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RESPECTING THE HETEROGENEITY OF THE NATIVES: ANTECEDENTS AND CONSEQUENCES OF INDIVIDUALS' DIGITAL NATIVENESS

Complete Research

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Abstract

The Internet and digital media have forced many individuals to change their attitudes and behaviours in nearly all aspects of life, including work and consumption. Other individuals, often younger, have grown up with digital media and seem not to have undergone changes in attitudes and behaviours. This research suggests, however, that age should not be used as the criterion to differentiate between individuals' attitudes and behaviours towards digital media. Rather, we suggest utilizing a construct that we call "digital nativeness," which we characterize as an individual's propensity to use and have a positive attitude towards digital media. Both a qualitative and a quantitative study investigate digital nativeness as well as its antecedents and consequences. Results show that digital nativeness consists of three dimensions: Expertise in digital media, sophisticated digital media use and sophisticated mobile media use. The studies suggest that early and ubiquitous access to digital media influence an individual's level of digital nativeness, while, importantly, age does not have such an influence. A high level of digital nativeness positively affects individuals' attitude towards online social network communication, preference for online advertising, learning by doing, and media multitasking. Important implications for scholars and managers can be derived from this research.

Keywords: Digital Natives, Attitudes towards Internet and Digital Media, Net generation, Structural Equation Modeling.

1 Introduction

The advent of the Internet and the rise of "new" or "digital" media have immensely impacted contemporary society and marketplace behaviour (e.g., DiMaggio et al., 2001). Digital media challenge both scholars and managers (Winer, 2009). While many companies today use an array of digital media to reach specific market segments and to interact with their customers, scholars call for more research on the transformational impact of the Internet and digital media on human behaviour in general and on consumption behaviour in particular (e.g., Biswas, 2004). Despite the fact that "those of us who grew up in the physical world cannot begin to imagine life as it will be for those who grow up in a digital world" (Achrol and Kotler, 2011, p. 38), only a limited amount of information systems,

business and management research deals with generational differences between individuals' digital media use and the consequences of such use (e.g., McWilliam and Deighton, 2000).

Of the few studies on the topic, one study, for instance, finds that Internet advertising reaches this "digital generation" better than traditional media advertising (e.g., Reisenwitz and Iyer, 2009). In the context of vacation decision making, Belch et al. (2005) show that "Internet mavens" have a greater relative influence in the family decision-making process than their non-maven counterparts. Researchers also find that traditional demographic breakdowns are decreasingly useful for market segmentation as vast differences exist between the media habits of those traditionally grouped in a single age segment, such as 18-year olds and 30-year olds (Winer, 2009). While the technology acceptance model (Davis, 1989) is the common framework for analyzing antecedents of users' technology adoption, it neglects the outcomes of such adoption and subsequent usage (Venkatesh et al., 2003). Generational concepts such as "digital natives," "millennials" (Howe and Strauss, 2007) or "net generation" (Tapscott, 1998), however, focus on the consequences of individuals' digital media consumption and usage. In the education literature, Prensky (2001a) introduces the concept of digital natives and digital immigrants to address the issue of technology-induced human transformation. Individuals who grow up using computers, video cameras, cell phones and other digital tools are "digital natives." Individuals that adopt these technologies at some later point in their lives constitute "digital immigrants" (Prensky, 2001a). The fact that the American youth spend more time with these media than for any activity other than sleeping, and that young people have an average digital media exposure of more than six hours per day (Roberts and Foehr, 2008) underscores the concept's relevance. Although empirical evidence is sparse, findings indicate that digital media affect the development of cognitive skills as they relate to visual-spatial abilities, multitasking and nonverbal forms of intelligence (OECD, 2008). The Internet's rise, individuals' increasing digital media literacy and social networks' explosive growth have consequences for individuals that managers need to understand in order to maintain or develop successful relationships with consumers (Meadows-Klue, 2008). In light of these facts, the objectives of this study are to introduce the concept of digital nativeness (DN), present a scale for its measurement, embed the construct into a nomological framework, test for postulated relationships, and derive theoretical and practical implications.

2 The concept of digital nativeness

2.1 Literature review

Prensky (2001a) coins the terms "digital natives" and "digital immigrants" and highlights the differences between individuals who have spent their entire lives using a "new" particular technology and individuals who adopt that "new" technology at some later point in their lives. He argues that current education systems inadequately cater to digital natives because digital technology has fundamentally changed the way individuals think and process information. The generation born after 1980 (i.e., digital natives) are accustomed to the twitch-speed, multitasking, random-access, graphics-first, actively connected, quick-payoff world of digital media (Prensky, 2001b). Tapscott's (1998) "net generation" is a similar concept, which builds on Strauss and Howe's (1991) generation theories and combines their concept of the "baby boomer generation" with changes that the "digital revolution" (i.e., the emergence of digital technology in general and the Internet in particular) induced. Studies suggest that the net generation learns, works, plays, communicates, shops, creates communities and gathers, accepts and retains information very differently than their parents do (e.g., Tapscott, 1998; 2009). Both concepts emphasize that the respective generation is involved in multitasking and relies on digital communication technologies to search for information and to interact with others. Prensky (2001a) even supposes that due to this altered use of technology, modern students' brains are physically different from the brains of digital immigrants. Both concepts clearly examine how digital

media influence human behaviour but despite their relevance for a multitude of academic fields, the concepts are currently primarily discussed in the education literature (e.g., Helsper and Eynon, 2009; Margaryan et al., 2011).

