Core Tech Support Networks and Digital Inequalities in American Disadvantaged Urban Communities

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This study originates the construct of core tech support networks to understand the most fundamental digital inequality issues that remain in disadvantaged communities. Beyond social inequalities, digital factors, and social capital, this study explores how three different characteristics of core tech support networks are related to digital inequalities, such as gaps in Internet use and basic digital skills. The results show that the overall size of core tech support networks and the better resources embedded in the networks can narrow gaps in Internet use and the presence of basic digital skills. However, they do not further improve the proficiency levels of basic digital skills. Core tech support networks’ composition based on tie strength is not related to inequalities in either Internet use or basic digital skills. This study provides both valuable theoretical and practical implications for digital inequalities and digital inclusion.

Lay summary

This study examines how core tech support networks (i.e., direct contact persons to whom individuals turn for assistance with basic computer and Internet use) can explain and address digital inequalities in disadvantaged communities. We find that if disadvantaged people have more core tech support contacts, they are more likely to use the Internet and to gain at least some basic digital skills. We also find that better-educated tech support contacts are useful when helping disadvantaged people become Internet users and gain basic digital skills. However, tech support contacts who are socially close to disadvantaged people are not that useful. Interestingly, after disadvantaged people gain basic digital skills, the core tech support contacts are not very helpful in further improving their proficiency.

Keywords: Digital Inequality, Digital Divide, Digital Inclusion, Social Network, Social Support, Social Capital, Disadvantaged Community

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Despite rapid Internet adoption in the United States, one out of 10 Americans still did not use the Internet as of 2019, and many more lacked adequate digital skills to independently or fully use the Internet (Pew Research Center, 2019). “Digital laggards,” a term used in the theory of diffusion of innovations (Rogers, 2010), often reside in disadvantaged communities, where their use of digital technologies is constrained by inadequate resources (Chen, 2013; Gangadharan, 2017; Gonzales, 2016). Studying the factors associated with digital inequalities in disadvantaged communities can provide insights into how to close or narrow the remaining digital divides.

Research on digital inequalities has increasingly moved to include a more nuanced understanding of these issues as multilayered and multidimensional (DiMaggio, Hargittai, Celeste, & Shafer, 2004; Robinson et al., 2015; van Dijk, 2005). Nevertheless, most studies on the factors associated with digital inequalities have focused on social inequalities marked by various sociodemographic and socioeconomic factors, as well as the interrelationships among different layers and dimensions of digital inequalities (Hargittai, 2010; Witte & Mannon, 2010). Questions remain regarding whether and how the relational factors embedded in social networks may shape digital inequalities (Chen, 2013), especially in disadvantaged communities. Although a growing body of research has begun to examine these factors (Chen, 2013; Selwyn, Johnson, Nemorin, & Knight, 2016; van Deursen, Courtois, & van Dijk, 2014), several important gaps remain with respect to their conceptualization and measurement.

To address these gaps, in this study, we originated and operationalized the concept of core tech support networks, which are defined as the direct social connections to whom people turn for assistance with basic computer and Internet use. Moreover, we explore how the different characteristics of core tech support networks, including network size, tie strength, and the embedded resources, may affect the most crucial digital inequalities in extremely disadvantaged urban communities, including inequalities related to Internet use and basic digital skills. The present study provides a fuller and more nuanced picture of how personal networks shape these digital inequalities while also taking into account (i.e., controlling for) the most frequently examined factors of digital inequalities, such as markers of social inequalities and digital factors like Internet access. In addition to its theoretical advancement, this study provides insightful policy suggestions regarding digital inclusion, especially in disadvantaged urban communities.

**Digital inequalities in disadvantaged communities**

Research on digital inequalities in the general population has largely shifted their focus from access inequalities to gaps in skills, usage, and outcomes (Hargittai, 2002; Helsper, 2012; Robinson et al., 2015). However, the percentage of Internet nonusers remains high in disadvantaged communities; the primary goals of increasing digital inclusion within these communities are still to bridge the basic gap in Internet use vs. nonuse and to help people gain basic digital skills (Gangadharan, 2017; Li, Chen, & Straubhaar, 2018). More broadly, local nonprofit organizations and public libraries often aim to help disadvantaged people become more digitally included by providing free computer and Internet access, as well as basic digital skills trainings (Thompson, Jaeger, Taylor, Subramaniam, & Bertot, 2014). Despite these efforts, it is still challenging to achieve even these basic goals. Disadvantaged families often adopt digital technologies at the cost of other important purchases (Katz & Gonzalez, 2016). Using cheap, low-quality digital devices and Internet services often results in additional costs for technology maintenance and discontinued adoption (Gonzales, 2016). Even though some people have access to free high-speed Internet, they often find that the Internet is too difficult to use (Li et al., 2018).
Accordingly, the present study focuses on two fundamental digital inequality issues—Internet use and basic digital skills—in one of the most disadvantaged communities in the United States—public housing communities—where the average household income is extremely low and most residents are unemployed, racially, and ethnically marginalized, and women. It further differentiates between the presence of and proficiency in basic digital skills, as moving from having no basic digital skills to having at least some basic digital skills is a big step for many members, especially adults, of disadvantaged communities. After accomplishing this step, their proficiency levels often remain low (Mamedova, Pawlowski, & Hudson, 2018; Witte & Mannon, 2010).

