Consequences of media and Internet use for offline and online network capital and well-being. A causal model approach

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This study sets out to identify relations between people's media use, network capital as a resource, and loneliness. Unlike many studies on this topic, this study aimed to test hypotheses on a national sample, and used insights from empirical research and theoretical notions from different research areas. Data collected via telephone interviews in 2005 were analyzed with Structural Equation Modeling. The assumption that traditional and new media destroy social capital is not supported empirically. Moreover, online network capital augments offline network capital and web surfing coincides with more online socializing. However, this additional capital appears not to have benefits in terms of social support and loneliness. The reverse causal relation between loneliness and media use also could not be established.

Introduction

As with many new media, the Internet has been viewed as one that may endanger the individual and society at large (Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998; Putnam, 1995; cf. Rice, 2002). The use of the Internet is viewed as detrimental for individual psychological and social well-being and, as such, for society as a whole. A sociological oriented approach is provided by Putnam (1995, 2000) who states that the increased use of new media technologies (i.e. television and the Internet) resulting in increased privatization of leisure time, not only decreases the degree of participation in society, but also decreases trust in fellow man and societal institutions. Trust, as a lubricant that makes society function more smoothly, is deemed vital for a well-functioning society.

Putnam's earlier claims are, in part, based on research in the cultivation analysis tradition (cf. Gerbner, Gross, Morgan, & Signorielli, 1980). In these studies, more television viewing is associated with less trust in people. In spite of theoretical and methodological critique on these cultivation studies (cf. Potter, 1993), Putnam extrapolates these findings to the Internet. Kraut et al. (1998) even state that increased use of the Internet leads to less social involvement and less psychological well-being. Based on theoretical and methodological critique as well as subsequent research (cf. Katz, Rice, & Aspden, 2001; Nie, Hillygus, & Erbring, 2002; Quan-Haase, Wellman, Witte, & Hampton, 2002), the initial ''across the board'' pessimistic views concerning the Internet were not substantiated empirically. Apparently, these relations appeared to be more complex and ambiguous. For instance, Shah, Kwak, and Holbert (2001) have argued that the use of the Internet is not one-dimensional. One important distinction is whether people use the Internet for information or entertainment purposes, or whether they use the Internet for communicative purposes (e.g. e-mail, chatting, and instant messaging). Furthermore, communicative Internet use can be synchronous (instant messaging) and asynchronous (e-mail).

In this study we will explore the relations between the use of different media (i.e. television and the Internet) and informal offline and online network capital (i.e. time spent and network size) and its consequences for social support and loneliness (Zhao, 2006). The main research question is what relations can be distinguished between different ways of Internet use and network capital?

Although social capital refers to a multitude of concepts (cf. Lin, 2001a), we will focus specifically on social relations (cf. Wellman & Frank, 2001; Van Oorschot, Arts & Gelissen).

1. What relations can be distinguished between (a) viewing television and web surfing on (b) maintaining social networks offline and online?
2. What relations can be distinguished between (c) maintaining social networks offline and online and (d) social support and (e) loneliness?

Theory and Hypotheses

Social Capital

In social theory, many approaches to social capital exist, resulting in different conceptualizations of social capital. For instance, Bourdieu uses the concept of social capital to explain the reproduction of societal inequality (1986). Here, relations between people refer to knowing people in other social strata that may be beneficial for one's social position (1986; Swain, 2003; Sum, Mathews, Hughes, & Campbell, 2008). In that sense Bourdieu is mainly interested in vertical social relations between social classes. Putnam's approach (e.g. 1995, 2000) can be classified as one that looks at the horizontal and transitive conceptualization of social capital, at the community level as well as the individual level. His approach focuses on formal social capital (e.g. membership and participation in organizations) and informal social capital

(e.g. socializing with friends and neighbors at home or elsewhere), which have decreased in the last decades, according to Putnam (2000). Wellman, Quan-Haase, Witte, and Hampton (2001), following up on Putnam's claims, distinguish two forms of social capital: network capital and participatory capital. A third domain consists of attitudinal concepts such as interpersonal trust, and sense of community (cf. Quan-Haase et al., 2002; Shah, McLeod & Yoon, 2001).

Although many approaches to social capital exist, they have common ground: All focus on people's relations with each other and utilizing these relations for certain purposes (e.g. social support, companionship, upward mobility). Some concepts refer to the formation and maintenance of actual relations (i.e. socializing), others to potential relations (i.e. network members). Again other concepts (e.g. interpersonal trust) are expected to facilitate or lubricate these social relations. This study builds upon the individualistic and horizontal conceptualization of social networks as a social resource: the degree people in one's social network may be willing and able to help others in need.

Although some earlier studies (e.g. Wellman et al., 2001) have focused on relations between network capital and the use of the Internet, the question whether online and offline network capital help to increase perceived social support and decrease loneliness has received little attention.