Several researchers, however, consider the theories of net generation and digital natives or similar concepts such as "born digital" (Palfrey and Gasser, 2010) or "homo-zappiens" (Veen and Vrakking, 2006) as too simplistic because these concepts primarily regard age as the source of differences in media use and learning styles (e.g., Bennett and Maton, 2010; Selwyn, 2009). Thus far, little empirical research has supported the digital native and net generation theories (Bennett et al., 2008). In a survey study, Jones et al. (2010) find that the net generation is not homogenous in its use and appreciation of new technologies and that significant variations exist among individuals within each respective age band. Findings obtained from British Internet use data suggest that a range of factors, including experience and breadth of use, rather than generation alone, define if someone is a digital native or not (Helsper and Eynon, 2009). In a qualitative study, Ben-David Kolikant (2010) finds that although the majority of interviewed students use information and communication technologies (ICT) for school purposes, they believe their generation is not as good at learning as the pre-ICT generation. Based on findings from a mixed-method investigation, Margaryan et al. (2011) argue that there is no evidence to support claims suggesting that the current generation of students adopts radical learning styles or uses digital technologies in sophisticated ways. The debate is still ongoing with advocates for (e.g., Palfrey and Gasser, 2010; Prensky, 2005; Tapscott, 2009) and against (e.g., Jones et al., 2010; Selwyn, 2009) the digital native and net generation concepts.

2.2   Preliminary study

As different research methods focus on different aspects of reality and a richer understanding of a research topic can be gained by combining several methods (Mingers, 2001) this research uses both a qualitative and a quantitative approach to investigate the phenomenon digital nativeness. To establish the boundaries and content (Lincoln and Guba, 1985) of digital nativeness and to identify relevant constructs for the quantitative study's questionnaire above and beyond our literature review, this research first performs a qualitative exploratory study. The authors conducted semi-structured interviews, involving a purposive sample of 21 participants and subsequently analyzed data using the constant comparative method (Glaser and Strauss, 1967). Two-thirds of the participants are male and the average age of the sample is 35 years. Prensky (2001b) suggests that people born after the year 1980 are digital natives. According to this criterion, twelve participants are digital natives and nine are digital immigrants. During the course of the interviews, informants talked about their general media habits, their computer, Internet, social media and mobile phone usage, and the impact of digital media on their everyday lives. Emergent themes from interviews with digital natives include growing up with digital media, daily Internet usage, strong interest in digital media, early possession of mobile phones and early access to computers. This exemplary quote illustrates some of these findings. "I grew up with digital media like computers, videogames, and mobile phones. I use the Internet every day and several times per day (female, age 23, digital native)."

The interviews reveal differences between the two groups as digital immigrants' emergent themes centre on growing up without digital media, little time spent online and a preference for personal communication. One informant describes his late adoption of digital technologies: "It was not until I had to use a computer at work that I was interested in all these new technologies (male, age 55, digital immigrant)." In addition, digital immigrants ascribe digital natives a natural approach to digital technologies: "It's easier for young people to use new technologies as they use them more naturally (male, age 51, digital immigrant)."

The findings of this qualitative study suggest that in addition to age, providing early and frequent access to computers, mobile phones, the Internet and digital media are drivers of DN. Digital immigrants indicated that they primarily use the Internet for e-mailing, searching for information, e-

banking, and online shopping. Several statements from the interviews highlight these uses (see Table 1 for a ranking of use patterns): "I use the Internet primarily for work, emails, and to retrieve information that I need from different websites (female, age 54, digital immigrant)." and "I switch on the computer, it's not constantly switched on, then I surf for about half an hour, to check what's new, I check my emails to know what my friends in America are doing, and otherwise …, yes I do all my bank transfers on the Internet (male, age 51, digital immigrant)."

Digital natives use additional services and applications, such as online social networks, chat rooms, forums, online newspapers, online videos and downloading music and software. This "sophisticated digital media use" is a crucial difference between digital natives and digital immigrants and the authors therefore integrated it into the main study as a component of DN. The qualitative data reveal that digital natives and digital immigrants also differ in their use of mobile devices; for example, digital natives regularly access the Internet on their mobile phones and use more sophisticated mobile phone applications (see Table 1).

