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Adolescents' internet use: Testing the ''disappearing digital divide'' versus the ''emerging digital differentiation'' approach

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Abstract

Research on digital divide phenomena has produced opposing theoretical frameworks. This study pits the disappearing digital divide approach against the emerging digital differentiation approach and empirically tests the validity of their predictions regarding adolescents' internet use and their tendency towards ubiquitous internetting. Multivariate analyses of a survey of 749 Dutch adolescents aged 13–18 showed that adolescents' unequal access to socio-economic and cognitive resources shaped their use of the internet as an information and an entertainment medium. Adolescents with greater socio-economic and cognitive resources used the internet more frequently for information and less often for entertainment than their peers with fewer socio-economic and cognitive resources. We found a similar pattern regarding adolescents' tendency towards ubiquitous internetting. The findings tentatively suggest that the emerging digital differentiation approach describes current digital divide phenomena more adequately than the disappearing digital divide approach.

The past decade has seen a plethora of studies about the digital divide (for reviews, see Gunkel, 2003; Selwyn, 2004). The term digital divide was coined in particular to describe inequalities in access to the internet as a result of varying socio-economic, cognitive, and cultural resources. However, several researchers have pointed out that much research on the digital divide is conceptually oversimplified and theoretically confusing (e.g., DiMaggio et al., 2001; Selwyn, 2004; Van Dijk and Hacker, 2003). Conceptually, scholars have criticized the term digital divide as only referring to the gap between ''haves'' and ''have-nots'' regarding internet *access*, while other digital divide phenomena such as differences in internet *use* are ignored (e.g., Bucy, 2000;

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Gunkel, 2003; Hargittai, 2002; Van Dijk, 2002). As a result, research should extend its notion of digital divide phenomena and more thoroughly deal with people's use of the internet.

Theoretically, various approaches to the digital divide phenomenon have been put forward. However, the approaches typically rest on different assumptions about the role of technology in people's lives and, as a consequence, come to opposing interpretations of digital divide phenomena (for reviews, see Henwood et al., 2000; Van Dijk and Hacker, 2003). For example, the denial approach rejects the notion that a digital divide exists, whereas the growth and persistence approach considers information inequality as just another manifestation of persisting and growing social inequalities. The disappearing digital divide approach, in turn, predicts homogeneous internet use patterns irrespective of socio-economic, cognitive, and cultural resources once internet access gaps are bridged, while the emerging digital differentiation approach expects just the opposite (Van Dijk and Hacker, 2003). The theoretical confusion that the various approaches have produced is exacerbated by the fact that we know little about the empirical validity of the predictions, which the approaches make. What is needed, then, is research that tests which approach receives the strongest empirical support.

In response to conceptual weaknesses of research on digital divide phenomena, this study focuses on potential differences in the use of, rather than the access to, the internet. Addressing theoretical shortcomings in this field of research, the study contrasts two theoretical approaches to the digital divide phenomenon, the disappearing divide approach and the emerging differentiation approach. From the two theoretical frameworks, we will derive predictions about potential differences in internet use and about their antecedents. Our goal is to contribute to a more profound understanding of the digital divide concept. Additionally, we try to improve theory formation by empirically studying the validity of the predictions that the two opposing theoretical frameworks make.

Besides its theory-discriminating character, this study extends existing research in three more ways. First, research on digital divide phenomena typically centers upon the internet as an information medium. However, studying additionally the internet as a social and as an entertainment medium may provide us with a more encompassing look at differences in internet use. After all, the number of internet applications with a social and entertainment character has increased considerably in the past years (Lenhart et al., 2005).

Second, the simultaneous use of the internet as an information, social, and entertainment medium goes hand in hand with an increased presence of the internet at different locations in our lives. Some years ago, most people had internet access, if anything, only at their work place. Today, many people use the internet not only at their work place, but also at home. Most importantly, with the recent advances in wireless technologies, internet access has become mobile and people do not have to be seated in front of a wired workstation to go online. Drawing partly on Weiser's (1993, 1996) concept of ubiquitous computing, we call this development *ubiquitous internetting*. Ubiquitous internetting means that, regardless of location and time of the day, people can choose to be permanently online (provided, of course, they have the necessary technological devices). Studies on the digital divide have not yet dealt with this phenomenon. However, the strikingly increased presence of the internet in our working and private lives offers the opportunity to study potential digital divides at a new, higher level.