In this study we specifically focus on the size of social networks and participation (time spent) in social networks (online and offline), and the consequences for social support and loneliness. We will specifically focus on the relations between the size of social networks and the time people spend on socializing, the degree people perceive they are supported by people in their social network, and the degree to which they feel lonely.

Time Displacement

Putnam's argument is that people increasingly spend leisure time privately at home, in front of the television or the computer. This results in a steady decrease of participation in, for example, voluntary organizations and participation with other people. In general, this time displacement hypothesis states that in a 24-hour day, where time is scarce, 1 hour of television is at the expense of 1 hour of socializing with friends. For instance, time diary findings for the Netherlands (Knulst, 1999) suggest that television acts like a sponge: People's uncommitted time (i.e., time that is not needed for essential activities such as sleep, work, eating, and transportation and therefore is available for socializing) is easily absorbed by watching television. In the Netherlands, the total time spent using media increased two percent from 18.5 hours in 1995 to 18.9 hours in 2005, while watching television increased six percent from 10.2 to 10.8 hours (Huysmans, De Haan, Van den Broek, & Van Ingen, 2006, p.45). Although the relation between watching television and the loss of social capital is tested numerous times, in the Netherlands empirical evidence based on microdata is scarce. Based on these considerations, the hypothesis is as follows:

H1: The more time people spend on watching television, the less time they spend on socializing with other people.

Apart from television, other activities compete as well for the limited time available. For instance, computer use almost doubled from 2 hours per week in 2000 to 3.8 hours in 2005, while web surfing as a nonsocial form of Internet use almost more than quadrupled from .5 hours per week in 2000 to 2.5 hours 2000 in 2005 (Huysmans et al., 2006). It seems plausible to expect that this increase should result in a decrease on time spent on other activities, such as socializing with others. The time displacement effects may even be stronger for Internet use as compared to television use, since Internet use seems to be a solitary activity (Nie, Hillygus & Erbring, 2002).

Although time spent web surfing seems to be competing with time spent socializing with others, the question is whether this applies for all types of content people surf the web for. Prior research has shown that specific media content that people consume is related differently to specific aspects of social capital. For instance, entertainment is often seen as the predominant way to relax and to pass one's spare time (Finn & Gorr, 1988; Rubin, 1984), especially when people have ample time (Knulst, 1999; Papacharissi & Rubin, 2000; Song, Larose, Eastin, & Lin, 2004; Weiser, 2001). Time, being a scarce commodity, competes with time to spend on socializing with other people. Therefore, the hypothesis is as follows:

H2: The more time people spend on entertainment websites, the less time they spend socializing with other people.

Apart from visiting websites for entertainment purposes, people can visit websites primarily for news and information. In prior research (cf. Norris, 1996), watching news and information television programs was viewed as an indication for keeping in touch with the world at large (i.e. surveillance). As such, the consumption of news and information appears to be positively related to more civic participation and interpersonal trust (Norris, 1996; Shah, McLeod, & Yoon, 2001). This implies that, although visiting news and informational websites costs time, it also may be positively related to being rooted in a larger social network resulting from more interpersonal trust and participation. Therefore, the hypothesis is as follows:

H3: The more time people spend on visiting information websites, the more time they spend on socializing with others.

Besides visiting websites for entertainment and informational purposes, people can visit websites for time-saving purposes, such as online banks and shops, and online travel agencies. Although visiting these websites for practical purposes still costs time, it may save time as compared to dealing with these matters outdoors and during office hours. As such, the use of these websites may, in the end, save time. This increased spare time could be spent on socializing with others. Although past

research didn't find any support for this so-called efficiency hypothesis (Franzen, 2000; Nie & Hillygus, 2002), we will put it to the test again:

> H4: The more time people spend on websites for practical purposes, the more time they spend socializing with other people.

Offline and Online Social Networks

Apart from the noncommunicative uses of the Internet (e.g. web surfing), we distinguish communicative acts (e.g. e-mail, chat, and instant messaging). Although Internet use is often thought to destroy social capital (cf. Quan-Haase et al., 2002), as the Internet is becoming a routine practice in everyday life (Wellman et al., 2001, p. 1), synchronous and asynchronous ways of online social interaction actually may enhance people's social network, instead of destroying it. To test this proposition we will look at the number of people that respondents socialize with (i.e. network size), and the amount of time spent socializing (i.e. network time). Network capital in terms of the time people spent on socializing with others, implies that, assuming time is scarce, online network capital competes with offline network capital. However, network capital conceptualized as network size may prove to show a positive relation. For instance, people that use Social Network Sites (SNSs, e.g. MySpace, Facebook) take their pre-existing offline network to the online realm (Ellison, Steinfield, & Lampe, 2007; Ofcom, 2008; cf. Hlebec, Manfreda, & Vehovar, 2006). Therefore, the hypotheses read as follows:

> H5: The larger the offline network is, the larger the online network is;

> H6: The more time people spend on their online social network, the less time they spend on their offline social network.

