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After Broadband Infrastructure Saturation: The Impact of Public Investment on Rural Social Capital

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Having attained 98% coverage in rural areas in South Korea, the Information Network Village (INVIL) project began to focus not only on constructing broadband infrastructure but also on building online social networks. The current study examined the impact of public investment in information communication technology on online interaction and social capital in rural areas after broadband infrastructure was saturated. The findings indicate that public investment can play a key role in the sustainable development of rural areas by increasing community attachment and reducing migration intention.

Keywords: Digital divide, broadband saturation, information communication technology, public investment, social capital, community attachment

Introduction

Public investment in information communication technology (ICT) and its effect on rural development is becoming a global issue as rural outmigration and the economic downturn threaten the sustainability of rural society. Efforts in telecommunication infrastructure investment have significantly impacted social and economic development in rural and developing regions (Hudson, 1995). Reducing the rural–urban broadband gap is a critical issue even in developed countries like the United States. Government investment in rural broadband has been shown to have significant relationships with rural employment and economic viability (Gillett, Lehr, & Sirbu, 2006; Katz & Suter, 2009).

However, it is unknown whether public investment in ICT remains effective after broadband adoption reaches high penetration levels nationally (i.e., "saturation," Katz & Suter, 2009, p. 2). A noteworthy case in addressing this question is South Korea's INVIL (Information Network Village), a

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government-driven project that aims to build broadband infrastructure in rural areas and online communities of local residents. Many parts of the world are still implementing public investment in infrastructure, but South Korea has already achieved 98% broadband coverage, even in small cities and rural areas (Kim & Santiago, 2005), and a high broadband penetration rate (75%) across the country (Ministry of Public Administrations and Security [MOPAS], 2009). Still, government continues to support training and maintenance for online social networks in rural communities. Thus, the South Korean case of INVIL provides a unique opportunity to examine what happens after the rural broadband gap is addressed systematically.

Because infrastructure penetration in South Korea has reached maturity, closing the rural–urban broadband adoption rate is no longer a primary issue (Korea Local Information Research & Development Institute, 2008). The new question becomes how is public investment in ICT used to enhance the viability of rural areas? This question is worth asking, as Korean rural areas, much like U.S. rural areas (Galston & Baehler, 1995), are suffering from economic decline and rural exodus (Kim, 2003).

Social capital is a significant determinant of sustainability of rural development initiatives, and ICT plays an important role in enhancing communities' social capital (Simpson, 2005). Yet the social benefits of the INVIL project are still unknown (Korea Local Information Research & Development Institute, 2008). Thus, the current study explored the impact of government support of use of ICT infrastructure in rural communities. How has the INVIL project affected the social capital of rural areas? Why is a public investment still needed, when ICT infrastructure is saturated? How can INVIL help preserve the fabric of rural communities?

This study examined the social impact of the INVIL project from three perspectives. First, from the perspective of social cognitive theory (Bandura, 1986), it examined INVIL's influence on Internet self-efficacy and outcome expectations, which are major indicators in overcoming the digital divide through sustainable broadband adoption (Hoffman & Novak, 1998; LaRose, Gregg, Strover, Straubhaar, & Carpenter, 2007). Second, given INVIL's emphasis on online social networks of local residents, its effect on social capital was investigated, specifically its effects on online interaction and real-life community attachment. Finally, the study examined INVIL's impact on community satisfaction and residents' intention to stay, indicators regarded as crucial to the sustainability of rural areas. As rural areas suffer from economic decline and rural exodus, this question relates closely to the viability of local communities. By examining these three aspects of social impacts, the current study aims to uncover implications for future public investment in closing the digital divide.

Overview of INVIL

Since its implementation in 2001, the INVIL project has aimed to (a) construct broadband infrastructure in informationally disadvantaged areas, (b) build content-rich local websites, (c) encourage community members to use information technology in their daily lives, and (d) increase the long-term viability of local communities by building an online community and improving the local economy (MOPAS, 2009).

In the early phase of the INVIL project, the government focused mainly on the first two objectives to close the infrastructure gap between rural and urban areas. Fiber-optic backbone networks connected each village, with each household linked via a 10 Mbps asymmetric digital subscriber line. The resulting Internet penetration rate was significantly higher for participating communities (65%) than for nonparticipating communities (40%) (Korean Association of Local Informatization [KALI], 2006). As of January 2008, the INVIL project had completed building local websites for a total of 358 participating villages.

A rural village wishing to benefit from the INVIL project has to apply to be considered as participant village, clarifying its aims and plans to build the community's ties and grow the economy through the network infrastructure and village websites. Cases that meet the criteria index designated by the government body in charge at a competing level are likely to be accepted. The main bodies in charge set the village selection criterion as follows. Farming and fishing villages have yet to develop Internet and informatization infrastructure. Villages should be able to generate income by making use of local specialties and encouraging tourism. Finally, village residents must exhibit a strong willingness to carry out self-operation following construction (MOPAS, 2009).

