# Unpacking the Relationship between Mobile Phone Usage Patterns, Network Size, and Civic Engagement

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**Abstract**

This study, based on a survey of 1,260 mobile phone users, investigates the relationships among patterns of mobile phone use, network size, and civic engagement. It finds that informational uses of mobile phones are positively associated with civic engagement – engagement in informal socializing and engagement in organized groups or clubs. On the other hand, relational and recreational uses have a neutral or negative association with civic engagement. Most important, the network size in mobile communication moderates the impact of relational and recreational uses on civic engagement while it mediates the impact of informational uses on civic engagement. This research indicates that the mobile phone, depending on its usage patterns and communication network size, can have different effects on civic engagement.

**Keywords:** mobile phone, civic engagement, network size, usage patterns

The mobile phone is an integral part of today's human society, affecting diverse aspects of civic life (Best & Krueger, 2005; Campbell & Kwak, 2011; Ling, 2004; Suarez, 2006). Although researchers admit that the mobile phone is exercising a significant impact on civic life, the direction and nature of the impact is still controversial. Some (*mobile optimists*) contend that mobile communication enriches civic life by providing the opportunities of tightened relations, expansive coordination and cooperation (Campbell & Kwak, 2010a, 2010b; Rettie, 2008). Others (*mobile pessimists*) are skeptical of the potential of the mobile phone, arguing that frequent mobile communication erodes psychological well-being, weakens social cohesion, and reduces civic involvement (Habuchi, 2005; Gergen, 2008; Matsuda, 2005; Ling, 2008; Wilken, 2011).

Both sides of the debate have failed to provide an adequate framework for studying the relationship between mobile phone use and the health of civil society. Many studies have tended to view the mobile phone as an amorphous whole, neglecting the fact that individuals use this medium in different ways and for different purposes (Kraut et al., 1998). Scholars often oversimplify the mobile phone, typically focusing on hours of use as opposed to patterns of use. The current study argues that what matters is not the time spent with media, but how people use media that affects civic engagement (Gil de Zúñiga & Rojas, 2010; Shah, Kwak, & Holbert, 2001). For instance, informational uses of the mobile phone can promote civic engagement, while recreational uses, such as online gaming, can discourage it.

The present study also focuses on the role of network size in mobile communication. Networks size, the number of individuals in one's regular conversation network, has been considered an important element that characterizes citizen communication networks together with network diversity and strength of network ties (Eveland & Hively, 2009; Kwak, Williams, Wang, & Lee, 2005; Scott, 1991). It appears that individuals who have larger social networks are more civically engaged than those with smaller networks (Granovetter, 1973; Putnam, 2000; Son & Lin, 2008). However, the empirical test of this link, especially its application to mobile communication, has rarely been conducted.

The purpose of the current study is to fill these gaps by testing how different patterns of mobile phone use and network size relate to civic engagement. More specifically, this study

tests the interconnection among three types of mobile phone use (information-seeking, sociability, and recreation), network size, and two indicators of civic engagement (informal and formal civic engagement). The current study also tests whether network size mediates and/or moderates the association between mobile phone use and civic engagement. To examine these propositions, the study analyzes original survey data from a large national sample of South Korean adults in 2013.

## Literature Review

Despite the vast scholarship on the subject, there is no agreed-upon definition of civic participation. Borrowing from the approach of Verba, Schlozman, and Brady (1995) and Gil de Zúñiga and Velenzuela (2011), the current study defines civic engagement as *voluntary civic activity*, which aims at addressing social and/or community issues that are conducive to the collective well-being. Bowling in a league, attending church, participating in community, and volunteering in communal activities can be considered voluntary civic activities (Shah, 1998).

Civic engagement can be broken into two types: informal and formal engagement (Campbell & Kwak, 2010b). Informal engagement includes socializing with friends and family, hanging out with neighbors, and spending leisure time with others. Informal engagement allows individuals to capitalize on their connections with each other, accruing benefits, such as information or support at the individual level. Formal engagement includes various forms of civic involvement, such as attending church, working for a civic organization, and volunteering for an election campaign. Formal engagement increases commitment to a community and the ability to mobilize collective actions at the community level.

### Patterns of Mobile Phone Use and Civic Engagement

Many studies suggest a four-part typology of media use: information seeking, personal identity, social interaction, and entertainment. For example, with regard to Internet use, studies primarily point to needs for information, social interaction, and entertainment (Charney & Greenberg, 2002; Kaye, 1998; Papacharissi & Rubin, 2000). As is typical with other media, purposes for using the mobile phone include both social and instrumental dimensions. Wei and Lo (2006) identify social utility, affection, and information-seeking as

some of the key functions of the mobile phone. In addition, researchers have found that purposes for mobile phone use include fashion/status, mobility, immediate accessibility, and recreation/entertainment (Leung &Wei, 2000; Wei, 2008; Wei & Lo, 2006). Based on the literature, this study has selected to examine three key dimensions of mobile phone use: (1) information seeking, (2) sociability with family and peers, and (c) personal recreation.

Regarding the informational media use, research shows that use of a medium for surveillance or information-acquisition purposes plays a positive role in civil society by providing individuals with information to reflect and deliberate on civic matters (Norris, 1996; Shah, 1998; Shah et al., 2001, 2005). Consumption of hard news from traditional news outlets such as newspapers and television has been found to have a positive influence on civic involvement (McLeod et al., 1996; McLeod, Scheufele, & Moy, 1999; Norris, 1996; Shah et al., 2001). Using the Internet for information-seeking purposes also tends to motivate people to engage in civic affairs (Shah et al., 2001, 2005).

