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Personal network on the Internet: How the socially marginalized stay marginalized in personal network diversity and multiplicity

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ABSTRACT

The Internet by its asynchronous and non-spatial nature may facilitate the diverse and multiple personal networks, but we hypothesize that this network affordance will be heavily influenced by one's socio-demographic positions. To test this hypothesis, we used a large survey data set of Internet users (n = 3,120) and examined how users' socio-demographic positions interact with Internet access to shape the affordance of network diversity and multiplicity. We found significant interactive effects, while network diversity, as indicated by homogeneity and heterogeneity, was not directly impacted by social positions. The effects of network multiplicity on personal wellbeing also differed by socio-demographic background. We argue that, without an understanding of socio-demographic disparities, a focus on Internet affordance fails to recognize the social reproduction in the creation and the benefits of personal networks.

1. Introduction

The Internet has enabled a shift from face-to-face relationships to network-based societies in which close interpersonal contacts can be established, expanded, or corroborated (Castells, 1996; Robinson et al., 2003). Just as the telephone in its inception provided individuals with a new way of establishing personal contacts independent of the constraints of physical distance (Pool, 1983) or social stratum (Fischer, 1994), the Internet may enable the creation of diverse personal networks that are less bounded by one's socio-economic status and are supportive of social wellbeing. Recent theories about the digital transformation of personal networks have been marked by a continuing debate over whether communities are becoming more fragmented or more integrated. Some researchers have argued that information and communication technologies (ICTs) help to break down barriers and decrease fragmentation by bringing together people in alienation (Castells, 1996; Robinson, 2003). On the other hand, many have contended that the Internet, mobile devices, and social media accelerate the insularity of personal networks, isolating them from each another. In this debate, however, little attention has been paid to how technologies intersect with a diverse variety of socio-demographic factors such as race, ethnicity, gender, education, and income to incubate the affordance of new personal networks. Further, little research has examined how this interplay may or may not translate into resource-enhancing personal outcomes that enable marginalized people to widen their networks.

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This paper aims to understand how Internet access in interaction with stratified offline conditions is conducive to building personal networks, with a particular focus on under-resourced communities. We argue that the debates concerning the digital transformation of personal ties may benefit from obtaining an understanding of (1) how existing social backgrounds influence people's ability to create personal networks online and (2) how different social groups benefit from their networks, potentially exacerbating disparities between haves and have-nots. Our central thesis is that ICTs, especially the Internet, may support diverse and multiple personal networks but that they do so within the context of existing social layers. We test this proposition using five socio-demographic indicators (education, income, age, gender, and having a child at home). Our evidence supports the conclusion that Internet access encourages the creation of multiple personal networks, but that such benefits are concentrated and exclude groups who are socially marginalized by education, income, and/or age, as the creation and functioning of personal networks are deeply tied to social stratification.

2. Personal network stratification

The Internet, in its asynchronous and non-spatial capabilities, allows individuals to assemble easily and reach out to distant contacts. Foremost, the Internet affords communication across times and space, lending itself to the creation of a network that can be sustained regardless of the physical or temporal constraints. From this, it is often posited that the Internet produces social capital and associated activities that make it easier for low-status people to form relations with high-status others (see Benkler, 2006). By facilitating the interactions among close and distant friends, family members, and those with similar or dissimilar interest in various venues and sizes, Internet can redefine modes of personal connection beyond social as well as geographical boundaries. For instance, even an email directory can enable new friendships as it can include distant others and foster wider and more diverse networks of discussion. Social media such as Facebook and Twitter can also serve as enablers of interaction, as users follow the status of friends and interject comments, potentially bringing out positive resources into their lives.

Despite the enabling possibilities of the Internet, however, it may also be possible that this account considers only the most optimistic scenario, one that is immune to status inequalities. Empirical studies make it clear that the use of new technologies is by no means uniform and consistent across groups. In an alternative scenario, the Internet's non-spatial and asynchronous capacities for network diversity and abundance may not enable a certain stratum of society, namely without access to resource and skills (DiMaggio et al., 2001; Neuman et al., 2011; Wellman, 2004; Hindman, 2008). There is a long tradition of scholarship (DiMaggio et al., 2001; Wellman, 2004) that suggests that the development of network contacts is not impervious to social and demographic variations. Rather, gaining resource-enhancing personal contacts is more likely when existing ties are already strong (Haythornthwaite, 2002; Lin, 1999) and, as a result, a portion of society may be unable to utilize the relationship between ICTs and multiple and diverse forms of networks to fertilize their social well-being.

