

Testing the validity of social capital measures in the study of information and communication technologies

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Social capital has been considered a cause and consequence of various uses of new information and communication technologies (ICTs). However, there is a growing divergence between how social capital is commonly measured in the study of ICTs and how it is measured in other fields. This departure raises questions about the validity of some of the most widely cited studies of social capital and ICTs. We compare the Internet Social Capital Scales (ISCS) developed by Williams [2006. On and off the 'net: scales for social capital in an online era. *Journal of Computer-Mediated Communication*, 11(2), 593–628. doi: 10.1111/j.1083-6101.2006.00029.x] – a series of psychometric scales commonly used to measure 'social capital' – to established, structural measures of social capital: name, position, and resource generators. Based on a survey of 880 undergraduate students (the population to which the ISCS has been most frequently administered), we find that, unlike structural measures, the ISCS does not distinguish between the distinct constructs of bonding and bridging social capital. The ISCS does not have convergent validity with structural measures of bonding or bridging social capital; it does not measure the same concept as structural measures. The ISCS conflates social capital with the related constructs of social support and attachment. The ISCS does not measure perceived or actual social capital. These findings raise concerns about the interpretations of existing studies of 'social capital' and ICTs that are based on the ISCS. Given the absence of measurement validity, we urge those studying social capital to abandon the ISCS in favor of alternative approaches.

Keywords: social support; belonging; attachment; social network; Facebook; social capital

Introduction

Over the past 20 years, the study of social capital has become a mainstay in the social sciences. Indeed, few concepts have received as much attention or critique (Woolcock, 2010). In the study of new information and communication technologies (ICTs), social capital has been considered a cause and consequence of the use of various technologies, including the mobile phone and social networking services (Hampton & Wellman, 2003; Hampton, Lee & Her, 2011; Campbell & Kwak, 2010; Robinson & Martin, 2010; Steinfield, Ellison, & Lampe, 2008). However, in recent years, a clear divergence has emerged between how social capital is measured within the study of technology and how it is studied in related fields. This divergence raises important questions about the validity of many studies of social capital and ICTs.

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Defining social capital

The definition of social capital has been heavily debated and contested. However, some of the earliest definitions have emerged as standard. Based on the work of Coleman (1988), Bourdieu (1986), and Lin (2001a), individual social capital is most commonly conceptualized as the sum of the resources embedded in social structure, or the potential to access resources in social networks for some purposeful action. Within this perspective is a recognition, articulated by Putnam (2000), that there are distinct dimensions of social capital: bonding and bridging. *Bonding* social capital refers to the resources accessible from one's closest, most homogenous social relationships. Bonding social capital, by the nature of the intimacy of the relationships involved, tends to be associated with network density or closure, trust, and shared norms (Burt, 2001). *Bridging* social capital refers to those resources most likely accessible from heterogeneous relationships. Bridging social capital is more likely to come from less intimate, 'weak', social ties and is associated with network diversity and outcomes, such as volunteering and civic engagement (Granovetter, 1973; Lin & Erickson, 2008; Putnam, 2000).

Although there is general agreement across fields of study on the conceptualization of social capital, there has long been disagreement about how to measure it. Some of the earliest studies of social capital analyzed levels of social trust, participation in voluntary associations, and other forms of political and civic engagement as indicators of social capital (Putnam, 1995). The availability of time-series data on these measures made it possible to argue that there had been a large-scale decline in social capital in America (Putnam, 2000). However, the flaws in this approach were quickly the subject of considerable debate by sociologists (Fischer, 2005; Lin, 1999), economists (Durlauf, 1999), and others. Common critiques included concerns about a lack of convergent validity within measures (e.g. not all measures of volunteering and group participation had fallen over time) and that the measures used in these studies belonged to unique social constructs with their own established intellectual histories. Substituting one or a combination of these constructs for 'social capital' negated the need to maintain social capital as a distinct concept.

If 'social capital' were to be anything more than an abstract metaphor, greater attention needed to be paid to aligning theories of social capital with direct measures of the underlying constructs. Thus, a construct, such as 'social trust is not part of the definition of social capital ... it is certainly a close consequence' (Putnam, 2001). Only by separating the structural component – social capital – from its outcome and contributors would it be possible to speak of the costs and benefits of social networks. The field of social network analysis offered a solution. It provided an intellectual history that described variation in network structure that aligned directly with the conceptualization of bonding and bridging social capital and methodologies for measuring variation in the resources contained within these structures (for a review, see Lin, Cook, & Burt, 2001).

Measuring social capital

Three structural measures of social capital have been used widely across disciplines and fields: name generators (Burt, 1997), position generators (Erickson, 2004; Lin & Dumin, 1986; Lin & Erickson, 2008), and resource generators (van der Gaag & Snijders, 2005). These measures have undergone extensive validity testing; they have been administered to a variety of populations and applied to the study of social capital across a range of fields and subject matter in and outside of the study of ICTs (for reviews, see: van der Gaag, Snijders, & Flap, 2008; Lin & Erickson, 2008).