**Conceptualization of core tech support networks**

Beyond social inequalities and the interrelationships among different layers and dimensions of digital inequalities, early research has seminally but briefly indicated that social capital and social support, especially technical assistance, could be important factors to increase people’s motivation to become Internet users and improve their digital competence (DiMaggio et al., 2004; Warschauer, 2003). Current research on digital inequalities has empirically explored these relational factors embedded in social networks. For instance, a few studies showed that social capital, as indicated by network diversity, can help reduce the gap in Internet use vs. non-use not only among the general population (Chen, 2013) but also in isolated communities (Correa, Pavez, & Contreras, 2017). Several studies have explored social support related to computer and Internet use, especially focusing on its patterns and sources. For instance, some have explored whether such support comes more from informal sources, such as family members and friends, or formal sources, such as colleagues and professional technicians, while others have explored who are more likely to have access to such support (Courtois & Verdegem, 2016; Helsper & van Deursen, 2017; Tsai, Shillair, & Cotten, 2017; van Deursen et al., 2014). The roles of family members, especially children, in helping individuals adopt and use the Internet are found to be salient (Friemel, 2016; Katz, Moran, & Gonzalez, 2018; Tsai et al., 2017).

Other studies have found that both frequent Internet users and Internet nonusers or limited users receive this type of support from their social networks (Dolničar, Grošelj, Hrast, Vehovar, & Petrovič, 2018). In particular, Internet nonusers or limited users might not directly use the Internet themselves but instead rely on informal proxy users—that is, other people in their social networks who use the Internet on their behalf (Dolničar et al., 2018; Selwyn et al., 2016).

Building on the previous research on the relational factors of digital inequalities, we originated the construct of core tech support networks based on theories and studies of core networks, social capital, and social support. A core network is an ego-centric network, which includes a focal person, often called “ego,” and other contacts to whom ego is directly connected, often called “alters” (see Kadushin, 2012). A core network is a small subset of ego’s social networks and is composed of the direct contacts that are central to or important in ego’s life in a certain way, for instance, with whom ego can discuss important matters (Marsden, 1987), from whom ego can gain informal support during emergency situations (Hurlbert, Haines, & Beggs, 2000), and so on. Core networks are important sources of social support and are also highly influential in attitude formation (Hampton, Sessions, & Her, 2011; Wellman & Wortley, 1990). Social capital at the individual level refers to the resources embedded in one’s social networks that can be accessed and/or mobilized in purposive actions (Lin, 1999). It is often operationalized by the degree of diversity in one’s social networks (Lin, Fu, & Hsung, 2001). Social support, in general, is an immediate outcome or return of social capital and refers to perceived and/or actual and tangible and/or intangible aid that is obtained from people’s
social contacts, who often possess relevant resources (House, 1981; Lin, 1986; Wellman & Wortley, 1990).

We define core tech support networks as the direct social connections to whom people turn for assistance with basic computer and Internet use. Based on theories of core networks and social support, core tech support networks refer to the most important alters a focal person turns to for a specific type of support, that is, technical support. These core ties can be informal ties, such as family members and friends, and/or formal sources, such as instructors, librarians, professionals, etc. More importantly, they are the first several contacts to whom a person turns for assistance with basic computer and Internet use because they are available, are willing to help, and/or possess a certain level of digital resources (i.e., skills, knowledge, information, devices, etc.) that can be accessed and/or mobilized (Lin, 1999; Small, 2013). We have developed the term core tech support networks to link together both the structural and functional elements of social support, the former of which refers to the social network structure that provides support and the latter of which refers to the specific functional activities or support content (Lin, Ye, & Ensel, 1999; Wellman & Wortley, 1990). Based on existing research on the features of core networks (Hampton et al., 2011; Marsden, 1987; Small, 2013), this study focuses on three characteristics of core tech support networks: network size, network composition based on tie strength, and the resources embedded in the networks.

