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Informative Internet Services and the New Digital Divide

Who Benefits from Using the Internet?

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ABSTRACT: This study aims to make an innovative contribution to the existing literature on the new digital divide by investigating which personality and socio-demographic factors influence the use of informative Internet services, and how these Internet services affect an individual's bridging social capital. These two questions are answered by analyzing longitudinal data using Structural Equation Modeling. We found that individuals who are more eager to learn or more open to new experiences (measured by personality factors 'need for cognition' and 'openness to experience') use a larger amount of informative Internet services than those who do not feel that urge. Furthermore, males and elderly people are more likely to use a larger amount of informative Internet services, as well as those who are higher educated and have higher incomes. No relationship was found between Internet use and bridging social capital, though. This implies that the assumed relationship between Internet use and bridging social capital might not exist when personality and socio-demographics are taken into account as well. Although patterns of a digital divide are clearly visible in people's surfing patterns, the implications of the new digital divide might not be as severe as has often been proclaimed.
KEYWORDS: new digital divide, Internet, personality, socio-demographics, social capital

1. INTRODUCTION

The arrival of the Internet has led to a series of rapid changes for people all around the world. Firstly, the Internet allows us to search and retrieve information in an incredibly fast pace, mainly as a result of the many search engines on the Internet (DiMaggio, Hargittai, Celeste & Shafer, 2004). Second, various Internet services, such as forums and newsgroups, increase possibilities for political discussion, and can provide citizens with direct access to the government (Schneider, 1996; Van Dijck & Nieborg, 2009). Third, it is argued that the Internet expands access to resources such as good education, high prestige jobs, and better health (DiMaggio et al., 2004). Lastly, the Internet offers an important social component. Internet services such as social networking sites and email enable us to get in touch with people around the globe (Wellman, Quan-Haase, Witte & Hampton, 2001). Therefore, the Internet can be considered as a tool to enhance an individual's social capital, which is the result of resources retrieved from social relations in daily life (Coleman, 1988; Ellison, Vitak, Grey & Lampe, 2014).

Unfortunately, not everyone is able to use the Internet in the same fashion. In the words of Selwyn et al. (2005: p. 7): "The Internet means different things to different people and is used in different ways for different purposes". This implies that, irrespective of the many possibilities offered by the Internet, not all users are equally capable and experienced in using it (Van Dijck & Nieborg, 2009; Brandtzæg, Heim & Karahasanovic, 2011). Only the more capable and experienced Internet users are able to retrieve the additional resources that give access to good education, high prestige jobs, and better health, for example (DiMaggio et al., 2004). Therefore, differences in user patterns between those who surf the Internet have the potential to contribute to social inequality (Hargittai & Walejko, 2008; Stern, Adams & Elsasser, 2009; Brandtzæg, 2010).

The aim of the present study is to investigate the new digital divide, a phrase used to denote social inequality resulting from variation in Internet uses (Hargittai, 2002; Brandtzæg et al., 2011). Two aspects of the new digital divide are addressed in this study. The first aim is to gain insight into different Internet user patterns by means of an interdisciplinary framework. Both personality and socio-demographics are expected to influence an individual's decision to use the Internet for specific purposes (Landers & Lounsbury, 2006; Porter & Donthu, 2006). Hence, we investigate to what extent personality and socio-demographics explain variation in Internet user patterns. The second aim of this study is to investigate how these different user patterns affect an individual's social capital. This way, we do not only explain the new digital divide, but also study its social implications.

With regard to personality dimensions, not all possible dimensions are investigated. Instead, we investigate the dimensions that previous literature has pointed out to be relevant (Tuten & Bosnjak, 2001; Guadagno, Okdie & Eno, 2008; Ross et al., 2009; Correa, Hinsley & de Zúñiga, 2010): Three out of five factors of the psychological Big Five personality model (McCrae & John, 1992)–'extraversion', 'neuroticism' and 'openness to experience'–will be included in this study, combined with the personality factor 'need for cognition', which deals with the degree to which individuals are eager to learn, and to engage in cognitive activities.

Socio-demographic characteristics that are studied are age, gender, education, and income; four indicators often included in research investigating the new digital divide (Zillien & Hargittai, 2008; Van Deursen & Van Dijck, 2014). Previous research pointed out that younger people appear to make more use of the Internet than older people (Porter & Donthu, 2006). Equally, gender inequality is still an important issue to be considered, as it has been reported that women use fewer Internet services (Hargittai, 2010). Lastly, education and income are important indicators, because people from a higher socioeconomic background,

i.e. people who are higher educated and have a higher income, tend to surf the Internet more intensively than people from a lower socioeconomic background (DiMaggio et al., 2004).

The second part of the longitudinal framework focuses on the effects of different Internet user patterns for an individual's offline social capital. Social capital is a construct used to refer to the social resources individuals might extract from their personal relationships (Coleman, 1988; Portes, 1998). It has, for example, been linked to new employment opportunities (Burt, 1997; Quite et al., 2013), organizational success (Nahapiet & Ghoshal, 1998), better health (Adler & Kwon, 2002), increased self-esteem (Bargh & McKenna, 2004), and general life satisfaction (Helliwell & Putnam, 2004). Over the last two decades, the Internet became a new and important medium for social structures, and it is found that proper Internet use might result in more social capital (Kraut et al., 2002; Valenzuela, Park & Kee, 2009). Social networking sites, for instance, allow individuals to maintain a larger network of friends, thereby increasing the opportunity to retrieve resources through social ties offline (Steinfiel, Ellison & Lampe, 2008; Ellison et al., 2014). Likewise, the search function of the Internet makes it possible to find information about the time and place of offline events. Individuals might, for instance, find an occasion to do voluntary work, which has been demonstrated to be beneficial for their social capital (Coleman, 1988; Wellman et al., 2001 Bauernschuster, Falck & Woessman, 2011).

This study contributes to the existing literature in two ways. First, we make use of a general measure of Internet usage by counting the total number of informative Internet services used by individuals. The majority of Internet studies have solely focused on online social networking sites (Ellison, Steinfield & Lampe, 2007; Zywica & Danowski, 2008; Ross et al., 2009; Valenzuela et al., 2009). There are several Internet services that have the potential to increase an individual's social capital, though. Therefore, a measure of general Internet use is more appropriate in digital divide research. In addition, nearly all studies focus on Internet use in terms of total hours spent. Today, many people use the Internet regularly, i.e. they are connected to the Internet continuously through smartphones and tablets. Consequently, it is no longer relevant to consider the amount of time spent on the Internet (Pasek, More & Romer, 2009). Instead, this study focuses on the degree to which people make use of the opportunities provided by the Internet. A count of the total amount of informative Internet services used will provide a more complete picture of differences in Internet use, and its influence on social capital.

Second, whereas most studies focus either on explanations for the variation in Internet user patterns or on effects of different use on social capital, this study takes both relations into

account in a parsimonious longitudinal study. Therefore, we gain a unique insight into the causal relationships between individual factors that explain use, and in turn how use affects an important offline concept: Social capital. To our knowledge, we are the first to combine these two aspects of the new digital divide in a way that can convincingly separate causes from effects.

In our examination of the new digital divide, we focus on the Netherlands. The Netherlands is an ideal country to study the new digital divide, because this country is the frontrunner of Europe in Internet penetration: In 2010, 94% of the households had Internet access at home (Eurostat, 2014; Statistics Netherlands, 2014). We use data of the LISS (Longitudinal Internet Studies for the Social sciences) panel, which is managed by CentERdata (Tilburg University, the Netherlands). The LISS panel is a representative sample of Dutch individuals aged over 16 who participate in monthly Internet surveys. We use data of three waves, conducted in the period 2010-2012. A total of 3797 respondents participated in these three waves.

2. THEORY

Before we derive hypotheses about the causes and effects of variations in Internet use, it is important to explicitly define our key concept. Because the focus is on social inequality resulting from Internet use, the concept is delimited to informative Internet services, such as newsgroups, search functions, and forums. Entertainment functions, such as the possibility to watch movies or play games online, are less likely to affect social inequality, and will therefore not be considered in this study. Previous studies focusing on general Internet uses have made these kind of distinctions as well. Hamburger & Ben-Arzti (2000), for example, distinguished social services, information services, and entertainment services. Likewise, Wolfradt and Doll (2001) distinguished information, entertainment, and interpersonal communication functions of the Internet. Contrary to these two studies, the present study considers social services to be informative as well. This is based on the assumption that social Internet services can also generate useful information. Social networking sites, for example, allow individuals to share news with their friends. Additionally, forums and newsgroups provide opportunities for discussion, and can therefore also offer information.

The first part of the theory section elaborates on explanations for the variation in Internet use. A mechanism-driven approach is used to derive hypotheses about the relation between personality factors and Internet user patterns (section 2.1). In a similar fashion, the hypotheses regarding the effects of the socio-demographic factors on Internet use are drafted

(section 2.2). The second part of the theory focuses on the offline effects of different patterns of Internet use by determining to what extent Internet use influences an individual's offline social capital (section 2.3). The complete theoretical framework including the supposed relationships between the concepts used is displayed in Figure 1 at the end of this chapter.