With respect to the relation between the different conceptualizations of network capital (size and time), we expect that there is a positive relationship: The more people one socializes with, the more time it costs. The hypothesis therefore is as follows:

> H7: The larger the social network is, the more time people spend socializing with others.

Offline and Online Networks as a Social Resource

Although research findings on the substitution of offline networks with online networks are contradictory (cf. Neustadl & Robinson, 2002; Nie, Hillygus & Erbring, 2002; Wellman et al., 2001), substitution would only be problematic if online social capital is less functional as a social resource than offline capital is. In several studies the role of social networks is seen as a social resource with respect to social support and loneliness (Caplan, 2007; Coleman, 1988; Lin, 2001b; Van den Eijnden & Vermulst, 2006). Social networks consist of people such as family members, neighbors, and acquaintances, all with more or less different potentials to help other

people. As such, these social networks are expected to contain resources (financial, practical, or emotional) that people can appeal to by asking for help. Therefore, these social networks have the potential to be supportive. However, findings thus far are inconclusive. Dykstra, van Tilburg, and Gierveld (2005) show that a larger social network leads to less loneliness while Larose, Guay, and Boivin (2002) find no relation. Helliwell and Putnam (2004) find positive relations between indicators of social networks (e.g. family, friends) on subjective well-being (i.e. happiness and life satisfaction).

The Internet lends itself well for socializing (i.e. online communication) with new people with all sorts of backgrounds. The limited social cues (e.g. social and cultural background), facilitating the development of a large and diverse social network, and the possibility to go online anonymously provide people with additional opportunities to talk about personal problems on the Internet (Kavanaugh, Carroll, Rosson, Zin, & Reese, 2005; Kavanaugh, Reese, Carroll, & Rosson, 2005). Other research however (cf. Hargittai, 2007) indicates that people also take their offline identity online, making online relations more tangible and less anonymous. In either case, the size of one's social network is expected to be positively related to perceived social support from that social network, while the time people spent socializing with people in this network is expected to be negatively related to loneliness. For instance, Moody (2001) shows that a larger offline network correlates with less loneliness (social and emotional), while a larger online social network coincides with less emotional loneliness.

Forming and solidifying these relations using communicative Internet applications (e.g. e-mail, instant messaging) seems easier than offline and face-to-face. The social cues that provide additional information about others during the communication process (cf. Goffman, 1959) are virtually absent and different in e-mail and chat with respect to approaching strangers who are distant hierarchically, geographically, or otherwise (Haythornthwaite, 2002). Social relations on the Internet are therefore most likely weaker than those offline (cf. Granovetter, 1973; Wellman & Gulia, 1999). Whether this means that online relations offer less social support than offline relations, resulting in more loneliness, has yet to be determined. In similar research, Valkenburg and Peter (2007) show that online communication with strangers leads to less well-being. A study conducted by Ofcom (2008) shows that people on Social Network Sites (SNS) predominantly bring their offline social network online, and use SNS to revitalize old relations.

For now we assume that both offline and online communication with people in one's social network, as available resources for support and socializing, have similar relations with social support and loneliness. Because we expect that loneliness is more about lacking social contact than a network being too small, the hypotheses are as follows:

H8: The larger people's social network is, the more social support they experience;

H9: The more time people spend on socializing with others, the less lonely they feel.

Social support can be seen as a social resource people can tap into when needed in times of problems. A number of studies have identified that more social support and a larger network size are correlated with less loneliness (Caplan, 2007; Eastin & LaRose, 2005; Larose et al., 2002). To test whether social support offers an additional explanation for loneliness we hypothesize that:

H10: The more social support people experience, the less lonely they are.

Loneliness as a Motive for Media Use

Earlier we formulated expectations that media use (i.e. watching television and web surfing) affects loneliness. However, a case can be made for the reverse causal order. For instance, the Uses and Gratifications approach in general (cf. Blumler & Katz, 1974; Papacharissi et al., 2000) and Mood Management Theory in particular (Zillmann, 1988; Knobloch, 2002; Knobloch-Westerwick, 2007) suggests that people who are lonely, shy, or depressed may watch more television and use the Internet more for entertainment to escape daily life (Perse & Rubin, 1990; Van den Eijnden & Vermulst, 2006; Vorderer, Klimmt & Ritterfeld, 2004; Weaver, 2003). Also, people may actively try to battle loneliness by searching for new people or socializing with others on the Internet. Saunders and Chester (2008) discuss a number of studies focusing on the relations between shyness and Internet use and forming social contacts online. Two central hypotheses often posed are that shy people are more likely to be addicted to Internet use and also feel less inhibited forming social relations online. However, empirical support is inconclusive whether to substantiate these hypotheses or not. Beaudoin (2007; cf. Van den Eijnden & Vermulst, 2006), testing different theoretical models on the relations between media use and social capital, concludes that the model where social capital depends on media use is best supported by the data. However, to test our proposed model rigorously, we will test whether the reverse relations between loneliness and media use exist.