We developed the construct of core tech support networks to address several practical and theoretical issues that arise from the existing research on the relational factors of digital inequalities. First, although social capital, as indicated by one’s diverse social networks, contributes to reducing digital inequalities (Chen, 2013; Correa et al., 2017), it is often challenging to enhance individuals’ social capital in the short-term, especially among disadvantaged groups. However, it is relatively easier to work on a person’s core tech support networks, primarily through intentional interventions, as core tech support networks are only a small subset of one’s full set of networks. Second, both the conceptualization and measurement of support related to computer and Internet use in existing research as reviewed above still need further development (Courtois & Verdegem, 2016; Dolničar et al., 2018; Friemel, 2016; van Deursen et al., 2014). We have responded to these gaps and opportunities by conceptualizing and operationalizing core tech support networks; we have also developed its measurement based on the well-known name generator in the studies of core networks (Burt, 1984), linking together network structure and technical support content. Third, our study has empirically tested whether and how different characteristics of core tech support networks can shape digital inequalities while controlling for social capital. It advances current research, which mostly examines the patterns and sources of technical support but not whether this support is effective in reducing digital inequalities (Courtois & Verdegem, 2016; Dolničar et al., 2018; Katz et al., 2018).

**Core tech support networks and digital inequalities**

This study explores how three characteristics of core tech support networks (i.e., overall network size, network composition based on tie strength, and embedded resources as indicated by alters’ educational levels) can shape the most fundamental digital inequality issues (i.e., gaps in Internet use vs. nonuse and inequalities in basic digital skills) after taking into account markers of social inequalities (i.e., various sociodemographic and socioeconomic factors), relevant digital factors (i.e., different Internet access), and social capital. In terms of Internet use vs. nonuse, members of disadvantaged communities are likely to remain Internet nonusers even though they are provided with access to the requisite material aspects of the Internet because they find using the Internet complicated and
frequently have no one available to teach them how to go online (Li et al., 2018). For those who have
never or rarely used the Internet, starting to use the Internet from scratch will surely be a long-term,
arduous process. Without others’ ongoing help or guidance, accomplishing this task becomes even
more challenging (Friemel, 2016). Accordingly, core tech support ties can provide timely, ongoing
technical support, thus increasing potential users’ confidence in adopting and using the Internet. As
such, people who have more core tech support ties might be more likely to use the Internet.

One important characteristic of core tech support networks is network composition based on tie
strength (Granovetter, 1973). Several existing studies have identified how individuals’ strong ties,
such as family members and close friends, can play important roles in providing support related to
computer and Internet use (Friemel, 2016; Katz et al, 2018; Selwyn et al., 2016; Tsai et al., 2017; van
Deursen et al., 2014). Theoretically, strong ties, compared with weak ties, are often more willing to
provide tangible support, which takes time and effort, and can exert greater influence on others’ atti-
dudes toward adopting a new behavior (Wellman & Wortley, 1990). People of lower socioeconomic
statuses are also more reliant on strong ties for various kinds of social support (Kadushin & Jones,
1992). However, according to the theory of homophily, the strong ties of a disadvantaged person
might also be disadvantaged financially, socially, and digitally (McPherson, Smith-Lovin, & Cook,
2001). Although such a person’s strong ties could be more willing to help, they might not be able to
provide substantial technical assistance due to their limited digital resources (Small, 2013). Thus, for
disadvantaged people, using strong ties to explain the likelihood of Internet use might not always be
beneficial.

Another crucial characteristic of core tech support networks is embedded resources, which are of-
ten indicated by alters’ educational levels (Marsden, 1987). Based on the targeted mobilization thesis
(Small, 2013), ego is likely to seek alters who possess relevant resources for specific support. Those
who have higher levels of education often have better digital resources as they are often frequent users
of the Internet and have adequate knowledge of how to use the Internet to achieve better life out-
comes (Hargittai & Hinnant, 2008; van Deursen & van Dijk, 2014). Accordingly, whether they are
strong ties or weak ties, core tech support ties who are more highly educated might function better as
Internet brokers for disadvantaged people as they possess higher-quality digital resources. Thus, we
formulate the following hypotheses and research question related to the likelihood of Internet use
among disadvantaged communities.

H1: The size of core tech support networks is positively related to the likelihood of Internet
use.
RQ1: How is the number of strong ties in core tech support networks related to the likelihood
of Internet use?
H2: The number of better-educated ties in core tech support networks is positively related to
the likelihood of Internet use.

Few studies until now have studied the role of technical support, especially from several core
available social contacts, in addressing gaps in digital skills. Local nonprofit organizations and public
libraries have endeavored to provide disadvantaged communities with free basic digital literacy train-
ing classes. However, residents often need to rely on public transportations to attend these training
sessions, which can be inconvenient and can create financial burdens. In addition, formal training
programs often operate at a fast pace in a one-to-many format within a short period of time. It is diffi-
cult for people with no or limited digital experiences to acquire basic digital skills within a short time.
If core tech support networks are available, people might have greater confidence to learn and practice
the skills, as they know that when they need help, there are people available to provide timely support.
Although the quality of support from core tech support networks might be a concern for disadvantaged individuals, the availability of such ties may at least help them become digitally literate. Thus, by differentiating between the presence of and proficiency in basic digital skills in this study, we can better articulate the roles of core tech support networks in addressing gaps in basic digital skills.