2.1. The influence of personality on Internet use

Personality factors have regularly been studied in relation to the consumption of mass media. Initially, the focus was on the consumption of movies, music, and television shows (Weaver, 1991). More recently, personality factors have also been studied in relation to the Internet (Hamburger & Ben-Arzti, 2000; Ryan & Xenos, 2011). The personality factors that are taken into account in the current study are 'need for cognition', 'openness to experience', 'extraversion' and 'neuroticism'. The last three factors are derived from the Big Five model of personality, in which five different factors are considered to capture all aspects of personality. The other two factors are 'agreeableness' and 'conscientiousness' (McCrae & John, 1992). In previous studies, no relationship was found between these two factors and Internet use (Ross et al., 2008; Zywica & Danowski, 2008), hence they are not included in the present study. Alternatively, 'need for cognition' is included, because in personality research, this factor is found to be an important contributor to the Big Five factors (Sadowski & Cogburn, 1997).

'Need for cognition' is defined by Cacioppo & Petty (1982) as a difference in people's tendency to engage in, and enjoy, effortful cognitive activity. Someone with much need for cognition is considered to naturally seek, acquire, and reflect on information in his environment. Therefore, need for cognition implies an eagerness to learn, and people with much need for cognition will constantly aim to satisfy this desire. The difference between much and little need for cognition becomes clear when you imagine a politician trying to convince his public about a specific point of view. Someone described as having little need for cognition will believe the politician as a result of simple cues, such as his attractiveness or the number of arguments used, whereas someone with much need for cognition will acquire more information at different sources, for example of other political parties, before formulating an opinion (Verplanken, Hazenberg & Palenéwen, 1992). The Internet is assumed to be an important tool for individuals with much need for cognition to search for additional information about a subject matter, and to learn about several sides of a story before formulating an opinion. Various types of Internet services can be deployed for this task. For instance, during an electoral period, newsgroups and forums could provide an individual with much need for cognition the desired additional information about political candidates.

Previous studies found that those with much need for cognition use the Internet for learning and educational purposes, gathering product information, reading about current events and news, and for work or professional purposes (Tuten & Bosnjak, 2001; Kaynar & Amichai-Hamburger, 2008). Based on this information, we derive the first hypothesis:

> H1: Individuals with much need for cognition are likely to use a larger amount of informative Internet services than individuals with little need for cognition.

'Openness to experience' captures the degree to which an individual is imaginative, curious, original, broad-minded, and intelligent (Barrick & Mount, 1991). A high score on this factor means that an individual is open and curious to new ideas and experiences. There are two different ways in which the Internet could be deployed to satisfy this desire. First of all, someone who is open to new experiences will be more likely to try out new technologies (Butt & Phillips, 2008). The Internet is no longer a new technology, but there are still countless possibilities of the Internet to be discovered. It can be argued that someone who is more open to experience would want to be the first to know about everything the Internet has to offer. Therefore, more openness to experience will result in more use of all kinds of informative Internet services. Previous research has indeed found openness to experience to be positively related to all kinds of Internet services: This group is found to be more likely to intensively use social networking sites (Ross et al., 2009), to be frequent bloggers (Guadagno et al., 2008), and to use the Internet for entertainment services, events, news, and education (Tuten & Bosnjak, 2001; Correa et al., 2010). A second mechanism behind the relationship between openness to experience and Internet use can be obtained from the information function of the Internet. Not just the Internet in itself could be an interesting experience, but the Internet can also be used to find information about new offline experiences, such as the possibility to buy tickets online for theater or music shows. In general, people who are more open to experience will continue to explore all options and services of the Internet in order to meet their desire for new experiences. These mechanisms allow us to derive the second hypothesis:

> H2: Individuals who are more open to experience are likely to use a larger amount of informative Internet services than individuals who are less open to experience.

Two additional personality factors are taken into account in this study: 'Extraversion' and 'neuroticism'. 'Extraversion' is about sociability, assertiveness, activity, and talkativeness (Judge, Martochhio & Thoresen, 1997; Costa & McCrae, 1992). 'Neuroticism' is considered the opposite of emotional stability. Neurotic people are categorized as more anxious, worried, pessimistic, and insecure (Judge et al., 1997; Barrick & Mount, 1991). These two personality factors have mainly been included in studies that examine the use of online social networking sites (Ehrenberg et al., 2008; Amichai-Hamburger & Vinitzky, 2010; Correa et al., 2010; Ryan & Xenos, 2011). The present study focuses on Internet use more general by counting the number of informative Internet services used by an individual. Because it is unclear what mechanisms could influence the relationship between these two factors and general Internet use, the factors are solely included for explorative reasons, meaning that no hypotheses are derived.

2.2. The influence of socio-demographic factors on Internet use

Age, gender, education, and income are included as socio-demographic factors, since all have been demonstrated to be related to differences in Internet user patterns (DiMaggio et al., 2004; Hargittai & Shafer, 2006; Porter & Donthu, 2006). With regard to gender, there were initially large differences between men and women and their access to the Internet (Bimber, 2000). Although these initial differences have entirely disappeared (Ono & Zavodny, 2003), this does not necessarily mean that men and women actually use the Internet in the same way. On the contrary, Hargittai and Shafer (2006) found that even though men and women do not differ greatly from each other in their actual online abilities, women's self-assessed skills regarding Internet uses are significantly lower than those of men. This discrepancy between women's actual and perceived Internet skills might affect their online behavior. Because they are convinced of having few Internet skills, they do not feel the opportunity of using the Internet for more complicated services. Therefore, their low confidence puts a constraint on the number of Internet services they use compared to men (Hargittai, 2010). This suggests that gender inequalities in Internet use remain, and leads to the following hypothesis:

> H3: Women are likely to use a smaller amount of informative Internet services than men.

Age is another important factor accounting for variation in Internet user patterns. Literature about the new digital divide often makes reference to the "Net generation" (Tapscott, 1998) or

"digital natives" (Prensky, 2001), when people from the younger age cohort are discussed. Because they grew up in the digital era, they are confronted with digital media at home, at school, and in other public places (Livingstone & Helsper, 2007). They naturally learn about the various possibilities of the Internet, which results in great knowledge about the Internet. On the contrary, elderly people are more likely to avoid using the Internet, because of their limited experience in using computers and the Internet, and because of the perceived difficulty they associate with the task (Porter & Donthu, 2006). As a result of these differences in experiences, younger people will be more familiar with all kinds of Internet services. They will take the lead in using the Internet for various different purposes. Previous studies have found that young adults take the lead with the use of communication tools and the use of the Internet for leisure activities (Dutton et al., 2011; Van Deursen & Van Dijk, 2014). In the present study, the focus is on informative Internet services. For these type of services, it is also expected that as a result of their Internet experience, younger people will use them more intensively. Therefore, we derive the hypothesis that:

> H4: Older people are likely to use a smaller amount of informative Internet services than younger people.

Education and income, two indicators of socio-economic status, are important predictors of Internet use as well. With respect to education, firstly, a lot of research has been conducted to test the effect of cultural omnivorousness (Katz-Gerro, 2002; Bihagen & Katz-Gerro, 2007). According to this theory, highly educated people tend to have a better cognitive ability to engage in a broad range of activities. As cultural omnivores, they spend their leisure time doing more varied activities (Peterson & Kern, 1996). This can be extended to the argument that their high cognitive ability allows them to use many different Internet services in their leisure time. Howard et al. (2001) found, for example, that those who are higher educated use the Internet more often to look for health information, to engage in financial transactions, and to do research. Madden (2003) found that higher educated people use the Internet more often for news, work, travel arrangements, and product information. Hargittai and Hinnant (2008), lastly, found that higher educated people use the Internet more often to seek political and government information, and to explore career opportunities. These services can all be considered informative. At the same time, all of these studies found lower educated people to employ the Internet mainly for entertainment purposes. As a result, we derive the fifth hypothesis:

H5: Higher educated people are likely to use a larger amount of informative Internet services than lower educated people.

Income, finally, is strongly related to the attained educational level. Still, many studies have found an independent effect of income, indicating that different mechanisms are at stake. With respect to income, it can be argued that the matter of productivity is very important. People who earn more employ the Internet more productively and to a greater economic gain than their less privileged, but nonetheless connected peers (Zillien & Hargittai, 2009; Van Deursen & Van Dijk, 2014). The main explanation that can be advanced for this difference is that this group will be better aware of the possibilities of informative Internet services, because they more often have to deal with complicated ICT at work. Furthermore, the Internet could be employed by people with a high income to protect and enhance their capital, for example by searching for financial information on the Internet or by the use of online banking services. Previous studies demonstrated that people with higher incomes use the Internet more often to seek news or product information and to arrange for travel (Madden, 2003). Furthermore, they were found to use the Internet more often for work purposes (DiMaggio, 2004). People with lower incomes, conversely, were found to use the Internet in more general and superficial ways (Van Dijk, 2005). All of these effects were found independent of an individual's education. Therefore, with respect to the relationship between income and Internet user patterns, the sixth hypothesis is derived:

H6: People with a higher income are likely to use a larger amount of informative Internet services than people with a lower income.