Digital immigrants		Digital natives	
Internet use	Mobile device use	Internet use	Mobile device use
E-Mail	Telephone	Online social networks	Telephone
Information search	SMS	E-Mail	SMS
E-Banking	Camera	Information search	Internet
Online-Shopping		Online newspapers	E-Mail
		Chatting	Camera
		Online forums	Calendar
		Videos	Alarm-clock
		Music and software-downloads	Video-games
			Online social networks
		Online-shopping	Music-player
		E-banking	Route-planning

Notes: Use patterns are ranked according to frequency counts provided by the preliminary study.

Table 1. *Schematic Internet and mobile device use patterns of digital immigrants and digital natives*

Therefore, in the quantitative study, the DN construct also accounts for "sophisticated mobile media use". Even though there are some attitudinal and behavioural patterns that seem to differentiate digital natives from digital immigrants, the qualitative interviews also show that these differences are sometimes blurred and thus confirm the authors' scepticism towards segmentations of digital media users according to age: "I use a smartphone, a Blackberry, a PC, and at home an iPad. […] I use the iPad for playing videogames and for work, and of course for surfing. […] Personally, I think that digital media have a lot of advantages. Many of the classic media are outdated. […] Many newspapers are completely outdated. The information is not sufficiently up-to-date. I think fast and up-to-date information is better (male, age 40, digital immigrant)."

Insights from this qualitative preliminary study and from the comprehensive literature review inform the quantitative study and lead to the formal definition of DN as a person's propensity to both use and have a positive attitude towards digital media.

3 The construct of digital nativeness

3.1 Expertise in digital media

A central argument in the digital natives debate is that this generation is different from prior generations because digital natives have been exposed to digital media since early childhood. For instance, a study of over 4,000 American students aged 25 years and younger reports that the majority owns personal computers and mobile phones and that they use these devices primarily for word processing, e-mailing and surfing the Internet (Kvavik et al., 2004). Prensky (2001b) anticipates that prior to graduating from college, adolescents have sent and received over 200,000 e-mails and instant messages, spent over 10,000 hours talking on mobile phones, watched 20,000 hours of TV and viewed over 500,000 commercials. Research reports that this generation uses digital media more intensively than other generations (e.g., Prensky, 2001a; Tapscott, 1998). The qualitative preliminary study suggests that digital natives are highly interested in digital media and consider themselves to be expert users. Therefore, this study considers expertise in digital media as one component of the DN construct.

3.2 Sophisticated digital media use

Blogs, social networking sites and other interactive services have broadened the Internet's uses. Although the technology underlying the Internet did not change much, some researchers associate these new applications with a fundamental change of the Internet into a Web 2.0 environment (e.g., Tapscott, 2009). Companies increasingly use these applications to communicate with customers and to engage them in co-creation activities (e.g., Kohler et al., 2011). Large-scale surveys, however, show a somewhat differentiated picture. While the majority of student respondents use the Internet and digital media for informational and communication purposes, fewer respondents use these technologies, apart from social networking, for content creation activities (e.g., Jones et al., 2010). These findings and insights from the preliminary study suggest that people who exhibit low levels of DN use digital media for basic applications, such as information search and e-mail, while people who exhibit high levels of DN employ more sophisticated uses, such as video-uploads or blogs. Consequently, the authors included sophisticated digital media use as another dimension of the DN construct.

3.3 Sophisticated mobile media use

The demand for mobile media such as mobile phones, PDAs and digital music players, which can be used anywhere, is growing worldwide (Shankar and Balasubramanian, 2009). Technology advancements such as the iPhone and other smartphones have revolutionized the mobile phone industry and have often become a personal extension of their owners (Bellman et al., 2011). An increasing number of people use mobile devices to access the Internet and can therefore access a wealth of Web 2.0 applications. Rice and Katz (2003) argue that there is a mobile phone digital divide. Following this notion, the construct of DN should incorporate differing mobile media use(s), especially pertaining to mobile Internet access as another dimension. Insights from the qualitative exploratory study support this supposition. To summarize, the construct of DN consists of two behavioural dimensions "sophisticated digital media use," and "sophisticated mobile media use," and one attitudinal dimension "expertise in digital media."

4 Hypotheses

The qualitative preliminary study not only helped to identify the components of the DN construct, but also indicated potential antecedents and consequences of DN. The qualitative findings and the literature review on the digital natives debate suggest that age, early access and ubiquitous access to digital media are antecedents of DN. While various consequences of DN are conceivable, this study investigates four consequences that are particularly interesting for researchers and practitioners: Attitude towards online social network communication, preference for online advertising, learning by doing, and multitasking.