In a similar vein, the current study expects a positive relationship between informational uses of mobile phones and civic engagement. But this is not because such prediction follows the previous research. Rather it is because the mobile technology provides "a heightened level of flexibility for information exchange by allowing users to talk about issues with others" (Campbell & Kwak, 2010a, p. 538). The positive relationship also stems from the convenience of textual exchange and information retrieval in the mobile phone. In addition, as the mobile phone is increasingly combining diverse functions of the Internet, people who have a high level of information needs or surveillance motives can easily have diverse opportunities to encounter communal issues and to engage in informal or formal activities in their community. Campbell and Kwak (2011) and Rojas and Puig-i-Abril (2009) have shown that using mobile phone for information seeking is positively associated with various forms of participation in public affairs. Thus, it is posed:

H1a: Use of the mobile phone for information seeking purposes will have a significantly positive relationship with informal civic engagement.

H1b: Use of the mobile phone for information seeking purposes will have a significantly positive relationship with formal civic engagement.

Bonding with strong ties may help to strengthen existing relationships. Relationship

maintenance may also offer models of social behaviors they can emulate in civic life or may engage them into broader issues of their community. Coleman (1990) argues that civic engagement can be an unintended by-product of socializing with friends and family members. The idea here is that informal social connections foster trust in others and environments for civic discussion (Putnam, 1995a, 1995b). As Kwak, Shah, and Holbert (2004) explain, ''the familiarity and equity that characterize informal associations likely encourage open interactions (Newton, 1997), thereby causing individuals to be receptive to information and opportunities that arise out of these forms of social connection'' (p. 644).

However, keeping relationships only with close-knit people may simultaneously cause a negative influence on social connections (Granovetter, 1982). For example, keeping relations only with like-minded or strong-tie people may increase alienation from open discussion with others, ultimately resulting in strengthening selective sociality (Matsuda, 2005). In addition, mobile communication is often said to "favor the intimate sphere of friends and family" (Ling, 2008, p. 159), potentially leading to network insularity (Habuchi, 2005). Therefore, when a user is more interested in maintaining private relationships, frequent use of mobile phones is likely to cause a detrimental impact on civic engagement (Gergen, 2008; Habuchi, 2005). Thus, the study hypothesizes:

H2a: Use of the mobile phone for relationship maintenance purposes will have a significantly negative relationship with informal civic engagement.

H2b: Use of the mobile phone for relationship maintenance purposes will have a significantly negative relationship with formal civic engagement.

Entertainment uses may be detrimental to civic engagement because the main function of such media use is to amuse and distract. Studies have found that recreational uses of traditional media do not contribute to engagement in civic life (Besley, 2006; Shah et al., 2001; Sotirovic & McLeod, 2001). Recreational uses of the Internet have been found to cause adverse civic consequences (Cho, Rojas, & Shah, 2003). Shah et al. (2001) also have found a negative association between recreational use of the Internet and civic engagement. A similar reasoning can be applied to mobile communication.

H3a: Use of the mobile phone for recreational purposes will have a significantly negative relationship with informal civic engagement.

H3b: Use of the mobile phone for recreational purposes will have a significantly negative relationship with formal civic engagement.

**Roles of Network Size in Mobile Communication**

Citizen communication networks have long been thought to have a positive impact on participation (Eveland, 2004; Lake & Huckfeldt, 1998; McLeod et al., 1999; Rojas, 2008). This study focuses on network size, which refers to the number of people with whom an individual communicates regularly. Although other network characteristics matter for participation, network size is central to civic engagement (Gil de Zúñiga, 2011; McLeod et al., 1999). The extensiveness or size of a network might be important to the development of civic-mindedness in several ways. First, network size tends to serve to multiply the frequency and expertise of individual discussants. Larger networks are more likely to include independent sources of information and expertise, thereby increasing the diversity and richness of the information transmitted regarding civic affairs (Granovetter, 1973; Huckfeldt et al., 1995). For example, diversified networks tend to bring more mobilizing information, such as details on an upcoming neighborhood meeting or an online protest against tax increases.

Second, network size consists of both strong and weak ties. Large networks tend to include more diverse individuals than small networks. In other words, small networks are likely composed primarily of strong ties that are highly trusted but carry primarily redundant information. Large networks likely comprise a mix of strong and weak ties. Weak ties tend to provide access to different perspectives and unique information relative to strong ties (Eveland, Hutchens, & Morey, 2013). Larger networks are more likely to have weak ties than smaller networks (Gil de Zúñiga & Valenzuela, 2011). When network size is broad, people are more likely to encounter more weak ties and heterogeneous information. Weak ties are more helpful to civic engagement than strong ties (Son & Lin, 2008).

Lastly, even if an individual seldom talks about civic issues, and even if (s)he is surrounded by other individuals who are particularly inexpert with respect to civic affairs, the proliferation of contacts increases the possibility that civically consequential information will be communicated. In other words, sheer network size should still increase the likelihood of

encountering opportunities for civic involvement (Huckfeldt, Beck, Dalton, & Levine, 1995). Hence, along several dimensions, people embedded in larger networks are more likely to be exposed to the information and skills that facilitate community and/or civic activity (Verba et al., 1995).

Scores of studies have shown that network size (Eveland & Hively, 2009; Jang, 2009; Lake & Huckfeldt, 1998; Pattie & Johnston, 2009) is positively linked to civic engagement. Rojas (2008) found that network size was a strong predictor of active membership in voluntary organizations, including neighborhood and educational organizations. Similarly, Lake and Huckfeldt (1998) found that individuals with larger networks participate more because they are more likely to meet people who are knowledgeable about civic matters.