Our third and final extension of research on the digital divide relates to the group of internet users studied. Existing investigations have been predominantly concerned with digital divide phenomena among adults, thus ignoring one of the most active groups on the internet, adolescents. The focus on adults has led to the advancement of important concepts such as

computer anxiety and digital skills (e.g., Broos, 2005; De Haan and Rijken, 2002; DiMaggio et al., 2001; Hargittai, 2002; Van Dijk and Hacker, 2003). However, recent data from the US and the Netherlands not only indicate that the vast majority of adolescents use the internet; the data also show that adolescents go online much more frequently, more extensively, and with more advanced skills than adults (e.g., Lenhart et al., 2005; Peter et al., 2005; Valkenburg and Peter, in press). Furthermore, US and Dutch teens tend to access the internet from different locations (Lenhart et al., 2005; Qrius, 2005). These data suggest that, at least among adolescents in the USA and in the Netherlands, access gaps have narrowed while there is a growing tendency towards ubiquitous internetting, presumably accompanied by low levels of computing anxiety. Most of the teenagers in the aforementioned countries may have already acquired what Van Dijk and Hacker (2003) call instrumental and informational skills, that is, the ability to operate hardware and software and the skill to search, select, process, and apply information.[1]

This investigation focuses on adolescents' internet use in a technologically advanced country – the Netherlands – where more than 90% of adolescents have home access to the internet (Roskamp, 2005). Studying adolescents' internet use in such a country may provide an interesting opportunity to test the two opposing approaches mentioned above. Differences in digital skills that typically lead to internet usage gaps (De Haan and Rijken, 2002) may be assumed to be relatively small among Dutch adolescents. Consequently, there is a good chance that the digital divide in terms of internet use may have disappeared among Dutch teenagers. Moreover, given how quickly Dutch adolescents typically embrace digital technologies (Qrius, 2005), their tendency towards ubiquitous internetting may not show the typical digital divide characteristics. Such findings would support the disappearing digital divide approach.

However, if under the conditions present in the Netherlands classic variables from social inequality research, such as socio-economic, cognitive, and cultural resources, do affect adolescents' internet use and the tendency towards ubiquitous internetting, we have first evidence of an emerging, socially textured digital differentiation. Socio-economic, cognitive, and cultural resources generally affect the likelihood that a person will achieve particular material or immaterial goals (Klein and Voigt, 1989). Largely following a suggestion by Van Dijk (2002), adolescents' socio-economic resources are operationally defined by their parents' income and education; cognitive resources refer to their own education and age; and cultural resources are constituted by the proxy variables of gender and ethnicity.[2]

[1] However, even in rich Western countries, these developments may not be homogeneous. Studies done in the United Kingdom and in Flanders, the Dutch-speaking part of Belgium, have shown that a number of adolescents rarely use computers and the internet (Broos and Roe, in press; Facer and Furlong, 2001). As a result, the notion that all adolescents in rich Western countries are technologically advanced 'cyberkids' is not warranted.

[2] Our operational definition of cultural resources is mainly inspired by current research on the digital divide because it is our main goal to offer as much compatibility of our study to existing research in that field as possible. It goes without saying that there may be other conceptual or operational definitions of cultural resources. For example, research inspired by Bourdieu (1983) may put a stronger emphasis on education as a component of cultural resources (or cultural capital, for that matter). Generally, we do not object to such a definition of cultural resources. However, regarding our specific topic – digital divide – and our specific sample – adolescents – we believe that education may capture cognitive resources rather than cultural resources. Moreover, at least our focus on ethnicity in our operationalization of cultural resources is partly supported by Bourdieu himself. Bourdieu (1985) has emphasized that the relative position of people in the social space may also be affected by other variables, such as ethnicity. That said, we by no means reject Bourdieu's (1983) notion that the different types of resources are interrelated. As will become clear later, we take this into account by analyzing the different types of resources not separately, but simultaneously in the same model.

1. Disappearing digital divide versus emerging digital differentiation

Although Van Dijk and Hacker (2003) identify four different theoretical approaches to digital divide phenomena, we will only investigate two of them, the disappearing digital divide approach and the emerging digital differentiation approach. We will not focus on the denial approach because research has indicated that the approach is both conceptually and empirically untenable (Bonfadelli, 2002; Bucy, 2000; Roe and Broos, 2005; Van Dijk and Hacker, 2003; Wyatt et al., 2002). We will also not deal with the persistence and growth approach because it tends to underestimate the dimension and dynamic of the changes induced by the internet (Van Dijk and Hacker, 2003). As a result, the approach does not seem conceptually elaborate enough to create predictions about potential differences in adolescents' internet use.

1.1. Disappearing digital divide approach

The disappearing digital divide approach regards gaps in internet access as transient. It conceptualizes adoption of the internet as a progressive phenomenon, eventually leading to equal access to the internet. In this approach, the characteristics of the internet seem to play a more important role in shaping internet adoption than the characteristics of the users. The approach thus leans towards technological determinism (for examples of a technologically oriented reasoning, see, e.g., Anderson et al., 2001; Compaine, 2001). In its evaluation of the social and political role of the internet, the disappearing digital divide approach tends towards optimistic, utopian positions. The digital age is seen as having four "very powerful qualities that will result in its ultimate triumph: decentralizing, globalizing, harmonizing, and empowering." (Negroponte, 1995, p. 229). As a result, it is predicted that "in the digital world, previously impossible solutions become viable. (...) Digital technology can be a natural force drawing people into greater world harmony" (Negroponte, 1995, p. 230).