The ways in which individuals get technical support from others can range from using the Internet collaboratively with people who can provide instruction, advice, and/or information to relying entirely on supportive ties who can use the Internet on their behalf (Selwyn et al., 2016). One study on general Internet users challenged the quality and effectiveness of the help that individuals receive from family members and friends, especially in regards to improving users’ basic operational skills (van Deursen et al., 2014). Another study showed that Internet users who sought help mostly from family members had lower levels of more advanced skills than those who sought help mostly from colleagues and friends (Courtois & Verdegem, 2016). In many cases, strong ties such as family members might not pay attention to the techniques of successful tutoring but, instead, might function more as proxy Internet users (Selwyn et al., 2016).

In addition, whether core tech support ties have adequate basic digital skills and usage experiences might have a greater impact on if and how they can help others gain basic digital skills. Better-educated support ties often have more of such digital resources (Hargittai & Hinnant, 2008; van Deursen & van Dijk, 2014). They might also be better private tutors as they have had more opportunities to observe effective teaching methods during their previous educational experiences. As few studies have explored these issues, we ask:

RQ2: How is the size of core tech support networks related to inequalities in the presence of (RQ2a) and proficiency in basic digital skills (RQ2b)?

RQ3: How is the number of strong ties in core tech support networks related to inequalities in the presence of (RQ3a) and proficiency in basic digital skills (RQ3b)?

RQ4: How is the number of better-educated ties in core tech support networks related to inequalities in the presence of (RQ4a) and proficiency in basic digital skills (RQ4b)?

Method

This study drew on a household survey of all the 1,825 households in all 18 public housing communities in 2015 at the beginning of a long-term, ongoing digital inclusion program. These housing communities, where the average household income was as low as $11,000, were operated by one of the largest Public Housing Authorities in the United States. Our research team delivered self-administered paper-and-pencil questionnaires to all the households door-to-door. Respondents were asked to return the questionnaires to onsite collection boxes within a month. To increase our survey response rate, we posted flyers in community centers and participated in a variety of community events. Only one adult resident per household was eligible to take the survey and received a five-dollar gift card as a small incentive for survey participation. A total of 402 households participated in the survey, yielding a response rate of 22%.

The data set has a certain amount of missing data because the targeted communities are hard-to-access and extremely disadvantaged. To correct the possible bias caused by missing data, we employed simulation-based multiple imputation with chained equations to impute missing values of variables of interests (van Buuren, 2007). Table 1 includes all the variables used for imputation in this study. About 86.8% of all respondents delivered data on more than 90% of these variables. The analytical
models and the statistics reported later were all based on the 30 imputed data sets we generated. Descriptive statistics show that respondents tended to be female, single, of racial and ethnic minorities, with an education of high school or less, and unemployed (see Table 1). The sociodemographic composition of the survey participants was in line with that of the general population in these public housing communities.

Measures

Internet use
We asked all respondents if they used the Internet at all (e.g., surf the web, chat, email, etc.). About 59.5% of all the respondents said they used the Internet whereas about 40.5% said they did not use the Internet.

Basic digital skill presence and proficiency
We adapted a list of 23 basic digital skills items, originally designed by a local nonprofit digital inclusion organization, which targets low-income, racial/ethnic minorities, and used in their training programs and skill assessment. The original questions used a binary scale of yes or no. We refined it to further evaluate the proficiency levels with a 3-point scale. The final questions were, “Have you ever independently done the following? And if yes, please let us know how good you are at it.” The 23 items on basic computer and Internet skills included “saved a file to the desktop,” “conducted a Google search,” “created an email account,” etc. The full item list can be provided upon request.

We measured both the presence of and proficiency in basic digital skills as shown in Table 1. Basic digital skill presence was a binary measure and indicated whether respondents had at least one of the 23 basic computer and Internet skills. About 34.6% of the respondents did not have any basic digital skills, which confirms that having some basic digital skills is already a big step for disadvantaged members. Second, among those who had at least one of the 23 basic computer and Internet skills, we constructed an index of basic digital skill proficiency by using the sum score of the 23 items measured by the 3-point scale (1 = “poor”, 2 = “fair”, 3 = “good”, $M = 40.33$, $SD = 22.18$, $Min = 1$, $Max = 69$, Cronbach’s $\alpha = 0.97$).