Currently, the INVIL project focuses on the latter two goals. To increase local residents' involvement, for each village the government hires program managers, who not only manage local websites and teach local residents computer skills but also organize online communities. From 2005 to 2007, local program managers' efforts increased the number of memberships on the INVIL website (http://www.invil.org) by 64%. At the same time, the number of forums and posts increased by 88% and 38%, respectively (KALI, 2006).

Village websites offer diverse functions: online social clubs, INVIL messenger, promotion pages for local specialty items, online shops, and so forth. These applications help residents interact and share information both online and offline, which means keeping in touch with customers as well as fostering social connections. On top of that, websites provide social network features such as blogs and Twitter, where rural residents practice grassroots/citizen journalism. Bloggers cover a variety of community events, promote the release of new products from each village, and provide policy updates and alerts that are critical to rural residents' welfare and financial interests. Also, to help rural residents connect with community members, INVIL promotes information sharing about the health care system and education and training opportunities. Because private education in South Korea is quite expensive and education services are concentrated in urban areas, rural residents who are eager to educate youth tend to see more advantage in village websites that share information about online education (e.g., free online resources or reviews of educational services).

Along with this active online participation, the e-commerce system on the INVIL website contributed to local economies. From 2005 to 2007, sales volumes of specialty goods and tour programs increased by 900% and 90%, respectively (KALI, 2006). Considering positive collateral effects such as online promotions of local specialties and tourism, the INVIL project has significantly contributed to enhanced economic viability of participating villages.

The results of the INVIL project have been promising. According to a survey conducted by MOPAS, 74.1% of the participants responded that the project was helpful in resolving the digital divide issue, and 62.4% agreed that it had enhanced the viability of their local community. Two thirds of participants (65.7%) agreed that the INVIL project was conducive to local economic growth. Regarding the outlook of e-commerce, 62.8% thought that revenue would increase in the near future (KALI, 2006). Along with these positive results, the 2006 World e-Gov Forum acknowledged the INVIL project as a notable case of closing the digital divide.

All these features tend to differentiate INVIL members from non-INVIL members in terms of the degree to which their online activities relate to their livelihoods and real-life ties with community.

Literature Review and Research Questions

Closing the Digital Divide and INVIL

The digital divide refers to "the gap between those who have access to digital technologies and those who do not" (Hargittai, 2003, p. 2). In terms of access to and usage of ICT, the digital divide's diverse dimensions include "quality of equipment, autonomy of use, the presence of social support networks, experience and online skill" (Hargittai, 2003, p. 3) among different segments of the populace. Research on the digital divide has focused on the relationship between demographics and the digital divide. Demographics are reported to influence broadband adoption more than does service availability via public investment (Government Accounting Office, 2006; Horrigan, 2009).

Seeking answers to the question "Is demography destiny?" (LaRose, Gregg, Strover, Straubhaar, & Inagaki, 2008, p. 5), empirical studies examined mediating factors such as education and ethnicity. By comparing different ethnic groups in the United States, Hoffman and Novak (1998) found that education had helped to transform Internet access into usage. Also, Hargittai (2003) suggested implementing policies to increase users' benefits by not only improving access to ICT but also investing in training. Moreover, broadband adoption was found to be enhanced by external stimuli such as government investment in broadband service and public education efforts targeting perceptions of broadband service (LaRose, Gregg, Strover, & Straubhaar, 2011)..

The INVIL project was originally meant to close the digital divide between rural and urban areas in terms of Internet accessibility. Various social projects implemented in Western countries (Hampton & Wellman, 2003; Kavanaugh & Patterson, 2001; Wellman, 1996) show that investment in community computer networks and ICT has led to social networks and ties. Given the findings that online social networking is conceivably a social-capital building technology, INVIL is expected to benefit participants similarly. Having attained broadband saturation, the INVIL project is now turning its focus to the creation of user benefits, such as improving economic viability and strengthening online social networks. However, it remains arguable whether the Internet effect is overall a positive force in community life or the other way round. Regarding this, in terms of the digital divide, the current study examined what happened to a community after broadband saturation.

Internet Self-Efficacy and Outcome Expectations

On the premise that demographic characteristics do not necessarily lead to significant differences in user behavior, social cognitive variables have received attention as indicators for overcoming the digital divide (Eastin & LaRose, 2000). Social cognitive theory has explained the factors that may promote information technology adoption in rural areas (LaRose et al., 2008). Social cognitive variables were viewed as factors in overcoming the Internet paradox (Kraut et al., 1998), that is, the Internet's negative effect on social involvement and psychological well-being (LaRose, Eastin, & Gregg, 2001). LaRose et al. (2008) claimed that Internet self-efficacy enabled individual users with few social ties to seek social support online.

Social cognitive theory (Bandura, 1986) proposes that self-efficacy and outcome expectations are associated with human behavior. Self-efficacy refers to "people's judgments of their capabilities to organize and execute courses of action required to achieve designated types of performances" (Bandura, 1986, p. 391). Individuals cognitively process information concerning their ability and regulate their choice behavior and exert effort accordingly (Bandura, 1977).