Compared with other media, the mobile phone is used by a wider range of people, regardless of age, gender, socio-economic class, and educational differences (Hermanns, 2008). Mobile technology has low entry barriers as it is cheap and relatively easy to master (Hermanns, 2008). By mitigating constraints of space and time (Castells, 2000; Castells & Portes, 1989; Ling & Campbell, 2009; Wellman, 2002a), the mobile phone also offers heightened flexibility for the nuanced coordination of social activities (Ling & Yttri, 2002). Mobile communication tends to provide new opportunities for instrumental and expressive communication.

Aforementioned characteristics of the mobile phone offer an unprecedented opportunity to expand users' networks. With the penetration of the Internet, researchers have found that social media, such as blogs and social network sites, can provide wide interactions (Gil de Zúñiga, Puig-I-Abril, & Rojas, 2009; Kavanaugh & Patterson, 2002; Valenzuela, Park, & Kee, 2009). Mobile phones appear to create much wider human networks than other media partly because the multi-modality offers more opportunities to extend users' networks. In other words, as the mobile phone is rapidly evolving into a smart device that is equipped with advanced computer functions, it creates new affordances for people to be connected beyond their existing networks (Campbell & Kwak, 2010b). Following the above reasoning, this study argues that network size is one of the determining factors that influence the relationship between mobile phone use and civic engagement.

H4a: The size of contacts in mobile communication will have a significantly positive relationship with informal civic engagement.

H4b: The size of contacts in mobile communication will have a significantly positive relationship with formal civic engagement.

In addition to exploring the association of the mobile phone with civic engagement, this study investigates the mediating and moderating role of network size. Network size may interact with influences of media use on individuals' behavioral consequences, and network size has been shown to account for different behaviors (Rojas, 2008; Lake & Huckfeldt, 1998). Research shows a positive association between informational use of the mobile phone and civic engagement (Kwak & Campbell, 2010b). However, information-seeking behaviors without enough connections with others may end up satisfying individuals' own informational demands, rather than developing skills and willingness to engage in issues at a broader level. Therefore, we need to take a close look at the mechanism that connects information seeking and civic engagement.

According to the cognitive mediation model, interpersonal discussion is a reasoning behavior that is a critical condition in producing outcomes of information exposure (Cho et al., 2009). Individuals who are engaged in interpersonal discussion become able to use complex concepts, make logical connections among them, and create consistent and reasoned argumentations (Cappella, Price, & Nir, 2002). Elaborative and collective thinking yields interest in civic issues that subsequently leads to civic engagement (Eveland, 2004). And the possibility to engage in interpersonal discussion is closely related to network size.

Based on the above reasoning, this study predicts that informational uses of mobile phones indirectly influence civic engagement through network size. A large network can create opportunities to participate in civic affairs (McLeod, Sheufele, & Moy, 1999; Rojas et al., 2005) because people can elaborate on problems facing the community and learn about civic issues through their wide networking. To put it another way, when network size is small, people who are attentive to obtaining information from their mobile phones may lose opportunities to elaborate on the information and, as a result, fail to engage in civic affairs.

H5: The network size in mobile communication will mediate the impact of

informational uses on civic engagement.

If people have many partners with whom they communicate regularly, they are more likely to be exposed to expanded connectedness. For instance, if a person communicates with only one friend, the boundary of interactions is constrained to the people that the friend is connected to. But if a person communicates with three friends on a regular basis, the possible interaction boundary gets tripled. This process is likely to lead to encounters with more weak-tie people and diverse viewpoints.

Expanded connection to weak ties, in turn, provides information and resources that individuals do not find in their immediate environment of relatives and close friends. In other words, expanded weak ties can provide nonredundant, diverse information that stimulates learning about civic issues (Granovetter, 1973). In addition to have access to more information, individuals who have more frequent contact with weak ties have more probabilities of being recruited to participate (Kotler-Berkowitz, 2005). The positive relationship between weak ties and civic and community engagement has been demonstrated by a number of studies (Eveland & Hively, 2009; Kavanaugh et al., 2005; Son & Lin, 2008).

The possibility to expand interpersonal network via the mobile phone is greater than in any other media (Park & Karan, 2014). In mobile communication, even those who usually use their mobile phones to interact with intimates cannot avoid encountering diverse opinions or people beyond their strong-tie networks. Therefore, this study predicts that a large network size may provide a significant opportunity to develop civic-mindedness and to engage in civic affairs even to the people who use their mobile phones primarily for relational or recreational purposes. Thus, the current study hypothesizes:

H6: The network size in mobile communication will moderate the impact of relational or recreational uses of the mobile phone on civic engagement, with a larger network size increasing the likelihood of influencing civic engagement.