Core tech support networks
Core tech support networks were created based on the name generator (Burt, 1984) used in the General Social Survey (GSS). After answering the basic digital skills questions and seeing the 23 computer and Internet basic digital skill items described previously, respondents were asked to name up to five people to whom they turned when they needed help for relevant computer and Internet activities. Follow-up name interpreter questions about each alter include tie strength and educational levels. Tie strength was measured by the question asking how close respondents felt with each core tech support tie with a 3-point scale—not close, so-so, and close or very close. Core tech support ties’ educational levels were measured by three categories—high school or less, some college, and Bachelor’s degree or more.

For all respondents, overall size of core tech support networks is the number of ties in core tech support networks ($M = 2.28$, $SD = 2.06$, $Min = 0$, $Max = 5$). About 29.4% of respondents did not have any ties to whom they could turn for help with computer and Internet use. About 17.7% had only one core tech support tie, 12.7% had two ties, and the rest had three (6.7%), four (2.7%), and five ties (30.9%).

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|                                    | Imputed Data                  | Observed Data                  |
|------------------------------------|------------------------------|--------------------------------|
|                                    | \(N\) | \(M (SD)\) or % | \(N\) | \(M (SD)\) or % |
| **Age**                            | 402   | 51.97 (14.52)   | 316   | 52.10 (14.44)   |
| Gender                             | 402   |                | 392   |                |
| Gender: Female                     | 71.42 | 71.43          | 71.43 |                |
| Gender: Male                       | 28.58 | 28.57          | 28.57 |                |
| Race and ethnicity                 | 402   |                | 371   |                |
| Race and ethnicity: Non-Hispanic white | 22.81 | 22.37          | 22.37 |                |
| Race and ethnicity: Other (African American, Hispanic, and other) | 77.19 | 77.63          | 77.63 |                |
| Current marital or relationships status | 402   |                | 385   |                |
| Current marital or relationships status: Single | 70.77 | 70.91          | 70.91 |                |
| Current marital or relationships status: Other (Married, partner, and other) | 29.23 | 29.09          | 29.09 |                |
| Children                           | 402   |                | 402   |                |
| Children: Yes                      | 27.36 | 27.36          | 27.36 |                |
| Children: No                       | 72.64 | 72.64          | 72.64 |                |
| Education                          | 402   |                | 382   |                |
| Education: Some college or more    | 38.86 | 39.53          | 39.53 |                |
| Education: High school or less     | 61.14 | 60.47          | 60.47 |                |
| Employment status                  | 402   |                | 384   |                |
| Employment status: Employed        | 15.30 | 15.36          | 15.36 |                |
| Employment status: Other (Unemployed, retired, and other) | 84.70 | 84.64          | 84.64 |                |
| Internet use                       | 402   |                | 402   |                |
| Internet use: Yes                  | 59.45 | 59.45          | 59.45 |                |
| Internet use: No                   | 40.55 | 40.55          | 40.55 |                |
| Internet access                    | 402   |                | 389   |                |
| Internet access: Yes               | 58.93 | 59.13          | 59.13 |                |
| Internet access: No                | 41.07 | 40.87          | 40.87 |                |
| Basic digital skills               | 402   |                | 402   |                |
| Basic digital skills: Presence     | 65.42 | 65.42          | 65.42 |                |
| Basic digital skills: Proficiency  | 34.58 | 34.58          | 34.58 |                |
| Basic digital skills: Proficiency: Proficiency | 263   | 40.33 (22.18)  | 263   | 40.33 (22.18)  |
| Social capital                     | 402   | 4.43 (4.23)    | 381   | 4.46 (4.24)    |
| Core tech support networks         | 402   | 2.28 (2.06)    | 402   | 2.28 (2.06)    |
| Core tech support networks: Overall size | 284   | 2.38 (1.78)    | 276   | 2.43 (1.78)    |
| Core tech support networks: Number of strong ties | 284   | 1.53 (1.65)    | 272   | 1.57 (1.66)    |
For respondents who had at least one core tech support tie, we created the number of strong ties and the number of better-educated ties. Strong ties referred to alters to whom ego felt “close or very close” whereas weak ties referred to alters to whom ego felt “so-so” or “not close.” The number of strong ties is the number of strong ties in core tech support networks (\( M = 2.38, SD = 1.78, Min = 0, Max = 5 \)). About 16.2% of respondents who had at least one core tech support tie did not have any strong tie in their core tech support networks whereas about 55.7% of those respondents did not have any weak tie in the networks. Moreover, about 24.7% of those respondents had one strong tie in their core tech support networks, 16.3% had two, 11.3% had three, 10.3% had four, and 21.1% had five.

The number of better-educated ties was measured by the number of core tech support ties who had an education of some college or more (\( M = 1.53, SD = 1.64, Min = 0, Max = 5 \)). Among respondents who had at least one core tech support tie, 36.7% only had core tech support ties whose education were high school or less. About 23.3% had only one better-educated tie, 17.2% had two, 5.8% had three, 7.1% had four, and 9.9% had five.