2.3. The influence of Internet use on social capital

The second part of the theoretical framework explicates the relationship between different uses of the Internet and the consequences for an individual's social capital. Social capital describes the access to resources through relationships among people (Burt, 1992; Coleman, 1988; Putnam, 2000). Examples of such resources include useful information, emotional support or the capacity to organize groups (Paxton, 1999). In much of the literature, a distinction is made between bonding and bridging social capital (Gittell & Vidal, 1998; Putnam, 2000; Ellison et al., 2014). Both types of social capital refer to the extent to which individuals are connected with each other by means of so-called ties: Social relationships

between at least two people (Granovetter, 1973). Someone is considered to have more bonding social capital when he or she is connected with many others by means of strong relationships. Strong relationships generally include ties with a spouse, family or close friends. A network consisting of many strong ties provides the individual access to scarce resources: Resources that can only be provided by someone close to an individual, such as emotional support.

Bridging social capital, on the other hand, can result from what Granovetter (1973) has termed weak ties: Loose connections between individuals. Examples of weak ties are acquaintances, colleagues, and more distant friends. In essence, these are ties with whom one has less social interaction. A network consisting of many weak tie connections usually links the individual to several different social contexts. New information, e.g. about employment opportunities, is more easily obtained as a result of large information diffusion processes between all social contexts (Burt, 1992). For instance, an individual could be closely connected in an occupational network, and at the same time have some weak ties resulting from membership at a sports association. The acquaintances at this sports association might give him new information about another job, which none of his close ties have access to. Weak ties thus provide the individual with an information advantage. Consequently, a social network largely consisting of weak relationships will result in more bridging social capital.

In the present study, the focus is on bridging social capital, because Internet use has especially been reported to positively influence this type of social capital (Kraut et al., 2002; Kavanaugh et al., 2005; Ellison et al., 2007; Steinfield et al., 2008). The relationship between Internet use and bridging social capital mainly results from network opportunities provided by various Internet services. Online social networking sites, for example, allow people to create and maintain larger networks of weak ties (Donath & Boyd, 2004). Furthermore, on blogs and forums, individuals can meet new people, which will further enlarge their network (Guadagno et al., 2008). Additionally, the information function of the Internet facilitates the acquisition of information about the time and place of offline events with other people, thereby again providing new social network opportunities (Bauernschuster et al., 2011). To summarize, these Internet services all support the creation of a larger social network, because they reconnect the individual with acquaintances, and provide him with an opportunity to meet new people. A larger network of weak ties results in more opportunities for an increase in bridging social capital. Therefore, through an increase in social networks, Internet services also increase the opportunity to retrieve resources from social ties offline. Consequently, we derive our final hypothesis:

H7: People who use more informative Internet services are likely to have more bridging social capital than people who make less varied use of the Internet.

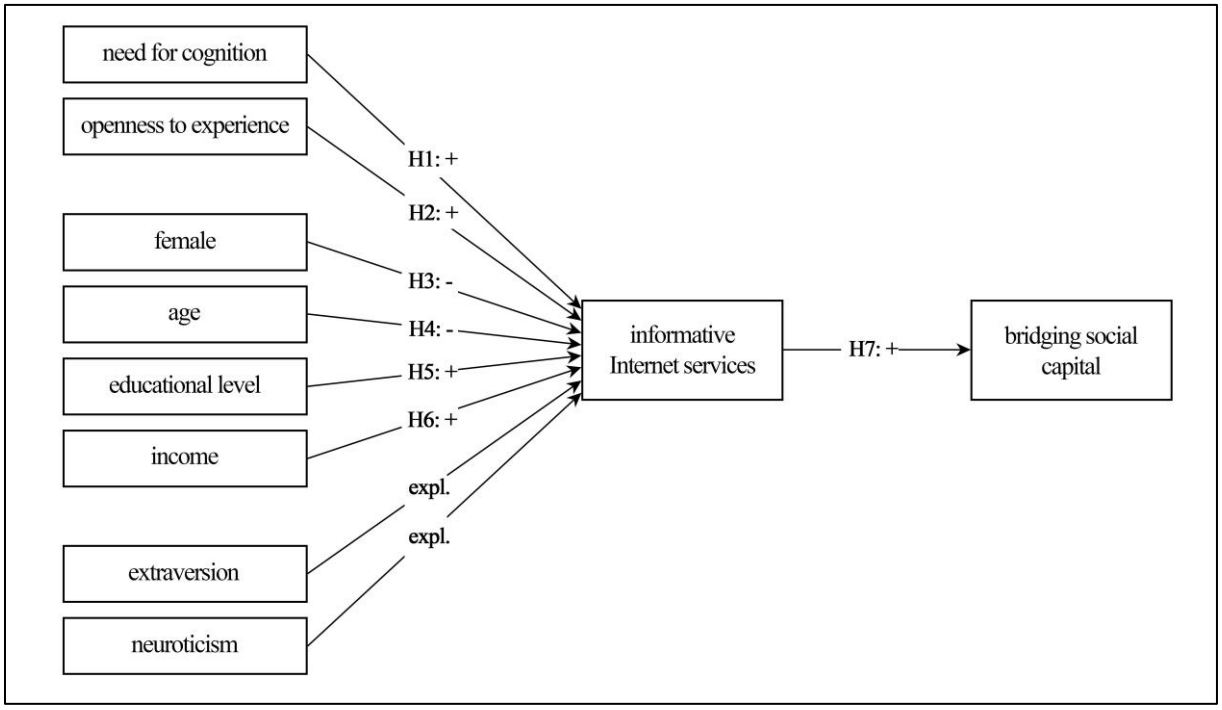

Figure 1. Theoretical model including all hypotheses and two explorative relationships.

3. METHODS

3.1. Sample

To test the hypothesized relationships, data of the LISS (Longitudinal Internet Studies for the Social sciences) panel of CentERdata (Tilburg University, the Netherlands) was used. The LISS panel aims to gain insight into Dutch people's needs and life situation. Their sampling frame was the nationwide address frame of Statistics Netherlands. Initially, a simple random sample of 10150 addresses was drawn from this frame. The response rate was 48%, so the final panel consisted of about 5000 households, comprising over 8000 individuals. All household members in the panel were invited to participate in monthly online questionnaires. Households without Internet access were provided with a computer and an Internet connection.

To test the relationships over time between personality, socio-demographics, Internet use, and social capital, survey data of three different points in time were used: Of 2010, 2011, and 2012. These are waves 3, 4 and 5 of the LISS panel. A total of 3797 respondents

completed all questionnaires in all three waves. Table 1 shows a comparison of sample characteristics of 2010 (wave 3) and population characteristics of the same year, in order to check the representativeness of the LISS sample. There is a slight overrepresentation of elderly, native Dutch, and married people. The average age of respondents in the LISS panel is 50.5, whereas this is 40.1 in the Dutch population. Likewise, 88.4% of the respondents are Dutch, compared to 79.7% of the population; and 60.4% of the respondents are married, whereas only 41.5% of the population are married. For education, finally, there is a slight overrepresentation of people with a higher vocational education (22.5% in the LISS panel compared to 18.0% in the population), and people with a lower secondary education (28.2% compared to 22.8%). Such differences between the data and the population as a result of non-response bias are common in survey research: Elderly, native Dutch, and higher educated people are more likely to participate in scientific research (Blair & Zinkhan, 2006). Nevertheless, it should be kept in mind when drawing conclusions.

Table 1
Comparison of LISS Statistics and Total Population, 2010

	LISS panel		Statistics Netherlands	
	M	%	*M*	%
Gender: % males		46.8		49.5
Age (in years)	50.5		40.1	
Ethnicity: % Dutch		88.4		79.7
Marital status: % married		60.4		41.5
Education:				
Primary education		10.3		8.2
Lower secondary education		28.2		22.8
Higher secondary and intermediate vocational education		31.9		40.3
Higher vocational education		22.5		18.0
University education		7.2		9.8

3.2. Measures

This section describes the measurement of the different independent and dependent variables. Measures were constructed for the personality factors, the socio-demographics, informative Internet services and bridging social capital. Information about all the items used for the construction of our variables can be found in Appendix A.

Before the variables are discussed, an additional note is required. Ideally, measures about personality would be used of wave 3 (2010). However, only 661 of the 3797 respondents completed both the personality survey in wave 3 and all other surveys in the consecutive years. The power of the analyses would decline severely if only 661 respondents

would be included. Personality traits are assumed to be stable over time (Cobb-Clark & Schurer, 2011), so if the two measures of wave 3 and 4 are strongly correlated, measures of wave 4 can be used in further analyses to increase the statistical power. For extraversion, a comparison of wave 3 and 4 resulted in a correlation of r (661) = .818 (p < .001). The two measures for neuroticism were strongly correlated as well (r (661) = .787, p < .001). The same is found for openness to experience (r (661) = .770, p < .001) and need for cognition (r (658) = .787, p < .001). The strong correlations between the personality factors suggest that the factors are relatively stable over time. Therefore, it was decided to use personality characteristics of wave 4 in the analysis, thereby increasing the observations with approximately N = 3000.

In order to preserve the longitudinal model, the socio-demographic variables are still selected from wave 3. In the remainder of this study, reference will be made to three different time points. Personality and socio-demographics are ascribed to time point 1, Internet use to time point 2, and social capital to time point 3. The assumption that personality characteristics are established earlier in time than Internet user patterns allows for this methodological division of time points.

