Spitzberg 1993; Kubey and Csikzentmihalyi 1990; Neuman 1995; Sidney *et al.* 1998). In the analyses of Internet use, participants were included from the television purchaser group, but controlled for sample selection bias by creating a

statistical dummy variable indicating whether participants were in the television or computer purchaser group.

In this new study, the differential effects of individual differences were also examined in extraversion and perceived social support on the effects of Internet use. Extraversion is the tendency to like people, to be outgoing, and to enjoy social interaction; it is highly consistent over the life course (Roberts and Del Vecchio 2000), and it is predictive of social support, social integration, well-being, and positive life events (Von Dras and Siegler 1997; Magnus *et al.* 1993). The perception of social support refers to feelings that others are available to provide comfort, esteem, assistance, and information or advice; perceived social support buffers the effects of stress (Cohen and Wills 1985; Abbey and Andrews 1985; Cohen 1998).

Two opposing hypotheses predict different relationships between extraversion or social support and Internet use. A “rich-get-richer” hypothesis predicts that those who are highly sociable and have existing social support will get more social benefit from using the Internet. Highly sociable people would reach out to others on the Internet and use it especially to foster relationships. Highly supported people would use the Internet to reinforce their support networks. Both groups may have the social skills necessary to elicit social benefits from using the Internet. If so, these groups would gain more social involvement and well-being from using the Internet than those who are introverted or have poor network relations.

By contrast, a “social compensation” hypothesis predicts that those who are introverted or lack social support would profit most from using the Internet. They might use the new communication opportunities to form connections and obtain supportive communications and useful information that they do not have locally (McKenna and Bargh 1998). At the same time, for those who already have satisfactory relationships, using the Internet could interfere with their real-world relationships if they swap strong ties for weaker ones. Analogous to the finding that cancer patients with emotionally supportive spouses can be harmed by participation in peer-discussion support groups (Helgeson 2000), it is possible that people with strong local relationships might turn away from family and friends if they used the Internet for social interaction.

STUDY METHOD

Some 446 participants were recruited through local newspaper advertisements for a study of household technology, soliciting people who had purchased a new computer or new television within the past 6 months. Agreement from adults and children in the family above age 10 was obtained to complete surveys. After the initial telephone contact, consent forms and pretest surveys were mailed with return envelopes. Unlike the procedures used in Study I, Internet use or provider technology support was not encouraged.

Surveys were administered three times during the study—in February 1998, 6 months later, and a year later (February 1999). An index of self-reported Internet use ($\alpha = .86$) from all participants was used rather than automated measures of usage as in Study I. (Automated usage records were available for the computer-experimental group but not for participants in the computer-control group or for TV purchasers. The self-report index of Internet use and the automated count of sessions logged into the Internet over 8 previous weeks was correlated $r = .55$ at Time 2, $n = 114$, and $r = .42$ at Time 3, $n = 104$.)

Self-report measures were used to assess demographic characteristics of the participants and measures from the original HomeNet study including perceived social support, size of local and distant social circles, and time talking with other family members. The same measure of extraversion (Bendig 1962) was used. New measures of anomie were added: trust in people, community involvement, and intentions to stay in the Pittsburgh area. Respondents' peer relationships with 10 specific family and friends were assessed by asking them to identify family members or friends (five living in the Pittsburgh area and five living outside of the area) who were closest to them in age. Participants described their feelings of closeness to each nominee at each time period on a five-point scale.