Background Characteristics

To control for spurious relations, background characteristics are incorporated in the model. Prior research showed that age, education, and gender are related to Internet use and to network size, social support, and loneliness. Youngsters and the higher educated more easily adopt new communication technologies than others (De Haan & Huysmans, 2006). The higher educated often have more access to the Internet, in part because of educational facilities. The higher educated are also expected to be more capable of solving technical difficulties associated with computer and Internet use. Women differ from men with respect to Internet use (cf. Boneva, Kraut, & Frohlich, 2001). They are expected to use e-mail more than man do, because women are more oriented towards nourishing relations with family and friends. Women also use e-mail more for expressive purposes than men, who use e-mail more instrumentally.
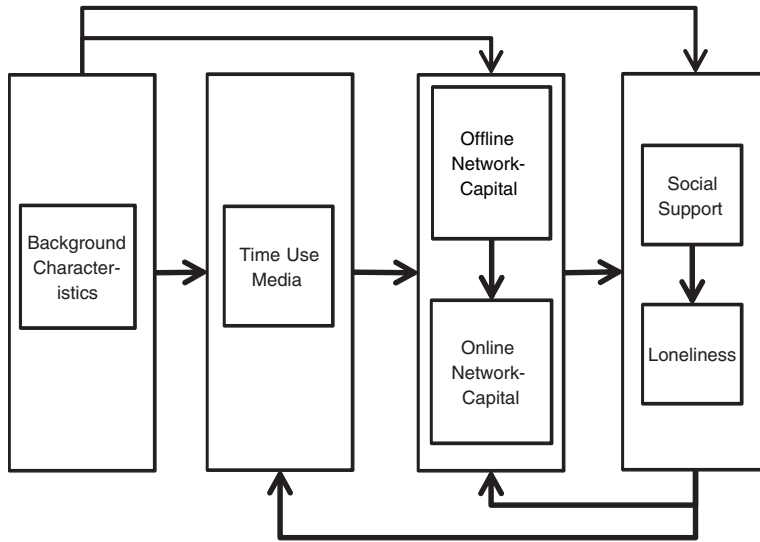
Figure 1 Conceptual model of relations between media use, network capital, social support, and loneliness.

With respect to the relations between age and social networks, the size of one's social network tends to shrink as people get older, resulting in more loneliness (Den Draak, 2006). Furthermore, since men seem to piggyback on the social network provided by their wives (Dykstra et al., 2005), men's loneliness increases sharply when the spouse deceases. All hypotheses formulated in prior sections can be summarized in the following conceptual model (see Figure 1).

Method

Data

The target population consisted of people of 18 years and older residing in the Netherlands. We drew a random sample of 2,147 households from all household telephone landline numbers. Because elderly and women are at home more often than men, the sampling procedure entailed asking for the youngest male to be having his birthday the soonest. If no male was present, the youngest female was asked to participate. Nevertheless, women were overrepresented ($\chi^2 = 166.37$, df $= 13$, $p < .001$) as compared to the population (Statistics Netherlands, 2005). A total of 857 people participated in the survey, a response rate of 44.6%. Only people with valid scores on all variables were included in the analysis (N $= 810$). The measurement instrument consisted of a telephone interview schedule that was administered in November 2005. The first question asked people from the entire sample whether they use the Internet for nonwork-related reasons or not. This question split the entire sample in an offline (N $= 714$) and online subsample (N $= 96$). People

Table 1 Factor analysis on items measuring loneliness and perceived social support

	Perceived Social Support	Loneliness	Communality
I have ample people in my surroundings ho can help me	.950		.819
I receive enough support from other people	.840		.729
When I need, I can always count on people	.677		.442
I know many people I can rely upon completely	.433		.271
I miss a real (girl) friend		.762	.588
I miss people around me		.761	.586
Eigen value	3.206	1.001	
Cronbach's α	.804	.740	

Factor loadings < |.20| are not printed.

who didn't use the Internet for nonwork-related reasons skipped all measurements pertaining to online network capital and nonwork-related Internet use. This routing procedure limited the duration of the telephone interview for those people considerably.

Measurements

Loneliness and *perceived social support* were measured using six items (see table 1). To test whether these items measured social support and loneliness separately, a factor analysis was performed (criteria: minimum eigen value > 1; communality > .20; factor loading own factor > .30; oblique rotation, KMO > .50). This resulted in two separate factors (r = −.596), measuring loneliness (Cronbach's α = .740) and social support (Cronbach's α = .804).

The *time spent on websites for entertainment, information, and practical purposes* was measured by asking respondents how much time they spent web surfing, multiplied by their estimated proportions for visiting three types of websites: entertainment, information, and practical purposes. All time measurements were positively skewed. Since skewed variables often have nonlinear relations with other symmetrically distributed variables, all time measurements were adjusted using a square root transformation (Cohen, Cohen, West, & Aiken, 2002).