Despite an established intellectual history that distinguishes social capital from other social constructs, many studies continue to operationalize social capital as a conglomeration of its antecedents and outcomes, including trust, altruism, attachment, community, civic participation,

social support, and social cohesion (Woolcock, 2010). The persistence of this approach remains problematic. At best, these studies are not studying social capital directly, but rather indirectly, through its causes and consequences. At worst, in a case where psychometric scales of these related constructs are combined into new measures, it is not clear what is truly being studied. These practices are particularly prevalent in the study of ICTs (Burke, Marlow, & Lento, 2010; Scheufele & Shah, 2000; Valenzuela, Park, & Kee, 2009). One measure that combines a number of constructs into a new measure of ‘social capital’ is particularly widespread – the Internet Social Capital Scales (ISCS) (Williams, 2006). Over the past decade, the ISCS has been used in some of the most highly cited studies of ICTs and social capital. For example, the work of Ellison, Steinfield, and Lampe (2007), one of the first to use the ISCS, has been cited more than 3000 times through the end of 2012. This work gained more than 500 citations in the last six months of 2012 alone. It is the second most frequently cited publication in the *Journal of Computer-Mediated Communication*, the flagship peer-reviewed journal published by the International Communication Association for research on ICTs.¹

Internet social capital scales

Williams (2006) developed the ISCS in response to concerns that the study of ICTs lacked a sufficient toolkit to measure the relationship between the use of new, virtual environments, and social interactions. Specifically, Williams wanted to address the problem of how to differentiate any gain or loss in ‘online’ social capital relative to what is generated ‘offline’. Thus, Williams designed the scale as an ‘apples-to-apples’ comparative measure of social capital in offline and online contexts. Williams (2006) recognized the bridging and bonding dimensions of social capital and developed the ISCS based on previous scales intended to measure outcomes attributed to social capital. For example, Williams (2006) operationalized *bridging social capital* (Williams-Bridge) as a combination of tolerance, community involvement, and contact with new people. *Bonding social capital* was operationalized as a combination of trust and emotional and instrumental support (Williams-Bond). The bonding and bridging subscales consisted of 10 items, each on a 5-point Likert scale. Williams intended each scale to be administered twice, once for ‘online’ and once for ‘offline’ interactions, for a total of 40 questions (Table 1). Analysis of the Williams-Bridge and Williams-Bond factors suggested a strong internal consistency, although the two factors were moderately to strongly positively correlated (online scales $r = .492$, $p < .001$; offline scales $r = .527$, $p < .001$; with Oblimin rotation) (Williams, 2006). Williams argued that the factors were so theoretically related that the strong positive correlation should be expected.

Since the publication of the ISCS, more than 50 papers published in peer-reviewed journals have utilized versions of the ISCS (in addition to a significant number of book chapters, dissertations, and theses). The rate of published papers has increased each year.² Of these studies, fewer than 10% use the original ISCS as proposed by Williams (2006). The majority are based on a revised version of the ISCS that is identical or similar to a version proposed by Ellison et al. (2007) (Ahn, 2012; Shiau, 2008; Skoric, Ying, & Ng, 2009; Steinfield, DiMicco, Ellison, & Lampe, 2009; Steinfield et al., 2008). Ellison et al. (2007) reduced the ISCS to 10 items – 5 for bonding (Ellison-Bond) and 5 for bridging – with 4 new items added to the bridging subscale (Ellison-Bridge). The distinction between online/offline social capital was dropped, and the wording of the scales was modified so that the words ‘online/offline’ were replaced with the name of a university. On the surface, these changes appear as parsimonious and relatively germane. It is reasonable that researchers might want to focus on a single domain of activity, such as a university or a specific online environment (Trepte, Reinecke, & Juechems, 2012). With controls for exposure to online activity, the use of regression eliminates the need for participants to attempt to distinguish for themselves the relative contributions of online and offline

Table 1. Williams (2006) Internet Social Capital Scales.

Bonding subscale

1. There are several people online/offline I trust to help solve my problems.
2. There is someone online/offline I can turn to for advice about making very important decisions.
3. There is no one online/offline that I feel comfortable talking to about intimate personal problems. (reversed)
4. When I feel lonely, there are several people online/offline I can talk to.
5. If I needed an emergency loan of \$500, I know someone online/offline I can turn to.
6. The people I interact with online/offline would put their reputation on the line for me.
7. The people I interact with online/offline would be good job references for me.
8. The people I interact with online/offline would share their last dollar with me.
9. I do not know people online/offline well enough to get them to do anything important. (reversed)
10. The people I interact with online/offline would help me fight an injustice.

Bridging subscale

1. Interacting with people online/offline makes me interested in things that happen outside of my town.
 2. Interacting with people online/offline makes me want to try new things.
 3. Interacting with people online/offline makes me interested in what people unlike me are thinking.
 4. Talking with people online/offline makes me curious about other places in the world.
 5. Interacting with people online/offline makes me feel like part of a larger community.
 6. Interacting with people online/offline makes me feel connected to the bigger picture.
 7. Interacting with people online/offline reminds me that everyone in the world is connected.
 8. I am willing to spend time to support general online/offline community activities.
 9. Interacting with people online/offline gives me new people to talk to.
 10. Online/Offline, I come in contact with new people all the time.
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Source: Williams (2006).

interactions to social capital. This has theoretical as well as methodological advantages. A number of arguments have been made to suggest that online and offline life are not clear dichotomies but rather a single, social system that is part of everyday life (Rainie & Wellman, 2012; Wellman & Hampton, 1999). However, a scale that has been modified in its wording or adjusted by increasing or decreasing the number of scale items might not have the same psychometric qualities as the original or even measure the same phenomena (Furr, 2011).

Name generators

Name generators are among the oldest method for enumerating network structure in communication research (Coleman, Katz, & Menzel, 1966). Name generators consist of one or more questions that elicit a list of names. Researchers often use a series of name interpreters (follow-up questions) to collect detailed information about each unique name listed (Fischer, 1982; Wellman, 1979). Perhaps the best-known example is the widely used ‘important matters’ name generator from the US General Social Survey: ‘From time to time, most people discuss important matters with other people. Looking back over the past six months – who are the people with whom you discussed matters that are important to you?’ (Marsden, 1987).