Decades ago, Pierre Bourdieu (1984) provided the conceptual foundation by which persistent social stratification can explain differences in the utilization of new technologies. Bourdieu's understanding is that the development of cultural capital is a disposition that evolves out of one's social position. Such skills as artistic appreciation, for instance, are not just individual attributes as is commonly perceived, but a product of participation in a particular social class. For Bourdieu, this type of cultural capital helps to maintain social hierarchies that become more firmly ossified over time, to the extent that societal positions are reproduced and the dominant classes retain prestige. In our view, Bourdieu's conception should serve as the starting point for investigating the differential effects of the Internet in sustaining or limiting network-building possibilities. Notable researchers (e.g., Donohue et al., 1975; Neuman et al., 2011, Zillien and Hargittai, 2009) have convincingly argued that Bourdieu's critical insight of stratification can be applied in various contexts of differentiated online uses, as accumulated advantages across socio-demographic statuses tend to widen existing societal gaps. This work is significant because these researchers refute the monolithic assumption that the Internet will lead uniformly to an increase of personal betterment and positive consequences in people's lives.

It thus appears that the Internet may reinforce and potentially increase, rather than decrease, network inequities by benefiting higher-status individuals who can secure and digest additional network contacts more efficiently than those from lower social backgrounds. This means that the affordance of personal networks online may be concentrated in highly selected social contexts and be less pronounced among those who are underprivileged in terms of social, human, and financial capital (Donohue et al., 1975; Neuman et al., 2011; Steyaert, 2002). In short, one's ability to create, build, and maintain personal contacts, and to translate those network ties into advantages in one's life, may be dependent on one's socialization (Zillien and Hargittai, 2009), which is deeply embedded in established disparities.

2.1. Hypotheses and empirical expectations of this study

The personal networking opportunities afforded by the Internet are our central focus in this paper. Given the importance of social background in the creation of diverse and multiple personal ties, this paper examines (1) how the diversity and multiplicity of one's personal networks are influenced by socio-demographic characteristics in interaction with Internet access, and (2) how those network contacts translate into beneficial personal outcomes, conditioned by socio-demographic background. Prior studies on social capital (Putnam, 2000; Wellman, 2004) and capital-enhancing activities have provided a solid foundation for developing empirical expectations. More specifically, advanced studies on network contacts (Boyd, 2006, for

social media friends; Hampton and Wellman, 2003; Zhao, 2006) have presented evidence that serves as an incubator in the field and established a tremendously fruitful agenda in this debate.

Our contribution is a systematic attempt to advance our understanding of social stratification and to call particular attention to under-resourced communities (older persons, those with low levels of education and income, females, and those with a child at home) (Chen and Wellman, 2005; DiMaggio et al., 2001; NTIA, 1999; Howard et al., 2001) for whom socio-demographic factors often explain differences in Internet activities. There is no direct evidence that suggests the precise nature of the relationships between socio-demographics and personal networks on the Internet. Still, we believe we have the sufficient grounds to suspect persistent influence of socio-demographic conditions, as systematic evidence (Bimber, 2000; Bonfadelli, 2002; Katz and Rice, 2002; Park, 2013, 2015a,b; Wellman, 2004; Zillien and Hargittai, 2009) consistently indicates that persons of higher levels of education and income, men, younger people, and those with no household duties associated with child rearing tend to use the Internet more effectively and for greater benefit than less privileged users.

While our central focus is on the function of social antecedents, it is certainly also necessary to measure the effects of Internet access on its affordances. Numerous empirical studies on various domains of Internet use (e.g., Boase and Wellman, 2006; Hsieh, 2012; cf. Kushin and Yamamoto, 2010; cf. Skoric and Park, 2014) have shown positive associations between online access indicators and the development of social capital. In our analysis of network benefits, distinctive types of personal networks should be regarded as contextual factors of Internet access, as they may be crucial amplifying agents fostering personal well-being. In other words, the benefits would not accrue if one did not already have technological access to the desired network contacts. Here it is reasonable to expect interactions between socio-demographic conditions and Internet access, based on the expectation, consistent with Bourdieu's conception, that social positions will remain differentiated through the varying possession and use of certain types of social resources (Chen and Wellman, 2005). For instance, use of the Internet by people of high status may tend to lead to the amassing of further resources through their friends, networks, and quality contacts, whereas people of lower status may not only have limited Internet access, but also fewer or no skills or resources permitting them to use the opportunities offered by the Internet to improve their positions (Robinson et al., 2003). In sum, the distinctive distribution of online resources according to one's social position is the premise underlying our predictions in this study.

We are primarily interested in two dimensions of personal networks: diversity and multiplicity. These dimensions recognize (1) the diverse *types* of personal contact, i.e., how homogeneous or heterogeneous one's personal contacts are, and (2) the multiple *modes* of personal contact, i.e., the extent of variance in the ways in which one's contacts are established online (cf. Boase and Wellman, 2006). Studies (e.g., Bastani, 2007; Campbell et al., 1986; Hsieh, 2012; Hsieh and Li, 2014) have suggested that the multiplicity of one's personal network is associated with access to diverse resources and information, and that the attributes of network heterogeneity may enhance a person's social and political activities (Carpini et al., 2004; Lin, 1999). Similarly, Baym et al. (2004) suggested a relationship between college students' use of interactive media such as the Internet (as opposed to other media channels; see Ramirez and Zhang, 2007) and the characteristics of social circles. In this sense, the consideration of various attributes that may contribute to potential social disparities in the creation and the benefit of personal networks remains a promising area of inquiry. We seek to advance understandings of (1) the two distinctive dimensions of personal network diversity and multiplicity, (2) the incubation as well as the function of these network characteristics, and (3) the theoretical grounding of these findings in broader implications of social stratification.