[Figure 1]

Hypothesized model.
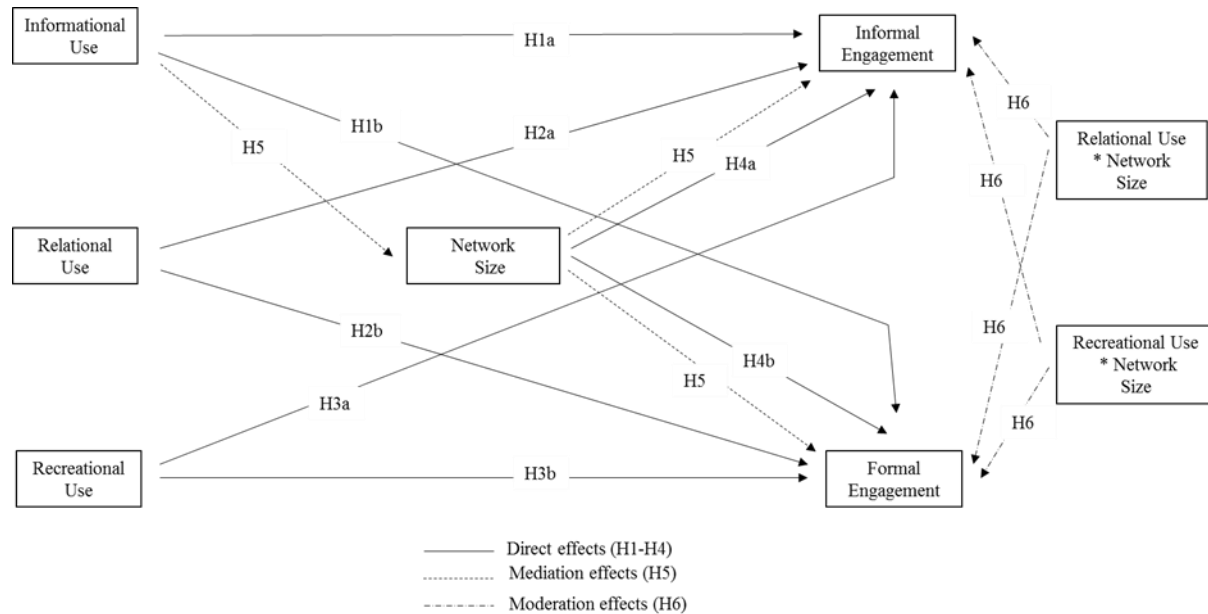


Method

Data Collection

This article relies on online survey data collected from the residents of South Korea between May 20 and June 20, 2013. In order to assure the representativeness of the sample, data were collected via a stratified quota sampling method. Before doing stratification, this study constructed a sampling frame of 90,000 using a random number generator from the 2012 voter registration data of the Korea Election Management Commission (2013). Out of the frame, a total of 3,500 adults were selected using a four-way cross-classification system (age x gender x education x income). This stratified quota sampling is differs from conventional probability sampling procedures, yet produces highly comparable data (Eveland & Shah, 2003; Putnam, 2000).

The target participants were provided the present survey's URL via emails. To increase the response rate, subjects were entered into a raffle for 10 $20 gift cards, and two reminder emails were sent out. The invitation obtained 1,260 responses. The response rate was 36% (AAPOR, 2009).

**Measurement**

Patterns of Mobile Phone Use. This study used 12 items adopted from previous studies (Gil de Zúñiga, Jung, & Valenzuela, 2012; Leung &Wei, 2000; Shah et al., 2001; Wei & Lo, 2006). The original items were revised to fit the South Korean context. Responses were coded on a 5-point scale ranging from 1 (never) to 5 (very frequently). For informational use, respondents were asked during the last one month over their mobile phones how often they (1) visited online to read opinions of others; (2) listened to radio news or watched TV news; (3) visited online to share news items; (4) called others to discuss social matters; and (5) visited online to express their opinions about issues. After a test of indicator reliability, (4) and (5) were dropped in the model, remaining the first three items ($\alpha = .79$, $M = 2.27$, $SD = 1.01$). For relational use, two items were employed: (1) called friends or family to be social; and (2) sent texts, pictures, or instant messages to friends or family to be social; (correlation coefficient r $= .43$, $M = 3.30$, $SD = 1.02$). Recreational uses were assessed with four items: (1) went online to upload content that is mostly just for fun; (2) went online for games and other forms of entertainment; (3) browsed the web just for fun; and (4) used a mobile phone to avoid boredom. After a test of indicator reliability, (4) was dropped in the analysis, remaining the first three items ($\alpha = .72$, $M = 3.08$, $SD = .96$).

Network Size. This study asked participants to examine the address book on their mobile phone and then count the number of people with whom they regularly communicate. The variable was positively skewed (skewness = 2.48), thus a natural log transformation was conducted ($M = 2.41$, $SD = .84$, skewness = .49).

*Informal engagement* was measured by asking respondents the frequency that they spent time doing the following activities over the past three months: (1) talked about social issues with friends or acquaintances; (2) provided monetary help to neighborhood in need; and (3) shared useful community information with others. Responses were coded as a 5-point scale ranging from 1 (never) to 5 (very frequently). An index was created by averaging the responses ($\alpha = .83$, $M = 2.53$, $SD = 1.35$).

To measure *formal engagement*, the study asked respondents how frequently they participated in the following activities during the past three months on a 5-point scale ranging from 1

(never) to 5 (very frequently): (1) worked for service clubs such as Lions and PTA; (2) donated time and/or money to NGOs and/or political parties; and (3) attended community meetings. An index was created by averaging the responses (α = .76, *M* = 2.05, *SD* = 1.37)

*Control variables*. For demographics, this study measured age, gender, education, and household income because previous research shows they can have an influence on measures for civic engagement (Anderson, 1996; Shah et al., 2001a). Demographic characteristics of the current sample is an average age of about 38 years; 52% of the respondents were females; the median income and education level were $40,000~$50,000 and 2-year college degree, respectively. Additionally, political interest was assessed on a 5-point scale by asking respondents how they are interested in political affairs (*M* = 2.47, *SD* = 1.53). Ideological extremity was measured using a 3-point scale (1 = moderate; 2 = liberal or conservative; 3 = very liberal or very conservative, *M* = 1.58, *SD* = .71). (Table 1)