Studies have made extensive use of name generators as a measure of social capital (Burt, 1984; Kadushin, 2004; Labianca, 2004; La Due Lake & Huckfeldt, 1998). However, name generators are not without problems. Specifically, although the ‘important matters’ name generator is widely used, there is no standard list of generators. Based on their placement within a questionnaire, name generators are also susceptible to context effects (Bailey & Marsden, 1999; Fischer, 2009). In addition, the use of a single name generator tends to elicit a relatively small and incomplete list of core ties (Burt, 1984). However, carefully selected generators from a domain that

focuses on subject matter dealing with informal socializing, significant relationships, the discussion of important matters, and the discussion of political matters tend to elicit names of people to whom a participant is especially close (Bearman & Parigi, 2004; Klofstad, McClurg, & Rolfe, 2009; Straits, 2000). A minimum of two name generators of this nature produces a measure of network size that is representative of the full domain of core, strong ties but avoids burdening survey participants with having to respond to a large number of name generators (Marin & Hampton, 2007). The resulting list of close, intimate ties is a good measure of bonding social capital.

Position generators

Position generators are another widely used measure of social capital (Batjargal, 2003; Erickson, 2001; Lin, et al., 2001; Tindall & Cormier, 2008). This measure is based on the understanding that people in different social locations in society can provide access to different types of information and resources (Lin & Dumin, 1986). Occupation is a good measure of variation in social location. Occupations vary in prestige; people in high-prestige occupations tend to have special resources tied to income, education, and authority. However, even people in middle- and lower-prestige occupations have specialized skills that offer access to unique opportunities. If one knows people in a range of occupations, the more social locations a person can access and the greater the range of information and resources he or she can potentially leverage. Because the position generator focuses on heterogeneity in network structure, it is a particularly good measure of bridging social capital. Although ‘weak ties’ are more likely to provide bridging resources, the position generator has the advantage of capturing bridging social capital from the full range of strong and weak ties.

A typical position generator includes a list of occupations purposefully selected to range from low to high prestige. The most common measure is ‘extensity’ or ‘diversity’, which sums a person’s total number of accessible occupations (Lin & Dumin, 1986). Participants can also be asked to provide demographic information (Erickson, 2004) and to indicate if they know a tie from a specific setting, such as a neighborhood, or if they are friends on a social networking service (Hampton, Goulet, Rainie, & Purcell, 2011). Although the position generator is a good measure of potential resources from a social network, it has been criticized for its abstract nature; it does not enumerate actual resources (Lin, 2001b).

Resource generators

The resource generator was designed to address concerns about the position generator’s abstract nature. It combines the economy and internal validity of the position generator with the detailed resource information of name generators (van der Gaag & Snijders, 2005). Resource generators ask individuals about their access to specific resources. Unlike the position generator, which focuses on social position, the resource generator focuses on different aspects of everyday life, such as education, politics, and finance. For example, participants might be asked if they know anyone knowledgeable about local government, anyone who has traveled abroad extensively, or has attended an Ivy League university, etc. As a measure of the heterogeneity of resources available within a network, resource generators have been used as a measure of bridging social capital (Kadushin, 2004; Webber & Huxley, 2007). Although the generators developed by van der Gaag and colleagues are widely used, no particular resource generator is regarded as a standard. The selection of a parsimonious list of resources generally depends on individual research questions and the population under study, which can generate problems with comparability across studies.

Comparing social capital measures

We question the validity of the ISCS when compared with other established, structural measures of social capital. Specifically, we are concerned about the most widely used versions of the ISCS – those that have been modified to replace the online/offline distinction with a reference to a specific social setting, such as the name of a university. These scales may not have discriminant validity from constructs generally attributed to outcomes and predictors of social capital. We believe the ISCS is closer to measures of ‘attachment’ and ‘perceived social support’ than social capital. We do not believe the ISCS bonding or bridging subscales capture the conceptual difference between bonding and bridging as well as established structural measures. We propose six hypotheses:

- H1: When operationalized using the ISCS, bonding and bridging social capital are not captured as distinct constructs.
- H2: Structural measures of social capital measure distinct constructs for bonding social capital (name generators) and bridging social capital (resource and position generators).
- H3: The ISCS bonding subscale does not have convergent validity with the name generator as a measure of bonding social capital.
- H4: The ISCS bridging subscale does not have convergent validity with the position generator or resource generator as a measure of bridging social capital.
- H5: The ISCS bonding subscale does not have discriminant validity from measures of social support.
- H6: The ISCS bridging and bonding subscales do not have discriminant validity with measures of institutional attachment and sense of belonging.

Method

We assess the validity of the ISCS through a comparison using the name, position, and resource generators. An ISCS bonding subscale will have convergent validity if it correlates at least moderately with the name generator, and an ISCS bridging subscale will have high convergent validity if it correlates at least moderately with either the position or resource generators (Campbell & Fiske, 1959). The discriminant validity of the ISCS is tested through a comparison with established scales for social support and attachment – concepts that are related but distinct from social capital. A low correlation with social support or attachment scales would suggest that the ISCS measures a construct distinct from these constructs. Consistent with established conventions for interpreting Pearson’s correlation coefficients (Cohen, 1988; Weiten, 2013), in our analysis, we interpreted correlations of 0.00–0.30 as weak, correlations of 0.31–0.50 as moderate, and those of 0.51–1.00 as strong. Thus, a correlation of less than 0.31 between measures that are expected to be similar would not meet the criteria to demonstrate convergent validity.