4.1 Age

The theoretical arguments relating to digital natives and the net generation build heavily on the supposition that age plays a significant role (e.g., Prensky, 2001b; Tapscott, 1998). Prior research finds that age relates negatively with perceived ease of use and perceived usefulness of the Internet (Porter and Donthu, 2006). Age, however, positively relates with online consumer self-efficacy indicating that learning from online media increases with age (Hill and Beatty, 2011). Theories of generational differences state that generations follow observable historical patterns and that generations shaped by similar early-life experiences often develop similar collective personae and follow similar life trajectories (e.g., Strauss and Howe, 1991). While this study does not follow certain proposed age cut-offs to classify digital natives versus digital immigrants (e.g., Howe and Strauss, 2000; Prensky, 2001b), it expects a negative correlation of DN with age: H1 Age relates negatively with a person's level of digital nativeness.

4.2 Early access to digital media

An increasing percentage of children grow up in societies in which computers, Internet connections and mobile phones are readily available and in which children are exposed to computers at an early age (OECD, 2008). In the U.S., children aged 6 months to 6 years increasingly use computers (Calvert et al., 2004). Twenty-seven percent of 5 to 6-year-olds use a computer for 50 minutes on average per day (Vandewater et al., 2007). Young children's acquaintance to digital technologies differentiates them from previous generations of children regarding their comfort with technology and the extent to which they use all forms of technology in their daily lives (OECD, 2008). To account for temporal differences regarding access to digital media, the authors hypothesize: H2 Early access to digital media relates positively with a person's level of digital nativeness.

4.3 Ubiquitous access to digital media

To use digital media, a person needs to have access to the necessary hardware and software (e.g., Lee et al., 2007). Personal computers with Internet access and mobile phones are widespread in industrialized countries. In 2012, 78.1% of the U.S. population use the Internet (internetworldstats.com) and 88.0% own a mobile phone (Smith, 2012). In Germany and Austria, where the authors conducted the present study, the respective proportions of Internet users are 83.0% and 79.8% in the year 2012 (internetworldstats.com). Furthermore, all participants in the qualitative exploratory study use the Internet and mobile phones on a regular basis. Ubiquitous access to the Internet, computers and mobile phones is a necessary prerequisite for a person's level of DN: H3 Ubiquitous access to digital media relates positively with a person's level of digital nativeness.

4.4 Attitude towards online social network communication

Online social networks (OSN), such as Facebook, Twitter and MySpace, impact the way people communicate. In 2005, already 55% of U.S. teenagers used online social networks, of which 48% visited these networks at least once daily (Lenhart and Madden, 2005). Gross and Acquisti (2005) discuss negative implications of OSN such as stalking and identity theft. Other scholars, however, highlight positive implications, such as OSN's potential as trustworthy information channels (Dickinger, 2011) or OSN's ability for creating and maintaining social capital (Ellison et al., 2007). Patterson (2012) suggests that digital natives enthusiastically embrace Facebook as it equates well with their needs of communicating with a multitude of friends in the virtual environment. The authors assert that people with a high level of DN strongly value OSN communication: H4 Digital nativeness relates positively with attitude towards online social network communication.

4.5 Preference for online advertising

Digital media alter contemporary marketing communications and advertising. Due to its interactive nature, online advertising equips advertising with a powerful additional channel (e.g., Ko et al., 2005). Various studies find that online advertising is as effective as traditional advertising (e.g., Gallagher et al., 2001; Wakolbinger et al., 2009). The field of online advertising undergoes regular changes. Social media advertising on platforms such as Facebook, Twitter, or MySpace becomes increasingly relevant (Wakolbinger et al., 2009). The authors expect people with a higher level of DN to be more receptive to online advertising and thus hypothesize: H5 Digital nativeness relates positively with preference for online advertising.

4.6 Learning by doing

Adaptive learning or learning by doing is a learning style that relies on experience as the source of learning. Learning by doing involves the active participation in a planned event, the analysis of and reflection on experiences and the application of learned principles to different life situations (Smart and Csapo, 2007). According to economists, learning by doing is a major source of technological progress and an important driver of economic growth (e.g., Arrow, 1962). Theories of digital natives and the net generation emphasize that people accustomed to digital technology and media tend to rely on learning by doing as they immediately try out newly acquired technological equipment rather than read instruction manuals (e.g., Prensky, 2001a). This study therefore argues that a high tendency towards learning by doing is a consequence of a high level of DN: H6 Digital nativeness relates positively with a learning by doing learning style.