In terms of this study's focus on adolescents' internet use, the disappearing digital divide approach assumes that, once access gaps are bridged, there will be homogeneous internet use patterns. This assumption becomes apparent in Negroponte's (1995) aforementioned vision of a harmonized and empowered world. If this harmonization and empowerment is to work, then people's use of the internet should not depend on socio-economic, cognitive, and cultural resources. The disappearing digital divide approach suggests that everybody uses the internet similarly to get information, to connect with other people, and to find entertainment. According to Negroponte (1995), such a homogenized use of the internet is already discernible among children and adolescents who grow up digital and acquire the necessary skills playfully. Consequently, adolescents appear to be the group to which the possibility of ubiquitous internetting appeals most.

Empirical research seems to support the notion that the young acquire digital skills more easily than older people. Furthermore, at least according to studies done in the USA, a considerable number of children and adolescents appear to use the internet as an information, social, and entertainment medium (e.g., Becker, 2000; Lenhart et al., 2005). The main differences in internet use therefore do not seem to be contained within this new young digital generation, but are to be found between children and adolescents on the one hand and (older) adults on the other (e.g., De Haan and Rijken, 2002). There is also tentative evidence that ethnic groups do not vary in their use of the internet to inform themselves, to communicate with others, and to enjoy themselves (Walsh et al., 2001). Finally, adolescents no longer access the internet only at one location: adolescents seem to be online nearly everywhere and at any time (Lenhart et al., 2005).

Supporters of the disappearing digital divide approach typically interpret such findings as evidence of the validity of their approach. Or, as Compaine (2001) succinctly puts it in a study titled ''Declare the war won'': ''[O]nce digitally enabled, all groups – by income, ethnicity, gender, and education – fall into almost identical patterns of usage'' (p. 332).

In conclusion, the disappearing digital divide approach puts forward the following predictions: Adolescents' use of the internet as (a) an information medium, (b) a social medium, and (c) an entertainment medium will be unrelated to adolescents' socio-economic, cognitive, and cultural resources. Moreover, adolescents' socio-economic, cognitive, and cultural resources will not affect their tendency towards ubiquitous internetting.

1.2. Emerging digital differentiation approach

The emerging digital differentiation approach conceptualizes digital divides as recursive, and thus dynamic phenomena (Van Dijk, 2002; Van Dijk and Hacker, 2003). If gaps close at one stage, they open at another. For example, if internet access gaps are bridged, internet skill gaps or internet usage gaps occur. In this approach, the characteristics of internet users play a more important role in shaping internet adoption and internet use than the characteristics of the internet. The approach thus leans towards social determinism. The emerging digital differentiation approach tends to evaluate the social and political role of the internet critically, with slightly pessimistic, dystopian undertones. It points out that existing inequalities in the use of the internet must be prevented from solidifying. If this is not achieved, technology-driven structural inequalities will lead to the disempowerment of large parts of a society.

Regarding adolescents' internet use, the emerging digital differentiation approach predicts that differential use patterns will occur even if all adolescents have access to the internet. These differential use patterns result from unequal socio-economic, cognitive, and cultural resources (Van Dijk, 2002). The conceptualization of digital divides as recursive, dynamic phenomena also entails that new developments such as ubiquitous internetting reflect differences in socio-economic, cognitive, and cultural resources.

Empirical research on internet and general media use tentatively supports the notion of internet usage gaps that result from socially determined recursive and dynamic digital divides. Adolescents' access to the internet is socially structured in that it depends on their socio-economic and cultural background (Becker, 2000). We also know from research on other media that adolescents' socio-economic, cognitive, and cultural resources affect the extent to which they choose information or entertainment content (Francis and Gibson, 1993; Roberts et al., 2005). Finally, preference for the internet as an information or entertainment medium is related to people's cognitive resources. Better educated people use the internet more often for information, while less educated people use the internet more frequently for entertainment (Bonfadelli, 2002; Van Dijk, 1999). People with greater socio-economic, cognitive, and cultural resources may increase their social network and, thereby, their social capital by communicating online (Van Dijk and Hacker, 2003).

In conclusion, the emerging digital differentiation approach puts forward the following predictions: Adolescents' use of the internet will depend on their socio-economic, cognitive, and cultural resources. Adolescents with greater socio-economic, cognitive, and cultural resources will use the internet more frequently as an (a) information and (b) as a social medium. Adolescents with less elaborate socio-economic, cognitive, and cultural resources will use the internet more frequently (c) as an entertainment medium. In addition, adolescents with greater

socio-economic, cognitive, and cultural resources will show a greater tendency towards ubiquitous internetting than adolescents with limited access to these resources.