In line with the preceding discussion, we formulated two hypotheses (H1 on the creation of personal network and H2 on the benefit gained from personal network) with the interactive relationships in each of the two hypotheses:

H1: Despite the new opportunities offered by Internet access, socio-demographic differences will persist in the distinctive dimensions of personal network diversity and multiplicity.

H1.1: The differences based on social strata will be large and significant in interaction with different Internet access levels, controlling for the direct effect of Internet access.

H2: Personal network diversity and multiplicity will have significant and sizable impacts on personal well-being in one's Internet use.

H2.1: However, the levels of positive impact will differ according to socio-demographic background and will be weaker among socially marginalized users.

3. Method and data

3.1. Participants

Testing these empirical expectations requires a large sample derived from probability sampling. Additionally, the sample must include participants from a variety of backgrounds to adequately capture socio-demographic stratification in a nation. To meet these criteria, we selected a U.K.-based dataset provided by the Oxford Internet Institute (OII). The OII surveys are representative random samples of about 2000 individuals in England, Scotland, and Wales. The participants for this study were recruited in 2009 based on a multistage sampling design. In the first stage, 175 paired districts, stratified by region, were randomly selected; in the second stage, within each of the randomly selected districts, interviewers were given 10 randomly selected addresses, from which they recruited potential interviewees (age 14 or older by their next birthday). Because the OII is a door-to-door survey based on face-to-face contact, it achieves a relatively high response rate (62%).

The overall characteristics of the 2009 OII survey sample closely matched the target U.K. parameters of age (26% over 65), gender (58% women), income and education (25% D and E, or the lowest U.K. classifications, for socioeconomic level), and other regional indicators (Scotland 9% and Wales 4%). The final sample for our analysis was limited to current Internet users (n = 3,120), excluding those who dropped their Internet service and non-Internet users. The U.K.'s relatively high Internet penetration rate makes its online user population unique and distinct from those in the U.S. or developing nations. Still, the stratified conditions under which users are situated remain fundamentally similar across nations. In addition, in the Internet user sample, the variations within each stratum remain similar to those in the general population. That is, in the Internet user sample, there exist considerable variations within each stratum, such as age (*Median* = 40, *SD* = 16.18), gender (57.1% women), income (*M* = 3.15, *SD* = 1.46, in a six-scale classification), the status of having a child at home (41% yes), and education (*M* = 8.42, *SD* = 5.69, in a scale anchored from 0 for no diploma at all to 18 for a doctoral degree), providing a fruitful dataset with which to test our predictions.

3.2. Measures

3.2.1. Personal network diversity

Measures of network diversity derive from the two related dimensions of heterogeneity and homogeneity. Here the logic is to measure the extent of one's network diversity in terms of similarity or dissimilarity, as indicated by various characteristics of personal contacts. For each dimension, respondents were asked to answer the following question on a five-point scale ranging from "greatly decreased" to "greatly increased": "Has your use of the Internet increased or decreased contact with [Insert group]?" The inserted groups included: (1) "family," (2) "friends," (3) "people who [share/do not share] your personal interests," (4) "people who [share/do not share] your religious views," and (5) "people who [share/do not share] your political positions." Items 1 and 2 each included two questions: one for those living nearby and those farther away.[1] Items 3, 4, and 5 each included two questions: one for contacts who share and one for contacts who do not share the named characteristics. We added together the items in each dimension to create an additive index (*M* = 15.25, *SD* = 2.75, alpha = .62, for heterogeneity; *M* = 14.88, *SD* = 2.41, alpha = .67, for homogeneity).

3.2.2. Personal network multiplicity

Measures of network multiplicity were based on the number of modes of personal contact, as indicated by the presence (yes = 1) or absence (no = 0) of use of Internet-based communicative channels including (1) social networking sites (e.g., Facebook), (2) email, (3) discussion groups and directories, (4) chat rooms, (5) personal weblogs, (6) interactive game sites, (7) instant messaging, (8) dating sites, (9) virtual world (e.g., Second-Life), and (10) online communities. Respondents were asked to answer either yes or no to the following question: "Have you met someone through [Insert channel]?" Just as we did with network diversity, we added the items to create an additive index (*M* = 0.92, *SD* = 1.74, alpha = .81).