3.2.1. Variables time point 1: Personality factors and socio-demographic factors

The LISS data included 50 items of the International Personality Item Pool (IPIP) (Goldberg, 1992; Goldberg et al., 2006). These 50 items capture the Big Five factors of 'extraversion', 'agreeableness', 'conscientiousness', 'neuroticism', and 'openness to experience'. In this study, three of these constructs were used, which contain 10 items each. The items contain statements describing people's behaviors. Respondents were asked to rate how accurately these statements described them on a 5-point scale from "very inaccurate" (1) to "very accurate" (5).

A maximum likelihood (ML) factor analysis with promax rotation was performed to explore the 50 items. ML factor analysis is an exploratory analysis used to discover the number and nature of latent variables that explain the variation and covariation in a set of measured variables. The latent variable, or factor, explains the common variance of all items loading on this factor (Preacher & MacCallum, 2003). In the analysis, five factors were specified to explore whether these correspond to the Big Five factors. All but three items loaded on the correct factor. The items "I pay attention to details" and "I am exacting in my work" are supposed to measure conscientiousness, but did in fact load on the factor openness to experience. The factor "I have a soft heart" supposedly measures agreeableness, yet

according to the factor analysis it measured neuroticism. The 30 items supposedly measuring extraversion, neuroticism and openness to experience all loaded on the expected factor. Factor loadings of these 30 items were at least .4 and about half of the factor loadings were above .6. However, because three other items also loaded on these factors, it was decided to create mean scales for the personality factors, including only the items indicated by Goldberg et al. (1992). Additionally, this comes with the advantage that the results are easier to interpret, because all items are included with the same weights.

The *extraversion* scale was measured using items like "I am the life of the party" and "I don't talk a lot" (reverse scored). Five items were reverse scored. After recoding these items, a higher score indicated more extraversion for all items. Cronbach's alpha for the present study was .87. The scale was constructed by calculating the mean score of the 10 items. The *neuroticism* scale was measured using items like "I get stressed out easily" and "I seldom feel blue" (reverse scored). The scale contained two reverse scored items that were recoded, and was constructed by calculating the mean score. Cronbach's alpha of this scale was .89. Lastly, the *openness to experience* scale was measured with items like "I have a vivid imagination" and "I have a difficulty understanding abstract ideas" (reverse scored). After the three reverse scored items of this personality dimension were recoded, a mean scale was constructed. This scale had a Cronbach's alpha of .78. No items were deleted for either one of the scales.

Need for cognition was measured using 18 items (Cacioppo, Petty & Kao, 1984). Examples of items are "I would prefer complex to simple problems" and "I like to have the responsibility of handling a situation that requires a lot of thinking". For each item, the respondent could choose how accurately the statements described him on a 7-point scale from "strongly disagree" (1) to "strongly agree" (7). Half of the items had to be recoded to have a higher score indicating more need for cognition. Cronbach's alpha for the present study was .87. The variable *need for cognition* was constructed by calculating the mean score for these items.

As measures for the socio-demographics, variables were constructed that indicated the gender, age, educational level, and income of the respondent. *Gender* was measured by a dummy variable with female coded as 1 and male as 0. *Age* was asked in an open-ended question and was included in the analyses as a continuous variable. *Education* was measured using the Dutch Standard Classification of Education (SOI), developed by Statistics Netherlands as the Dutch variant of the International Standard Classification of Education (ISCED) developed by UNESCO. The initial variable contained six categories ranging from

primary school to university. Dummy variables were created for each category, indicating whether individuals belonged in a category (1) or not (0). When testing the full causal model, dummy variables were not allowed in the analysis. Therefore, *educational level* was included as an ordinal variable. Education as an ordinal variable is preferred above education in years, because there are qualitative differences in educational levels with the same years of education. Furthermore, a transformation to education in years is fairly arbitrary. However, as a control, the analysis was also performed with *education in years*, with 8 years for primary school, 12 for lower secondary education, 14 for higher secondary education, 16 for intermediate vocational education, 17 for higher vocational education, and 18 for university education.

Finally, *income* was included as the personal net monthly income in euros. For this variable, missing values were imputed if information about the gross income was available. More information about this procedure can be found on the LISS website (www.lissdata.nl). The variable contained two outliers: a monthly income of €114.303,- and of €160.536,-. These two values were coded as missing values, because they would strongly influence the analysis if they were included. As a test for normality, the Shapiro Francia W' test was performed. The distribution of the remaining income values, ranging from €0 to €15.000, was still found to be positively skewed (W' = .917, $p < .001$). However, considering that the non-normality is likely to be a result of a skewed population distribution, rather than from flaws in the data, it was decided not to transform the variable. Linear regression analyses are fairly robust against non-normality, and it will make interpretation of the effects of income easier. When drawing conclusions, this should be kept in mind, though.

Based on histogram plots, all other variables were found to be normally distributed. Summary statistics of the variables of time point 1 are presented in Table 2.

3.2.2. Variable time point 2: Informative Internet services

Internet user patterns were operationalized as the total amount of informative functions for which the respondent uses the Internet. In total, the LISS data contained 16 items that asked whether the respondent ever used the Internet for that specific purpose. For all items, the answer categories were "yes" (1) and "no" (0). Respondents that did not make use of the Internet at all were counted as answering "no" (0) on all 16 items. The Internet services selected as informative are 'emailing', 'searching for information', 'searching for products', 'purchasing products', 'banking', 'searching for news', 'participating in newsgroups', 'chatting', and 'participating in forums'. The services 'downloading software', 'downloading

music or films', 'watching online movies', 'watching YouTube films', 'gaming', and 'gambling' were considered entertaining services, and were excluded from the analyses. The remaining item 'other' was also excluded, because it cannot be classified.

A maximum likelihood factor analysis with promax rotation was performed to explore the variance within the selected informative Internet functions. The items were distributed over two factors. One could be argued to focus more on solitary and static information functions (email, information, searching for products, banking), and one more on social information functions (searching for products, purchasing, news, newsgroups and forums). Theoretically, this distinction is not perfect, though. In that regard, 'searching for products' and 'purchasing' should load on the first factor, and 'email' should load on the second factor. Therefore, another factor analysis was performed in which only one factor was specified. The item 'chatting' was not included in this analysis, because it did not load on any of the factors in the first analysis. For the remaining eight items, the single factor of the second factor analysis explained 40.98% of the variance within these items, which is a reasonable score. In order to ease interpretation, it was decided to include all eight items in a single variable called *informative Internet services*, which measured the sum of Internet services a respondent makes use of by counting the number of times he answered "yes" (1) on all of these items. A higher score indicated more Internet use. The created scale had a Cronbach's alpha of .777. Summary statistics are displayed in Table 2.

3.2.3. Variable time point 3: Bridging social capital

Bridging social capital was measured using four items that ask the respondent how often he or she spends an evening either with family members other than direct family, with neighbors, with friends outside the neighborhood, or in a bar or café. These types of ties are assumed to reflect weak tie relationships. Having more contact with these type of ties will result in more bridging social capital. The items were measured on an ordinal scale of measurement, with answer categories "almost every day" (1), "once or twice a week" (2), "a few times per month" (3), "about once a month" (4), "a number of times per year" (5), "about once a year" (6), and "never" (7). The categories were reversed to create a more logical sequence: A higher score means that the respondent undertakes the activity more often. A mean scale was constructed out of these four variables as an indicator of bridging social capital. The scale had a Cronbach's alpha of .599, which, given the small number of items included, is a reasonable score. Summary statistics are shown in Table 2.

Table 2
Summary Statistics for the Independent and Dependent Variables

	Min.	Max.	*M*	*SD*	*N*
Extraversion	1	5	3.23	.62	3796
Neuroticism	1	5	2.53	.70	3796
Openness to experience	1	5	3.44	.49	3796
Need for cognition	1	7	4.28	.92	3796
Female	0	1	.53	-	3797
Age	16	96	51.12	16.51	3797
Education					3790
Primary education	0	1	.10	-	389
Lower secondary education	0	1	.28	-	1068
Higher secondary education	0	1	.11	-	407
Intermediate vocational education	0	1	.21	-	803
Higher vocational education	0	1	.23	-	851
University education	0	1	.07	-	272
Net monthly income in Euros	0	15000	1417.90	1022.88	3619
Informative Internet services	0	8	4.62	2.04	3797
Bridging social capital	1	8	3.41	1.07	3743

3.2.4. Control variables

In the first part of the model, which estimates the effects of personality and socio-demographics of time point 1 on the use of informative Internet services in time point 2, no control variables were included. Although the relationship between personality, socio-demographics, and the use of informative Internet services was tested over time, it was decided not to include informative Internet services of time point 1 as control variable. The inclusion of this control variable would result in an estimation of the differences in Internet use after one year. This way, it would be tested which groups learn more about Internet use, and thus who become more experienced. Instead, the present study aims to explain the differences in total Internet use between groups of people, e.g. the difference in the use of informative Internet services between older and younger individuals or between individuals with more or less need for cognition. Inequality in Internet use can only be measured by taking the total differences in Internet use into account, hence it is not necessary to control for Internet use in time point 1.