2. Method

2.1. Sample and procedure

In March and April 2005, an online survey was conducted among 749 Dutch adolescents between 13 and 18 years of age. We deliberately chose an online sample because we were interested in disappearing digital divides or emerging digital differentiation beyond issues of access to the internet. All of our respondents had regular access to the internet and consequently constituted an appropriate sample for the purpose of this study.

Sampling and fieldwork were done by Intomart GfK, the Netherlands. Respondents were recruited from an existing online panel managed by Intomart GfK. Intomart GfK had sampled the respondents in all parts of the Netherlands, partly through random telephone interviews, partly through respondents' social networks. Analyses showed that the gender, age, and formal education of our respondents did not deviate significantly from official statistics, so the net sample may be regarded as representative of Dutch adolescents who use the internet. Prior to the implementation of the survey, parental consent for an adolescent's participation and adolescents' informed consent were obtained.

2.2. Measures

2.2.1. Dependent variables

Use of the internet as an information medium was operationalized with the question "How often do you look for specific information on the internet?" Use of the internet as a social medium was measured with the question "How often do you chat on the internet?" Finally, because to adolescents online entertainment mainly means playing games (Valkenburg and Soeters, 2001), we asked the respondents "How often do you play games online?" to measure their use of the internet as an entertainment medium. Response categories to all questions were 1 (*never*), 2 (*sometimes*), and 3 (*often*).

We measured adolescents' tendency towards ubiquitous internetting with three dichotomous items: access to the internet at school; access to the internet at friends'; and access to the internet with mobile devices such as laptops. We did not include home internet access in the scale because all but three respondents had wired home internet access. The three items were coded such that 1 meant *access* and 0 meant *no access*. With the three items, we formed a Mokken scale. Loevinger's H of the entire scale was .47, indicating a moderate scale (Mokken, 1971). For the items separately, Loevinger's H was .41. for internet access at friends', .50 for mobile internet access, and .51 for internet access at school.

2.2.2. Independent and control variables

Adolescents' socio-economic resources were operationalized as a combination of two measures, the profession and the educational level of the family's primary breadwinner. The two measures were combined so that a 5-point scale resulted. On this scale, 1 meant *low socio-economic resources* and 5 meant *high socio-economic resources* ($M = 2.97$, S.D. = 1.28).

The cognitive resources of adolescents were tapped with two measures: first, their age and second, their formal education. The measurement of age was straightforward ($M = 15.51$, S.D. = 1.70). Education was measured on a 5-point scale that represented the different educational levels in the Netherlands ($M = 2.75$, S.D. = 1.22).

We tapped adolescents' cultural resources also with two measures: their gender and their ethnicity. Male adolescents' were coded with 0 (48%), female adolescents were coded with 1 (52%). We operationalized respondents' ethnicity as a dichotomy where 0 meant *Non-Dutch* (8%), and 1 meant *Dutch* (92%).

We added four control variables to the model that tests the influence of socio-economic, cognitive, and cultural resources on adolescents' internet use. Adolescents' use of the internet as an information, social, or entertainment medium may be affected by the frequency with which they use the internet and by the speed of their internet connection. Adolescents who generally spend more time on the internet and have fast internet connections may be more likely to use the internet for more diverse purposes than adolescents who are online only infrequently and have slow internet connections. Research has also indicated that the use of the internet as an entertainment and a social medium is related to adolescents' levels of sensation seeking and life satisfaction (e.g., Valkenburg and Peter, in press; Weisskirch and Murphy, 2004). As a result, we controlled for these four variables in order to preclude spurious influences of adolescents' socio-economic, cognitive, and cultural resources on their internet use.

2.3. Data analysis

To test our hypotheses we ran multiple regression analyses. Because multiple regression analyses require the variables to be normally distributed, we checked with Shapiro–Wilk tests whether the non-dichotomous variables were normally distributed. We subsequently log-transformed the variables that were not normally distributed: use of the internet as an information medium, use of internet as a social medium, socio-economic resources, age, education, frequency of internet use, sensation seeking, and life satisfaction.

3. Results

3.1. Adolescents' use of the internet and their tendency towards ubiquitous internetting

Fifty-three percent of our respondents reported that they used the internet *often* as an information medium. Forty-four percent looked *sometimes* for information on the internet and 3% *never* did so. Regarding the internet as a social medium, 66% of the adolescents reported that they communicated online *often*, 24% did so *sometimes*, and 10% said that they *never* used the internet to communicate with others. Forty-two percent *often* used the internet for entertainment, 43% did so *sometimes*, and 15% *never* used the internet for entertainment. These descriptive findings indicated that the frequency with which adolescents used the internet for information, social purposes, and entertainment varied. Statistically speaking, there was sufficient variance to test the opposing hypotheses put forward by the disappearing digital divide approach and the emerging digital differentiation approach.