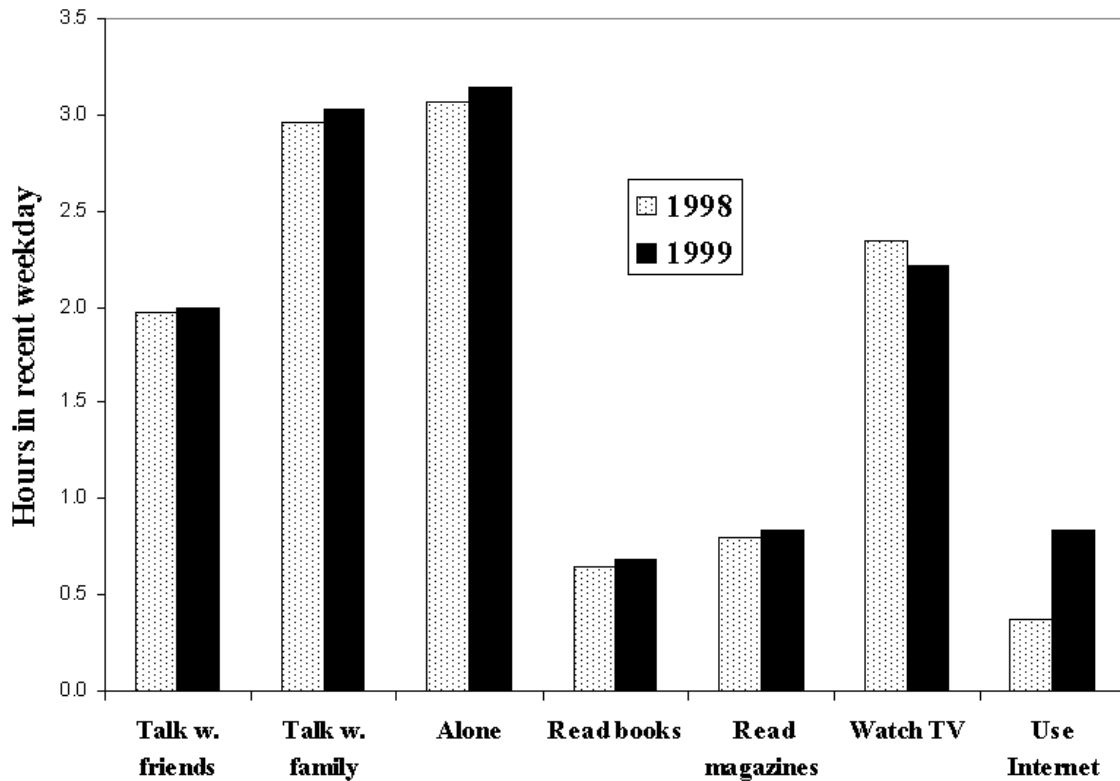
To assess well-being, again depressive symptoms were measured with a widely used scale (Radloff 1977). Also the daily life stresses scale (Kanner *et al.* 1981) was used, as well as the UCLA Loneliness Scale (Russell *et al.* 1980) from the original HomeNet study. Measures of self-esteem, positive and negative affect, perceived time pressure and physical health were added. Finally, because the Internet is a source of skill and information as well as communication, a self-report was included to measure skill in using computers and a test of knowledge, including multiple-choice items on national current events, Pittsburgh current events, and general knowledge from a high school equivalency test (GED). References for published measures and a list of all unpublished measures are available in Kraut *et al.* (2002).

RESULTS

Of the 446 members of 216 households who were eligible to be in the sample, 96 percent completed survey 1, 83 percent completed survey 2 and 83.2 percent completed survey 3. Figure 1 shows self-reported time usage data for the sample at the beginning and end of the study. It shows that, as participants gained Internet access over the year, the only home activity that declined overall was watching television. Almost all of this decline happened among adults.

The analyses of social impact were similar to those performed for Study 1. In the Study 2 models, social involvement, well-being, and knowledge outcomes at the second and third time period were regressed on self-reported Internet use during that period, controlling for demographic characteristics and

FIGURE 1
Household Time on Activities at Home



the lagged dependent variables. The models controlled for whether the respondent came from the TV purchaser or computer purchaser subsample and whether the dependent variables were collected at the second or third time period. Extraversion, social support, or age moderated the effects of using the Internet were also tested. The models included the main effects for the measure of extraversion (Bendig 1962) and Cohen *et al.*'s (1984) measure of social support and the interaction of these variables with Internet use.