Internet self-efficacy can be constructed as the belief in one's capabilities to organize and execute courses of Internet actions needed to produce given attainments (Eastin & LaRose, 2000). It has strong ties to other relevant factors such as prior Internet experience, outcome expectancies, and Internet use (Eastin & LaRose, 2000). Previous studies found that the level of cognitive outcome expectations is an antecedent factor of a successful outcome. Expected outcomes of Internet usage predict Internet use (LaRose et al., 2001). Outcome expectations are deemed as significant indicators in closing the digital divide between rural and urban areas (Eastin & LaRose, 2000). Expected outcomes of broadband usage were explored as factors in increasing broadband adoption intentions (LaRose et al., 2007), encouraging purchases online (Vijayasarathy, 2004), trying new e-services (Hsu & Chiu, 2004), and motivating engagement in Web-based instruction (Joo, Bong, & Choi, 2006). The findings indicated that strong Internet self-efficacy was related to high levels of outcome expectations and thus mediated the behavioral intention. Prior experience, encouraged by behavioral intentions, in turn produced higher expected outcomes, recurrently affecting Internet self-efficacy.

Considering that INVIL supports diverse programs to motivate rural residents' Internet usage, the current study aimed to investigate the INVIL project's impact on rural residents' Internet-self efficacy and the expected outcomes. The project also provides training programs and maintenance of village websites to maximize the utilization of infrastructure. Further attention is paid to the promotion of village websites to achieve community viability through active online interaction. Taken together, from the social cognitive perspective, it is likely that the INVIL project has contributed to rural residents' usage, Internet self-efficacy, and expected social outcomes. This leads to the following questions:

RQ1a: What is the relationship between the INVIL project and the degree of rural residents' Internet self-efficacy?

RQ1b: What is the relationship between the INVIL project and the degree of rural residents' expected social outcome?

Social Capital and INVIL

To examine the social benefit of the INVIL project, this study uses a social-capital framework as one of its major theoretical frameworks. The social-capital framework claims that social networks have value (Jacobs, 1960). Social capital, formed through various aspects of social engagement, results in enhanced community ties and bonds. Putnam (2000) claimed that social capital contributes to the entire society by enabling political and social participation to flourish. Besides the altruistic dimension of social capital indicated in Putnam's language, social capital can pertain to a "shared interest" within economically engaged circles (Salisbury, 1969), such as membership in social networks (Portes, 1998). At the individual level, social capital should be distinguished from the altruistic dimension of community involvement. For example, people who appear to be friendly neighbors could be business partners or stakeholders within the same economic community, as demonstrated in the INVIL project. This means social capital can involve a self-serving dimension of community members' attachment that is associated with the desire for high-quality living conditions.

Many studies have also investigated the correlation between Internet use and its play in social capital creation. Representatively, the case of Blacksburg Electronic Village (BEV) (Kavanaugh & Patterson, 2001; Kavanaugh, Carroll, Rosson, Zin, & Reese, 2005) is similar to that of INVIL in this study in that both were initially bolstered by public grants to address the digital divide and eventually advanced to social networking. The BEV study supports the expectation that a community network might point to increased social use of the Internet over time. However, consistent with Putnam's skeptical view of the role of Internet (2000), the BEV study indicated that in practice, social-capital-building technologies are a force in community involvement and attachment only when their use is encouraged through preconditioning civic activities—that is, the classic chicken-or-the-egg problem about the ramifications and causes of online social networking still remains. Nevertheless, this study aimed to examine the phase in which formal social groups based in a local community that might have been engaged in the prerequisite high levels of community involvement can be synergized through social network technology. Because INVIL was built upon strong consensus about self-development needs among its members and rural villages in South Korea that already had universal access to the Internet, it provides an opportunity to address the question of the relation between online social networking and social capital. In this regard, the current study focused on the social networks and social-capital-building activities generated through the shared interests and goals of the INVIL project, and on the project's relationship with the degree of online interaction and real-life community attachment among rural residents.

Online Interaction and Community Attachment

Online interaction refers to social use of the Internet. People generate contacts with diverse kinds of social relationships through e-mail, social network sites, blogs, instant messaging, and so on. Here online interaction means community-oriented online engagement as opposed to mere accumulated time spent online. Other sorts of online activities, such as entertainment and information seeking, also differ from online interaction. That is, more time devoted to online activity does not necessarily produce more online interaction or stronger community ties. In this respect, it was found that the Internet has no

effect on social capital as online interaction is combined with real-life activities (Wellman, Haase, Witte, & Hampton, 2001).

Internet use has been found to have both positive and negative effects on social capital. For example, some studies have argued that intense Internet use might diminish face-to-face interaction among friends and family, a clear indication of reduced intimacy among community members (Nie & Erbring, 2000; Nie, Hillygus & Erbring, 2002). This means many other Internet features, such as entertainment and information searches in globe-spanning cyberspace, might have lured local community members away from ongoing issues of life in a rural community and self-development efforts.