Adolescents' tendency towards ubiquitous internetting also varied. In addition to going online at home, 5% of the respondents accessed the internet at school, at their friends', and while being mobile. Thirty-six percent of the adolescents went online at two more locations outside their

home, 43% did so at least at one more location outside their home. Sixteen percent of the respondents only accessed the internet at home.

3.2. Testing the predictions made by the two approaches

The disappearing digital divide approach predicted that adolescents' use of the internet as an information medium, as a social medium, and as an entertainment medium would be unrelated to their socio-economic, cognitive, and cultural resources. The emerging digital differentiation approach, in contrast, predicted that adolescents with higher socio-economic, cognitive, and cultural resources would use the internet more frequently as an information and as a social medium, but less frequently as an entertainment medium.

Table 1 shows that adolescents' *use of the internet as an information medium* was influenced by their socio-economic and cognitive resources. Adolescents' with greater socio-economic resources (i.e., adolescents who have parents with better jobs and higher education) tended to use the internet more frequently as an information medium than adolescents with fewer socio-economic resources. Adolescents' with higher cognitive resources (i.e., adolescents who were older and those with a higher formal education) also tended to look more frequently for information online than their counterparts with lower cognitive resources. These two findings confirmed the predictions made by the emerging digital differentiation approach. Cultural resources as defined by adolescents' gender and ethnicity were unrelated to the use of the internet as an information medium, which supported the prediction of the disappearing digital divide approach. In sum, however, the results supported the emerging digital differentiation approach more strongly than the disappearing digital divide approach.

Regarding adolescents' *use of the internet as a social medium*, we also found influences of adolescents' socio-economic and cognitive resources on the frequency with which they

Table 1
Predictors of adolescents' use of the internet as information, social, and entertainment medium

$n_{min} = 730$	Information medium (ln)			Social medium (ln)			Entertainment medium		
	B	S.E. *B*	β	*B*	S.E. *B*	β	*B*	S.E. *B*	β
Socio-economic resources (ln)	.05	.02	.11**	.05	.02	.07*	−.11	.05	−.08*
Cognitive resources									
Age (ln)	.46	.08	.21***	.09	.11	.03	−1.53	.23	−.24***
Education (ln)	.06	.02	.14**	−.05	.02	−.07*	−.10	.05	−.08*
Cultural resources									
Gender (Female)	−.00	.02	−.00	.04	.03	.06	−.11	.05	−.08*
Ethnicity (Dutch)	−.03	.03	−.03	−.02	.04	−.01	−.02	.09	−.01
Control variables									
Fast internet connection	−.02	.03	−.02	−.01	.04	−.00	.33	.08	.15***
Frequency internet use (ln)	.04	.02	.07	.28	.03	.32***	.29	.07	.16***
Sensation seeking (ln)	−.05	.03	−.06	.17	.04	.15***	−.01	.09	−.00
Life satisfaction (ln)	.03	.03	.02	−.03	.04	−.02	−.10	.09	−.04
Constant	−.36			.11			5.87		
R^2	.10			.14			.14		

Note: ln = log-transformed. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$ (*t*-test, two-tailed).

communicated online. Adolescents with greater socio-economic resources were more likely to use the internet as a social medium than adolescents with fewer socio-economic resources. This finding supported the prediction made by the emerging digital differentiation approach. Adolescents with fewer cognitive resources were more likely to communicate online than adolescents with greater cognitive resources. However, this pattern only held for formal education, but not for age. Thus, the result concerning education was neither in line with the emerging digital differential approach nor with the disappearing digital divide approach. As the disappearing digital divide approach predicted, cultural resources were unrelated to the use of the internet as social medium. Overall, in terms of adolescents' use of the internet as a social medium both the disappearing digital divide approach and the emerging digital differentiation approach were partly supported.

Adolescents' socio-economic resources affected their *use of the internet as an entertainment medium* as Table 1 shows. Adolescents' with fewer socio-economic resources were more likely to play online games than adolescents with greater socio-economic resources. This confirmed what the emerging digital differentiation approach predicted. As the negative regression coefficients for age and formal education indicate, adolescents with lower cognitive resources played online games more frequently than their counterparts with higher cognitive resources. Again, this was in line with what the emerging digital differentiation approach hypothesized. Finally, cultural resources in terms of a negative gender effect influenced adolescents' use of the internet as an entertainment medium. Male adolescents played online games more frequently than female adolescents. No significant effect emerged for the other indicator of cultural resources, ethnicity. In sum, the results concerning adolescents' use of the internet as entertainment medium more strongly supported the digital differentiation approach than the disappearing digital divide approach.