In the second part of the model, which measures the relationship between the use of informative Internet services and bridging social capital, several control variables were included. First of all, bridging social capital of time point 2 was included as a control variable, because for this relationship we are interested in changes over time due to Internet use. The two variables of bridging social capital in time point 2 and 3 are strongly correlated (r (3709) = .697, $p < .001$). Yet, the correlation is not as high as would be expected if bridging social

capital did not change over time. Therefore, inclusion of this control variable improves the overall validity of the model and yields more appropriate inferences. Second, all personality and socio-demographic factors of time point 1 were included as control variables for the relationship between Internet use and bridging social capital. This was done with the aim of monitoring possible direct relationships between these factors and bridging social capital.

3.3. Analytical strategy

Three different analytical tests were performed. First, the effects of the personality and socio-demographic variables of time point 1 on Internet use of time point 2 were estimated. By means of an ordinary least squares (OLS) regression, it was explored whether there would be any effects of the independent variables of time point 1 on time point 2. This offered a first insight in what to expect when the full causal model is tested. OLS regression handles missing values by means of list wise deletion of all cases with missing values on one of the variables included. In total, 195 respondents were excluded from the analysis, corresponding to 5% of the sample.

Second, an analysis of Internet use of time point 2 on bridging social capital of time point 3 was performed, again with the aim of exploring whether there would be any effects. A nested OLS regression with list wise deletion was used as method of analysis. A nested regression allows for a comparison of two models, because the models are tested with the same group of respondents. In Model 1, only bridging social capital of time point 2 was included as a control variable. In Model 2, all factors of time point 1 were included as well. Because only respondents were included that had no missing values on any of the items included in Model 2, 271 respondents were excluded from the analyses, 7% of the total sample.

Lastly, as a test for our hypotheses, the full causal model was estimated using Structural Equation Modeling (SEM). SEM is a technique that can be used to empirically measure causal relations in a model with multiple dependent variables (Spirtes, Richardson, Meek, Scheines & Glymour, 1998). In our model, the variable *informative Internet services* is both a dependent and an independent variable: Personality and socio-demographic variables were used to predict *informative Internet services*, and at the same time the effect of *informative Internet services* on *bridging social capital* was estimated. With SEM, both causal relations can be tested simultaneously in a path model. The analysis was performed with the *sem* command in Stata version 12 (StataCorp, 2011). This command uses list wise

deletion of missing values by default. Therefore, again, 269 respondents were excluded from the analyses.

The full causal model was evaluated by means of an assessment of three statistics of model fit: the Chi-Square (χ^2), the Comparative Fit Index (CFI), and the Root mean squared error of approximation (RMSEA). The Chi-Square (χ^2), first of all, states to what extent the tested model differs from the saturated model, the model in which all possible relationships between variables are tested. A significant χ^2 implies that the model significantly differs from the saturated model. When the chi square test is not statistically significant, it thus more closely fits the data. The CFI indicates whether the model fits better than the baseline model, the model in which zero correlation is assumed to exist between the observed variables. A CFI closer to 1 indicates a better fit. The Root Mean Squared Error of Approximation (RMSEA) is similar to the CFI. A RMSEA below .05 points to a good fit with the data.

As a test for multicollinearity, VIF (Variance Inflation Factor) analyses were performed on all independent variables of time point 1 and 2 to check whether they were highly correlated. As a rule of thumb, VIF values above 10 may merit further investigation. In the present study, the mean VIF was 1.80, and the highest score was 2.92 for higher vocational education, indicating that there are no problems with multicollinearity. Hence, the final analyses could be carried out. In these analyses, all hypotheses were tested one sided, using an alpha level of 5%. The personality factors extraversion and neuroticism, which are included for explorative reasons, were tested two sided ($\alpha = .05$). Because we are not interested in comparing effect sizes between variables, all regression coefficients are presented unstandardized. This allows for an intuitive interpretation of the effects.

4. RESULTS

4.1. Effects of personality and socio-demographic factors on Internet use

The results of the OLS regression of personality and socio-demographic variables on Internet use are presented in Table 3. The total model has an R^2 of .240, which means that 24% of the variance in the use of informative Internet services is explained by these socio-demographic and personality variables (F (12, 3589) = 95.88, $p < .001$).

Both need for cognition ($B = .272$, $p < .001$) and openness to experience ($B = .376$, $p < .001$) were found to be positively related to Internet use. For need for cognition, one unit increase results in the use of .272 more Internet services. More intuitively stated, an increase of 3.67 in need for cognition will result in the use of 1 additional informative Internet service. Given that need for cognition is measured on a 7-point scale, the average difference between

individuals with the least and most need for cognition is estimated at nearly 2 informative Internet services. Accordingly, those higher in need for cognition indeed seem to make use of a larger amount of informative Internet services. The same is true for openness to experience, as one unit increase results in an increase of .376 in the use of informative Internet services and, conversely, an increase of 2.66 in openness to experience results in the use of 1 additional informative Internet service. For this factor, measured on a 5-point scale, the average difference between the lowest and highest is estimated at nearly 2 informative Internet services as well. The remaining two personality factors, extraversion and neuroticism, were included for explorative reasons. Neither of these factors were found to be significant predictors of Internet use for informative purposes (B = –.044, p = .391, and B = .016, p = .740, respectively).

As for the socio-demographics, all variables were found to be significantly related to Internet uses. Firstly, women use fewer Internet services than men (B = –.253, p < .001). The gender difference, although significant, is not that large in actual size, though, as it does not even encompass one type of Internet service. With respect to age, a negative effect is found as well (B = –.038, p < .001). This implies that one year difference in age results in a .038 reduction in the use of informative Internet services. Conversely, those who are 26.32 years older are estimated to use 1 type of informative Internet service less. The difference between the oldest and youngest respondent is thus estimated at 3 types of informative Internet services. For education, dummy variables were used, with primary education as reference category. The effects of all dummies are positive and significant, which means that people with more than primary education make more use of the Internet than those who only attended primary education (p < .01). The effect increases with each educational level, apart from university education. The largest difference exists between people who only had primary education and people with higher vocational education (B = .873, p < .001). Although all effects of educational levels are significant, on average, these differences in education do not result in the use of an entire Internet service more or less. Finally, people with a higher income make more varied use of the Internet as well (B = .00033, p < .001). The equivalent of this is that a €1000 increase in monthly income results in a .33 increase in the use of informative Internet services. For each €3030 increase in income, conversely, an increase in Internet use of 1 Internet service is expected. Based on this model, a divergence of nearly 5 Internet services is thus expected between the highest (€15000) and lowest (€0) income. In actual effect size, this implies a rather large difference, since Internet use is measured on a scale of 1 to 8.

To summarize, two of the personality factors and all of the socio-demographics appear to attribute to the use of informative Internet services. The estimation of the full causal model will provide more insight in these relations.

Table 3
OLS Regression: Effects of Personality and Socio-demographic Variables on Internet Use

	B	*SE*
(Constant)	3.293***	.341
Need for cognition	.272***	.043
Openness to experience	.376***	.082
Extraversion	–.044	.052
Neuroticism	–.016	.047
Female	–.253***	.067
Age	–.038***	.002
Education[1]		
Lower secondary education	.344**	.108
Higher secondary education	.640***	.132
Intermediate vocational education	.862***	.114
Higher vocational education	.873***	.120
University education	.682***	.158
Income	.000***	.000
N = 3602		
F (12, 3589) = 95.88***		
Adj. R^2 = .240		

Note. All hypotheses were tested one sided. [1]Primary education was used as reference category. * p <.05, ** p < .01, *** p < .001.

4.2. Effects of Internet use on bridging social capital

The results of the OLS regressions of Internet use on bridging social capital are shown in Table 4. In Model 1, the effect of Internet use on social capital was estimated while controlling for the level of social capital in time point 2. Internet use was found to lead to an increase in bridging social capital (B = .019, p = .002). This implies that using one additional informative Internet service leads to a .019 increase in bridging social capital. Although significant, the total effect is not that large, given the fact that bridging social capital is measured on a 7-point scale. With an R^2 of .500, this model explains a substantial amount of the variation in bridging social capital (F (2, 3523) = 1766.46, p < .001). This is probably the result of the inclusion of bridging social capital of time point 2 as a control variable, since the two measures of social capital are highly correlated.

In Model 2, the personality and socio-demographic variables were added to control for the direct effects of the variables of time point 1 on time point 3. Although only age (B = –

.005, $p < .001$), extraversion ($B = .155$, $p < .001$) and neuroticism ($B = -.049$, $p = .013$) were found to be significant predictors of social capital, the findings suggest that there no longer exists an effect of Internet use on bridging social capital ($B = .005$, $p = .485$). This second model explains 51.3% of the variance in bridging social capital ($F(14, 3511) = 266.25$, $p = <$ .001). Because of the better model fit, the personality and socio-demographic variables were included as control variables in the full causal model as well.

Table 4
Nested OLS regression: Effect of Internet Use on Social Capital

	Model 1		Model 2	
	B	*SE*	*B*	*SE*
(Constant)	.901***	.050	1.156***	.153
Informative Internet services	.019**	.006	.005	.007
Bridging social capital 2011	.699***	.012	.652***	.013
Need for cognition			.004	.018
Openness to experience			–.055	.035
Extraversion			.155***	.022
Neuroticism			–.049**	.020
Female			–.015	.028
Age			–.005***	.001
Education[1]				
Lower secondary education			–.067	.046
Higher secondary education			–.021	.056
Intermediate vocational education			–.073	.049
Higher vocational education			–.027	.050
University education			–.034	.067
Income			–.000	.000
	$F(2, 3523) = 1766.46$***		$F(14, 3511) = 266.25$***	
$N = 3526$	Adj. $R^2 = .500$		Adj. $R^2 = .506$	

Note. All hypotheses were tested one sided. [1]Primary education was used as reference category. * p <.05, ** $p < .01$, *** $p < .001$.