Network capital was measured in terms of network size and time spent on the network. *Offline network size* was measured by asking people how many family and friends and acquaintances they spoke on private matters during the last week, face-to-face or on the phone. *Time spent on the offline network* was measured by asking how much time they spent on socializing with people offline this last week. *Online network size* was measured by asking people how many family and friends and

acquaintances they spoke on private matters during the last week using e-mail, chat, or instant messaging. *Time spent on the online network* was measured by asking how much time they spent on socializing with people online during the last week. Since network size in the offline and online samples were positively skewed a square root transformation was applied.

Age was measured by asking the person's year of birth. We divided the age in years by 10 to obtain age effects that can be interpreted in terms of a 10-year age increase. *Education* was measured by asking what highest level of education was completed, using 13 categories ranging from "no education" to "Ph.D. level." *Gender* was treated as a dummy variable (0 = male, 1 = female).

Analysis

The analysis was performed using Structural Equations Modeling (Jöreskog & Sörbom, 1999). The offline subsample (N = 714), consisted of people who did not use the Internet for private purposes. The online sample (N = 96) consisted of people that were using the Internet for nonwork-related purposes. In table 2, the descriptive statistics of all variables for both samples are presented.

The purpose of the analysis was to find the most parsimonious model that fits the data best, starting with a saturated model and subsequently eliminating nonsignificant parameters. Since the reliability of the latent concepts social support and loneliness are known (estimated by Cronbach's α), a correction for attenuation was used (Bollen, 1989; Jöreskog & Sörbom, 1999).

Table 2 Means and standard deviation of model variables for the offline sample and online sample

	offline (N = 714)		online (N = 96)	
	Mean	SD	Mean	SD
age	53.370	15.227	34.740	16.053
education	6.640	3.090	7.680	2.654
gender (0 = male, 1 = female)	.605	.489	.542	.501
exposure to TV	15.418	10.239	13.068	8.355
web surfing for entertainment	.571	2.871	2.211	3.102
web surfing for information	1.046	3.053	2.536	3.051
web surfing for practical purposes	.621	1.711	1.452	2.073
offline network size	15.819	16.364	14.740	12.702
time spent on offline network	7.219	12.928	6.994	9.667
online network size	na	na	19.292	20.771
time spent on online network	na	na	4.913	6.437
perceived social support	4.140	.661	4.240	.626
loneliness	1.963	.882	1.849	.909

'na' means that these concepts were not measured for the offline sample.

Results

The fit of the final model, as presented in figure 2, was good ('minimum fit function chi-square' = 84.179, df = 93, p = .73). The model shows that when people spend more time watching television they do not necessarily socialize more or less with others, offline and online. Contrary to expectation (H1), there is no relation between exposure to television and offline network size and offline network time. A second source of time displacement is the time people spend surfing the Web. The results show that web surfing for entertainment has a positive effect on time spent on the online social network (b = .40), and no effects on offline capital (size and time), failing to confirm the time displacement hypothesis (H2). Visiting websites for information, as an indication for societal participation, is unrelated to time spent on the offline social network. However, visiting information websites does have a positive influence on the time spent on the online network capital (b = .39), confirming hypothesis 3. The expectation that visiting websites for practical purposes creates more spare time to socialize with others does not receive empirical support, failing to confirm hypothesis 4.

The question whether offline network capital is being substituted or supplemented by online network capital is partially supported in favor of supplementation. Although the prediction that offline network size is positively related to online network size (H5) is not supported, the more time people spend on socializing with others offline, the more they do so online (b = .16), failing to confirm substitution hypothesis 6. With respect to relations between network size and time spent on networks, the results confirm our expectations (H7): The larger the network size, the more time people spend socializing. This effect is larger for the offline sample than for the online sample ($b_{offline}$ = .44; b_{online} = .18).

The question whether an increased social network size leads to more social support is only supported for the offline situation: The larger the offline network size, the more social support people perceive (b = .09). It appears that it is not necessary for people to actually spend time with others, considering the absent relationship between social support and the time spent on socializing. The online social network size and the time people spend on socializing with others online are unrelated to social support. Hypothesis 8 is not confirmed for the online sample, but is confirmed for the offline sample.

The degree to which people socialize with others (in terms of size and time) is not related directly to feelings of loneliness, for the offline as well as the online sample, failing to confirm hypothesis 9. There is, however, an indirect relation between the offline network size and loneliness, mediated by social support. Exposure to television has a small positive direct effect on loneliness (b = .05) There is no evidence that watching television has a deteriorating effect on network participation.