3.2.3. Personal well-being

Measures of well-being were based on the presence or absence of perceived personal benefit in each of four distinct dimensions: (1) health, (2) event information, (3) saving money, and (4) job-seeking. Respondents were asked on a binary scale (yes = 1, no = 0) whether using the Internet has helped them to improve their health (*M* = 0.43, *SD* = 0.49), find out about an event (*M* = 0.59, *SD* = 0.49), save money by shopping online (*M* = 0.73, *SD* = 0.44), or find a job (*M* = 0.15, *SD* = 0.36).

3.2.4. Socio-demographics

We included five primary measures of socio-demographic characteristics, as prior research suggests that age, gender, education (Katz and Rice, 2002), income (Van Dijk, 2005), and the status of having a child at home (cf. Horrigan and Rainie, 2002; Kennedy, 2002) are consistent predictors of individual differences in Internet use.

3.2.5. Internet access

We measured variations in individual Internet access on two dimensions: (1) number of hours of Internet access weekly at work, school, and home (*M* = 17.17, *SD* = 8.84), and (2) number of Internet access locations, treating library, school, home, another person's home, work, travel, and Internet cafés as distinct possible venues (*M* = 2.06, *SD* = 1.20) see Table 1 for all measures.

4. Results

Hypothesis 1 predicted associations between socio-demographic factors for the two dimensions of personal network diversity and multiplicity, despite the positive influence of Internet access. Hypothesis 1.1 further predicted the interaction

[1] For family and friend contacts, distant contacts were classified as heterogeneous and close contacts as homogeneous. This makes sense because geographical proximity tends to help mitigate potential misunderstandings, or make it easier to make connections, while monitoring cost tends to increase with the greater distance. We ran separate regressions without family and friend contacts, but found no significant difference in our findings.

Table 1
Means and standard deviations for measures.

		M	*SD*
Internet access			
1. Number of Access Location		2.06	1.20
2. Amount of Access Time (Hours Per Week)		16.0	8.84
Network multiplicity			
1. Met someone through: Social network sites (e.g., Facebook, My Space)		0.21	0.40
2. Met someone through: Online dating site		0.04	0.21
3. Met someone through: Discussion group or bulletin board		0.07	0.25
4. Met someone through: Message board or comment on a personal website/blog		0.06	0.25
5. Met someone through: Instant messaging (e.g., Yahoo! Messenger, Skype chat)		0.11	0.32
6. Met someone through: Email		0.16	0.37
7. Met someone through: Multiplayer online game (e.g., World of Warcraft, Halo)		0.04	0.21
8. Met someone through: Chat room		0.09	0.29
9. Met someone through: Online community (e.g., hobby groups, interest groups, Flickr)		0.07	0.26
10. Met someone through: Virtual world (e.g., Second Life)		0.02	0.15
Network diversity of heterogeneity and homogeneity			
1. Has Internet use increased/decreased contact with: Family nearby	Homogeneity	3.10	0.56
2. Has Internet use increased/decreased contact with: Family living further away	Heterogeneity	3.40	0.81
3. Has Internet use increased/decreased contact with: Friends nearby	Homogeneity	3.17	0.57
4. Has Internet use increased/decreased contact with: Friends living further away	Heterogeneity	3.44	0.80
5. Has Internet use increased/decreased contact with: People who share my interests	Homogeneity	3.14	0.67
6. Has Internet use increased/decreased contact with: People with different interests	Heterogeneity	2.98	0.62
7. Has Internet use increased/decreased contact with: Someone who share my religious beliefs	Homogeneity	2.72	0.96
8. Has Internet use increased/decreased contact with: Someone with different religious beliefs	Heterogeneity	2.69	0.96
9. Has Internet use increased/decreased contact with: People who share my political views	Homogeneity	2.72	0.94
10. Has Internet use increased/decreased contact with: People with different political views	Heterogeneity	2.71	0.92

terms, i.e., that the effects of Internet access on personal network diversity and multiplicity would differ across socio-demographic groups. To test the hypotheses, we conducted three separate hierarchical regression analyses.

As Table 2 shows, Internet access, indicated by both time and location, had a significant impact on network multiplicity. However, there was no direct impact of Internet access on the two dimensions of network diversity, i.e., contact with similar and with dissimilar people (homogeneity and heterogeneity, respectively). Regression analyses reveal support for H1. Socio-demographic factors had a persistent effect on network multiplicity: older users and females were less likely to have network multiplicity, and users with higher education were more likely to utilize multiple modes of network contacts than those with lower education. Education had a positive effect on both network heterogeneity and homogeneity, and income was positively associated with network heterogeneity. There was no direct effect of gender, age, or having a child at home on either dimension of network diversity. However, the interaction terms show that education interacted with access time to affect contact with both similar and dissimilar people (homogeneity and heterogeneity). In terms of network multiplicity, we once again found an interaction between education and access time, and age and gender interacted significantly with access time to explain network multiplicity; these results collectively indicate support for H1.1.