In November 2012, surveys were administered to students in six undergraduate classes with a combined enrollment of approximately 1400 students. The selected courses ranged from introductory to more senior classes. Participants signed a consent form approved by the Rutgers Institutional Review Board (IRB) indicating the voluntary and anonymous nature of the survey. Depending on the course, some students received extra credit for their participation. We estimate that approximately 80% of students enrolled in the courses attended class on the day the survey was administered; a total of 880 students responded. The analysis was conducted using SPSS 20 for Windows. The number of missing cases per question ranged from 2 to 21 cases and no more than 2.4% per question.

Although student samples may be problematic for some studies, this was not the case here. The study replicated the way ISCS is most commonly administered – with wording that specifically mentions the name of a university. Therefore, it is most appropriate to collect data from a population of university students. We have no reason to believe our student population is

unrepresentative of other undergraduate students who have completed the ISCS. Our sample consisted of 20.6% freshman, 31.2% sophomores, 32.2% juniors, and 16% seniors. Females made up 60.3% of the sample; 56.3% were White or Caucasian, 7.2% Black or African American; 19.7% Asian or Pacific Islander; 7.0% identified as mixed race; and 9.5% some other race. In total, 12.9% of the sample identified as of Hispanic or Latino origin or descent.

Survey instrument

The ‘important matters’ name generator (Appendix: Q.2) and a name generator that captures ‘especially significant’ ties (Appendix: Q.3) were included as measures of bonding social capital. These generators were selected because of their popularity in the literature and in prior research, which suggests that the two generators produce names that conform to a construct of close, intimate relations (Straits, 2000). The ‘important matters’ name generator can be used as a stand-alone measure of bonding social capital. There is little prior research using the ‘especially significant’ generator as a stand-alone measure. Best practices in the use of name generators suggest that multiple generators, combined into a measure of unique names, are a more reliable measure of core network size. Studies of ICTs have used both ‘important matters’ and ‘especially significant’ name generators (Hampton, 2011; Hampton, Goulet, et al., 2011; Hampton, Sessions, & Her, 2011).

The survey instrument included a 22-item position generator (Appendix: Q.1) developed by Nan Lin, Yang-chih Fu, and Chih-jou Jay Chen at the Institute of Sociology, Academia Sinica. A number of studies about ICTs and social capital have used this version of the position generator (Hampton, 2011; Hampton, Goulet, et al., 2011; Hampton, Lee, et al., 2011; Chen, 2013a, 2013b). The sum of the items on this scale was used as a measure of bridging social capital.

The resource generator (Appendix: Q.6) is based on one originally developed by van der Gaag and Snijders (2005). It was reduced and modified to an 18-item scale by Goulet (2012) for an American audience in a study of ICTs and social capital. The sum of the items from this index is used as a measure of bridging social capital.

Williams (2006) originally developed the 10-item ISCS bonding (Appendix: Q.7.1–Q.7.10; Williams-Bond) and 10-item bridging (Appendix: Q.7.11–Q.7.20; Williams-Bridge) subscales included in the survey. Scale items were modified to conform to how most previous studies commonly used them in the context of a sample of undergraduate students. In this case, the name of a university, ‘Rutgers’, replaced the ‘online/offline’ distinction. Four additional questions were included as part of a revised version of the bridging subscale (Appendix: Q.7.21–Q.7.24), as developed by Ellison et al. (2007) and most commonly adopted in subsequent studies that utilize the ISCS. Including the full set of ISCS items allows us to test the validity of the original Williams-Bond and Williams-Bridge subscales as well as the modified ISCS bonding (Appendix: Q.7.1, Q.7.2, Q.7.5, Q.7.7, Q.7.9; Ellison-Bond) and bridging subscales (Appendix: Q.7.12, Q.7.15, Q.7.17, Q.7.18, Q.7.20–Q.7.24; Ellison-Bridge).

Social support was measured using the Medical Outcomes Study (MOS) scales developed by Sherbourne and Stewart (1991) (Appendix: Q.5). Because the ISCS includes questions adapted from the Interpersonal Support Evaluation List (ISEL) (Cohen & Hoberman, 1983), we did not want to use a version of the ISEL (such as ISEL-student). The MOS consists of 19 items on a 5-point Likert scale. It was developed as a multidimensional measure of perceived social support and includes subscales for emotional, tangible, affectionate, and positive support. Several studies have used the MOS to investigate the relationship between social capital and social support (Janevic et al., 2004; Rains & Keating, 2011; Verhaeghe, Pattyn, Bracke, Verhaeghe, & Van De Putte, 2012).

Attachment is typically conceptualized as an emotional bond, a sense of affiliation, involvement, or belonging (Bowlby, 1979; O'Reilly & Chatman, 1986). The common practice of rewording the ISCS to reference activity in the context of a specific university setting suggests that the ISCS may be measuring attachment to the institution or people associated with that setting. Attachment was measured using France, Finney, and Swerdzewski's (2010) university attachment scales (UAS) (Appendix: Q.8). The UAS is an 8-item scale designed to measure two distinct dimensions of attachment (Tovar & Simon, 2010): attachment to the university as an institution and a sense of belonging with members of the school. Each item on the scale uses a unique 5-point Likert scale.