4.3. Full causal model: hypotheses tests

Finally, the full causal model was tested using Structural Equation Modeling (SEM). In this final model, the hypotheses were tested. The results of the analysis are depicted in Figure 2. Overall, the model fits the data very nicely ($\chi^2(1) = .457$, $p = .499$; *CFI* = 1.000; *RMSEA* < .001). The regression coefficients are slightly different from those obtained by the explorative regression analyses, because in the SEM model, education was included as an ordinal variable measuring education in years.

The effects of time point 1 on time point 2 were estimated first. First of all (H1), people who are eager to learn, i.e. score high on the factor need for cognition, were found to

use more informative Internet services (B = .276, p < .001). Since a one unit increase in need for cognition results in an increase of .276 in the use of informative Internet services, an increase of 3.62 in need for cognition results in the use of 1 additional informative Internet service. Hence, the estimated difference between individuals with the highest and lowest need for cognition encompasses almost 2 informative Internet services. For openness to experience, it was found that (H2) those who are looking for new experiences use more informative Internet services (B = .305, p < .001). Again, since one unit increase in openness to experience results in the use of .305 additional Internet services, an increase of 3.28 in openness to experience results in the use of 1 additional informative Internet service. In other words, the difference between the two extremes of openness to experience encompasses nearly 2 Internet services as well. Consequently, evidence was found in support of both hypotheses 1 and 2. However, in accordance with the exploratory regression analysis, no effects were found for the factors extraversion (B = –.032, p = .524) and neuroticism (B = –.024, p = .598).

In contrast, all socio-demographic variables were found to influence Internet use. With regard to gender, it was found that (H3) women make less use of the Internet than men (B = –.269, p < .001). Hypothesis 3 is thus supported, although essentially, the gender difference does not even encompass an entire Internet service. Furthermore, (H4) older people were found to be less likely than younger people to use the Internet to search for information (B = –.040, p < .001). People who are 1 year older use .040 fewer Internet services. Hence, an age difference of 25 years implies a difference of 1 Internet service. In other words, there is a difference of over 3 Internet services between the oldest and youngest people in the sample, which provides strong support for hypothesis 4. In addition, (H5) education was found to positively influence the use of informative Internet services (B = .178, p < .001). One level increase in education result in the use of .178 additional Internet services. In other words, an increase of 5.6 educational levels goes hand in hand with the use of 1 additional Internet service. By estimation, this would correspond to the difference between primary school and university education. Hence, hypothesis 5 is supported. Similarly, (H6) people with a higher income were found to use a larger amount of informative Internet services (B = .0003, p < .001). Thus, a €1000 increase in monthly income results in the use of .3 additional informative Internet services, and, conversely, for each €3333,33 increase in income, it is estimated that people use 1 more Internet service. The total difference in Internet use based on income is estimated at 4.5 Internet services, providing strong support for hypothesis 6 as well.

Subsequently, the effects of time point 2 on time point 3 were estimated, while controlling for the direct effects of the personality and socio-demographic factors in time point 1. In accordance with the explorative analyses, no significant relationship was found between the use of informative Internet services and bridging social capital (B = .004, p = .538), which means that hypothesis 7 is not supported. The use of informative Internet services does not contribute to an individual's offline bridging social capital. As for the control variables, the variables extraversion (B = .153, p < .001) and neuroticism (B = -.048, p = .016) were significant positive predictors of social capital, as well as the variable age (B = -.006, p < .001). In Table 5, the detailed results of the analysis are displayed. Furthermore, in Appendix B, results of additional analyses are discussed.

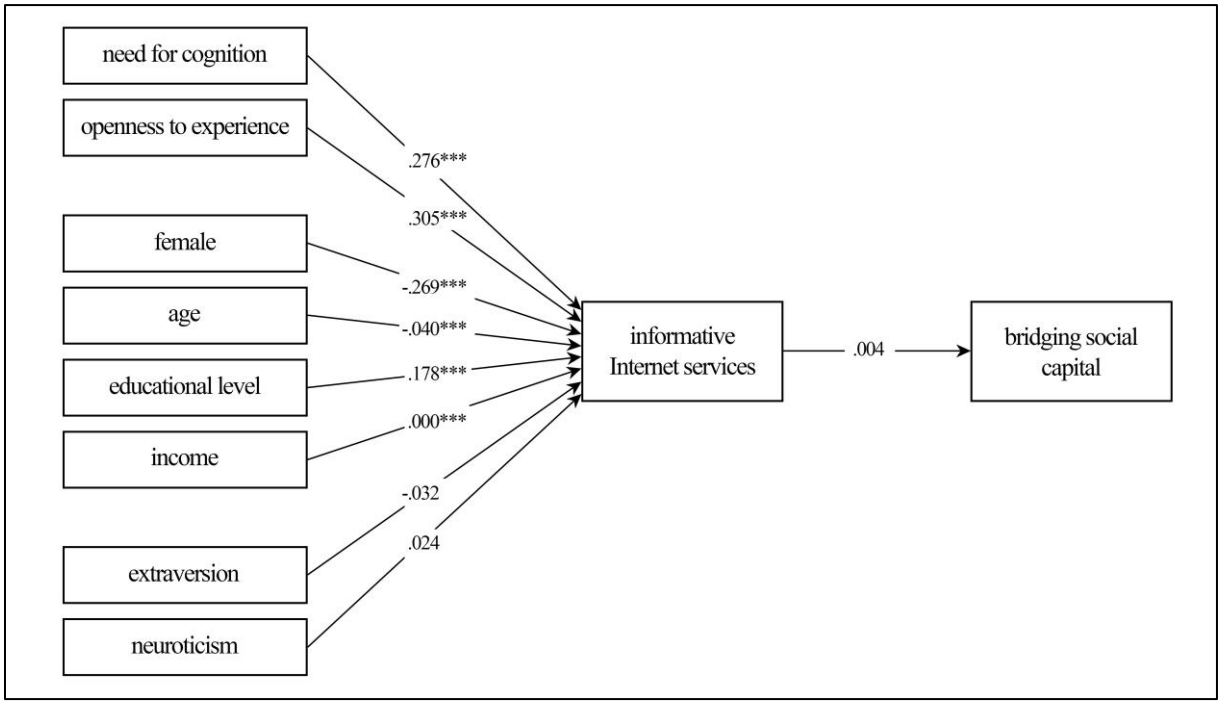

Figure 2. Results of Structural Equation Modeling.
Note. N = 3526. Controlled for bridging social capital in time point 2 and the direct effects of all factors in time point 1 on time point 3. Model-fit: χ^2 (1) = .314, p = .575; *CFI* = 1.000; *RMSEA* < .001. * p < .05, ** p < .01, *** p < .001.

Table 5
Results of Structural Equation Modeling for the Full Causal Model

	Path 1: informative Internet services (DV)		Path 2: bridging social capital (DV)	
	B	*SE*	*B*	*SE*
(Constant)	3.657***	.325	1.183***	.147
Need for cognition	.276***	.043	.007	.018
Openness to experience	.305***	.080	–.049	.034
Extraversion	–.032	.051	.154***	.022
Neuroticism	.024	.046	–.048*	.020
Female	–.269***	.066	–.014	.028
Age	–.040***	.002	–.005***	.001
Education[1]	.178***	.023	–.001	.010
Income	.000***	.000	.000	.000
Informative Internet services 2011			.004	.007
Bridging social capital 2011			.654***	.013
N = 3526				
$\chi^2(1) = .457$, p = .499				
CFI = 1.000				
RMSEA < .001				

Note. All hypotheses were tested one sided. [1]*Education in years* was also a significant predictor of Internet use (*B* = .097, *p* < .001), no other relations changed.
* *p* < .05, ** *p* < .01, *** *p* < .001

5. CONCLUSION AND DISCUSSION

The present study aimed to make an innovative contribution to the existing literature on the new digital divide, a phrase used to denote social inequality resulting from variation in Internet use (Hargittai, 2002). Regarding Internet uses, we distinguished informative Internet services (e.g. newsgroups, search functions, and forums) from entertainment services (e.g. online gaming or movies services), and use informative services as the focus of this study. The key objective was to investigate (1) why some people use the Internet differently than others, and (2) what the social implications of these differences are. Specifically, variation in informative Internet services were explained by taking into account personality and socio-demographics. Additionally, the social implications of different user patterns were studied for an important sociological concept: Bridging social capital (Putnam, 2000). This combination of causes and effects of Internet use in a single longitudinal study has provided a unique test for the claim that the new digital divide has the potential to increase social inequality. We used longitudinal datasets of the LISS panel (Tilburg University, the Netherlands), conducted in the period 2010-2012, to test the hypothesized relationships in structural equation models.

Use of this data assures Dutch national generalizability, thereby providing a broader and more reliable picture of the causes and effects of Internet uses for the entire Dutch population.