[Table 1]

Descriptive statistics of variables.

|  | M | SD | Min | Max |
|---|---|---|---|---|
| Age | 38.1 | 22.63 | 19 | 61 |
| Gender (female) | .52 | .50 | 0 | 1 |
| Education | 3.7 (Mdn: 2-year college degree) | .28 | 1 | 5 |
| Income | 2.8 | .32 | 1 | 5 |
| Political interest | 2.47 | 1.53 | 1 | 5 |
| Informational use | 2.27 | 1.01 | 1 | 5 |
| Relational use | 3.30 | 1.02 | 1 | 5 |
| Recreational use | 3.08 | .96 | 1 | 5 |
| Network size | 11.45 | 9.25 | 1 | 45 |
| Informal engagement | 2.53 | 1.35 | 1 | 5 |
| Formal engagement | 2.05 | 1.37 | 1 | 5 |

**Analytic Procedure**

PLS (Partial Least Squares) was used to test the hypotheses. In estimating structural equation models, the PLS approach offers greater and more nuanced evidence for relationships between variables, compared with covariance-based SEMs, such as LISREL and AMOS (Howson & Urbach, 2005). Two important aspects of the measurement model must be examined to determine model adequacy in PLS: convergent and discriminant validity (Gefen et al., 2000). Convergent validity is the extent to which a measure correlates positively with alternative measures of the same construct. Convergent validity is assessed using three criteria – indicator reliability, composite reliability, and average variance extracted (AVE). To test the discriminant validity, item cross-loadings and the Fornell-Larcker criterion must be examined.

## Results

### Scale Validation in the Measurement Model

Table 4 shows that most outer loadings were above the .70 for their respective construct, suggesting good indicator reliability. Three items from usage patterns were dropped from subsequent analyses since their loadings were lower than .50. The composite reliabilities of all factors ranged from .70 to .89, which exceeded the recommended the threshold value of .70. In addition, all latent variables indicated good AVE scores. Hence, all three conditions of convergent validity were met (Table 2).

For the discriminant validity, cross-loadings and inter-correlations were calculated. As shown in Table 3, all AVE scores in the matrix diagonals were larger than the off-diagonal correlations, satisfying the Fornell-Larcker criterion. In the test of cross-loadings, the magnitude of the factor loading of each item on its corresponding construct exceeded the magnitude of its cross-factor loadings. Hence, the discriminant validity criteria were also satisfied.

[Table 2]

Assessment of the convergent validity.

|  | AVE | Composite Reliability |
|---|---|---|
| Informational Use | .737 | .865 |
| Relational Use | .720 | .781 |

| | | |
|---|---|---|
| Recreational Use | .602 | .768 |
| Informal Engagement | .537 | .750 |
| Formal Engagement | .524 | .735 |

[Table 3]

Construct correlations and square root of AVE.

| | 1.Informatio-nal Use | 2.Relational Use | 3.Recreational Use | 4.Network Size | 5. Informal Engagement | 6. Formal Engagement |
|---|---|---|---|---|---|---|
| 1 | **.858** | | | | | |
| 2 | .239 | **.849** | | | | |
| 3 | .166 | .398 | **.776** | | | |
| 4 | .201 | .250 | .134 | **1.000** | | |
| 5 | .285 | .181 | .257 | .324 | **.733** | |
| 6 | .301 | .152 | .294 | .305 | .441 | **.724** |

Note: Diagonal elements (shaded) are the square root of the variance shared between the constructs and their measures. Off diagonal elements are the correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.

Table 4

Factor Loadings (bolded) and Cross-Loadings.

| | Informational Use | Relational Use | Recreational Use | Informal Engagement | Formal Engagement |
|---|---|---|---|---|---|
| Informational Use 1 | **.861** | .212 | .202 | .306 | .365 |
| Informational Use 2 | **.790** | .244 | .187 | .291 | .382 |
| Informational Use 3 | **.842** | .222 | .142 | .388 | .325 |
| Relational Use 1 | .242 | **.875** | .392 | .152 | .212 |
| Relational Use 2 | .229 | **.769** | .387 | .188 | .226 |
| Recreational Use 1 | .198 | .395 | **.917** | .178 | .302 |
| Recreational Use 2 | .178 | .426 | **.848** | .294 | .277 |

| | | | | | |
|---|---|---|---|---|---|
| Recreational Use 3 | .137 | .373 | **.752** | .230 | .294 |
| Informal Engagement 1 | .230 | .221 | .202 | **.734** | .392 |
| Informal Engagement 2 | .294 | .192 | .192 | **.726** | .421 |
| Informal Engagement 3 | .325 | .163 | .267 | **.723** | .375 |
| Informal Engagement 4 | .296 | .172 | .272 | **.737** | .366 |
| Formal Engagement 1 | .344 | .228 | .328 | .404 | **.701** |
| Formal Engagement 2 | .268 | .152 | .292 | .432 | **.736** |
| Formal Engagement 3 | .330 | .173 | .273 | .394 | **.723** |