Results

Bonding and bridging as distinct constructs

We verified the reliability of all scales through confirmatory factor analysis with Varimax rotation. Within the MOS scale, consistent with Sherbourne and Stewart (1991), we identified four distinct dimensions of perceived support: tangible ($\alpha = 0.843$), emotional ($\alpha = 0.816$), affectionate ($\alpha = 0.926$), and positive ($\alpha = 0.869$). The alpha for the combined MOS scale for social support was 0.946. Within the UAS, consistent with France et al. (2010), the UAS divided into two factors – institutional attachment ($\alpha = 0.749$) and sense of belonging ($\alpha = 0.793$). As explored in Table 2, institutional attachment and sense of belonging have a strong positive correlation ($r = 0.662$, $p < .01$, two-tailed). This strong relationship casts doubt on how successfully this scale differentiates attachment to a university as an institution versus feeling a sense of belonging.

The ISCS divided into two components: Williams-Bond ($\alpha = 0.779$) and Williams-Bridge ($\alpha = 0.917$). However, as hypothesized (H1) and reported in Table 2, Williams-Bond and Williams-Bridge are strongly positively correlated ($r = 0.577$, $p < .01$, two-tailed), as are the variants of Ellison-Bond and Ellison-Bridge ($r = 0.534$, $p < .01$, two-tailed). The two ISCS subscales do not measure meaningfully distinct constructs for bonding and bridging social capital.

The name, position, and resource generators are indexes that accumulate scores. Their reliability cannot be determined through a measure of internal consistence, such as Cronbach's alpha. However, as anticipated, the two name generators are moderately positively correlated ($r = 0.398$, $p < .01$, two-tailed). Similarly, the bridging social capital measure from the position generator has a moderate positive correlation with the resource generator ($r = 0.379$, $p < .01$, two-tailed). The levels of association are consistent with previous studies comparing resource and position generators (van der Gaag et al., 2008). Consistent with the hypothesis (H2), neither the combined nor the individual name generators have more than a weak positive correlation with the position or resource generators. When operationalized using established structural measures, bonding and bridging social capital are distinct constructs.

Convergent validity

We compared two measures of bonding social capital – the original Williams-Bond scale and the reduced Ellison-Bond scale – with the individual and combined name generators. As hypothesized (H3), neither version of the ISCS bonding subscales has convergent validity with structural measures of bonding social capital. The analysis in Table 2 shows that the correlation between name generators and Williams-Bond and Ellison-Bond ranges from a correlation of 0.133–0.197 ($p < .01$, two-tailed) – a weak relationship.

The original Williams-Bridge scale and the modified Ellison-Bridge subscales were compared to two, structural measures of bridging social capital – the position and resource generators. As hypothesized (H4), there was low convergent validity between the ISCS measures of bridging and

Table 2. Correlation matrix: ISCS, structural measures of social capital, perceived social support, and attachment.

	Important matters	Especially significant	Name generators	Position generator	Resource generator	Williams Bond	Ellison Bond	Williams Bridge	Ellison Bridge	ISCS all bridge	ISCS all items	MOS tangible	MOS emotional	MOS affectionate	MOS positive	MOS all items	UAS institution	UAS belonging
Important matters	1																	
Especially significant	.398**	1																
Name generators	.585**	.571**	1															
Position generator	.179**	.129**	.159**	1														
Resource generator	.226**	.181**	.174**	.379**	1													
Williams – Bond	.183**	.133**	.197**	.077*	.253**	1												
Ellison – Bond	.184**	.143**	.188**	.071	.236**	.932**	1											
Williams – Bridge	.256**	.171**	.237**	.099**	.243**	.577**	.526**	1										
Ellison – Bridge	.269**	.161**	.227**	.100**	.255**	.579**	.534**	.922**	1									
ISCS – all bridge	.267**	.164**	.235**	.097**	.251**	.591**	.543**	.976**	.979**	1								
ISCS – all items	.260**	.169**	.245**	.099**	.281**	.844**	.781**	.909**	.912**	.931**	1							
MOS – tangible	.100**	.149**	.040	.072	.223**	.199**	.183**	.157**	.171**	.167**	.201**	1						
MOS – emotional	.179**	.199**	.081*	.073	.230**	.322**	.328**	.238**	.254**	.251**	.312**	.645**	1					
MOS – affectionate	.156**	.209**	.097**	.061	.187**	.241**	.250**	.182**	.197**	.192**	.237**	.587**	.732**	1				
MOS – positive	.189**	.181**	.099**	.134**	.257**	.356**	.382**	.285**	.290**	.295**	.357**	.556**	.719**	.680**	1			
MOS – all items	.182**	.213**	.089*	.095*	.260**	.329**	.335**	.252**	.267**	.264**	.324**	.802**	.938**	.844**	.839**	1		
UAS – institution	.175**	.127**	.131**	.039	.167**	.357**	.367**	.493**	.589**	.556**	.531**	.167**	.244**	.219**	.282**	.263**	1	
UAS – belonging	.231**	.107**	.192**	.059	.164**	.552**	.560**	.595**	.656**	.647**	.679**	.102**	.196**	.180**	.270**	.214**	.662**	1

* $p < .05$, two-tailed.
 ** $p < .01$, two-tailed.

either generator. Williams-Bridge ($r = 0.099$, $p < .01$, two-tailed) and Ellison-Bridge ($r = 0.100$, $p < .01$, two-tailed) do not have a meaningful relationship with the position generator. The relationship between Williams-Bridge ($r = 0.243$, $p < .01$, two-tailed) and Ellison-Bridge ($r = 0.255$, $p < .01$, two-tailed) and the resource generator is slightly better, but a weak relationship does not meet the criteria for convergent validity.