Yet if wired communities are to be offered a convenient communicative option for members, then we should pay practical attention to studies that highlight online social networking's positive role in terms of local community ties (Kavanaugh & Patterson, 2001; Simpson, 2005). Online interaction was found have a long-term positive effect on social involvement and psychological well-being, notwithstanding the previously found negative effect known as the "Internet paradox" (Kraut et al., 2002). Also, online interaction was found to have a significant effect of increased social contact, community attachment, and participation (Kavanaugh et al., 2005). In a way, online interaction facilitates community attachment and psychological well-being because it facilitates alternative access to a community (Ellison, Steinfield, & Lampe, 2007). This benefit may accrue especially to those with low self-esteem and low life satisfaction (Ellison et al., 2007), and to those who lack interaction with friends and neighbors (Bargh & McKenna, 2004). Moreover, certain aspects of online interaction were found more conducive to optimal conditions for motivating self-disclosure than face-to-face communication (Bargh, McKenna, & Fitzsimons, 2002).

Hence this study came to focus on the extent of the relation between online interaction through INVIL, and real-life community attachment.

RQ2a: What is the relationship between the INVIL project and the degree of rural residents' online interaction?

RQ2b: What is the relationship between the INVIL project and the degree of rural residents' community attachment?

Community Satisfaction and Intention to Stay

Rural exodus is a critical issue across the globe. U.S. rural areas are suffering from economic decline and rural exodus (Galston & Baehler, 1995), as is likely the case for South Korean society as well. To be specific, the group aged 10 to 30 years—considered to be the "effective labor force of society"—is dramatically decreasing in rural areas (Kim, 2003), which meets the definition of the rural exodus. However, consistent findings have pointed to promising factors in rural economic viability and the influx of new residents, one of which is information technology (Galston & Baehler, 1995; Parker, 2000).

Reaping one of the expected benefits of Internet communication, rural residents seem to have overcome their disadvantaged location to some extent. For instance, rural residents can connect with friends or relatives beyond their local community and link their online and offline relationships together. Still, there is concern about global-spanning capabilities of the Internet that might possibly have community members estranged from real-life community by reducing in-person contact among neighbors. In response to this concern, an important finding of a study by Hampton and Wellman (2003) asserted the positive effect of the Internet on local community ties. They found that online interaction among community members mainly helped solidify existing relationships, which encourages hope that online interaction can enhance real-life community attachment.

According to Putnam (2000), bonding capital means social connection within common groups, whereas bridging capital means social linkage across groups of diverse character, which have an incremental effect on each other. As for the clearly marked difference between bonding and bridging social capital in particular, INVIL might play out both ways, helping outbound interaction as well as inbound interaction. Through outbound interaction, INVIL residents can have an extensive online reach to urbanite customers, sisterhood community members, and colleagues in other INVIL participant villages in rural areas. Thus bridging social capital could be expected to help rural residents feel more connected to a bigger community on a par with that of urbanites.

On the other hand, bonding social capital can give rural residents a greater sense of belonging, thereby pointing to increased attachment to the community. To illustrate, INVIL can be a venue for extensive interaction among community members by way of an e-commerce site run to bring participants into open discussions as well as various types of social group activities. Thus the expectation emerges that INVIL participants would show a higher level of community attachment and involvement. In this respect, the INVIL project is expected to contribute to creation of bonding social capital.

Whereas social capital works to both bond and bridge, the relationship between Internet usage and migration intentions remains arguable. The Internet has been found to ease the burden of looking for better living conditions (Wellman et al., 2001). Also, heavy use of the Internet decreases community commitment (Wellman et al., 2001). For example, computers placed in rural libraries (Egan, 2002) have been reported as a possible cause for outmigration, as they help library patrons find city jobs online. Also, online communication with users outside of the community could downgrade the quality of the services and goods provided by rural suppliers and employers, which would be detrimental to the sustainability of the rural communities (Rowley & Porterfield, 1993).

In another light, the bonding capital shown in INVIL seems cause to hope that over time, community networking can strengthen intentions to stay. One interpretation of this possibility is that online interactions result in social integration, one of the dimensions of social well-being (Smith, Krannich, & Hunter, 2001). Social trust built on a social network eventually boosts quality of life (Kavanaugh & Patterson, 2001). As an indicator of social well-being, community satisfaction may be subject to the availability of entertainment, education, and public services (Smith et al., 2001); also, rural community self-development efforts might lead to increased social capital (Flora, Sharp, Newlong, & Flora, 1997). In a longitudinal study conducted in rural U.S. communities, social uses of the Internet were found to

constitute community satisfaction and attachment, leading to less intention to relocate from the rural communities (LaRose et al., 2008). Thus, it is plausible that a government-sponsored project that, like INVIL, promotes social networking could be a predictor of enhanced community attachment. Community attachment, community satisfaction, and intention to stay were constructed as major variables affecting relocation, because enhanced satisfaction and intention to stay may lead to extended residency. Thus, the research questions are as follows:

RQ3a: What is the relationship between the INVIL project and the degree of rural residents' community satisfaction?

RQ3b: What is the relationship between the INVIL project and the degree of rural residents' intention to stay?