A striking finding is the strong negative effect social support has on loneliness (b = −.78). As such, the perceived reliance on other people when in need is very important to prevent or overcome loneliness, confirming hypothesis 10.
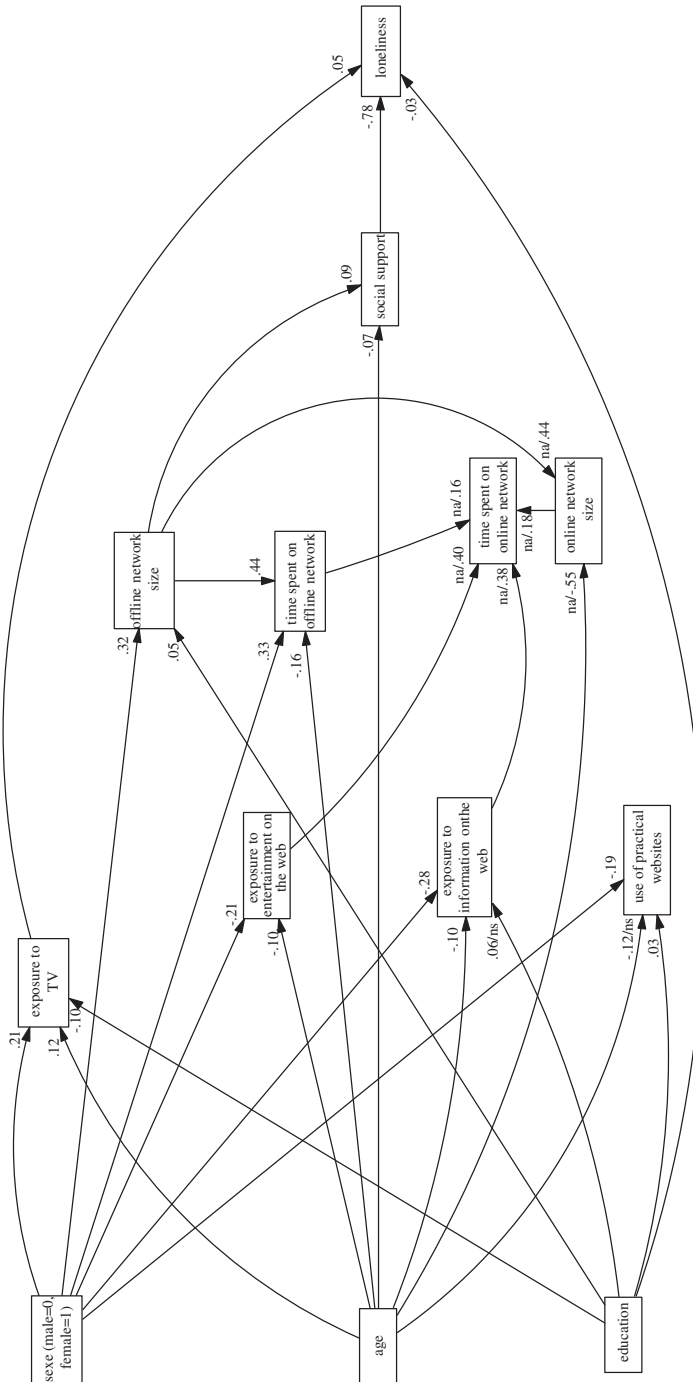
Figure 2 Empirical model of time spent on media use, social networks, and the effects on social support and loneliness.

Note: Reported regression coefficients are nonstandardized and significant at p <.05, tested one-sided. A single coefficient is reported when coefficients for the offline and online sample are equal. Coefficients that differ for both samples are presented before (i.e. offline sample) and after (online sample) the forward slash. When coefficients for both samples are not significant, the arrow is omitted. 'ns' indicates that the coefficient is not significant for one sample. 'na' indicates when a relation is not applicable for a sample (e.g. an effect of age on *online* network size for the *offline* sample).

Regarding the background characteristics, women watch more television than men (b = .21), but use the Internet less for various purposes (entertainment: b = −.21; information: b = −.28; practical: b = −.19). Women possess a larger offline social network than men and use it more intensively (size: b = .32; time: b = .33). In contrast, they possess a smaller online social network (i.e. time and size) because they use the Internet less for entertaining and informing purposes than men do. For men, using the web leads to more time spent online socializing.

As for age, the older people are, the more time they spend watching television (b = .12). At the same time, older people spend less time web browsing (entertainment: b = −.10; information: b = −.10; practical: $b_{offline}$ = −.12). Although older people do not have a smaller or larger offline network, they do spend less time with people offline (b = −.16). Older people, however, do have a smaller online network is (b = −.55). They also spend less time with people online (mediated by Internet use for entertainment and information, by offline network time and by online network size). Furthermore, older people perceive less social support resulting in more loneliness.

Higher educated people spend less time watching television (b = −.10), but spend more time browsing the web for informational ($b_{offline}$ = .06) and practical purposes (b = .03 for both samples). Higher educated people have a larger offline social network (b = .05). Also, they spend more time with their online social network (mediated by browsing for information and by offline network size and time). There is also a negative effect of education on loneliness (b = −.03).

Since we argued that loneliness can also act as a motive for media use, where loneliness has effects on network capital and media use, this relation was modeled as well. The model fit, however, did not improve significantly, showing that these relations were not significant.