4.7 Media-Multitasking

The concept of multitasking has its roots in the computer industry and describes the capability of computers to run several programs simultaneously or to learn tasks in parallel (e.g., Caruana, 1997). The term also frequently describes a change in the way people work (e.g., Lindbeck and Snower, 2000). Multitasking is a common phenomenon in our daily lives, but researchers suggest differences between the genders (e.g., Offer and Schneider, 2011) and generations (e.g., Wallis, 2006). Young people often engage in other media activities while using e-mail or visiting websites, with media multitaskers spending approximately one quarter of their media time with more than one medium (Foehr, 2006). Although the specific combination of tasks and the difficulty ratings of specific multitasking combinations highly correlate across generations (Carrier et al., 2009), Prensky (2001a) and Tapscott (2009) note that the capability of and tendency towards multitasking are central elements of their concepts. Thus, the authors suppose that media multitasking is another consequence of DN:

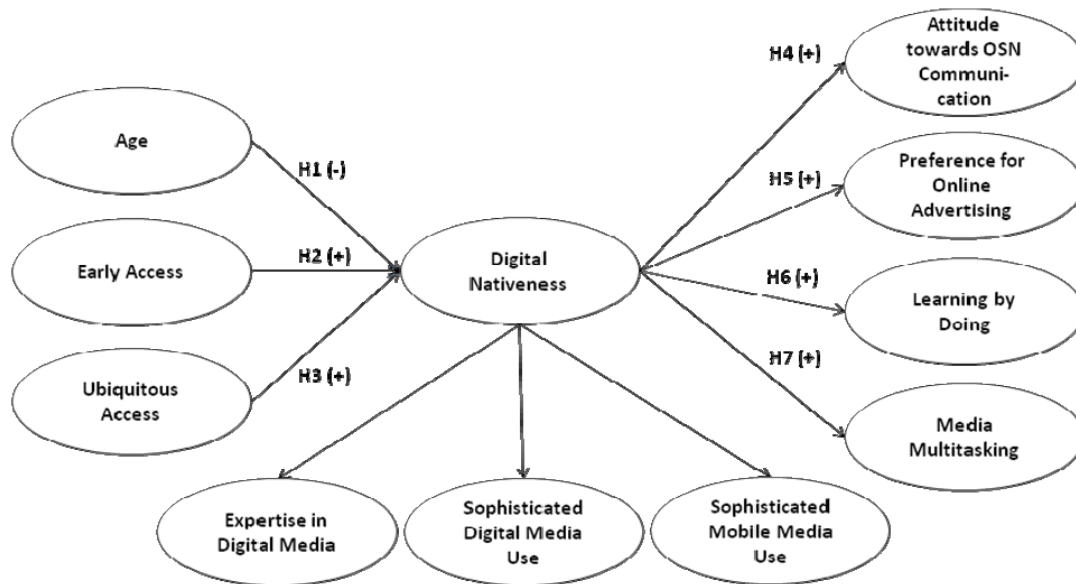H7 Digital nativeness relates positively with media multitasking. Figure 1 depicts the conceptual model.

Figure 1.   Conceptual model

5   Main study

5.1   Sampling

This study tests the hypothesized model of DN with data from a convenience sample of Austrian and German individuals. A research assistant distributed an invitation to participate and a link to the online questionnaire via e-mail and the online social network Facebook. To incentivise participation three prices (shirts) were raffled among respondents. Six-hundred-seventy-three people accessed the questionnaire, and 221 respondents completed the questionnaire, yielding a response rate of 32.8%. The average age of respondents is 31.9 years and 36.2% of the sample is female. The majority of respondents are employees (50.7%), whereas 19.9% are students, 12.2% run a business or are self-employed and the remaining 17.2% are homemakers, retirees, unemployed, or do not respond to the question.

5.2   Measures

The study adapts the majority of the items used from existing scales. To measure expertise in digital media the authors adapt two items from Kleiser and Mantel (1994) and one item from Keaveney and Madhavan (2001). Based on insights from the preliminary study, the authors adapt items from McKnight et al. (2002) to measure sophisticated digital media use (three items) and sophisticated mobile media use (three items). A continuous variable measures age, and one item based on Vandewater et al. (2007) measures early access to digital media. To measure the construct of ubiquitous access to digital media, the authors use items based on Lee et al. (2007) and adapt them to account for the use of computers, mobile phones and the Internet. The preliminary study and studies by Smart and Csapo (2007) and Ellison et al. (2007) provide items to measure learning by doing (three items) and attitude towards online social network communication (three items). One item from the Kaufman et al. (1991) scale on polychronic time use and one item from Rohm et al.'s (2009) scale on

multitasking measure the construct "media multitasking." To measure preference for online advertising, the authors adapt items from Ducoffe (1996). With the exception of age, gender and profession, the study measures all items on a 7-point agree-disagree scale (see Appendix for a complete list of items, descriptive statistics and EFA factor loadings).

5.3 Analysis and results

The study assesses the measurement model with exploratory factor analysis (EFA), reliability analysis (i.e., Cronbach's α), and confirmatory factor analysis (CFA). EFA reveals an eight-factor structure in the data and accounts for 70.2% of the variance. The authors omit one item measuring online social network communication (i.e., "Personal communication decreases due to online social networks. (R)") from further analyses because its factor loading is less than .50 (Bagozzi and Yi, 1988). Cronbach's α values for expertise in digital media (.86), sophisticated mobile media use (.81) and ubiquitous access (.73) reveals satisfactory reliability of these constructs. The reliabilities of sophisticated digital media use (.69), learning by doing (.68), media multitasking (.69), online social network communication (.73) and attitude towards online advertising (.93) are acceptable considering the rather small number of items employed.