Method

Participants

Two hundred and nine participants were recruited from 14 randomly selected rural towns listed on the INVIL website in South Korea and another 14 non-INVIL villages located near the selected INVIL towns. Among participants, 63.2% lived in villages designated as INVIL, while 36.8% lived in non-information villages. Participants were recruited from both INVIL and non-INVIL communities (in close geographical proximity), which allowed estimation of the causal impact of INVIL on rural residents. The empirical study has a quasi-experimental design. In practice it was not possible to control treatment groups and randomly assign participants by forcing them to live in a certain village, so we used INVIL as a treatment group for a realistic representation/sampling. Therefore, the quasi-independent variable in this study becomes a grouping variable with different residential statuses based on whether a participant lived in an INVIL participating village or not. The non-INVIL residents group functioned as a control group that was not affected by INVIL projects.

This method might harm the study's internal validity in comparison to a randomized experiment conducted in a controlled lab setting. Nevertheless, this method minimizes threats to external validity as the experiment uses natural environments so that findings might be applied to general settings and population.

The sample consisted of almost identical numbers of male (N = 99) and female (N = 100) participants. Participants' average age was 44.71 (SD = 12.50). On average, participants had lived in their respective towns for 25.38 years (SD = 2.85), working as farmers (24.29%) or housewives (23.72%). More than half of participants did not have college education (21.2% some high school, 38.4% high school graduates). Most participants had family income of US$8,500–17,000 (27.6%) or US$17,000–30,000 (22.9%).

Procedure

The study used a cluster sampling method for participant recruitment. The INVIL website (http://www.invil.org/) provided a list of 358 rural villages participating in the INVIL project and supported diverse forms of online social clubs of rural residents. Fourteen sample villages were randomly selected from among the villages listed on the website. Non-INVIL residents were recruited from another set of 14 villages geographically close to INVIL. After selection of 28 villages (14 INVIL and 14 non-INVIL), we searched the INVIL website for the INVIL group (e.g., http://community.invil.org/community/html/club/), and other general social network services in South Korea for the non-INVIL group (e.g., http://club.cyworld.com/club/clubsection2/home.asp; http://cafe.daum.net; and http://cafe.naver.com). We used a search function to seek the social clubs based in non-INVIL villages.

The difference between INVIL and non-INVIL members was that INVIL members benefited from the variety of government support programs mentioned above and ties with other village members in an economic community, while non-INVIL residents merely had opened and were operating online social clubs using the features of a social network service.

The websites provided contact information for each INVIL village organizer and club organizer in non-INVIL villages. E-mails were sent to them to request they provide e-mail addresses of club members. Then, using alphabetical order listing, we randomly drew contact information for 400 potential participants from the selected villages.

E-mails were sent to the drawn addresses, describing the purpose of the study to community organizers, church members, and social club members. Once they replied to the e-mail by agreeing to participate in the survey, participants were notified of the time and location at which the survey would be conducted.

The researcher then visited the selected communities to conduct the survey on-site at the appointed place. Participation took the form of a self-reported written survey. Participants signed a consent form prior to taking the survey and were thanked for their input upon completion.

In this way, 28 villages succeed in covering each and every administrative district of South Korea. It turned out that 209 out of 400 actually participated in the survey, for a 52% participation rate.

Measurement

A demographical questionnaire coded participants' ages and whether or not they were INVIL residents into a nominal scale. Ages and incomes were set in a ratio scale. Education level was recorded via a 5-point ordinal scale.

The questionnaire used 5-point scales ranging from strongly agree (scored 5) to strongly disagree (scored 1), and negatively worded items were reflected. The responses to multi-item indices were averaged across the number of items. Questionnaires, originally written in English, were carefully translated into Korean by a bilingual researcher. Each scale showed evidence of a good fit for a one-factor model and satisfactory reliability.

Internet Self-Efficacy. A summative index of seven items was used to gauge Internet self-efficacy. The seven statements, drawn from Eastin & LaRose (2000), were "I feel confident explaining why a task will not run on the Internet," "I feel confident I know how to learn advanced skills related to the Internet," "I feel confident understanding terms/words relating to Internet software," "I know how to make new friends on the Internet," "I use the Internet so much it interferes with other activities," "I know how to get help with my personal problems through the Internet," and "I am confident I can find social support on the Internet." Each item used a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). With a maximum-likelihood estimation procedure, a one-factor model showed an acceptable fit, NFI (normed fit index) = .92; IFI (incremental fit index) = .94; CFI (comparative fit index) = .94; SRMR (standardized root mean residual) = .05. The reliability (Cronbach's alpha) was $\alpha = .92$.

Social Outcome Expectations of Internet Use. Participants were asked to indicate how strongly they agreed with statements using a 5-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The statements, selected from LaRose et al. (2007), included "Interacting with people online makes me interested in things that happen outside of my town," "Interacting with people online makes me want to try new things," "Interacting with people online makes me feel connected to the bigger picture," "There is someone online I can turn to for advice about making very important decisions," and "The people I interact with online would put their reputation on the line for me." A summative index of these five items was used to measure social outcome expectations of Internet use. A one-factor solution yielded a good fit, NFI = .94; IFI = .95; CFI = .95; SRMR = .04. The reliability was $\alpha = .88$.