In terms of adolescents' *tendency towards ubiquitous internetting*, the disappearing digital divide approach stated that socio-economic, cognitive, and cultural resources would not affect adolescents' tendency towards ubiquitous internetting. In contrast, the emerging digital differentiation approach predicted that adolescents with greater socio-economic, cognitive, and cultural resources would show a greater tendency towards ubiquitous internetting than adolescents with limited access to these resources. Table 2 indicates that adolescents with greater socio-economic resources had a stronger tendency towards ubiquitous internetting than their counterparts with more restricted access to such resources. This finding confirmed the

Table 2
Predictors of adolescents' tendency towards ubiquitous internetting

$n = 744$	B	S.E. (B)	β
Socio-economic resources (ln)	.15	.05	.10**
Cognitive resources			
Age (ln)	.27	.27	.03
Education (ln)	.22	.06	.15***
Cultural resources			
Gender (Female)	−.09	.06	−.05
Ethnicity (Dutch)	−.09	.11	−.03
Constant	.65		
R^2	.04		

Note: ln = log-transformed. $^{**}p < .01$, $^{***}p < .001$ (t-test, two-tailed).

differentiation approach, but was opposed to what the disappearing digital divide approach predicted. However, in line with the disappearing digital divide approach, adolescents' cultural resources were unrelated to their tendency towards ubiquitous internetting.

The results regarding the impact of cognitive resources on adolescents' tendency towards ubiquitous internetting were mixed. On the one hand, adolescents with greater cognitive resources tended more strongly towards ubiquitous internetting than teenagers with fewer cognitive resources. This supported the differentiation approach. On the other hand, adolescents' tendency towards ubiquitous internetting did not vary by age. This confirmed the disappearing digital divide approach. In conclusion, as far as predictions of adolescents' tendency towards ubiquitous internetting were concerned, both the disappearing digital divide approach and the emerging digital differentiation approach were partly supported.

4. Discussion

The debate about the digital divide has been surrounded by considerable conceptual and theoretical confusion (e.g., DiMaggio et al., 2001; Selwyn, 2004; Van Dijk and Hacker, 2003). In research on the digital divide, this confusion has manifested itself in a number of opposing approaches to the phenomenon. This study has pitted the disappearing digital divide approach against the emerging digital differentiation approach to test the validity of the predictions made by the two approaches. Overall, our results suggest that the main predictions of the emerging digital differentiation approach are somewhat more convincing than the main predictions of the disappearing digital divide approach: once access gaps are bridged, other gaps open, most notably in terms of adolescents' use of the internet and their tendency towards ubiquitous internetting. This new digital differentiation largely results from unequal socio-economic and from varying cognitive resources, particularly from differences in formal education.

The impact of socio-economic and cognitive resources on internet use is remarkable because the age group we studied – adolescents – may be expected to be less prone to the influence of social inequality than other age groups. Recent data indicate that, in the Netherlands and the USA, the internet access gap among adolescents has become very small (Lenhart et al., 2005; Roskamp, 2005; Sociaal en Cultureel Planbureau, 2005). Moreover, adolescents use the internet with extensive skills (Lenhart et al., 2005; Peter et al., 2005). However, there is little evidence in our study that the vision of supporters of the disappearing digital divide approach has become reality. Although there were clearly no internet access gaps in our sample, internet use has not become the natural force that harmonizes societal groups and empowers the powerless. On the contrary, even among young members of the fairly egalitarian Dutch society, unequal access to socio-economic and cognitive resources led to differential uses of the internet. The socially structured digital differentiation of adolescents' internet use does not differ much from the socially structured differentiation of adolescents' use of traditional media (e.g., Francis and Gibson, 1993; Roberts et al., 2005). Adolescents' internet use thus does not transcend the boundaries of social inequality. Digital technology may indeed add a new quality to life. Yet – in contrast to what the disappearing digital divide approach contends – it is not a natural, but a socially determined force.

Our overall finding that an emerging digital differentiation results from unequal socio-economic and cognitive resources was less clear-cut for the use of the internet as a social medium. We did find the expected impact of socio-economic resources, but the effect of cognitive resources as defined by age and education either did not occur (age) or was different from what both approaches predicted (education). Other research carried out in the Netherlands has shown

that online communication has become a pervasive phenomenon among Dutch adolescents (Peter et al., 2005; Valkenburg and Peter, in press). Similarly in this study, 85% of the respondents reported communicating sometimes or often on the internet. It may well be that, due to its dynamic character, digital differentiation regarding the use of the internet as a social medium has moved to another stage. As a result, we would have to study with whom and about what adolescents communicate online to find more encompassing support for either of the two approaches.