Results of the CFA suggest that the hypothesized model fits the data well. According to fit statistics of the CFA, the hypothesized model is a good representation of the data with $\chi^2(191)=300.266$ (p-value<.001), comparative fit index (CFI)=.94, root mean square error of approximation (RMSEA)=.05 and square root mean residual (SRMR)=.06. Highly significant factor loadings of .58 for expertise in digital media, .65 for sophisticated digital media use and .63 for sophisticated mobile media use support the second-order structure of the DN construct. The results for average variance extracted (AVE) and construct reliability (CR) are satisfactory and discriminant validity is fulfilled as values of AVE exceed the shared variance (i.e., squared intercorrelations) between each pair of constructs (Fornell and Larcker, 1981). Table 2 shows CR, AVE and latent construct intercorrelations.

Constructs	1.	2.	3.	4.	5.	6.	7.	8.
1. Expertise in digital media	(0.86, 0.68)	a, b						
2. Sophisticated digital media use	0.38	(0.71, 0.45)						
3. Sophisticated mobile media use	0.28	0.38	(0.81, 0.59)					
4. Ubiquitous access	0.25	0.33	0.25	(0.74, 0.50)				
5. Learning by doing	0.30	0.40	0.30	0.26	(0.70, 0.44)			
6. Media multitasking	0.35	0.47	0.35	0.31	0.54	(0.69, 0.52)		
7. Preference for online advertising	0.17	0.22	0.16	0.14	0.08	0.03	(0.93, 0.81)	
8. Attitude towards OSN communication	0.29	0.39	0.28	0.25	0.21	0.55	0.18	(0.75, 0.61)

Notes: [a] The diagonal entries are construct reliabilities and average variance extracted.
[b] The off-diagonal entries are intercorrelations among the latent constructs.

Table 2. *Construct reliabilities, average variance extracted and latent construct intercorrelations*

Fit statistics for the structural model show good values: $\chi^2(235)=386.327$ (p-value<.001), CFI=.92, RMSEA=.05 and SRMR=.06. Highly significant factor loadings of .53 for expertise in digital media, .72 for sophisticated digital media use, and .53 for sophisticated mobile media use again support the second-order structure of the DN construct. Despite the path from age to DN, all structural paths are significant and in the hypothesized direction, thereby supporting the conceptual model. Table 3 shows standardized parameter estimates.

Contrary to H1, the results show that age does not significantly relate with DN ($\gamma 1=-.19$, p-value>.05). However, the analysis supports H2 because early access relates positively with DN ($\gamma 2=.38$, p-value<.001). The results also provide support for H3 as ubiquitous access relates positively with DN ($\gamma 3=.35$, p-value<.01). DN relates positively with attitude towards online social network communication ($\gamma 4=.54$, p-value<.001), preference for online advertising ($\gamma 5=.31$, p-value<.001), learning by doing ($\gamma 6=.56$, p-value<.001), and media multitasking ($\gamma 7=.66$, p-value<.001), thereby supporting H4, H5, H6 and H7. The model explains a substantial proportion of variance in attitude towards online social network communication (29%), learning by doing (32%), and media multitasking (44%). In addition, the model explains a modest proportion of variance in preference for online advertising (10%).

	Hypothesis	γ
H1: Age $\rightarrow$ DN	Not supported	-0.19 (0.12) ns
H2: Early access $\rightarrow$ DN	Supported	0.38 (0.10) ***
H3: Ubiquitous access $\rightarrow$ DN	Supported	0.35 (0.10) **
H4: DN $\rightarrow$ Online social network communication	Supported	0.54 (0.09) ***
H5: DN $\rightarrow$ Preference for online advertising	Supported	0.31 (0.08) ***
H6: DN $\rightarrow$ Learning by doing	Supported	0.56 (0.11) ***
H7: DN $\rightarrow$ Media multitasking	Supported	0 .66 (0.10) ***

Notes: Standard errors in parentheses.
ns= not significant, ** p <0.01, *** p <0.001

Table 3.   Structural model estimates

To test whether the second-order construct DN adds value over age as a (single) predictor of the consequences or over simpler representations of DN, the authors estimate three alternative models (see Batra et al., 2012 for a similar procedure). In Model 1, age is the predictor of attitude towards online social network communication, preference for online advertising, learning by doing, and media multitasking. In Model 2, "composite DN" is a mean value of all the indicators (i.e., DN is not a latent construct) and the predictor of the consequences. In Model 3, DN is a first-order construct of all the indicators (i.e., DN is not a second-order construct) and the predictor of the consequences. The authors compare these models to a simplified version of the original model (i.e., baseline model with the proposed second-order construct of DN as the predictor of the consequences) with respect to three criteria: model fit, number of hypothesized parameters that are statistically significant and percentage of variance explained by the predictor variables (e.g., Cotte et al., 2006). The lower portion of Table 4 reports the global fit statistics of the four models. With the exception of Model 3, all other models show good to satisfying model fit (e.g., CFI>.90, RMSEA<.08, SRMR<.08).