Online Interaction. Five items were drawn from LaRose et al.'s survey questionnaire on socializing online (2008). After the opening passage "Thinking of your use of e-mail, instant messaging, village website or social networking site (such as café and Cyworld), to what extent. . ." the following questions were asked: "Does your participation make you feel a part of a community?" "Do you communicate with friends from your local community?" "Do you communicate with friends in other communities?" "Do you communicate with family from your local community?" and "Do you communicate with family in other communities?" Participants marked their responses using a 5-point scale, ranging from 1 (not at all) to 5 (a great deal). Then a summative index of the five items was used. A one-factor solution yielded a good fit, NFI = .98; IFI = .98; CFI = .98; SRMR = .03. The reliability was $\alpha = .92$.

Community Attachment. A summative index of seven items regarding community attachment, adopted from LaRose et al. (2008), was used. Participants were asked to indicate how strongly they agreed with the following statements using a 5-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree): "I feel I am part of it," "I spend a lot of time participating in activities there," "I come into contact with new people all the time," "I am willing to spend time to support activities there," "I can count on my neighbors to run errands for me," "The longer I live in this town, the more I feel that I

belong," and "If I were in trouble, most people in this community would go out of their way to help me." A one-factor model showed a good fit, NFI = .94; IFI = .95; CFI = .95; SRMR = .04. The reliability was α = .92.

Intention to Stay. Five items adopted from LaRose et al. (2008) addressed intention to stay. The statements used were "I would never consider leaving here," "If I had to move away from this community for some reason, I would be very sorry to leave," "Our community has seen better days," "Our community has a lot of future potential," and "Our community's future depends on the efforts of its residents." Strength of participants' agreement with them was gauged on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Intention to stay was measured by a summative index of these five items. A one-factor model showed a good fit, NFI = .97; IFI = .98; CFI = .98; SRMR = .04. The reliability was α = .86.

Community Satisfaction. A summative index of six items was used to gauge community satisfaction. Participants used a 5-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree), to indicate whether they were satisfied with the following community attributes: "The recreational services and opportunities available," "The quality of streets and roads," "The availability of Internet services," "The shopping facilities in my community," "The programs for youth in my community," and "My employment opportunities." The community attributes were adopted from LaRose et al. (2008). A one-factor model yielded a good fit, NFI = .94; IFI = .95; CFI = .95; SRMR = .04. The reliability was α = .88.

Data Analysis

Independent sample t-tests, Pearson product-moment correlations, and point-biserial correlations were analyzed using SPSS, Inc. (2007) version 16.0. A confirmatory factor analysis was conducted using the Amos package (Arbuckle, 2006). Prior to the analysis, outliers were eliminated and missing data were imputed using maximum likelihood estimates.

Results

Demographic Differences

Prior to the test of the INVIL project's effect, the demographic differences between INVIL residents and non-INVIL residents were examined. The results showed a significant difference in age, $t(194) = 4.82$, $p < .001$. INVIL residents ($M = 47.72$, $SD = 11.95$) were older than non-INVIL residents ($M = 39.19$, $SD = 11.64$). In terms of the length of residency, INVIL residents ($M = 29.16$ years, $SD = 17.37$) had lived in their villages longer than non-INVIL residents ($M = 18.43$, $SD = 14.24$), $t(194) = 4.39$, $p < .001$. Differences were not significant for income, $t(190) = 1.32$, $p = .19$, or education, $t(196) = 0.67$, $p = .50$.

Correlation Analysis

Table 1 shows the correlations among variables after controlling for demographic variables (gender, age, family income, education, and length of residency). And Table 2 presents t-test analysis showing group statistics about variables examined among INVIL and non-INVIL participants.

INVIL was not correlated with Internet usage, $r = -.03$, $p = .75$. There was no significant difference between INVIL residents ($M = 3.31$ hours per day, $SD = 2.78$) and non-INVIL residents ($M = 3.41$, $SD = 2.26$).

For social cognitive variables (RQ1a and RQ1b), INVIL was not associated with Internet self-efficacy ($r = .06$, $p = .44$). Internet self-efficacy of INVIL residents ($M = 2.61$, $SD = 0.95$) did not differ from that of non-INVIL residents ($M = 2.66$, $SD = 0.96$); $t(179) = -.495$, $p = .621$. In contrast, INVIL had a significant, positive relationship with social outcome expectations of Internet use ($r = .39$, $p < .001$). INVIL residents ($M = 3.05$, $SD = 0.88$) reported higher social outcome expectations than non-INVIL residents ($M = 2.12$, $SD = 0.77$); $t(182) = 6.532$, $p < .001$.

For social capital variables (RQ2a and RQ2b), INVIL was associated with both online interaction ($r = .21$, $p = .005$) and community attachment ($r = .28$, $p < .001$). Online interaction was higher for INVIL residents ($M = 3.14$, $SD = 1.03$) than non-INVIL residents ($M = 2.75$, $SD = 0.99$); $t(178) = 2.31$, $p < .05$. Community attachment was also higher for INVIL residents ($M = 3.60$, $SD = 0.89$) than for non-INVIL residents ($M = 2.82$, $SD = 0.87$); $t(201) = 5.98$, $p < .001$.