Hypothesis 2 predicted significant and sizable effects of network diversity and multiplicity on personal well-being as a result of Internet use. Hypothesis 2.1 further predicted that the positive impacts of network diversity and multiplicity would differ by socio-demographic background. The results shown in Table 3 indicate positive and significant associations between network multiplicity and three of the four dimensions of personal well-being (health, event information, and job-seeking). In contrast, network diversity had no direct impact on any measures, providing partial support for H2. The findings concerning the interactions supported H2.1. We found that network multiplicity interacted with both age and gender in facilitating the benefit of job-seeking on the Internet, and the interaction between gender and multiplicity was also significant in enabling cost saving online. Education played a consistent role, as it interacted with network heterogeneity in job-seeking and event information. Finally, the interaction between the status of having a child at home and network heterogeneity was significant for the benefit of finding event information online, but the significance level was marginal. Fig. 1 summarizes the significant main predictors.

5. Discussion

In this paper, we have addressed the question of what effect one's socio-demographic position may have on the ability to build a personal network of dispersed and multiple personal ties, with specific respect to online environments. We found, as predicted, that the Internet may not empower underprivileged groups to increase their personal networks in such a way as to benefit their personal well-being relative to others in discrete dimensions; instead, the Internet adds to existing degrees of social stratification along five lines (age, education, income, gender, and having a child at home). We have argued that online personal ties are not a distinct product of an individual user's activity, independent from existing layers of social status and position. Rather, the Internet seems to bring forth a new, digital form of status reproduction, in which personal network use

Table 2
OLS regression (n = 1,318) for personal network.

	Network multiplicity	Network heterogeneity	Network homogeneity
Age	−0.217***	0.048	0.021
	[0.004]	[0.006]	[0.005]
Gender (High = Female)	−0.130***	0.028	−0.026
	[0.117]	[0.175]	[0.154]
Income	−0.033	0.103**	0.044
	[0.041]	[0.062]	[0.054]
Education	0.099**	0.074*	0.062†
	[0.011]	[0.016]	[0.014]
Child at home	−0.01	0.026	−0.003
	[0.122]	[0.184]	[0.162]
R square	0.073	0.023	0.01
	0.102**	0.036	0.046
Access location	[0.056]	[0.084]	[0.074]
	0.089*	0.044	0.034
Access time (hours per work)	[0.007]	[0.011]	[0.010]
Inc. *R* square	0.02	0.003	0.003
Age × location interaction	0.124	0.1	0.083
	[0.004]	[0.006]	[0.005]
Age × time interaction	−0.354**	−0.061	−0.033
	[0.000]	[0.001]	[0.001]
Gender × location interaction	0.02	0.089	0.091
	[0.108]	[0.165]	[0.146]
Gender × time interaction	−0.172*	0.06	0.038
	[0.015]	[0.022]	[0.020]
Income × location interaction	0.14	0.007	−0.055
	[0.036]	[0.055]	[0.049]
Income × time interaction	−0.149	−0.047	0.053
	[0.005]	[0.008]	[0.007]
Education × location interaction	0.198†	0.121	0.056
	[0.010]	[0.016]	[0.014]
Education × time interaction	−0.437***	−0.386**	−0.229†
	[0.001]	[0.002]	[0.002]
Child at home × location interaction	0.081	0.01	0.065
	[0.111]	[0.170]	[0.150]
Child at home × time interaction	0.031	−0.004	−0.021
	[0.016]	[0.024]	[0.021]
Inc. *R* square	0.027	0.018	

Notes: Each level of explanatory variables was entered in the order of socio-demographics and Internet access in hierarchical regression analyses. Separate analyses were conducted for interaction terms, after controlling all prior blocks that included all the variables of Internet access and socio-demographics. Entries are standardized final regression coefficients, with standard errors in parentheses.
† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

and its consequences are highly socially conditioned (see DiMaggio et al., 2001; Hindman, 2008; Neuman et al., 2011; Wellman, 2004; Zillien and Hargittai, 2009).

These observations are not intended to disregard the enabling role of the Internet. As a channel of communication exchange, the Internet offers unique affordances in terms of how people can create and benefit from network contacts. In this regard, we found (1) that Internet access time and location had a positive impact on network multiplicity, meaning that users could make contact with other people in different ways, and (2) that network multiplicity in turn was positively associated with benefits in job-seeking, health, and event information seeking. Instead, our central argument is that while the Internet certainly offers great possibilities for people to construct new personal networks, it also remains fundamentally structured by their social and demographic positions. In our view, what is significant here is not just that Internet access opens up multiple and diverse forms of new networks, but that its affordances and the benefits gained from this access evolve in different ways according to the strength and the prestige of existing social positions (Bourdieu, 1984; Donohue et al., 1975; Neuman et al., 2011; Zillien and Hargittai, 2009).