With respect to the relationships between the selected representations of DN (or age) and the outcome variables attitude towards online social network communication, preference for online advertising, learning by doing, and media multitasking, all paths in the baseline model are strong and statistically significant. In Model 1, in which age substitutes DN, only two out of four paths are statistically significant. This finding, along with the result that all four paths are significant in Model 2 and Model 3, confirm the superiority of DN over age as a predictor of the outcomes. Finally, Table 4 presents the related R-squared statistics (SMC; squared multiple correlations) of these four models. The results indicate that the respective proportions of explained variance are highest for the baseline model (i.e.,

second-order DN). The authors perform significance tests with an adaption of Fisher's r-z-transformation, that is, they z-transform the relevant R-squared values. The results show that the R-squared values of the four dependent variables are significantly higher for the baseline model than for Model 1, where age is the predictor variable. In addition, all R-squared values (with the exception of the construct "preference for online advertising") are significantly higher for the baseline model than for Model 2 and Model 3 (see Table 4). Therefore, the second-order construct DN is a better predictor of attitude towards online social network communication, preference for online advertising, learning by doing, and media multitasking than alternative concepts. This procedure also indicates that the second-order structure of the DN construct is adequate as it is a better predictor of variations in consequences than the first-order DN construct.

Dependent variables/ Global fit	Baseline model (Second-order DN) R^2	Model 1 (Age) R^2 (t-value)	Model 2 (Composite DN) R^2 (t-value)	Model 3 (First-order DN) R^2 (t-value)
Attitude OSN communication	0.36	0.02 (5.75**)	0.17 (2.66**)	0.11 (3.64**)
Preference for online advertising	0.12	0.02 (2.29*)	0.06 (1.16)*	0.10 (0.35)
Learning by doing	0.28	0.10 (2.73*)	0.16 (1.72°)	0.11 (2.55*)
Media multitasking	0.28	0.12 (2.38*)	0.12 (2.38*)	0.10 (2.73**)
Global Fit SEM				
χ^2(df)	186.97 (139)	29.42 (35)	37.86 (35)	486.56 (142)
CFI	0.97	1.00	1.00	0.77
RMSEA	0.04	0.00	0.02	0.11
SRMR	0.06	0.03	0.03	0.10

Notes: Attitude OSN communication= Attitude towards online social network communication.
°p <0.10, *p <0.05, ** p <0.01

Table 4.   Alternative model testing

6   Discussion, Implications and Future Research

This study makes several key contributions. First, the study detaches the idea of digital natives from the context of generations to account for heterogeneity in respective age groups and proposes the concept of DN as an appealing alternative that overcomes simplified, age-based conceptualizations of the underlying phenomenon. Second, the study presents a scale for the measurement of DN and shows that DN is a higher-order construct that consists of the dimensions expertise in digital media, sophisticated digital media use and sophisticated mobile media use. Individuals scoring high on these three dimensions exhibit a high level of DN. High expertise regarding digital media, Internet usage beyond browsing, e-mailing and simple transactions, and the sophisticated use of mobile media differentiate people with respect to digital media use and its consequences. Third, the study shows that early and ubiquitous accesses to digital media positively affect a person's level of DN and that age does not significantly relate to the proposed construct. Thus, contrary to popular theories and concepts such as digital natives (Prensky, 2001b), net generation (Tapscott, 1998) or millennials (Howe and Strauss, 2000), this research finds that age is not driving differences in individuals' digital media behaviour and attitude. Fourth, this study identifies attitude towards online social network communication, preference for online advertising, learning by doing, and media multitasking as consequences of higher levels of DN. Fifth, this study reveals that the second order construct DN better explains variations in attitude towards online social network communication, preference for online advertising, learning by doing, and media multitasking than does age or alternative representations of DN.

While generational concepts like "digital natives" or "net generation" added to the technology acceptance model (TAM) by investigating consequences of individuals' digital media usage, this study's model further accounts for individual heterogeneity. As it is likely that the TAM becomes less relevant due to more common Internet skills and experiences (Laroche, 2010), and several researchers criticize generational concepts for being purely age-based (e.g., Bennett and Maton, 2010), DN can be a useful alternative concept for researchers in the digital age.