## Structural Model Testing

PLS does not have well-established overall fit measures (Hair et al., 2012). Paths and coefficients of determination (R-squares) are two typical indicators that show overall model goodness of fit. Recently, Wetzels et al. (2009) proposed a global fit measure (GoF) for PLS path modeling which is defined as the geometric mean of the average communality and average $R^2$ (for endogenous constructs). Following the guidelines of Wetzels et al., the current study obtained a GoF values of .45 (Figure 2), .46 (Figure 3), and .48 (Figure 4), which exceed the cut-off value of 0.36 for large effect sizes of $R^2$ ($GoF_{small} = 0.1$, $GoF_{medium} = 0.25$, $GoF_{large} = 0.36$). Thus, the models in Figure 2, 3 and 4 represent the best theoretical predictions of the relationships between the variables of interest to this study.

$$GoF = \sqrt{\overline{AVE} \times \overline{R^2}}$$

H1 expected a positive association between informational uses of the mobile phone and civic engagement. As shown in Figure 2, informational uses had a significant effect on informal engagement and formal engagement ($\beta = .15$, $p < .01$; $\beta = .11$, $p < .05$, respectively), supporting H1a and H1b. Relational use had a negative association with

formal engagement ($\beta$ = -.11, $p < .05$), yet it had no significant link to informal engagement. Thus, H2b was supported. Recreational uses of the mobile phone were found to have a significantly negative association formal engagement ($\beta$ = -.10, $p < .05$), but not with informal engagement. Hence, H3b received support. Network size was found to have a significant association with the two indicators of civic engagement (informal engagement: $\beta$ = .40, $p < .001$; formal engagement: $\beta$ = .36, $p < .001$, respectively), supporting H4a and H4b.

[Figure 2]

Results of direct relations.
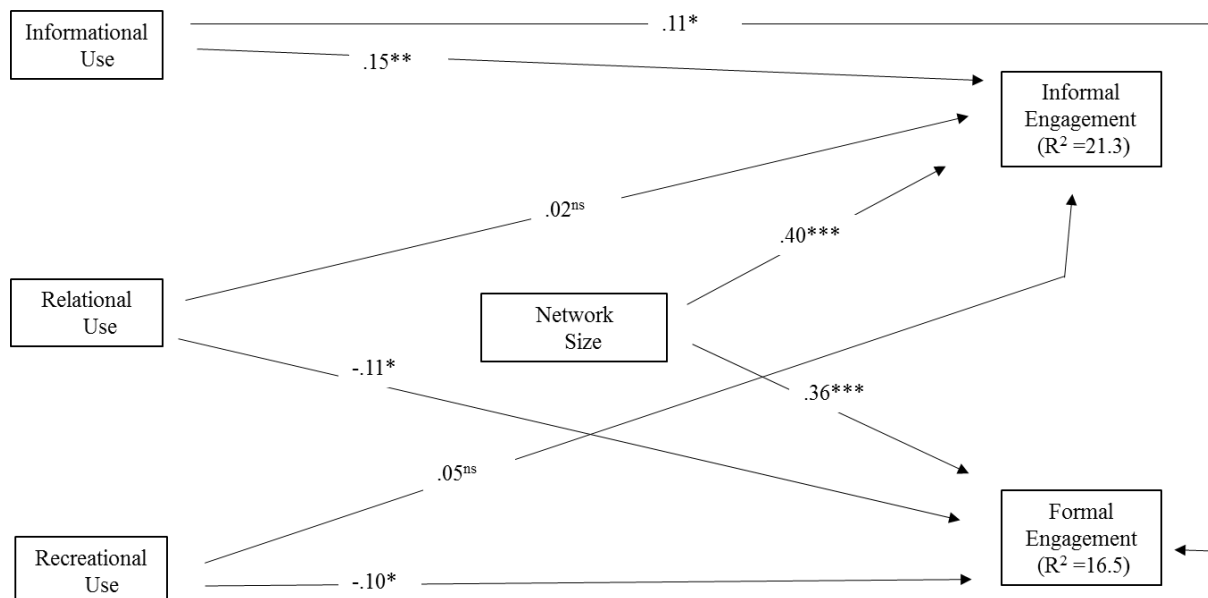


Note: Cell entries are standardized path coefficients. The effects of control variables (age, gender, education, income, political interest, and ideological extremity) on endogenous and exogenous variables have been controlled. [ns]= not significant, * $p < .05$, ** $p < .01$, *** $p < .001$.

When testing mediation effects, the current study followed Preacher and Hayes (2008) and bootstrapped the sampling distribution of indirect effects. The number of bootstrap samples was 5,000. When the mediator is included in an analysis, the indirect effect must be significant to prove a mediating effect. If so, the mediator absorbs some of the direct effect.

For instance, in a PLS path model without the mediator variable, a positive direct effect would become smaller or insignificant after the inclusion of the mediator variable.

Figure 3 shows that when network size is introduced as a mediator, the direct impact of informational use on informal engagement becomes significantly smaller (from $\beta = .15$ to $\beta = .11$), whereas its indirect effect via network size achieves a point estimate of .10 (a*b). Since all CIs do not contain zero (Table 5), the indirect effect is significant. This means that network size partially mediates the influence of informational use on informal engagement. When network size is introduced as a mediator, the direct association between informational use and formal engagement becomes nonsignificant (from $\beta = .11$ to $\beta = .08$), whereas its indirect effect via network size achieves a point estimate of .09 (a*c). Since all CIs do not contain zero, the indirect effect is significant. This means that network size fully mediates the influence of informational use on formal engagement. Consequently, H5 was supported.