In fact, as beneficial as the effect of Internet access may be in terms of network multiplicity, those in the best position to take advantage of the multiple modes of network contacts tended to be younger, more educated, and male. Also, as higher-income people were more likely than others to have a heterogeneous online personal network, it is apparent that income level continues to contribute to social disparity (Chen and Wellman, 2005; Wellman, 2004; Zillien and Hargittai, 2009). Most notably, people with more higher-education people were more likely to use the Internet to make not only heterogeneous but

Table 3
Logistic regression (n = 1,318) for personal wellbeing.

	Job-seeking		Health		Event info		Cost-saving	
Network multiplicity	0.149***	1.161	0.186***	1.205	0.241***	1.272	0.052	1.053
	[0.046]		[0.044]		[0.057]		[0.054]	
R square		0.118		0.083		0.147		0.095
Network heterogeneity	0.019	1.019	0.012	1.012	0.005	1.005	0.012	1.013
	[0.037]		[0.028]		[0.030]		[0.032]	
R square		0.109		0.063		0.126		0.094
Network homogeneity	0.017	1.017	0.006	1.006	−0.019	0.981	−0.004	0.996
	[0.042]		[0.031]		[0.034]		[0.036]	
R square		0.109		0.063		0.126		0.094
Network multiplicity × age interaction	0.005†	1.005	0.002	1.002	0.000	1.000	0.002	1.002
	[0.003]		[0.003]		[0.003]		[0.003]	
Network multiplicity × gender interaction	0.210*	1.233	−0.039	0.962	−0.135	0.874	−0.336**	0.715
	[0.098]		[0.092]		[0.121]		[0.126]	
Network multiplicity × income interaction	0.029	1.029	−0.020	0.980	−0.040	0.960	0.004	1.004
	[0.033]		[0.032]		[0.042]		[0.041]	
Network multiplicity × education interaction	−0.009	0.991	0.005	1.005	−0.011	0.989	−0.003	0.997
	[0.010]		[0.009]		[0.012]		[0.012]	
Network multiplicity × child interaction	−0.106	0.899	0.043	1.043	0.004	1.004	−0.030	0.970
	[0.102]		[0.097]		[0.124]		[0.121]	
Inc. *R* square		0.01	0.001			0.004	0.009	
Network heterogeneity × age interaction	0.004	1.004	0.002	1.002	−0.001	0.999	0.000	1.000
	[0.003]		[0.002]		[0.002]		[0.002]	
Network heterogeneity × gender interaction	−0.069	0.933	−0.077	0.926	−0.039	0.962	−0.109	0.896
	[0.087]		[0.064]		[0.066]		[0.074]	
Network heterogeneity × income interaction	−0.020	0.980	0.022	1.022	0.000	1.000	0.009	1.009
	[0.029]		[0.022]		[0.024]		[0.027]	
Network heterogeneity × education interaction	−0.017*	0.983	−0.004	0.996	0.012*	1.012	0.009†	1.010
	[0.008]		[0.005]		[0.005]		[0.006]	
Network Heterogeneity × Child Interaction	−0.031	0.969	−0.071	0.931	0.114†	1.121	0.111	1.117
	[0.084]		[0.061]		[0.067]		[0.076]	
Inc. *R* square		0.007	0.007		0.009		0.009	
Network homogeneity × age interaction	0.001	1.001	0.001	1.001	0.000	1.000	0.000	1.000
	[0.003]		[0.002]		[0.002]		[0.002]	
Network homogeneity × gender interaction	−0.104	0.901	−0.111	0.895	−0.135†	0.917	−0.165†	0.848
	[0.097]		[0.072]		[0.081]		[0.087]	
Network homogeneity × income interaction	−0.003	0.997	0.036	1.036	−0.003	0.997	−0.034	0.967
	[0.032]		[0.025]		[0.027]		[0.031]	
Network homogeneity × education interaction	−0.015†	0.985	0.003	1.003	0.014*	1.014	0.010	1.010
	[0.009]		[0.006]		[0.006]		[0.007]	
Network Homogeneity × child interaction	−0.114	0.892	−0.105	0.900	0.128	1.137	0.110	1.116
	[0.091]		[0.069]		[0.080]		[0.086]	
Inc. *R* square	0.005		0.012		0.009		0.007	

Notes: Separate hierarchical logistic regression analyses were conducted for network heterogeneity, homogeneity, multiplicity and associated interaction terms, after controlling the prior blocks that included all the variables of network heterogeneity, homogeneity, multiplicity and socio-demographics. Entries are standardized final regression coefficients and log odds, with standard errors in parentheses.
† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

also homogeneous personal network contacts, hinting that education plays a powerful role in harnessing the Internet for all network building, whether with similar or dissimilar people (DiMaggio et al., 2001).