This study helps managers to better understand technology-based heterogeneity in their customer base. Managers could use an individual's level of DN as a valuable criterion for segmentation. This study shows that managers should target people with a higher level of DN via social media marketing. Managers also learn that people with a high level of DN prefer online advertising over traditional advertising. In addition, this study suggests that it may not be necessary for companies to provide extensive product manuals, as people with a higher level of DN rely much more on learning by doing. Providing product manuals and feature descriptions via an integrated online communication strategy could be an alternative for companies that predominantly target people with high levels of DN. DN not only impacts companies' communication strategies, but also affects all organizational and managerial levels of companies. As people with a higher level of DN value and intensively engage in online social network (OSN) communication, they can be expected to engage in OSN communication at the workplace and consequently employers must develop responsive strategies. This study's findings indicate that people with a high level of DN are also more likely to multitask and thus multitasking between OSN communications and working may not necessarily be detrimental to work productivity, but should be considered by each company individually. In this respect, the DN construct can be an additional assessment tool for human resource managers in the recruiting process.

DN is a phenomenon with effects beyond academia and management. Policy makers should understand that DN is not linked to age. This implies that education systems and other governmental services (e.g., e-governance) should account for differences between people with high and low levels of DN. Consequently, more individually tailored education and communication solutions are needed. Prior research shows that digital media can have negative implications such as stress induced by e-mails (Barley et al., 2011) or online social networks (Maier et al., 2012). In this context, the DN construct might be an important factor that to date has not been investigated.

Although this study makes a number of substantial contributions, it is limited to an investigation at a specific point in time. Further research in this field should seek to employ a longitudinal perspective to investigate changes in the levels of DN. Further research should try to replicate the results in other countries or cultures and by using additional data collection approaches. The results of this study should, for instance, be validated with data collected through additional online platforms (e.g., Twitter, Foursquare) or collected in schools. Although this study involved a number of antecedents and consequences of DN, additional variables that are related to DN, such as anxieties regarding Internet privacy or risk aversion, could provide academics and practitioners with further interesting insights. Future research could use this study as a basis to further explore this theoretically and managerially relevant field of research.

Appendix

Construct (Items)	Mean	SD	EFA Factor Loadings
Expertise in digital media (adapted from Keaveney and Madhavan, 2001; Kleiser and Mantel, 1994)			
I keep current on the most recent developments in digital media.	4.05	1.77	0.81
I consider myself a digital media expert.	3.29	1.71	0.85
My knowledge of digital media helps me to understand very technical information about these products.	4.32	1.89	0.85
Sophisticated digital media use (adapted from McKnight et al., 2002)			
I regularly use video platforms (e.g., YouTube, MyVideo, Clipfish) on the Internet.	5.05	1.72	0.67
I regularly use online communication tools (e.g., Chats, Blogs, Internet forums).	4.69	2.08	0.76
I regularly use online information services (e.g., Wikipedia).	5.81	1.41	0.78
Sophisticated mobile media use (adapted from McKnight et al., 2002)			
I regularly access the Internet on my mobile phone.	3.73	2.41	0.71
I regularly compose and receive e-mails on my mobile phone.	3.74	2.50	0.84
I regularly use the online route planning function on my mobile phone.	3.01	2.12	0.81
Ubiquitous access (adapted from Lee et al. 2007)			
I can access a computer or laptop whenever I want to.	5.85	1.56	0.85
I can access a mobile phone whenever I want to.	6.54	1.01	0.69
I can access the Internet whenever I want to.	5.78	1.66	0.79
Learning by doing (adapted from Smart and Csapo, 2007)			
When I acquire a new technological appliance, I like to try it out immediately.	5.63	1.57	0.70
I rarely read manuals for new technological appliances.	5.22	1.87	0.75
When dealing with new technological appliances, I stick to learning by doing.	5.80	1.28	0.80
Media multitasking (adapted from Kaufman et al., 1991; Rohm et al., 2009)			
On my computer, I like to perform several tasks simultaneously.	4.93	1.80	0.53
I often use several media (e.g., computer, TV, newspapers) at the same time.	5.23	1.83	0.52
Attitude towards online social network communication (adapted from Ellison et al., 2007)			
Due to the existence of online social networks, it is easier to stay in touch with my friends.	4.35	1.99	0.73
Online social networks are meaningful communication tools in addition to mobile phones and short messages.	5.08	1.64	0.77
Personal communication decreases due to online social networks. (R)*	4.05	1.81	0.48
Preference for online advertising (adapted from Ducoffe, 1996)			
Compared to traditional advertising, online advertising is more entertaining.	2.94	1.60	0.92
Compared to traditional advertising, online advertising is more enjoyable.	2.72	1.35	0.94
Compared to traditional advertising, online advertising is more pleasing.	2.89	1.55	0.89
Early access to digital media (informed by Vandewater et al., 2007)			
I have been using digital media (e.g., computers, mobile phones, Internet) since my youth.	5.25	2.09	n.a.
Age	31.9	12.01	n.a.

Notes: (R) reverse coded item. *Item dropped for CFA and SEM.

Table 5.   Items

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