

Chapter xx

Internet Evolution and Social Impact

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ABSTRACT

In an earlier publication, we 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. We called the effects 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 3-year follow-up of the original sample, we find that negative effects are no longer evident. We also report a longitudinal study in 1998-1999 of new computer and television purchasers. This new sample used the Internet for communication and for information, and 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. Our studies suggest that many people, especially those with good social resources, have integrated the Internet into their ordinary lives to their advantage.

INTERNET EVOLUTION AND SOCIAL IMPACT

With the rapidly expanding reach of the Internet into most aspects of everyday life, we need to understand its social impact and the behaviors leading to this impact. Since 1995, our studies have consistently pointed to communication as a principle 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 [1, 2]. Over 90% of people who used the Internet in a typical day in 2000 sent or received email [3]. 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 [4]. 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 positive social impact. Communication, including contact with neighbors, friends, and family, and participation in social groups, affects 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 [e.g., 5-10].

Through its use for communication, the Internet could have important positive social effects on individuals (e.g., [11, 12]), groups, organizations [1], communities [13], and society at large [14, 15]. Broad social access could increase people's social involvement, as the telephone did [16, 17]. It also could facilitate the formation of new relationships [11], social identity and commitment among otherwise isolated persons [18], participation in groups and organizations by distant or marginal members [1], and political mobilization [19].

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 [e.g., 20, 21]. 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 [22, p. 179]. 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 [23].

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 off-line relationships [24], that people who use email regard it as less valuable than other modes of communication for maintaining social relationships [23, 25], that people who use email heavily have weaker social relationships than those who do not [26] and that people who use the Internet heavily report spending less time communicating with their families [27, 28]. 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 [3] and that people use the Internet to bolster existing community [29]. 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, Patterson, Lundmark, Kiesler, Mukophadhyay and Scherlis [30], 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 initially with high social involvement and strong social ties, 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 chapter addresses these issues of generalizability through a follow up of the original HomeNet sample and a new longitudinal study. We first examine the longer-term impact of Internet use on those in the original study. Although following the same participants over time does not allow us 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. We next follow 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.

We examined data from 208 members of 93 Pittsburgh families, to whom we provided a computer and access to the Internet in 1995 or 1996. The families were recruited through four high school journalism programs and four community development organizations in 8 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. [31].

The analyses of social impact reported in Kraut et al. [30] were drawn from Internet usage records and 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 our reanalysis, we looked at the impact of the use of the Internet using a third survey administered in February 1998. For about half the participants, the final survey came nearly 3 years after they first used the Internet; for the other half, the final survey came 2 years later. We limited analysis to the 208 participants who completed 2 out of 3 surveys.

To assess changes in social and psychological outcomes, we 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. We statistically controlled for the prior level of social involvement and psychological well-being 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, we included the lagged variable for loneliness at the second posttest to control for the effects of prior loneliness on Internet use.

Table 1 summarizes our later findings, and compares them with those reported by Kraut et al. [30]. Except for the increase in stress with more Internet use, the effects reported earlier were not maintained over the longer period. Two Internet use X 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 we tested effects of age, the only effect of note was that adults' stress increased more than teens' stress with more Internet use ($p < .10$).

Insert Table 1 about here

STUDY 2: A PANEL STUDY OF COMPUTER AND TELEVISION PURCHASERS

In this study, we attempted to replicate the original HomeNet research design in a sample of households that had recently purchased a new personal computer or television set. We added controls to the design and new measures. First, we attempted to manipulate Internet use to create a true randomized experiment. We randomly offered free Internet service to half of those households purchasing a computer and arranged 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% of the control households obtained Internet access on their own (versus 94% of the experimental group).

Because of this failed attempt to conduct a true experiment, we combined the groups for analyses of the effects of using the Internet.

The addition of the television buyer comparison group (of whom 28% had Internet access after 6 months) helps us 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 [32-36]. In our analyses of Internet use, we included participants 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, we also examined the differential effects of individual differences 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 [37], and it is predictive of social support, social integration, well-being, and positive life events [38, 39]. 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 [5, 40, 41].

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 the Internet 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 [18]. 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 [42], it is possible that people with strong local relationships might turn away from family and friends if they used the Internet for social interaction.

METHOD

We recruited 446 participants through advertisements placed in local newspapers, soliciting people for a study of household technology who purchased a new computer or new television within the past six months. We obtained agreement from adults and children in the family above age 10 to complete surveys. After the initial telephone contact, we mailed consent forms and pretest surveys with return envelopes. Unlike the procedures used in Study 1, we did not encourage Internet use or provide technology support.

We administered surveys 3 times during the study, in February 1998, 6 months later, and a year later, February 1999. We used an index of self-reported Internet use ($\alpha=.86$) from all participants rather than automated measures of usage as in Study 1. (Automated usage records were available for the computer-experimental group but not for participants in the computer-control group and 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 [$n = 106$].)

We used self-report measures 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. We used the same measure of extraversion [43]. We added new measures of anomie, trust in people, community involvement, and intentions to stay in the Pittsburgh area. We also assessed respondents' peer relationships with 10 specific family and friends by asking them to identify family members or friends (5 living in the Pittsburgh area and 5 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 5-point scale.

To assess well-being, we again measured depressive symptoms with a widely-used scale [44]. We also used the daily life stresses scale [45], and the UCLA Loneliness Scale [46] from the original HomeNet study. We added measures of self-esteem, positive and negative affect, perceived time pressure and physical health. Finally, because the Internet is a source of skill and information as well as communication, we included a self-report measure of skill 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. [47].

RESULTS

Of the 446 members of 216 households who were eligible to be in the sample, 96% completed survey 1, 83% completed survey 2 and 83.2% 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.

Insert Figure 1 about here

Our 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 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. We also tested whether extraversion, social support, or age moderated the effects of using the Internet. In the models we included the main effects for the measure of extraversion [42] and Cohen et al.'s [47] 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.

Outcomes of using the Internet for extraverts versus 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. We illustrate the nature of these effects in Figure 2, showing the relationship of extraversion and Internet use with changes in loneliness.

Insert Figure 2 about here

Outcomes of using the Internet for 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 [49].

Outcomes of using the Internet for 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 the Internet 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. We asked participants to report how often they used the Internet for various purposes. We conducted a factor analysis of these items to create four scales reflecting different uses of the Internet: (a) for acquiring information, including product information; (b) for communication with friends and family; (c) for meeting new people or socializing in chat rooms, and (d) 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 effects. We believe 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.

Insert Table 2 about here

IMPLICATIONS

The original HomeNet sample began using the Internet in 1995 or 1996. Our 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 1 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, 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 [3, 50, 52]. People who used the Internet heavily in our new sample were very likely to use both communication and information services. We believe 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. Our 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 like the Internet.

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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.

Note: Summary results from [29] and Kraut et al. (in press, Table 1).

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.

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1. Time Reported on Different Activities

Figure 2. Interaction of Internet Use and Extraversion on Loneliness