[Figure 3 and Table 5]

Mediating effects of network size between informational use and civic engagement.
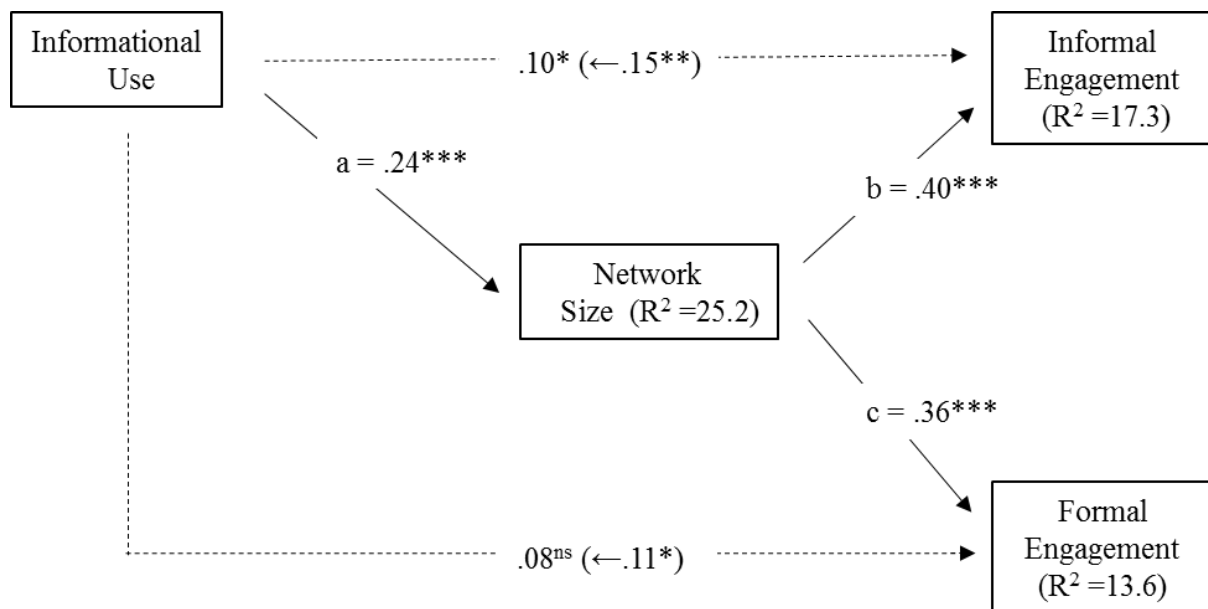


Note: Cell entries are standardized path coefficients. The effects of control variables (age, gender, education, income, political interest, and ideological extremity) on endogenous and exogenous variables have been controlled. The coefficients in parentheses indicate direct effects.    $^{ns}$= not significant, * $p < .05$, ** $p < .01$, *** $p < .001$.

Path coefficients and indirect effects for mediation models.

| | Direct effect to | | Indirect effects | | |
|---|---|---|---|---|---|
| | Informal Engagement (IE) | Formal Engagement (FE) | Point estimate | Percentile bootstrapping 95% confidence interval | |
| | | | | Lower | Upper |
| Informational Use (IU) | .15 (2.87) | .11 (2.04) | | | |
| IU → Network Size → IE | | | .10 | .09 | .22 |
| IU → Network Size → FE | | | .09 | .07 | .19 |

Note: * *p* < .05, ** *p* < .01, *** *p* < .001; *t* values in parenthesis. Point estimates were obtained by multiplying the direct effect of Informational use on network size and the direct effect of network size on informal engagement and formal engagement (.24 x .40 = .10; .24 x .36 = .09).

This study also investigated whether network size moderates the impact of mobile phone use on civic engagement. To this end, interaction terms were formulated by multiplying the corresponding indicators of the predictor and the moderator construct (Chin, Marcolin, & Newsted, 2003). Figure 4 presents the results of the structural model with the moderator variable, which is network size. Network size played a significant moderating role between relational uses and civic engagement; the influence of relational use on informal engagement was greater among people who have a broader network size (β = .12, *p* < .05). Network size exercised a similar effect to recreational use of the mobile phone; the positive relationship between recreational use and informal engagement was stronger among people who have a broader network size (β = .14, *p* < .01). Therefore, H6 was partially supported.

[Figure 4]

Moderating effect of network size between relational/recreational uses and civic engagement.
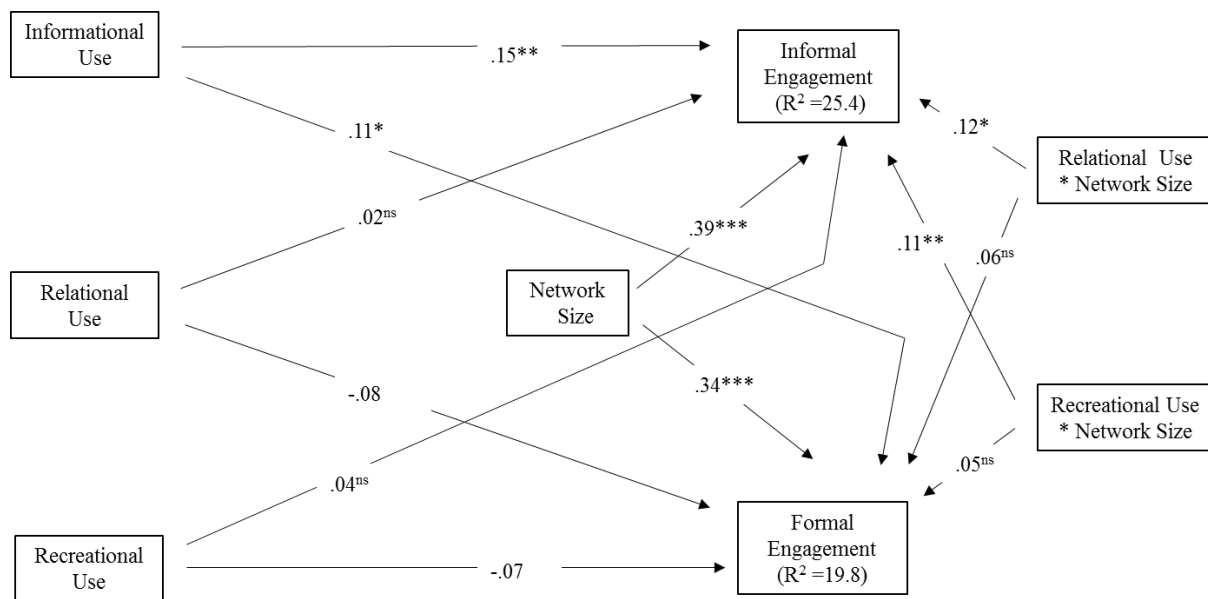
Note: Cell entries are standardized path coefficients. The effects of control variables (age, gender, education, income, political interest, and ideological extremity) on endogenous and exogenous variables have been controlled. $^{ns}$= not significant, * $p < .05$, ** $p < .01$, *** $p < .001$.