The results hold across a diverse set of interactive conditions. The interactive patterns displayed in the bar graphs on the upper row of Fig. 2 show that gender and age had dramatic effects in shaping the relationship between access time and network multiplicity. For instance, increased Internet access time was more likely to aid younger users than older users in creating multiplicity. Likewise, under the condition of greater Internet access time, men were more likely than women to translate this access time into multiple forms of network contacts. In assessing the effects of personal networks, the lower row of Fig. 2 also shows that higher levels of education magnified the disparities among those with higher levels of network heterogeneity and homogeneity. For example, more education helped people to use both dissimilar and similar networks in order to reap the benefits of obtaining event information via the Internet.

One significant interaction pattern is that in the case of network heterogeneity, people with less education benefited from greater access time to a greater extent than those with more education. We also see the function of multiplicity in facilitating the benefit of job-seeking among women to a far greater magnitude than among men. These results certainly indicate the Internet's potential to assistance people in less privileged positions in particular contexts (e.g., Bastani, 2007; Campbell

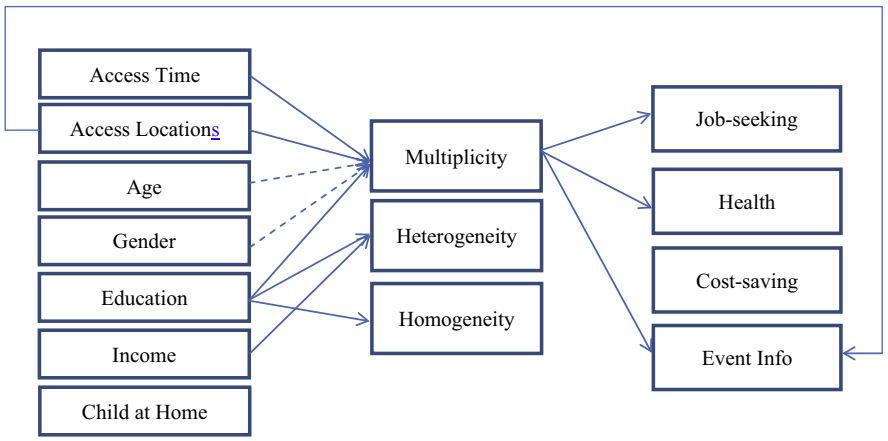

Fig. 1. Mapping of the creation and the benefit of personal network. *Note:* Only significant main predictors are shown, with solid arrows indicating positive effects and dotted ones indicating negative effects.

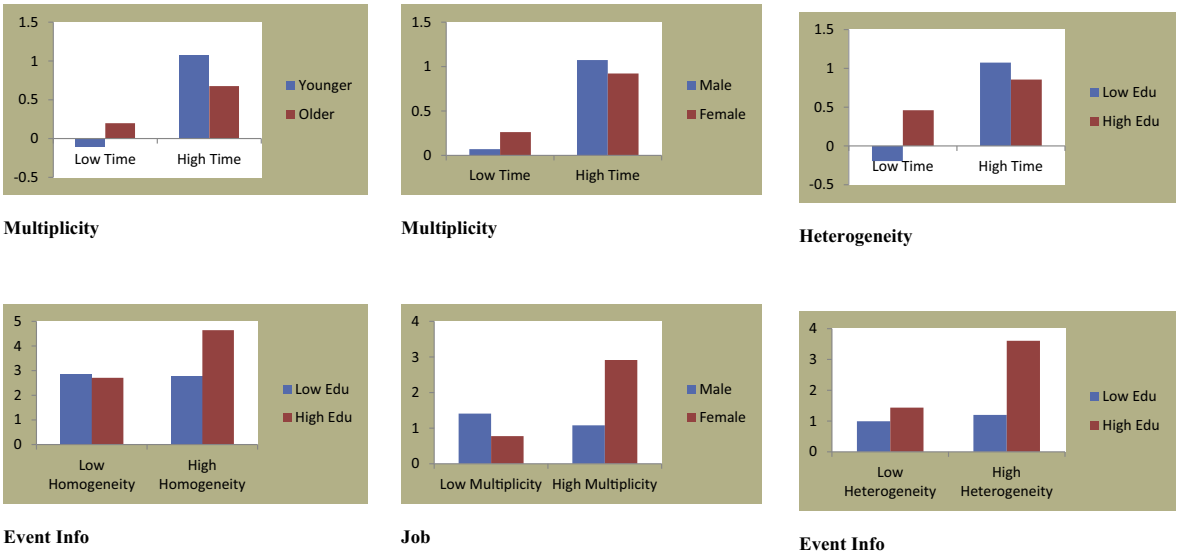

Fig. 2. Interaction relationships: network creation and benefit moderated by socio-demographics. *Note:* For all figures, the high or low group for each variable refers to those whose value for a respective variable was one standard deviation higher or lower than the mean.