Control variables

We used sociodemographic and socioeconomic variables as well as Internet access and social capital as control variables. Age was a continuous variable (\( M = 51.97, SD = 14.52, Min = 18, Max = 92 \)). Gender was a binary variable and 71.4% of respondents were female. We created a binary measure for race and ethnicity for the sake of parsimony, non-Hispanic whites (22.8%) and others (77.2%), which included mainly African Americans and Hispanics, very few Asians, and few other races and ethnicities. Marital or relationship status and children were binary: 70.8% were singles and 27.4% had at least one child under 18 living together in the same household. Education and employment status were also created as binary for the sake of parsimony. Only 38.9% of respondents had some college or more education whereas 61.1% had only an education of high school or less. Only 15.3% of respondents were employed and other respondents were unemployed, retired, or in the other category. We did not include household income as a control variable because it was extremely low and lacked variation. Internet access in this study referred to whether respondents had a private Internet access, that is, a home Internet or a smartphone or both. About 58.9% had an Internet access. Social capital was measured by the position generator (Lin et al., 2001). We gave respondents a list of 16 occupations, such as taxi driver, farmer, social worker, nurse, journalist, middle school teacher, lawyer, etc., and asked whether they knew someone on a first name basis in each occupation. Social capital was measured by the sum of the 16 occupations in which respondents knew someone (\( M = 4.43, SD = 4.23, Min = 0, Max = 16 \), Cronbach’s \( \alpha = 0.89 \)).

Results

We conducted a series of logistic regressions to examine how the overall network size (H1), the number of strong ties (RQ1), and the number of better-educated ties (H2) of core tech support networks are related to the likelihood of Internet use after controlling for sociodemographic and socioeconomic factors, Internet access, and social capital. As shown in Table 2, Model 1 and Model 2 were for all respondents and examined the role of overall size of core tech support networks on the likelihood of Internet use; Model 3 and Model 4 were for respondents who had at least one core tech support tie and focused on the number of strong ties and the number of better-educated ties. Model 1 included only sociodemographic and socioeconomic factors, Internet access, and social capital. In Model 2, we further added the overall size of core tech support networks. Model 2 showed that those with a larger...
Specifically, one unit increase in the size of core tech support networks (i.e., having one more core tech support tie) was associated with a 21% increase in the odds of Internet use vs. Internet nonuse. This was higher than the 10% increase in the odds of Internet use vs. Internet nonuse associated with one unit increase in social capital (i.e., knowing someone in one more occupation).

In terms of RQ1 and H2, as shown in Table 2, Model 3 included only controlled variables and Model 4 further added the number of strong ties and the number of better-educated ties in core tech support networks. Model 4 showed that core tech support ties’ educational levels played a significant role in increasing the likelihood of Internet use among people who had at least one core tech support tie. However, having more strong ties in core tech support networks did not play any significant role in influencing the likelihood of Internet use.

As shown in Table 3, we conducted a series of logistic regressions to examine how different characteristics of core tech support networks were related to the presence of basic digital skills, that is,

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**Table 2** Logistic Regressions on the Likelihood of Internet Use

|                        | Internet Use Among all respondents | Internet Use Among respondents who had at least one core tech support tie |
|------------------------|------------------------------------|-----------------------------|
|                        | Model 1 (OR (SE)) | Model 2 (OR (SE)) | Model 3 (OR (SE)) | Model 4 (OR (SE)) |
| Age                    | 0.95*** (0.01)     | 0.95*** (0.01)     | 0.92*** (0.02)    | 0.92*** (0.02)    |
| Female                 | 0.83 (0.25)        | 0.75 (0.23)        | 0.90 (0.34)       | 0.80 (0.31)       |
| White                  | 1.51 (0.53)        | 1.61 (0.57)        | 1.55 (0.69)       | 1.58 (0.72)       |
| Single                 | 1.97* (0.61)       | 2.01* (0.63)       | 1.51 (0.57)       | 1.48 (0.57)       |
| Children               | 1.75 (0.68)        | 1.59 (0.63)        | 1.32 (0.60)       | 1.57 (0.75)       |
| Some college or more   | 1.74 (0.53)        | 1.74 (0.53)        | 1.67 (0.61)       | 1.17 (0.47)       |
| Employed               | 1.39 (0.59)        | 1.45 (0.61)        | 1.12 (0.58)       | 1.06 (0.57)       |
| Internet access        | 10.19*** (3.00)    | 11.17*** (3.40)    | 8.30*** (2.99)    | 7.97*** (2.96)    |
| Social capital         | 1.12** (0.04)      | 1.10* (0.04)       | 1.10* (0.04)      | 1.10* (0.05)      |
| Core tech support      |                     | 1.21** (0.09)      | 0.88 (0.10)       | 1.40* (0.19)      |
| networks               | Overall size       |                     |                 |
| Number of strong ties  |                     |                     |                 |
| Number of better       |                     |                     |                 |
| educated ties          |                     |                     |                 |
| N                      | 402                 | 402                 | 284              | 284              |
| Pseudo R²              | 0.35                | 0.37                | 0.34             | 0.36             |