OUTCOMES OF USING THE INTERNET

Entire Sample: Generally, the effects of using the Internet on interpersonal communication, community involvement, well-being, and knowledge were negligible or positive. Participants who used the Internet more had larger increases in the sizes of their local ($\beta = .12, p < .01$), distant social circle ($\beta = .15, p < .01$), and face-to-face interaction with friends and family ($\beta = .09, p < .05$). They also became more involved in community activities ($\beta = .03, p < .10$) and felt greater trust in people ($\beta = .07, p < .05$), although those who used the Internet more were less likely to want to stay in the Pittsburgh area ($\beta = -.13, p < .05$). Among the psychological well-being measures, overall, both stress

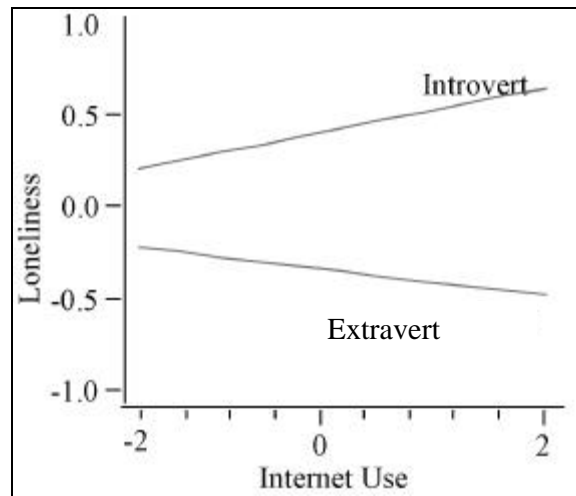
($\beta = .01$, $p < .05$) and positive affect ($\beta = .14$, $p < .001$) increased with more Internet use. Computer skill increased with more Internet use ($\beta = .31$, $p < .001$). Knowledge of national current events and general knowledge did not change with Internet use, but those who used the Internet more became less knowledgeable about the local Pittsburgh area ($\beta = .03$, $p < .05$). There were no effects on measures of telephone communication, a measure of anomie, or physical health.

Extraverts Vs. Introverts: Statistical interactions (combined effects) of Internet use and extraversion tended to show that extraverts benefited more than introverts from greater use of the Internet. The association of Internet use with increases in community involvement was stronger for extraverts ($\beta = .10$, $p < .05$). Extraverts, as compared with introverts, who used the Internet more also reported decreased levels of loneliness ($\beta = -.08$, $p < .05$), negative affect ($\beta = -.12$, $p < .01$), time pressure ($\beta = -.14$, $p < .01$), and increased self esteem ($\beta = .09$, $p < .01$). Indeed, these effects were in the reverse (negative) direction for introverts. The nature of these effects is illustrated in Figure 2, showing the relationship of extraversion and Internet use with changes in loneliness.

Those High and Low in Social Support: There were only two significant interaction effects, but both were in the same direction as those for extraversion. The association of Internet use with increases in family communication was larger for those who initially had more social support ($\beta = .05$, $p < .01$). The increase in computer skill was larger among those with more social support ($\beta = .10$, $p < .05$). This effect may be related to family members' frequent need for help using computers and the Internet; those having more social support can gain the most from their use of the Internet (Thoits 1983).

Teens and Adults: Interactions of age with Internet use suggest different positive effects for adults and teens. Teens with more Internet use, as compared with adults, increased their social support ($\beta = -.11$, $p < .10$) and family communication ($\beta = -.06$, $p < .10$), whereas adults with more Internet use, comparatively, increased their face-to-face interaction with family and friends ($\beta = .30$, $p < .05$) and their closeness to distant relatives and friends ($\beta = .35$, $p < .05$). These results suggest that the Internet affects teens most through its impact on the quality of their interactions with local close ties (family and close friends who provide social support), whereas Internet use affects adults most through their local and distant interactions with co-workers, friends, and relatives.

Different Purposes of Internet Use: How people choose to use the Internet could strongly influence its effects. Participants were asked to report how often they used the Internet for various purposes. A factor analysis was

FIGURE 2: INTERACTION OF INTERNET USE AND EXTRAVERSION ON LONELINESS

conducted of these items to create four scales reflecting different Internet uses.