To determine the relative importance of different explanations (i.e. background characteristics, media use, offline and online capital) for social support and loneliness, we calculated the direct, indirect and total coefficients of determination for blocks of explanatory variables (see appendix). Table 3 shows that background characteristics explain the most variance in total in loneliness (total $R^2_{offline}$ = .055; total R^2_{online} = .050) followed by the offline capital (total $R^2_{offline}$ = .020; R^2_{online} = .021) and media use (total $R^2_{offline}$ = .006; R^2_{online} = .007). This holds for both the offline and online sample. Media use is of limited importance in explaining loneliness.

With respect to social support, we see that offline network capital slightly explains more variance (total $R^2_{offline}$ = .055; R^2_{online} = .049) than the background characteristics (total $R^2_{offline}$ = .036; R^2_{online} = .036). Media use does not contribute to the explanation of social support.

Discussion

In this study, we set out to contribute to the discussion on whether the use of media contributes to an integrated society or whether media use leads to a more

Table 3 Coefficients of determination for blocks of explanatory variables*

Dependent variables		Blocks of explanatory variables				
		background	use of media	offline capital	online capital	social support
Offline sample						
social support	direct	.032	ns	.055	na	na
	indirect	.001	ns	ns	na	na
	total**	.036	ns	.055	na	na
loneliness	direct	.019	.006	ns	na	.361
	indirect	.018	ns	.020	na	
	total	.055	.006	.020	na	.361
Online sample						
social support	direct	.034	ns	.049	ns	na
	indirect	.001	ns	ns	ns	na
	total	.036	ns	.049	ns	na
loneliness	direct	.016	.007	ns	ns	.421
	indirect	.020	ns	.021	ns	ns
	total	.050	.007	.021	ns	.421

Coefficients are significant at $p < .05$. 'ns' = nonsignificant. 'na' = not applicable.
*Building on Wright's (1934) coefficient of determination of a single explanatory variable, we derived the direct, indirect and total coefficient of determination for a block of explanatory variables. For details see the appendix.
**The sum of the direct and indirect coefficients of determination do not necessarily need to equal the total coefficient of determination. For an explanation see the appendix.

fragmented, disconnected and individualized society. Using a random sample from the Dutch population, a higher degree of external validity was realized than samples based on limited populations such as youngsters (Valkenburg & Peter, 2007) or the elderly (Wright, 2000), or even nonrandom samples (Williams, 2007). Furthermore, the range of age and level of education is much wider than in samples of other studies. Subsequently, we tested a causal model with Structural Equations Modeling, uncovering the process as to how the use of television, websites and Internet applications affects social support and loneliness.

Online and Offline Network
The results showed that the impact of noncommunicative use of media (i.e. television and web surfing) on socializing with other people is limited or nonexisting. Web surfing for entertainment and information even shows positive effects on communication with other people. As such, this does not support the time displacement hypothesis (cf. Moy, Scheufele & Holbert, 1999; Nie & Hillygus, 2002; Nie, Hillygus & Erbring, 2002; Putnam, 1995, 2000). An interpretation of this finding is that web surfing and online socializing increasingly become intertwined for a number of reasons. First,

time use research not only shows that people perform multiple activities at the same time, it also shows that this is specifically the case for online socializing (Kenyon, 2008, p.305, 309–310). Second, because time spent on necessary activities (i.e. work, education, and personal care) has increased with 12% from 72.9 hours per week in 1975 to 81.6 hours per week in 2005 (Huysmans et al., 2006), time pressure has increased, thereby increasing the need for multitasking. Third, multitasking may be facilitated by user configurable websites: AJAX enhanced websites and mashups (e.g. Netvibes, iGoogle) and SNS (e.g. Facebook, Hyves) as well as embedding content and applications, allow web users to adapt their website desktop entirely to their liking by adding applications they most frequently use.

Furthermore, the findings show that online and offline network capital are positively associated, suggesting that they supplement each other instead of replacement, confirming that "the rich get richer" (cf. Kraut, Kiesler, Boneva, Cummings, Helgeson, & Crawford, 2002). The interpretation of this finding is twofold. First, people may simply copy their offline network to the online realm (cf. Ofcom, 2008). The total network size stays the same, only the manner in which people communicate with network members changes. Second, personality characteristics may play a role in how offline or online communication takes plays. For instance, shyness, extraversion, and neuroticism have shown to be related to Internet use, although findings are contradictory (cf. Rice & Markey, 2009; Saunders & Chester, 2008).

Whether the increasingly popular SNS will drastically enhance online communication is unclear. One could argue that, after registering probably out of curiosity, the mere membership of one or more Social Network Sites may only be weakly associated to actual online communication within this online network. Although many people may register and even chart their social network online, actually engaging online may be an entirely other matter. Furthermore, online communication within one's entire network using a SNS is hampered by limited interoperability: People are not able to fully enclose their entire social network into one single online social network because it is not yet possible to connect or transfer several online social networks from different SNS platforms to a single online network (cf. W3C, 2009). Although there are initiatives to increase interoperability (cf. www.opensocial.org), it is unclear whether SNS platforms (e.g. Google, Facebook) will fully adopt it.