Notes: *p < .05; **p < .01; ***p < .001; OR = refers to odds ratio.
having at least some basic digital skills (RQa2, RQ3a, and RQ4a). Model 1 and Model 2 were for all respondents and Model 3 and Model 4 were for respondents who had at least one core tech support tie. Model 2 showed that the overall size of core tech support networks had a positive relationship with the presence of basic digital skills (RQ2a). One unit increase in the size of core tech support networks was associated with a 37% increase in the odds of the presence of basic digital skills. Comparatively, one unit increase in social capital was associated with a 11% increase. In terms of RQ3a and RQ4a, only the number of better-educated ties in core tech support networks played a positive role in increasing the likelihood of having at least some basic digital skills whereas the number of strong ties did not play any significant role.

As shown in Table 4, we conducted a series of Tobit regressions to examine the relationships of different characteristics of core tech support networks (RQ2b, RQ3b, and RQ4b) to the proficiency in basic digital skills. Among people who had the presence of basic digital skills, their proficiency levels were right censored by 11.8% (i.e., about 11.8% of them had the highest score of basic digital skill proficiency). Thus, Tobit regressions instead of OLS regressions were used to address the censoring of the proficiency in basic digital skills. Model 1 and Model 2 were for respondents who had the presence of basic digital skills and Model 3 and Model 4 were for respondents who had the presence of basic digital skills and at least one core tech support tie. In terms of RQ2b, Model 2 showed that the overall size of core tech support networks had a positive relationship with the proficiency in basic digital skills. One unit increase in the size of core tech support networks was associated with a 37% increase in the odds of the presence of basic digital skills. Comparatively, one unit increase in social capital was associated with a 11% increase.
support networks did not have any significant role in further improving people’s proficiency in basic digital skills. In terms of RQ3b and RQ4b, again, neither the number of strong ties nor the number of better-educated ties in core tech support networks played any significant role.

**Discussion and conclusion**

By linking theories and studies of digital inequalities, core networks, social support, and social capital, we originated the construct of core tech support networks. We explore how three dimensions of core tech support networks—overall network size, network composition based on tie strength, and the embedded resources—can help explain and address the fundamental digital inequality issues that remain
in disadvantaged communities. This study demonstrates both promise and caution regarding how core tech support networks can help address digital inequality issues, especially in disadvantaged communities.

Two main reasons for Internet nonuse among members of disadvantaged communities are the difficulty of using the Internet and having no one to teach them how to go online (Li et al., 2018). Our study provides empirical evidence that support this. After taking into account people’s sociodemographic and socioeconomic characteristics, whether they have home and/or mobile Internet access, and their social capital, our study shows that the more core tech support ties disadvantaged people have, the more likely they are to use the Internet. Core tech support ties can function as important brokers to connect “digital laggards” to the Internet, as they are the several core contacts who are willing to help, are available, and/or have some relevant digital resources. Our study advances current research that focuses on patterns and sources of support related to computer and Internet use (Courtois & Verdegem, 2016; Dolničar et al., 2018; Helmsper & van Deursen, 2017; Katz et al., 2018; Selwyn et al., 2016) by directly demonstrating the effectiveness of technical support in addressing the fundamental digital inequality issues that remain in disadvantaged communities. On the other hand, our study reveals that about three in 10 public housing residents do not have any core tech support ties and another three in 10 have only one or two core tech support ties. Given the significant roles that core tech support networks can play in reducing the gap in Internet use vs. nonuse, intentional interventions (originating from disadvantaged members themselves, external digital inclusion efforts, or both) are needed to help disadvantaged individuals gain at least one core tech support tie.

Noticeably, whether core tech support ties include more strong ties seems unimportant in addressing the inequality of Internet use vs. nonuse, but the resources embedded in core tech support networks matter a great deal. Previous studies have shown that strong ties, such as family members, often play important roles in promoting Internet use, especially among the general population or populations with higher socioeconomic levels (Friemel, 2016; Selwyn et al., 2016; Tsai et al., 2017). The dynamic interplay between parents and children in terms of digital engagement also frequently occurs in lower-income households with children (Katz et al., 2018). However, in public housing communities, where the household income is extremely low and most residents are single or do not have children living with them, technical support from strong ties, especially children, might not always be available. In addition, as their strong ties are also likely to have limited resources (McPherson et al., 2001), technical support from their strong ties might not always be preferential or useful. In addressing the issue of Internet nonuse, the resources embedded in core tech support networks, as indicated by alters’ educational levels, seem to be much more important than tie strength between ego and alters, as better-educated ties often possess higher-quality digital resources, such as skills, knowledge, information, devices, etc. (Hargittai & Hinnant, 2008; van Deursen & van Dijk, 2014). When such ties are available, disadvantaged members can feel more confident in using the Internet as they know those ties are not only available for support but also capable of offering reliable technical assistance.