We also tested the possibility that a combined version of the Williams-Bridge with the four additional items added by Ellison et al. (2007) would have convergent validity with either the position or resource generators. However, the correlation between the combined ISCS bridging items and the position generator was negligible, 0.097 ($p < .01$, two-tailed) and weakly positive to the resource generator ($r = 0.251$, $p < .01$, two-tailed). Similarly, a combined measure consisting of all 20 items of the original ISCS and the 4 items added by Ellison did not produce a meaningful correlation to any of the name, position, or resource generators. There is no convergent validity between structural measures of social capital and any version of the ISCS.

Discriminant validity

The ISCSs were constructed based on scale items designed to measure constructs often considered predictors or outcomes of social capital. Perceived social support and attachment are related but distinct from social capital. The ISCS may have more similarity with measures of social support and measures of attachment and belonging than with measures of social capital.

As documented in Table 2, Williams-Bridge and Ellison-Bridge have similar, weak, positive relationships to measures of perceived support based on the MOS, as well as the MOS subscales for emotional and positive support. The correlation between Ellison-Bridge and the overall MOS scale is 0.267, 0.290 for the subscale for positive support, and 0.254 for the subscale for emotional support (all correlations are significant, $p < .01$, two-tailed). There is a moderate, positive correlation between Williams-Bond, Ellison-Bond, and the combined MOS scales and subscales for emotional and positive support. The correlation between Ellison-Bond and the full MOS scale is 0.335, 0.382 for positive support, and 0.328 for emotional support ($p < .01$, two-tailed). There is also a weak, positive relationship between the Williams-Bond and affectionate support; Ellison-Bond correlates with affectionate support at $r = 0.250$ ($p < .01$, two-tailed). As hypothesized (H5), there is moderate convergence between the ISCS bonding subscales and the MOS measure of perceived social support. Williams-Bond and Ellison-Bond are closer to a measure of perceived support than a measure of social capital. As might be expected, based on prior literature that connects close ties and social support (Stansfeld & Marmot, 1992; Wellman & Wortley, 1990), the ISCS bonding subscales did a marginally better job at predicting perceived social support than did the ISCS bridging subscales. However, because the ISCS is based on a subset of select questions from an established scale of support (the ISEL), as would be expected, bonding measures based on the ISCS do not converge with all components of a multidimensional scale of perceived support. It has low to no convergent validity for both tangible and affection dimensions of support. Although there is modest evidence of convergence with the overall MOS scale, the correlations are only slightly better than a weak relationship. It would be a conceptual stretch to argue that Williams-Bond and Ellison-Bond are good measures of perceived support.

The relationship between the ISCS bonding measures and perceived social support also contrasts with the relationship between support measures and structural measures of social capital. As reported in Table 2, there is a negligible to weak relationship between the MOS, the MOS subscales, and name, position, and resource generators. Structural measures of social capital do not measure support.

The use of a specific institution, typically the name of a university, in versions of the ISCS suggests the ISCS may be a measure of institutional attachment or sense of belonging with an

institution's members. There are moderate to strong correlations between the ISCS and measures of university institutional attachment and sense of belonging based on the UAS. Ellison-Bond has a moderate, positive correlation to institutional attachment ($r = 0.367, p < .01$, two-tailed), and a strong, positive relationship to sense of belonging ($r = 0.560, p < .01$, two-tailed). Ellison-Bridge has a strong, positive relationship to attachment ($r = 0.589, p < .01$, two-tailed) and a strong, positive relationship to belonging ($r = 0.656, p < .01$, two-tailed). Again, this is very different from structural measures of social capital. Name, position, and resource generators all have weak relationships to measures of university attachment and belonging. As hypothesized (H6), we find versions of the ISCS that have been modified to reference the name of a specific organization, institution, or place to be a better measure (even a good measure) of attachment than measures of social capital.

Conclusion

Social capital is one of the most studied and debated topics within the study of new ICTs. Despite conceptual agreement with other fields of research, in many studies of ICTs, the measurement of social capital has diverged from what is commonly used in other fields. One measure, the ISCS is widely used in the study of ICTs. The ISCS substitutes psychometric measures of the predictors and outcomes of social capital for structural measures of social capital. The ISCS is most often modified to replace an online/offline distinction, originally intended as a way to distinguish between online and offline social capital, with the name of an organization. Most commonly, in studies of undergraduate student populations, the organization is the name of a university.

As summarized in Table 3, our finding is that the ISCS is not a valid measure of social capital. The ISCS subscales for bonding and bridging do not provide discrete measures that correspond to the unique constructs of bonding and bridging social capital (H1). This contrasts with established, structural measures of bonding (name generators) and bridging (position and resource generators), which do provide discrete measures of the bonding and bridging dimensions of social capital (H2). Neither the ISCS bonding subscale nor the bridging subscale has convergent validity with structural measures of bonding and bridging social capital (H3 and H4).

The ISCS was designed based on measures of constructs often regarded as a cause or consequence of social capital, such as social support and sense of belonging. The ISCS does not have discriminant validity from these constructs (H5 and H6). ISCS bonding measures have a moderate correlation with measures of overall social support, emotional support, and support through positive interactions. However, the ISCS is not a particularly good measure of social support. The ISCS does not provide an adequate measure of many of the dimensions of perceived support, notably tangible and affectionate support. When the ISCS is modified to include references to the name of a university, as has become a common practice, the ISCS bonding and bridging measures of social capital are strongly correlated with established measures of university institutional attachment and a sense of belonging.