- For acquiring information, including product information
- For communication with friends and family
- For meeting new people or socializing in chat rooms
- For entertainment such as playing games and downloading music

Table 2 shows the Pearson correlations of overall Internet use, the measures of extraversion and social support, and different purposes of using the Internet. Using the Internet for information and for communication with family and friends had the highest association with overall Internet use. Extraverts were somewhat more likely than introverts to use the Internet to keep up with friends and family and to meet new people or frequent chat rooms. Those with stronger initial social support were less likely than those with weaker support to use the Internet to meet new people or use chat rooms online or for entertainment. Teens were especially more likely than adults to use the Internet for meeting new people and for entertainment. However, adding the measures of specific Internet use to the social impact models did not significantly affect the overall results. It is believed additional longitudinal research will be needed to advance understanding of what people do online and offline over time that leads to changes in important domains of their lives.

TABLE 2: PURPOSES OF USING THE INTERNET: STUDY 2

	Purposes of Using the Internet			
	Information	Communication with family & friends	Meeting new people, visiting chat rooms	Entertainment
Communication with family & friends	.65***			
Meeting new people; visiting chat rooms	.39***	.48***		
Entertainment (e.g., games, music)	.61***	.52***	.44***	
Overall Internet use	.62***	.69***	.38***	.51***
Extraversion	.06	.10*	.12*	.03
Social support	-.07	.02	-.11*	-.14**
Adult vs. teen	-.13**	-.18**	-.41***	-.29***

Note. Responses were averaged over three survey administrations before computing correlations. $N=446$. + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

IMPLICATIONS

The original HomeNet sample began using the Internet in 1995 or 1996. The follow-up of participants remaining in the sample in 1998 showed that, overall, the previously reported negative outcomes associated with greater use of the Internet had all but disappeared, except for the association of Internet use with increased stress. The statistical interactions of loneliness and depressive symptoms with time period, however, suggest that use of the Internet led to negative outcomes early in participants' history online and more positive outcomes later.

In Study 2, conducted from 1998 to 1999, more use of the Internet was associated with mainly positive outcomes over a range of dependent variables measuring social involvement and psychological well-being—local and distant social circle, face-to-face communication, community involvement, trust in people, positive affect, and unsurprisingly, computer skill. On the other hand, heavier Internet use also was associated with greater stress, less local knowledge, and lower desire to stay in the local area. In general, having more social resources amplified the benefits from using the Internet.

There were many differences between the original HomeNet sample and the Study 2 sample. For example, the original sample included a larger proportion of teens, minority households, and computer novices. The sample differences preclude direct comparisons of the two studies. However, the similarity of findings in the later period of Study I with the findings in Study 2 suggest that changes in the Internet environment might be more important to understanding the observed effects than differences between the two samples.

From 1995 to 1998, the number of Americans with access to the Internet at home more than quadrupled. As a result of the vast expansion of subscribers to Internet services, many more of the participants' close family and friends were likely to have obtained Internet access at home. Similarly, the services offered online changed over this period. More news, useful health, financial, hobby, work, community and consumer information and new synchronous communication services such as instant messaging and online shopping became widely available. These changes could have promoted better integration of participants' online behavior and Internet use into their lives (Pew Internet Report 2000; Cummings and Kraut in press; Boneva *et al.* in press). People who used the Internet heavily in the new sample were very likely to use both communication and information services. It is believed that the Internet is becoming easier for the average person to use in the service of his or her personal, work, household or community goals. The finding that extraverts and those with more support benefited more from their Internet use is consistent with this idea. That is, the Internet may be more beneficial to individuals to the extent they can leverage its opportunities to enhance their everyday lives. Those who are already effective in using social and informational resources in the world are likely to be well positioned to take advantage of a powerful new technology such as the Internet.

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ENDNOTES

¹ This research was funded by the National Science Foundation (Grants IRI-9408271 and 9900449). In addition, initial data collection was supported through the grants from Apple Computer Inc, AT&T Research, Bell Atlantic, Bellcore, CNET, Intel Corporation, Interval Research Corporation, Hewlett Packard Corporation, Lotus Development Corporation, the Markle Foundation, The NPD Group, Nippon Telegraph and Telephone Corporation (NTT), Panasonic Technologies, the U.S. Postal Service, and U.S. West Advanced Technologies. Tridas Mukophadhyay and William Scherlis participated in designing and carrying out the original HomeNet studies.