et al., 1986; Chen and Wellman, 2005; Hsieh and Li, 2014). On the other hand, when Internet access time is less, the gap between people with lower and higher levels of education is magnified. As with heterogeneity, the disparity between men and women became obvious at the lower level of multiplicity, as men could still benefit more from the Internet in terms of job-seeking despite having a relatively low number of contact modes. Collectively, this pattern, coupled with the main finding that the status of one's online personal network can in fact be predicted by socio-demographic factors such as income and education, counters the claim that ICTs, especially the Internet, uniformly spur greater diversity and multiplicity of personal network contacts. Rather, the problem of the reproduction of status through personal online networks seems more complex and subtle, requiring nuanced qualifications to account for (1) the highly specific contexts in which Internet access occasionally plays an enabling role and (2) the powerful overriding impact of socio-demographic factors as a whole on the benefits received (Bonfadelli, 2002; Katz and Rice, 2002; Wellman, 2004).

It is interesting to note the lack of effect of network diversity on any of the four measures of personal benefits. In addition, network diversity was impacted only marginally, if at all, by social position. Our dataset does not enable us to discern the reasons why network multiplicity, more so than network diversity, follows the characteristics of social and demographic patterns and predicts one's ability to enhance well-being via the Internet. On the one hand, it is possible that the multiple modes of personal contact may be more immediate benefits of Internet access, as shown by the positive associations between network multiplicity and access time and location. On the other hand, the gap in heterogeneity or homogeneity of network relationships can be more invariant to technological platforms, as it persists to a lesser extent from one

technological platform to another and potentially has a less powerful effect on one's prospects of well-being in such areas as job-seeking, finding event information, saving money, and health. Supporting this interpretation, we note that our sample shows larger variations in diversity than in multiplicity. This eliminates the possibility that we are conservatively estimating the direct effects of network diversity due to reduced statistical power.

6. Conclusion, implications, and future research

Our central argument extends Bourdieu's (1984) premise into online contexts of differentiated personal networks, which holds that accumulated advantages across socio-demographic factors tend to widen existing societal gaps. This point is well demonstrated in the significant impact of socio-demographics on heterogeneity, as we also extend previous empirical research on the links between Internet use and deepening social divisions more broadly (e.g., Chen and Wellman, 2005; Donohue et al., 1975; Hsieh, 2012; Neuman et al., 2011; Zillien and Hargittai, 2009). In this sense, our study calls attention to the fact that the examination of personal networks must go beyond a simplistic account of new technological possibilities. Technologies matter in personal network creation and its benefits, yet their affordance depends on how one's social background interacts with the technology's potential (Bourdieu, 1984; cf. Kushin and Yamamoto, 2010, for political use of social media). In particular, our interactive findings show a more complex set of personal network conditions playing different roles among people from different social backgrounds. Accordingly, future research in this area should explore the context of mediated interactions with friends and family networks and the ways in which socio-demographic conditions support and suppress the creation and benefits of online personal networks over time.

In this regard, our study does not address whether the distinctive dimensions of personal networks will remain differentiated by socio-demographic background over the long term. For instance, we do not know whether Internet network affordance will remain limited or become more robust, as Internet access in most advanced nations is increasingly moving toward full penetration. Regardless, it will be important to observe whether the future brings deepening network disparities related to the key variables of income, education, gender, and age as documented in this work. Accordingly, we suggest an ongoing research agenda in this area that goes beyond the scope of the present study.

First, as our study relied on a cross-sectional dataset, the precise causal relationships behind the creation and the benefits of personal networks are left unexplained. In this vein, it is important to have longitudinal trend data that allows us to observe greater variations in network diversity and multiplicity as the overall Internet access gap shrinks. Second, our examination of the social antecedents and consequences of having dispersed and multiple personal networks was confined to Internet-related issues, but these network contacts do not occur in isolation from other digital platforms, notably mobile devices. It is important to consider how other portable devices, in interaction with computer-based Internet access, may contribute to exacerbating or alleviating network disparities between the haves and have-nots along various social and demographic lines. Third, as in most survey studies, our focus was on the overall stratification pattern of a general population; therefore, we could not address the context-specific effects associated with network diversity and multiplicity within a particular area of engagement, such as political involvement.

If personal network diversity and multiplicity can be predicted by one's socio-demographic background, we are perhaps witnessing the perpetuation of a trend according to which the rich are better off than the poor not only in economic well-being, but also in building personal contacts, and in which men, better educated people, and younger people are always more likely to create diverse and multiple modes of personal networks and benefit from them. At a deeper level, this situation creates a trap for disenfranchised or marginalized individuals as they encounter the dominant resilience of prestige even amidst the possibilities offered by new technologies. It is difficult to conclude whether social and demographic status is immutably linked to network disparities. But if this is the case, how to subvert this disheartening pattern should be a major task for policymakers and others who are concerned with equalizing opportunity for all citizens. Fundamentally, it means that we must reformulate the persistent premise that the affordance of personal networks and their benefits can be promoted by the enabling power of new ICTs, such as the Internet, alone.

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