Although our results in sum rather supported the notion of the digital divide as an emerging socially structured digital differentiation, the disappearing digital divide approach does not seem to be completely illusionary. As this approach predicted, cultural resources as defined by adolescents' gender and ethnicity were consistently unrelated to how adolescents used the internet, the effect of gender on the use of the internet for entertainment notwithstanding. The similarity between male and female adolescents does not correspond with findings from research among adults, which has consistently demonstrated gender differences in issues related to computing (e.g., Bimber, 2000; Bonfadelli, 2002; Broos, 2005; De Haan and Rijken, 2002; Roe and Broos, 2005). However, at least with respect to adolescents' use of the internet as an information and social medium, we seem to witness an increasing gender similarity. A similar conclusion can be drawn from the missing impact of ethnicity on the various types of internet use. These findings concur with results from the USA (Walsh et al., 2001). Although we clearly need research from other countries, our results tentatively suggest that internet use may start to surmount gender and ethnic differences.

In terms of adolescents' tendency towards ubiquitous internetting, the disappearing digital divide approach was also partly supported. Adolescents' cultural resources and their age were unrelated to adolescents' tendency towards ubiquitous internetting. That said, the tendency towards ubiquitous internetting clearly depended on adolescents' socio-economic resources and their cognitive resources as defined by their formal education. The important new development of a permanent, mobile use of the internet, then, hinges upon the classic determinants of social inequality, the access to socio-economic and cognitive resources. The emerging digital differentiation approach was correct in forecasting this new digital diversification. At least among its youngest users, the omnipresence of the internet is currently largely a privilege of the wealthy and the better educated. This finding illustrates nicely what digital differentiation and the notion of the digital divide as a dynamic and recursive phenomenon entail.

This study is one of the first to contrast opposing approaches to the digital divide phenomenon in order to empirically test the validity of their predictions. As a result, it may advance the formation of theories that adequately describe the antecedents and ramifications of digital divide phenomena. However, there are at least three limitations to the results of this study. First, the study is based on a cross-sectional design. Although this does not hamper the internal validity of our results, it does not fully capture the dynamic nature of digital divides. In line with van Dijk's (2002) framework for digital divide research, we would therefore encourage future researchers to choose a longitudinal perspective when studying digital divide phenomena. Second, our study was conducted in one of most advanced countries of the world in terms of internet use, the Netherlands. Therefore, we caution researchers against prematurely generalizing our findings to technologically less advanced countries. Third, in our operationalization of socio-economic, cultural, and cognitive resources, we largely followed van Dijk's (2002) valuable suggestions. However, future researchers may think about refining the measurement of the concepts.

Our study has demonstrated that adolescents' internet use can tentatively be described as an emerging digital differentiation that primarily results from unequal access to socio-economic and

cognitive resources. Overall, the emerging digital differentiation approach currently presents a somewhat more valid theoretical framework to explain digital divide phenomena than the disappearing digital divide approach. However, the emerging digital differentiation approach is also silent about the potential consequences of the digital differentiation we found. In order to adequately assess the societal impact of what is called the digital revolution, an extension of our research activities in this direction is urgently needed.

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References

Anderson, R.H., Bikson, T.K., Law, S.A., Mitchell, B.M., 2001. Universal access to email: feasibility and societal implications. In: Compaine, B.M. (Ed.), The digital divide. Facing a crisis or creating a myth? MIT Press, Cambridge, MA, pp. 243–262.

Becker, H.J., 2000. Who's wired and who's not: children's access to and use of computer technology. The Future of Children 10, 44–75.

Bimber, B., 2000. Measuring the gender gap on the Internet. Social Science Quarterly 81, 868–876.

Bonfadelli, H., 2002. The Internet and knowledge gaps. A theoretical and empirical investigation. European Journal of Communication 17, 65–84.

Broos, A., 2005. Gender and information and communication technologies (ICT) anxiety: male self-assurance and female hesitation. Cyberpsychology & Behavior 8, 21–31.

Broos, A., Roe, K., in press. The digital divide in the computer generation: ICT exclusion among adolescents. In: Golding, P., Murdock, G. (Eds.), Unpacking digital dynamics: participation, control and exclusion. Hampton Press, Creskill, NJ.

Bourdieu, P., 1983. Ökonomisches Kapital, kulturelles Kapital, soziales Kapital [Economic capital, cultural capital, social capital]. In: Kreckel, R. (Ed.), Soziale Ungleichheiten [Social Inequalities]. Schartz & Co, Göttingen, Germany, pp. 183–198.

Bourdieu, P., 1985. The social space and the genesis of groups. Theory and Society 14, 723–744.

Bucy, E.P., 2000. Social access to the internet. Harvard International Journal of Press/Politics 5, 50–61.

Compaine, B.M., 2001. Declare the war won. In: Compaine, B.M. (Ed.), The digital divide. Facing a crisis or creating a myth? MIT Press, Cambridge, MA, pp. 315–335.