Another reason why it is not clear that online communication is to increase is because communication interfaces on SNSs are very similar to the traditional (web-based) e-mail and IRC interfaces. As such the SNS communication applications may only replace the older ones, instead of being additional communication channels on the Web.

Social Support and Loneliness

Although there are no indications for less network capital attributable to watching television or web surfing, the functional contribution of the online network to more social support and less loneliness is absent. Whereas the offline network capital seems capable of offering social support and decreasing loneliness, online network capital

seems to lack these benefits. This implies that online social networks in general lack characteristics that offline networks have. Whether these networks differ in richness of communication cues or in network composition is unclear. However, previous research shows that increasingly popular SNSs are mostly used for copying the offline social network to the Net (Ofcom, 2008) and only seldom used to contact friends of friends, or even strangers. SNSs may have more potential to bridge than to bond (cf. Ellison et al., 2007). The question why online socialization seems less useful for bonding may have to do with the lack of online social trust due to lack of information (cf. Boyd, 2003). Some studies have demonstrated that social trust and Internet use are related (Beaudoin, 2008; Uslaner, 2004; Shah et al., 2001). Because SNSs ask members for profile information and SNS members use SNSs for impression management (boyd & Ellison, 2007), they disclose information to their network members and others. This provides people with more information to determine trustworthiness of others online. Depending on the outcome of that evaluation, online communication might be more beneficial for bonding capital and more specific social support.

The use of the Internet for socializing in the personal, nonwork-related sphere is still limited (12% of the sample) and mostly practiced by younger people. Although the findings for the offline and online samples are quite similar, it is not clear how this will develop in the near future. While it is expected that a larger portion of the population will use the Internet more extensively to maintain social relations, it is unclear how this will affect people's interconnectedness in society and their perceived social support and degree of loneliness. The present younger generations, for whom online maintenance of social networks is common practice (cf. Ofcom, 2008), may continue to do so in the future, because the formative years appear to be important for media habits in later life (cf. Knulst, 1999). The question whether this cohort of younger people will pass on the use of SNSs on as part of a socialization process to subsequent younger generations is yet unclear and worthwhile for future study.

In the future, the Internet in general and specific Internet applications are likely to become easier to use as well as more mobile (Lin & Anol, 2008). At the same time, the Internet will also provide richer information about people in one's network as well as during the communication process. This may lead to an offline and online realm that are increasingly becoming entwined to such a degree that it will be very difficult to distinguish them from each other (cf. Beer, 2008).

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Appendix

For the simple path-diagram given below the calculation of direct, indirect, and total coefficients of determination is demonstrated.
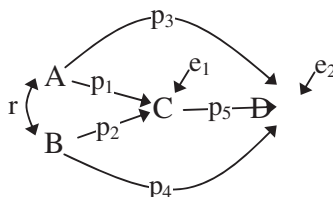
Variables A, B, C, and D are standardized with zero mean and unit standard deviation, p_1 to p_5 are path-coefficients and r is the bivariate correlation of A and B; e_1 and e_2 denote error in C and D, respectively. The reduced form equation relating D to both A and B is derived as follows:

$$D = p_3 A + p_4 B + p_5 C + e_2$$
$$= p_3 A + p_4 B + p_5 (p_1 A + p_2 B + e_1) + e_2$$
$$= (p_3 + p_5 p_1)A + (p_4 + p_5 p_2)B + p_5 e_1 + e_2$$

The proportion variance in D *directly* explained by both A and B is

$$\text{var}(p_3 A + p_4 B) = p_3^2 + p_4^2 + 2p_3 p_4 r.$$

The proportion variance in D *indirectly* explained by both A and B is

$$\text{var}(p_5 p_1 A + p_5 p_2 B) = p_5^2 p_1^2 + p_5^2 p_2^2 + 2p_5^2 p_1 p_2 r$$

The proportion of variance in D, *totally* explained by both A and B is

$$\text{var}[(p_3 + p_5 p_1)A + (p_4 + p_5 p_2)B]$$
$$= (p_3 + p_5 p_1)^2 + (p_4 + p_5 p_2)^2 + 2(p_3 + p_5 p_1)(p_4 + p_5 p_2)r$$
$$= \text{proportion directly explained variance}$$
$$+ \text{proportion indirectly explained variance}$$
$$+ 2(p_1 p_3 p_5 + p_2 p_4 p_5 + p_2 p_3 p_5 r + p_1 p_4 p_5 r).$$

The last expression shows that, depending on the signs of the path-coefficients and r, the proportion totally explained variance may be higher or lower than the sum of the directly and indirectly explained proportions. We used the term 'total' because of the close relation with the way a 'total' causal effect is commonly calculated in path analysis for a single explanatory variable. However, it is understood that the total concerns a 'net' proportion as direct and indirect determination can be re-enforcing as well as counterproductive. For a single exogenous variable the total coefficient of determination equals the reduced form R-square e.g. given by the SEM software package Lisrel (Jöreskog, 2000).