For community satisfaction and intention to stay (RQ3a and RQ3b), INVIL was significantly associated with intention to stay, $r = .28$, $p < .001$. INVIL residents ($M = 3.80$, $SD = 0.92$) reported higher intention to stay than non-INVIL residents ($M = 3.05$, $SD = 0.77$); $t(200) = .80$, $p = .43$. INVIL was not significantly correlated with community satisfaction ($r = .02$, $p = .81$). The degree of community satisfaction did not significantly differ between INVIL residents ($M = 2.42$, $SD = 0.83$) and non-INVIL residents ($M = 2.33$, $SD = 0.72$); $t(178) = 2.31$, $p < .05$.

Table 1. Correlation Matrix of Variables Controlling for Demographics

Variable	1	2	3	4	5	6	7	8	*M*	*SD*
1. INVIL	1.00								0.66	0.47
2. Internet usage	.02	1.00							3.36	2.63
3. Internet self-efficacy	.06	.32**	.92						2.63	0.97
4. Social outcome expectations	.39**	.26**	.54**	.88					2.75	0.98
5. Online Interaction	.21**	.26**	.73**	.62**	.92				3.04	1.03
6. Community attachment	.28**	.13	.21**	.57**	.37**	.92			3.37	0.96
7. Intention to stay	.29**	.07	.10	.38**	.30**	.60**	.86		3.58	0.92
8. Community satisfaction	.02	.01	.27**	.18**	.12	.18*	.11	.88	2.41	0.80

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 2.* t-*Test Analysis

	INVIL			Non-INVIL			Statistics	
	n	*M*	*SD*	*n*	*M*	*SD*	*t*	*p*
Internet use per day	126	3.33	2.84	53	3.51	2.70	0.39	.70
Internet self-efficacy	122	2.60	0.98	59	2.68	1.09	0.50	.62
Social outcome expectations	126	3.06	0.90	58	2.14	0.86	–6.53	.00
Online interaction	121	3.15	1.07	59	2.75	1.19	–2.31	.22
Community attachment	130	3.60	0.90	73	2.82	0.89	–5.98	.00
Intention to stay	129	3.08	0.93	73	3.04	0.79	–5.89	.00
Community satisfaction	129	2.42	0.83	73	2.33	0.73	–0.80	.43

Discussion

The current study investigated the impact of the INVIL project on (a) social cognitive variables, (b) social capital, and (c) community attachment. The effect of Internet usage was tested prior to the main analyses. The results show that INVIL was not correlated with Internet usage. This finding diverges from previous studies conducted in the United States (e.g., LaRose et al., 2008) that showed a significant increase in Internet usage following public investment. The difference may be due to the completion of broadband infrastructure construction in rural areas in South Korea: Non-INVIL residents were also well connected to the Internet, so the difference in usage was not significant.

Though there was no infrastructure gap to close, the INVIL project had a significant effect on rural residents' Internet usage, specifically in terms of social networking online, given that its operations centered mainly on providing online community features. Examining social cognitive variables is thus a critical point of the current study. The results show that INVIL was significantly associated with social outcome expectations. It is possible that over time, the online community activities of INVIL became a factor in local residents' higher social outcome expectations. This implication is also supported by Eastin

and LaRose (2000), who found that once self-efficacy beliefs are established, it takes some time for positive outcome expectations to form, in social cognitive terms.

However, the correlation between INVIL and Internet self-efficacy was not significant. The explanation for the low correlation between INVIL and Internet self-efficacy might be similar to that for the low correlation between INVIL and Internet usage. That is, given the diverse phases and purposes of Internet usage available to all rural residents, the online social networking supported by the government grants did not necessarily create Internet self-efficacy, which might be established from all sorts of Internet usage.

Internet self-efficacy and social outcome expectations correlated with each other, consistent with the prediction of social cognitive theory. Outcome expectations are partly determined by self-efficacy beliefs: The outcomes individuals expect depend on their judgments of how well they will be able to perform in given situations (Bandura, 1986). For example, individuals who are apprehensive about their computer skills might expect their usage to result in disappointment, while individuals competent in computer skills might anticipate convenience. Hence, social outcome expectations depend to some extent on the adequacy of individuals' performances. This highlights the need to improve local residents' Internet self-efficacy through more effective computer training.

In terms of social capital variables, the current study shows that INVIL was positively associated with online interaction and community attachment. This finding points to the use of INVIL as a social network and is consistent with previous studies that showed the positive effect of online interaction on community involvement and social capital (Hampton & Wellman, 2003; Kavanaugh et al., 2005).