The first set of hypotheses, explaining variation in the use of informative Internet services, resulted from a theory driven approach that combined psychological and sociological measures. This interdisciplinary approach allows for a better understanding of the interplay between different background characteristics that underlie behavioral patterns. The combination appears to be successful, as both personality dimensions and socio-demographics were found to affect Internet use. In line with the hypotheses regarding the effects of socio-demographics on the use of informative Internet services, we found that people who are younger, male, higher educated or have a higher income tend to use a larger amount of informative Internet services. The personality factors 'need for cognition' and 'openness to experience' were found to be positively related to Internet uses as well. Those individuals who are more eager to learn and are more open to new experiences tend to use a larger amount of informative Internet services. These findings are consistent with results of other studies that related socio-demographic and personality dimensions to the new digital divide (DiMaggio et al., 2004; Kaynar & Amichai-Hamburger, 2008; Correa et al., 2010; Hargittai, 2010; Van Deursen & Van Dijk, 2014). A noteworthy contribution of our study lies in the fact that the results were upheld with a year-long lag between the independent and dependent variables. Our longitudinal design, combined with knowledge from previous studies, lends credibility to the idea that there potentially exists a causal relationship between these different factors and Internet use.

Apart from the preceding factors, two other dimensions of personality, 'extraversion' and 'neuroticism', were included in this study as well. Extraversion is about sociability and talkativeness, whereas neuroticism captures anxiety and insecurity. These factors have often been included in studies investigating social Internet services, but there is no clarity about the mechanisms by which they would influence general Internet use. Therefore, no hypotheses were derived for these factors, but we included them for explorative reasons. We found no statistically significant relationship between these factors and the use of informative Internet services. This might illustrate that there are other mechanisms at work for different types of Internet services. Neuroticism can be used as an example in this regard: It could be that neurotic people intensively use social networking sites to avoid feelings of loneliness (Ehrenberg et al., 2008), but at the same time employ fewer other Internet services than people who are more emotionally stable, resulting from a concern for privacy and security when using the Internet (Tuten & Bosnjak, 2001). More in-depth research, focusing on

specific types of Internet services, is needed to provide clarity about the relationship that neuroticism and extraversion have with Internet use.

The second part of our study provided insight into the social implications of Internet user patterns with respect to bridging social capital. These results capture what is perhaps the most surprising finding of this study. Contrary to our expectations, no statistically significant relationship was found between informative Internet services and bridging social capital. This result also contradicts findings of earlier studies on the relationship between Internet use and bridging social capital (Steinfield et al., 2008; Valenzuela, Park & Kee, 2009; Ellison et al., 2014). Most of these studies focused on specific social Internet services, such as social networking sites, forums or blogs. Hence, it could be that not all informative Internet services are beneficial for an individual's social capital, but some specific Internet services are. However, all types of informative Internet services were assumed to somehow involve possibilities for social relationships, and consequently for increases in bridging social capital.

Therefore, a better explanation for the absence of an effect might be derived from the fact that we tested the relationship between Internet use and social capital in a parsimonious longitudinal study. Contrary to earlier studies, we analyzed this relationship both with and without inclusion of personality factors and socio-demographic variables as controls. After inclusion of these control variables, the relationship disappeared. Instead, our findings suggest that greater bridging social capital would actually result from being younger, more extraverted, and less neurotic, rather than from the use of informative Internet services. In earlier studies, although statistically significant effects were reported, the actual effect size of the relationship was found to be very small. Hence, it might be that the hypothesized relationship between Internet use and social capital does not actually exist. Although the Internet does allow for online social relationships, it might not add to other, offline factors that affect social capital. In fact, this might imply that the relationship between Internet use and bridging social capital is spurious. The present knowledge about this topic is too ambiguous to draw any definite conclusions, though. At the very least, the longitudinal design of the present study challenges the conclusions made in earlier studies. Future research is warranted to clarify, verify, and extend these results.

Nonetheless, some initial conclusions about the meaning of these results might be drawn. After all, the findings in this study provide evidence for the existence of a new digital divide. The first part of the study clearly points to structural differences in Internet user patterns, and suggests that an individual's social background influences his Internet behavior. Accordingly, this means that if the Internet truly gives access to additional resources, it is also

coupled with social inequality. The present study does provide a new perspective on the new digital divide, though, as no effect has been found for one specific social resource. On a societal level, the absence of a relationship between Internet use and an individual's social capital might indicate that, although there is a digital divide, this does not necessarily increase social inequality. At the very least, it might not cause inequality through bridging social capital.

Caution is still warranted regarding implications of the new digital divide, though. Although it could be that different Internet user patterns do not result in differences in social capital, there are still several possible social implications of Internet use that have not been examined in the present study. DiMaggio (2004) argued, for example, that the Internet could potentially give access to good education, high prestige jobs, and better health. To use the resource of better health as an example: The new digital divide might increase social inequality, because more experienced users, e.g. individuals who are younger, higher educated or financially better off, might look for health information on the Internet more often. Additionally, they might be better capable of finding the correct information, because they have an information advantage resulting from increased knowledge about Internet possibilities. Future research is required to examine these potential consequences for social inequality.

Altogether, the present study has several limitations. First and foremost, this study attempted to assess the relationship between personality, socio-demographics, Internet use, and social capital over time. However, because only a small group of respondents completed all questionnaires of interest, we used personality measures from 2011 rather than from 2010. Since personality does not vary greatly over time (Cobb-Clark & Schurer, 2011), this did not cause large misspecified inferences. Yet, for the interpretation of our longitudinal study, it would have been better to test the relationship between all factors over three different time points. Additionally, this study attempted to address the new digital divide by investigating several Internet services, rather than just social networking sites. Data allowed us to compare sixteen different Internet services, of which we selected eight. In the future, a richer measure of general Internet use should be developed that includes several aspects, such as type and intensity, and not just the sum of services used. Survey questions might not be an ideal way of measuring this. Instead, an option would be to ask respondents to record their Internet activities in a time diary. Alternatively, behavioral data could be obtained by installing apps on smartphones and computers that record specific Internet behavior of respondents.

Although this paper contributes to our understanding of the causes and effects of Internet user patterns, it also raises a number of questions that should be addressed in future research. Firstly, future research should continue to disentangle how personality and socio-demographic dimensions lead people to engage in Internet use. In this field of study, a lot is to be gained from an interdisciplinary collaboration. Research should focus on grasping the interplay between personality and socio-demographic dimensions, and how they might possibly strengthen each other in relation to Internet uses. Additionally, the role of the factors 'extraversion' and 'neuroticism' warrants an in-depth analysis, in which their relation to specific types of Internet services should be considered. Finally, future research should continue to assess the role of Internet use in creating social capital. Potential relationships with different types of Internet services should be analyzed with the current control variables included. In this regard, other possible social implications of the new digital divide, such as access to high prestige jobs, should be explored as well. By taking into account a broader range of possible resources obtained through the Internet, it will be possible to assess whether the new digital divide truly increases social inequality. Subsequently, it is important to evaluate which groups of people are deprived of access to these resources, and what could potentially be done about it. It is important to get these issues sorted out, before the concern about a new digital divide becomes utterly disproportionate.

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APPENDIX A - Question wording

The three personality factors 'extraversion', 'neuroticism' and 'openness to experience' each contained 10 items measured on a 5-point Likert scale. The respondents were asked how accurately the statements described them. Answer categories ranged from "very inaccurate" (1) to "very accurate" (5). The need for cognition scale was made up of 18 different items with answer categories ranging from "totally disagree" (1) to "totally agree" (7), which results in higher item means. Tables A1 to A4 display the item wordings and summary statistics for these items.

Table A1

Item wordings and summary statistics of the extraversion items, wave 4 (2011)

Item name	Item label	Mean	*SD*
cp12e020	Am the life of the party	3.41	.809
cp12e025	Don't talk a lot[1]	2.73	1.071
cp12e030	Feel comfortable around people	3.87	.796
cp12e035	Keep in the background[1]	3.02	.972
cp12e040	Start conversations	3.49	.871
cp12e045	Have little to say[1]	2.35	.915
cp12e050	Talk to a lot of different people at parties	3.40	1.015
cp12e055	Don't like to draw attention to myself[1]	3.49	.997
cp12e060	Don't mind being the center of attention	2.90	1.099
cp12e065	Am quiet around strangers[1]	2.93	1.078

Note. N = 3797. [1]These items are reverse scored. Before the mean extraversion scale was created, these items were recoded to create positive statements.

Table A2

Item wordings and summary statistics of the neuroticism items, wave 4 (2011)

Item name	Item label	Mean	*SD*
cp12e023	Get stressed out easily	2.62	1.082
cp12e028	Am relaxed most of the time[1]	3.48	.867
cp12e033	Worry about things	3.51	.918
cp12e038	Seldom feel blue[1]	3.25	1.082
cp12e043	Am easily disturbed	2.85	.982
cp12e048	Get upset easily	2.40	1.002
cp12e053	Change my mood a lot	2.46	.934
cp12e058	Have frequent mood swings	2.23	.998
cp12e063	Get irritated easily	2.63	.990
cp12e068	Often feel blue	2.11	.914

Note. N = 3797. [1]These items are reverse scored. Before the mean neuroticism scale was created, these items were recoded to create positive statements.