The ISCS does not measure perceived or actual social capital. This finding raises significant concerns about the interpretation of existing studies of social capital and ICTs that are based on ISCS. For example, the frequently cited work of Ellison et al. (2007) should not have been interpreted as having found a positive relationship between Facebook use and bridging social capital. Somewhat ironically, if the ISCS had not been modified to reference the name of the university where the undergraduate population was sampled for this research, it would not be clear how Ellison, Steinfield, and Lampe's findings should be interpreted. Because of the strong relationship between the ISCS bridging scales and measures of university attachment and belonging, the findings of Ellison et al. (2007) are better understood as having found a positive relationship between Facebook use and a sense of belonging with members of the university they studied. Similarly, the

Table 3. Summary of hypotheses and findings.

	Hypothesis	Evaluation	Results
H1	When operationalized using the ISCS, bonding and bridging social capital are not captured as distinct constructs.	Supported	Williams-Bond and Williams-Bridge are strongly correlated ($r = 0.577$, $p < .01$). Ellison-Bond and Ellison-Bridge are strongly correlated ($r = 0.534$, $p < .01$).
H2	Structural measures of social capital measure distinct constructs for bonding social capital (name generators) and bridging social capital (resource and position generators).	Supported	The two combined name generators are weakly correlated with the position ($r = 0.159$, $p < .01$) and resource generators ($r = 0.174$, $p < .01$).
H3	The ISCS bonding subscale does not have convergent validity with the name generator as a measure of bonding social capital.	Supported	The two combined name generators weakly correlate with Williams-Bond ($r = 0.197$, $p < .01$) and Ellison-Bond ($r = 0.188$, $p < .01$).
H4	The ISCS bridging subscale does not have convergent validity with the position generator or resource generator as a measure of bridging social capital.	Supported	Williams-Bridge ($r = 0.099$, $p < .01$) and Ellison-Bridge ($r = 0.100$, $p < .01$) do not have a meaningful relationship with the position generator. Williams-Bridge ($r = 0.243$, $p < .01$) and Ellison-Bridge ($r = 0.255$, $p < .01$) weakly correlate with the resource generator.
H5	The ISCS bonding subscale does not have discriminant validity with measures of social support.	Supported	Williams-Bond and the MOS combined scale of perceived social support are moderately correlated ($r = 0.329$, $p < .01$). Ellison-Bond and the MOS are moderately correlated ($r = 0.335$, $p < .01$).
H6	The ISCS bridging and bonding subscales do not have discriminant validity with measures of institutional attachment and sense of belonging.	Supported	Williams-Bond has a moderate, positive correlation with UAS-institution ($r = 0.357$, $p < .01$), and a strong relationship to UAS-belonging ($r = 0.552$, $p < .01$). Williams-Bridge has a strong, positive relationship to UAS-institution ($r = .493$, $p < .01$) and a strong relationship to UAS-belonging ($r = 0.595$, $p < .01$). Ellison-Bond has a moderate, positive correlation with UAS-institution ($r = 0.367$, $p < .01$, two-tailed), and a strong relationship to UAS-belonging ($r = 0.560$, $p < .01$). Ellison-Bridge has a strong, positive relationship to UAS-institution ($r = 0.589$, $p < .01$) and a strong relationship to UAS-belonging ($r = 0.656$, $p < .01$).

reported longitudinal finding that Facebook use increases bridging social capital (Steinfeld et al., 2008) should be interpreted as Facebook use increases a sense of belonging among members of a university. The reinterpretation of ISCS findings is more problematic for studies conducted with non-university populations. Unexpected findings, such as a reported negative relationship between the consumption of content on Facebook and bridging social capital, based on the ISCS (Burke et al., 2010), are not valid and are difficult to reinterpret.

A good measure of any construct must measure only that particular construct, not a closely related idea. Just as a scale designed to measure depression would be rejected if it were found actually to measure the related, but very different constructs of stress or anxiety, the ISCS should be rejected as a measure of social capital. As structural measures, name, position, and resource generators serve as good measures of social capital. However, as discussed in our methods section, these measures, like all measures, have their weaknesses and limitations. This is particularly true for those who are interested in studying large-scale change over time (Hampton, Sessions, et al., 2011; Putnam, 2000). The absence of time-series, population-level, network measures significantly limits the ability to study change in social capital over time. It is one reason why other constructs may continue to serve as indicators of change. A growing interest in the study of whole network data, particularly 'big data', increasingly introduces the possibility of analyzing social capital within bounded networks, such as interactions within Facebook (Ugander, Karrer, Backstrom, & Marlow, 2011). Although these whole network analyses seem to eliminate concerns about the limitations of survey measures of social capital, the whole network and big data approaches also have limitations. The limitations of whole network analysis, in terms of incomplete data and fixed network boundaries, reintroduce the problem of differentiating between 'online' and 'offline' social capital. These data are generally limited to the study of online social capital. The limitations of whole network analysis in early network studies of neighborhoods and organizations and the need to study relations outside of 'little boxes' gave rise to name, position, and resource generators (Wellman, 1999).

The goal of this paper is to reverse the trend in the study of ICTs to adopt a conglomeration of constructs related to social capital as equivalent substitutions for direct structural measures of social capital. A continuation of this trend has significant implications for the field. Large swaths of otherwise theoretically interesting and important research may continue to draw misleading conclusions about the relationship between ICT use and social capital. An important subarea in the study of social capital risks isolation from other fields of study that share its interest in understanding the resources embedded in social structure.

Notes

1. Information is based on an analysis of citations from Google Scholar on 17 June 2013 and 23 December 2013.
2. As of 10 June 2013, information is based on an analysis of English language publications using Google Scholar.