Concerning basic digital skills, a greater number of core tech support ties and better-educated ties can help members in disadvantaged communities gain at least some basic digital skills. However, these factors do not necessarily contribute to improving proficiency levels. The number of strong ties in one’s core tech support networks was inconsequential in addressing gaps in either the presence of or proficiency in basic digital skills. The results of our study highlight the importance of differentiating between the presence of and proficiency in basic digital skills when studying extremely disadvantaged populations. On the one hand, our results suggest that if disadvantaged individuals have more core tech support ties and these ties possess more relevant digital resources, they are at least more willing to seek technical support when they need it and gain some basic digital skills. Previous studies
have shown that when getting technical support from others, some prefer using the Internet on their own while receiving others’ instruction, whereas others prefer relying on support ties to use the Internet on their behalf (Dolnicar et al., 2018; Selwyn et al., 2016). Regardless, disadvantaged people can at least gain some basic digital skills through active participation or passive observation (Tsai et al., 2017).

On the other hand, our results raise concerns about the quality of existing core tech support ties in disadvantaged communities, as they seem unable to further improve individuals’ proficiency in basic digital skills. First, more than two thirds of the core tech support ties in public housing communities do not have a college degree. Even better-educated core tech support ties, whom we refer to in this study as those with an education level of some college or more, are considered better-educated merely when compared with public housing residents, most of whom have an education level of high school or less. Generally, core tech support ties’ own digital skills and knowledge might be far from sufficient. Although disadvantaged people want to seek technical support from those who possess better and more relevant resources, their limited social networks seem not to allow them to fully achieve this goal. Second, many core tech support ties are strong ties. They might not be professional instructors and, thus, might not know how to effectively encourage people to actively practice using the Internet while getting technical support from them. Gradually, when it is possible, disadvantaged people might simply rely on their support ties to use the Internet on their behalf (Selwyn et al., 2016). Our results support the findings found in previous studies, which question the effectiveness of the assistance provided by family members and friends in improving users’ basic digital skills (van Deursen et al., 2014).

Limitations and future directions
This study has several limitations that future studies can address. First, this study focuses on the three most important characteristics of core tech support networks. Future studies can explore other characteristics of the networks in addressing digital inequalities. Second, future studies can further differentiate between technical support involving active interaction between helpers and receivers and technical support for proxy use. Third, this study uses self-reported instruments of basic digital skills. Future studies can use performance tests instead to fully capture actual basic digital skills. Fourth, future studies can expand the study, which only targets public housing communities with extremely low income in a major U.S. city, to other cities or at the national level. Fifth, future studies can adapt and apply the conceptualization and measurements of core tech support networks in other relevant studies.

Theoretical and practical implications
This study has several theoretical practical implications. Theoretically, we originated the construct of core tech support networks based on theories and studies of core networks, social support, social capital, and digital inequalities, and we have operationalized it by its three most important characteristics—network size, network composition based on tie strength, and the resources embedded in the networks. We also developed the measurement based on the widely-used name generator (Burt, 1984), linking together network structure and technical support content. We further differentiate core tech support networks from social capital to address gaps in the emerging literature regarding the relational factors of digital inequalities, which often mixes the theories of social support and social capital in a confusing way or does not articulate its theoretical framework. Our results confirm that core tech support networks have their salient effects on gaps in Internet use and can impact the presence
of basic digital skills in tandem with social capital. As it is often difficult to enhance individuals’ social capital, especially among disadvantaged groups, the development of core tech support networks based on a small subset of one’s full network can make the goals of digital inclusion interventions more achievable.

Practically, as indicated by our study results, we suggest that digital inclusion projects targeting disadvantaged urban communities, such as public housing communities, need to realize the importance of providing long-term technical support to their recipients, in addition to providing computers and Internet access and the common short-term digital skill training programs. The availability of core tech support ties, especially those with relevant digital resources, is important, whereas whether they have a close relationship with people that need technical support support is inconsequential. Thus, digital inclusion projects can establish a long-term relationship with disadvantaged people by having some qualified, educated staff to work on-site to function as people’s core tech support ties. Most importantly, such staff need to focus on providing constant, timely, reliable technical support in a one-on-one format. As trained technical supporters, these staff members can avoid serving as proxy Internet users, instead functioning as individual instructors or tutors who can encourage the recipients of their support to practice what they have learned and use the Internet independently. In the long-term, not only could on-site staff help disadvantaged people become Internet users, but they might also help disadvantaged people improve their basic digital skills.

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