Table A3

Item wordings and summary statistics of the openness to experience items, wave 4 (2011)

Item name	Item label	Mean	*SD*
cp12e024	Have a rich vocabulary	3.67	.890
cp12e029	Have difficulty understanding abstract ideas[1]	2.62	.989
cp12e034	Have a vivid imagination	3.45	.982
cp12e039	Am not interested in abstract ideas[1]	2.78	.926
cp12e044	Have excellent ideas	3.51	.742
cp12e049	Do not have a good imagination[1]	2.26	.935
cp12e054	Am quick to understand things	3.82	.730
cp12e059	Use difficult words	2.51	1.010
cp12e064	Spend time reflecting on things	3.74	.786
cp12e069	Am full of ideas	3.45	.860

Note. N = 3797. [1]These items are reverse scored. Before the mean openness to experience scale was created, these items were recoded to create positive statements.

Table A4

Item wordings and summary statistics of the need for cognition items, wave 4 (2011)

Item name	Item label	Mean	*SD*
cp12e166	I would prefer complex to simple problems	4.10	1.661
cp12e167	I like to have the responsibility of handling a situation that requires a lot of thinking	4.27	1.575
cp12e168	Thinking is not my idea of fun[1]	3.32	1.746
cp12e169	I would rather do something that requires little that than something that is sure to challenge my thinking abilities[1]	3.28	1.687
cp12e170	I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something[1]	2.90	1.515
cp12e171	I find satisfaction in deliberating hard and for long hours	3.99	1.633
cp12e172	I only think as hard as I have to[1]	4.20	1.638
cp12e173	I prefer to think about small, daily projects to long-term ones[1]	3.91	1.705
cp12e174	I like tasks that require little thought once I've learned them[1]	3.94	1.653
cp12e175	The idea of relying on thought to make my way to the top appeals to me	4.28	1.611
cp12e176	I really enjoy a task that involves coming up with new solutions to problems	4.70	1.525
cp12e177	Learning new ways to think doesn't excite me very much[1]	3.61	1.622
cp12e178	I prefer my life to be filled with puzzles that I must solve	3.40	1.552
cp12e179	The notion of thinking abstractly is appealing to me	3.66	1.547
cp12e180	I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought	4.05	1.529
cp12e181	I feel relief rather than satisfaction after completing a task that required a lot of mental effort[1]	4.05	1.637
cp12e182	It's enough for me that something gets the job done; I don't care how or why it works[1]	3.55	1.729
cp12e183	I usually end up deliberating about issues even when they do not affect me personally	4.33	1.423

Note. N = 3797. [1]These items are reverse scored. Before the mean need for cognition scale was created, these items were recoded to create positive statements.

Internet user patterns were measured by determining the amount of purposes for which the respondent made use of the Internet. A higher number of services listed indicates more Internet use. The respondent was asked the question "Can you indicate whether you ever spend time on the following online activities?" Subsequently, he was given 16 options, each with answer categories "yes" (1) or "no" (0). Respondents that never make use of the Internet have been included as answering "no" on all 16 items. Table A5 shows which purposes were presented to the respondents. For each item, statistics are given about the number of respondents that answered to use the Internet for that purpose.

Table A5
Item wordings and summary statistics for the Internet use items, wave 4 (2011)

Item name	Item label	% yes	*N*	*SD*
cs11d251	email	89.9	3633	.301
cs11d252	searching for information on the Internet (e.g. about hobbies, work, opening hours, daytrips, etc.)	87.9	3550	.327
cs11d253	searching for and comparing products/product information on the Internet	73.1	2953	.444
cs11d254	purchasing items via the Internet	58.5	2365	.493
cs11d255	watching short films (e.g. via YouTube)	50.7	2049	.500
cs11d256	watching online films or TV programs	26.4	1067	.441
cs11d257	downloading software	28.0	1131	.449
cs11d258	downloading music or films	20.9	846	.407
cs11d259	visiting gambling sites	1.9	75	.135
cs11d260	Internet banking	74.7	3019	.435
cs11d261	playing Internet games/online gaming	22.9	924	.420
cs11d262	reading online news and magazines	46.9	1895	.499
cs11d263	newsgroups	14.8	598	.355
cs11d264	chatting/MSN	20.1	814	.401
cs11d265	visiting forums and Internet communities	18.1	731	.385
cs11d266	other activities on the Internet	25.7	1039	.437

Note. $N = 4040$.

To measure bridging social capital, four items were used that asked the respondent how often he met with weak ties. Answer categories were "never" (1), "about once a year" (2), "a number of times per year" (3), "about once a month" (4), "a few times per month" (5), "once or twice a week" (6) and "almost every day" (7). The exact item wordings and summary statistics are given in Table A6.

Table A6

Item wordings and summary statistics for the bridging social capital items, wave 5 (2012)

Item name	Item label	*N*	Mean	*SD*
cs12e290	Spend an evening with family (other than members of your own household)	3907	4.46	1.410
cs12e291	Spend an evening with someone from the neighbourhood	3863	3.24	1.682
cs12e292	Spend an evening with friends outside your neighbourhood	3846	3.65	1.444
cs12e293	Visit a bar or café	3916	2.38	1.578

Note. $N = 3743$.

APPENDIX B – Additional analyses

Various additional tests were performed in order to improve the validity of the model. This section presents the results of the additional SEM analyses. First of all, the full causal model was tested using personality factors of wave 3, to check whether the results would change if only 660 respondents were included in the model. Table B1 displays the results of the analysis. In the first part of the model, which estimates the effects of the personality and socio-demographic variables on Internet use, the effect of gender disappears. All other hypotheses are still supported. However, the regression coefficients are significant at a lower significance level, resulting from a difference in power. In the second part of the model, there is still no significant effect of the use of informative Internet services on bridging social capital. The total model fits the data nicely ($\chi^2(1) = 1.539$, p = .215; CFI = .999; RMSEA = .029), but compared to our main SEM model, the fit is slightly worse.

Table B1
Results of Structural Equation Modeling using personality items of wave 3 (2010)

	Path 1: informative Internet services (DV)		Path 2: bridging social capital (DV)	
	B	*SE*	*B*	*SE*
(Constant)	4.480***	.808	1.114**	.392
Need for cognition	.276**	.105	.036	.048
Openness to experience	.318*	.190	–.055	.086
Extraversion	–.248	.127	.151**	.059
Neuroticism	–.016	.123	–.038	.056
Female	–.214	.164	.047	.074
Age	–.043***	.004	–.005*	.002
Education	.103*	.054	.011	.025
Income	.000***	.000	–.000	.000
Informative Internet services 2011	–	–	.021	.018
Bridging social capital 2011	–	–	.596***	.031

N = 631
$\chi^2(1) = 1.539$, *p* = .215
CFI = .999
RMSEA = .029

Note. All hypotheses were tested one sided. * *p* < .05, ** *p* < .01, *** *p* < .001

A second check was performed by including Internet use of 2010 as a control variable (Table B2). The effects of openness to experience and gender disappear. All other effects remain the same. The main difference of this model with the main model lies in the decrease of the actual effects. Informative Internet services of 2010 and 2011 are highly correlated (*r* (3795) = .751,

$p < .001$). Hence, the use of informative Internet services in 2010 is a good predictor for use in 2011, meaning that it takes away part of the effects of the other variables. The second path of the model does not change. The model fit is good ($\chi^2(2) = 4.647$, p = .098; CFI = 1.000; RMSEA = .019), although it is slightly worse compared to the main model used in this study.

Table B2
Results of Structural Equation Modeling with the inclusion of informative Internet services 2010 as control variable for path 1

	Path 1: informative Internet services (DV)		Path 2: bridging social capital (DV)	
	B	*SE*	*B*	*SE*
(Constant)	.968***	.241	1.180***	.148
Need for cognition	.086**	.031	.007	.018
Openness to experience	.082	.059	–.048	.034
Extraversion	.042	.037	.154***	.022
Neuroticism	.034	.034	–.048**	.020
Female	–.007	.048	–.014	.028
Age	–.013***	.001	–.005***	.001
Education	.054***	.017	–.001	.010
Income	.000***	.000	.000	.000
Informative Internet services 2010	.690***	.012	–	–
Informative Internet services 2011	–	–	.004	.007
Bridging social capital 2011	–	–	.654***	.013
N = 3526				
$\chi^2(2) = 4.647$, p = .098				
CFI = 1.000				
RMSEA = .019				

Note. All hypotheses were tested one sided. * $p < .05$, ** $p < .01$, *** $p < .001$

As a final test for the main model, an analysis was performed to explore whether there would exist any indirect effects of the variables of time point 1 through the use of informative Internet services in time point 2 on bridging social capital in time point 3. As can be seen in Table B3, no indirect effects exist. This can be explained by the fact that no significant relationship was found between the use of informative Internet services and social capital.

Table B3

Results of the test for indirect effects with Internet use of time point 2 as mediating variable

	B	*SE*
Need for cognition	.001	.002
Openness to experience	.001	.002
Extraversion	–.000	.000
Neuroticism	.000	.000
Female	–.001	.002
Age	–.000	.000
Education	.001	.001
Income	.000	.000

Note. * $p < .05$, ** $p < .01$, *** $p < .001$