De Haan, J., Rijken, S., 2002. The digital divide in the Netherlands: the influence of material, cognitive, and social resources on the possession and use of ICT's. Electronic Journal of Communication 12 (1,2).

DiMaggio, P., Hargittai, E., Neuman, W.R., Robinson, J.P., 2001. Social implications of the Internet. Annual Review of Sociology 27, 307–336.

Facer, K., Furlong, R., 2001. Beyond the myth of the 'cyberkid': young people at the margins of the information revolution. Journal of Youth Studies 4, 451–469.

Francis, L.J., Gibson, H.M., 1993. The influence of age, sex, social class and religion on television viewing time and program preferences among 11–15 year olds. Journal of Educational Television 19, 25–35.

Gunkel, D.J., 2003. Second thoughts: toward a critique of the digital divide. New Media & Society 5, 499–522.

Hargittai, E., 2002. Second-level digital divide: differences in people's online skills. First Monday 7(4). Retrieved August 15, 2003 from http://firstmonday.org/issues/issue7_4/hargittai/.

Henwood, F., Wyatt, S., Miller, N., Senker, P., 2000. Critical perspectives on technologies, equalities and the information society. In: Wyatt, S., Henwood, F., Miller, N., Senker, P. (Eds.), Technology and in/equality. Questioning the information society. Routledge, London, pp. 1–18.

Klein, M.-L., Voigt, D., 1989. Ungleichheit [Inequality]. In: Endruweit, G., Trommsdorff, G. (Eds.), Wörterbuch der Soziologie [Sociological Dictionary]. Enke, Stuttgart, Germany, pp. 764–765.

Lenhart, A., Madden, M., Hitlin, P., 2005. Teens and technology. Youth are leading the transition to a fully wired and mobile nation. Retrieved September 20, 2005 from http://www.pewinternet.org/pdfs/PIP_Teens_Tech_July2005web.pdf.

Mokken, R.J., 1971. A Theory and Procedure of Scale Analysis. De Gruyter (Mouton), NewYork.
Negroponte, N., 1995. Being Digital. Hodder & Stoughton, London.
Peter, J., Valkenburg, P.M., Schouten, A.P., 2005. Developing a model of adolescent friendship formation on the Internet. Cyberpsychology & Behavior 8, 423–430.
Qrius, 2005. Jongeren 2005. Het speelveld verandert [Youth 2005. The Playing Field is Changing]. Qrius, Amsterdam.
Roberts, D.F., Foehr, U.G., Rideout, V., 2005. Generation M: Media in the Lives of 8–18 Year Olds. Kaiser Family Foundation, Menlo Park, CA.
Roe, K., Broos, A., 2005. Marginality in the information age: the socio-demographics of computer disquietude. A short research note. Communications 30, 91–96.
Roskamp, H., 2005. MSN en 'respect' domineren huidige jongerencultur [MSN and 'respect' dominate current youth culture]. Adformatie 37, 21–22.
Selwyn, N., 2004. Reconsidering political and popular understandings of the digital divide. New Media and Society 6, 341–362.
Sociaal en Cultureel Planbureau, 2005. Surfende senioren [Surfing seniors]. Retrieved April 21, 2005 from http://www.scp.nl/nieuws/persberichten/9039523266.html.
Valkenburg, P.M., Peter, J., in press. Internet communication and its relationship to well-being: identifying some underlying mechanisms. Media Psychology.
Valkenburg, P.M., Soeters, K.E., 2001. Children's positive and negative experiences with the Internet: an exploratory study. Communication Research 28, 652–675.
Van Dijk, J., 1999. The Network Society. Sage, London.
Van Dijk, J., 2002. A framework for digital divide research. Electronic Journal of Communication 12 (1,2).
Van Dijk, J., Hacker, K., 2003. The digital divide as a complex and dynamic phenomenon. The Information Society 19, 315–326.
Walsh, E.O., Gazala, M.E., Ham, C., 2001. The truth about the digital divide. In: Compaine, B.M. (Ed.), The digital divide. Facing a crisis or creating a myth? MIT Press, Cambridge, MA, pp. 279–284.
Weiser, M., 1993. Some computer science problems in ubiquitous computing. Communications of the ACM 36 (7), 74–83.
Weiser, M., 1996. Ubiquitous computing. Retrieved, December 11, 2005 from http://www.ubiq.com/hypertext/weiser/UbiHome.html.
Weisskirch, R.S., Murphy, L.C., 2004. Friends, porn, and punk: sensation seeking in personal relationships, Internet activities, and music preference among college students. Adolescence 39, 189–201.
Wyatt, S., Thomas, G., Terranova, T., 2002. They came, they surfed, they went back to the beach: conceptualizing use and non-use of the internet. In: Woolgar, S. (Ed.), Virtual society? Technology, cyberbole, reality. Oxford University Press, Oxford, pp. 23–40.

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