At the same time, online interaction and community attachment were positively associated. This finding is consistent with the suggestion in Hampton and Wellman's (2003) study that the Internet did not weaken community by disengaging people from the neighborhood, or transform community by creating new forms of online relationships. Instead, INVIL enhanced existing relationships by adding a new means of extending relationships with neighbors. This could be because the online community supported by the government grant was geographically based. Moreover, direct government support of the personnel in charge of INVIL website management enabled online communities to function as venues for viable online-offline communication among village residents. These features distinguished the INVIL project from other conventional social networking sites. INVIL may have provided more effective online tools to strengthen *the fabric of real-life community*.

As for community attachment, the results indicate that INVIL was positively related with residents' intention to stay. This finding suggests that intention to stay might be predicted by intensive online social networking. Sharing information (regarding health, education, etc.) with neighbors strengthens residents' psychological and economic bonds with each other and might encourage them to stay longer in rural areas.

On several points, attention should be drawn to the specific features and particular Internet uses fostered by INVIL projects, as well as the difference between INVIL and non-INVIL Internet use in terms of kinds of content creation, online information use, and social networking.

With respect to social gathering, non-INVIL participants frequently used the Internet to build casual connections outside of their economic activities (e.g., opening a social club to promote a general social gathering such as a church or class reunion), while INVIL members were tightly connected to both their economic activities and social gatherings with their neighbors online, where they discussed shared economic interests (e.g., they might use chat forums to discuss current market trends). Because each village participating in INVIL had its own specialty goods or service items—foods, tours, and so on—INVIL residents' online interaction also connected them to both cohorts and customers in and out of town.

For example, content provided by bloggers based in INVIL communities usually aimed to cover stories or deliver information specifically pertinent to fellow local residents (e.g., a village tour season promotion, a dentist's visitation schedule for seniors, a specialty goods sales report, etc.). On the other hand, bloggers based in other rural areas tended to provide more general information that might be useful to visitors or concern the individual blogger's specialties (e.g., weekend getaways, travel deals, product promotion, etc.).

These differences indicate that content created by INVIL members tends to pull audiences into local residents' lifestyle and issues, while content created by non-INVIL participants tends to plug in to a broader category.

Differences between INVIL and non-INVIL members' online activities might thus provide additional insight into the finding that despite similar levels of Internet usage, social capital variables such as social outcome expectations, online interaction, community attachment, and intention to stay are higher for INVIL members. These results also emphasize that social networking matters for real-life community issues and economic concerns, both in and outside of the community.

Interestingly enough, neither community satisfaction nor intention to stay correlates with INVIL membership. A possible explanation is that the functions offered by INVIL merely focused on online social networking. Considering that diverse purposes of Internet usage might affect rural residents' quality of life, online social networking did not necessarily bring about enhanced satisfaction with community life. Also, it should be noted that INVIL does not provide other online resources, such as entertainment resources and health/education services connected to life in the rural community, that can be indicators of community satisfaction.

Notably, online interaction was positively associated with both community satisfaction and the intention to stay. This finding is inconsistent with a study by LaRose et al. (2008) that showed a positive relationship between social capital and relocation intention. Apparently, exposure to the outside world through the Internet and creation of new social ties online stimulated outmigration from rural communities (LaRose et al., 2008).

The difference might lie in the characteristics of the social networks created by INVIL. Uniquely, INVIL combined an online marketplace and online social networking based in the same geographic area and real-life community. These features helped the INVIL project create the "shared interest" among village members that might increase intention to stay instead of stimulating outmigration intention. In this sense, INVIL has potential to encourage local residents to act on their common interests and concerns in a systematic and sustainable manner, and to actively cope with economical decline and rural exodus.

Limitations and Future Research

The current study indicates that Internet usage and Internet self-efficacy have a causal relationship with online interaction and community attachment. However, INVIL residents did not show a higher degree of Internet usage and Internet self-efficacy than non-INVIL residents. It is thus inadvisable to jump to the conclusion that INVIL might have encouraged more Internet usage and thus led to more social networking among rural residents. Arguably, the benefits of INVIL came from the online social networking, but at the same time the INVIL project could have been supporting something else that was irrelevant to the online community, such as simply strong ties of participant villages. Another possibility is that the strong ties that encourage INVIL residents to bond online hinged on the economic benefits of selling their commodities and specialties online.

To address the limitations of this study, further research should explore whether the high degree of social capital found among INVIL participants was due to e-commerce initiative or social networking initiative. Such research would likely examine and embody the source and aspect of social capital induced by the government-driven project in rural areas in a more specific manner.

Conclusion

The current study implies that the online social network services supported by rural ICT policy relate to social capital. This result might answer the question of whether ICT investment in rural areas should be continued when access is no longer an issue. INVIL residents' high community attachment and intention to stay indicate that community attachment might be predicted by geographically based online social networking.

In this regard, it is proposed that government investment in ICT should focus on the utilization of existing infrastructure pertaining to social capital in rural areas. Even after the access and the adoption gap is closed, continuous public investment is still needed for community development in rural areas.

The current study also provides insight into global society, which, like South Korea, suffers from rural exodus. As access and adoption become more available in rural and developing areas, the INVIL case paints a picture suggesting what ICT policy should seek to do after broadband adoption.

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