**Discussion**

The purpose of this study was to examine the relationship among mobile phone use, network size, and civic engagement. The analyses find that informational uses of the mobile phone have a significantly positive association with civic engagement. On the other hand, relational and recreational uses have a neutral or negative association with civic engagement. Network size of mobile communication moderated the impact of relational and recreational uses on civic engagement while it mediated the impact of informational uses on civic engagement. The statistical analyses indicate that the mobile phone, depending on its usage patterns and communication network size, can have different effects on civic engagement.

The current study sheds light on the ways patterns of mobile phone use translate into civic engagement. Prior studies found that use of the Internet for information seeking purposes nurtures engagement in civic issues (Kwak et al., 2011; Norris, 1996; Shah et al., 2005). This study confirms that the same logic can be applied to mobile communication. However, the findings of the current study do not necessarily support *mobile optimism* (for example, Kwak

et al., 2011). Using mobile phones mainly for communicating with intimates or for having recreation was either neutrally or negatively associated with civic engagement. These findings indicate that when users stick to keeping relationships with close-knit ties and having fun, mobile phone use rarely results in civic engagement beyond users' personal boundaries.

The current study also contributes to mobile communication research by investigating the nuanced role of network size in the process of civic engagement. As mentioned earlier, larger networks tend to stimulate greater discussion frequency (McLeod et al., 1999). In this process, the size of communication networks (*network size* in this study) tends to develop civic skills and interest in community issues (McLeod et al., 1999; Scheufele et al., 2006). As a result, network size has a positive link to civic engagement (Huckfeldt et al., 2004; Kwak et al., 2005; Moy & Gastil, 2006). The present study suggests that network size in mobile communication plays a crucial role in the process of civic engagement.

This study moves beyond examining a direct relationship between mobile phone use and civic engagement and tests what roles network size plays regarding the relationship. Findings reveal that network size channels the positive association between informational use and civic engagement. The mediating role of network size can be partly explained from the nature of information access and consumption via the mobile phone. Unlike other types of media, mobile phones provide content through numerous methods, such as Web, social media, messenger, and texting. Despite the abundance of information, many mobile phone users seem to browse whimsically for information without much attention (Habuchi, 2005; Gergen, 2008; Matsuda, 2005). In this context, network size is important because frequent interactions triggered by large networks can provide an opportunity to engage in a vibrant exchange of information and to meet diverse people including civically motivated people. In this process, mobile phone users who have large networks can develop civic consciousness (Gastil & Dillard, 1999; Klofstad, 2007). Although more studies are needed to investigate why the network size in mobile communication mediates the impact of informational use on civic engagement, this study at least challenges previous findings that informational uses of media directly influence civic engagement.

Network size also played a significant role in relational and recreational uses. Findings show that the association of relational and recreational uses and civic engagement is moderated by network size. Again, this result highlights an important role of network size in fostering civic minds among mobile phone users. Prior research shows that network size tends to increase exposure to diverse people and viewpoints (McLeod et al., 1999; Scheufele et al., 2006). As network size increases, the likelihood of encountering people who function as important sources of new information also increases (Weimann, 1982). Accordingly, the mobile phone, regardless of different usage patterns, can provide a greater opportunity to meet diversity and to engage in civic processes as long as users have large communication networks. According to Hampton et al. (2011), mobile phone users have large communication networks than Internet users in general. Relatively a large size of networks in mobile communication coupled with various technological affordances seems to provide a critical tool for users to get involved in civic processes.

Despite the new insights brought by this study, several caveats invite us to be cautious when interpreting the findings. It should be noted that the nature of the data employed may not be well-suited for testing causal-effects relationships. In order to ensure causality among variables, a panel survey should be conducted (Campbell & Kwak, 2010). But Shah and his colleagues (2005), using panel data, find that network size is an antecedent of civic engagement. Thus, it is more likely that network size leads to civic engagement than the other way around. Readers also should be careful in interpreting the role of network size. Although the current study found that network size moderated the association between relational or recreational uses of the mobile phone and civic engagement, the pattern was not consistent. Network size did not moderate the impact of relational and recreational uses on formal engagement. This suggests that besides network size other intervening variables, such as network diversity and heterogeneity, might work between mobile phone use and civic engagement. Limitations notwithstanding, this study provides an initial foundation for research on the role of the mobile phone and its network size in civic engagement processes.

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