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Appendix 1. Rutgers Relationship Survey

Q. 1. Look over the following list of jobs and indicate whether people you know hold such jobs. These people include relatives, friends, and acquaintances. Do you happen to know someone who is ...

1.1	A nurse	Yes	No
1.2	A farmer	Yes	No
1.3	A lawyer	Yes	No
1.4	A middle school teacher	Yes	No
1.5	A full-time babysitter	Yes	No
1.6	A janitor	Yes	No
1.7	A personnel manager	Yes	No
1.8	A hairdresser	Yes	No
1.9	A bookkeeper	Yes	No
1.10	A production manager	Yes	No
1.11	An operator in a factory	Yes	No
1.12	A computer programmer	Yes	No
1.13	A taxi driver	Yes	No
1.14	A professor	Yes	No
1.15	A policeman	Yes	No
1.16	A Chief Executive Officer (CEO) of a large company	Yes	No
1.17	A writer	Yes	No
1.18	An administrative assistant in a large company	Yes	No
1.19	A security guard	Yes	No
1.20	A receptionist	Yes	No
1.21	A Congressman	Yes	No
1.22	A hotel bell boy	Yes	No

Q. 2. From time to time, most people discuss important matters with other people. Looking back over the last six months – who are the people with whom you discussed matters that are important to you? If you did not discuss important matters with anyone you can leave the list blank, or you can list up to five names. There is no need to give the person's full name, just use their first name or their initials.

1. _____
2. _____
3. _____

- 4. _____
- 5. _____

Q. 2.1 Add up the total number of names that you listed in Q.2 0 1 2 3 4 5

Q. 3. Now let's think about people you know in a different way. Looking back over the last six months, who are the people especially significant in your life? If there is no one who is especially significant in your life you can leave the list blank, or you can list up to five names. These may be some of the same people you mentioned in the previous question or it may be other people. Again, there is no need to give the person's full name, just use their first name or their initials.

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

Q. 3.1 Add up the total number of names that you listed in Q.3 0 1 2 3 4 5

Q. 4. Look at the lists of names from Q.2 and Q.3. How many different people did you list? Count the number of unique people. If you listed someone on both lists, count them only once.
0 1 2 3 4 5 6 7 8 9 10

Q. 5. People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it? [Answer choices are: None of the time, A little of the time, Some of the time, Most of the time, All of the time]

- 5.1 Someone to help you if you were confined to bed
- 5.2 Someone you can count on to listen to you when you need to talk
- 5.3 Someone to give you good advice about a crisis
- 5.4 Someone to take you to the doctor if you needed it
- 5.5 Someone who shows you love and affection
- 5.6 Someone to have a good time with
- 5.7 Someone to give you information to help you understand a situation
- 5.8 Someone to confide in or talk to about yourself or your problems
- 5.9 Someone who hugs you
- 5.10 Someone to get together with for relaxation
- 5.11 Someone to prepare your meals if you were unable to do it yourself
- 5.12 Someone whose advice you really want
- 5.13 Someone to do things with to help you get your mind off things
- 5.14 Someone to help with daily chores if you were sick
- 5.15 Someone to share your most private worries and fears with
- 5.16 Someone to turn to for suggestions about how to deal with a personal problem
- 5.17 Someone to do something enjoyable with
- 5.18 Someone who understands your problems
- 5.19 Someone to love and make you feel wanted

Q. 6. Here are some questions about people you may know. These people include relatives, friends and acquaintances. Do you know anyone who ...

- | | | | |
|------|--|-----|----|
| 6.1 | Can speak and write in a foreign language | Yes | No |
| 6.2 | Knows a lot about computers | Yes | No |
| 6.3 | Has knowledge of literature | Yes | No |
| 6.4 | Has attended an Ivy League University | Yes | No |
| 6.5 | Is an elected official | Yes | No |
| 6.6 | Owens a second home | Yes | No |
| 6.7 | Can give you advice about a conflict with a family member | Yes | No |
| 6.8 | Knows a lot about governmental regulations | Yes | No |
| 6.9 | Can find a temporary or permanent job for a family member | Yes | No |
| 6.10 | Has knowledge about financial matters such as taxes and investment opportunities | Yes | No |
| 6.11 | Can play an instrument | Yes | No |
| 6.12 | Can help you move homes | Yes | No |

6.13	Has travelled abroad extensively	Yes	No
6.14	Can recommend a restaurant or hotel for you when you are traveling	Yes	No
6.15	Knows a lot about current events and world news	Yes	No
6.16	Can lend you a home improvement tool such as a ladder	Yes	No
6.17	Can give you a ride somewhere or lend you their vehicle in a pinch	Yes	No
6.18	Knows a lot about your local government	Yes	No

Q. 7. Now think about your experiences at Rutgers. For each of the following statements choose the response that best describes how you feel. [Answer choices are: Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree]

- 7.1 There are several people at Rutgers I trust to help solve my problems.
- 7.2 There is someone at Rutgers I can turn to for advice about making very important decisions.
- 7.3 There is no one at Rutgers that I feel comfortable talking to about intimate personal problems.
- 7.4 When I feel lonely, there are several people at Rutgers to whom I can talk.
- 7.5 If I needed an emergency loan of \$500, I know someone at Rutgers to whom I can turn.
- 7.6 The people with whom I interact at Rutgers would put their reputation on the line for me.
- 7.7 The people with whom I interact at Rutgers would be good job references for me.
- 7.8 The people with whom I interact at Rutgers would share their last dollar with me.
- 7.9 I do not know people at Rutgers well enough to get them to do anything important.
- 7.10 The people with whom I interact at Rutgers would help me fight an injustice.
- 7.11 Interacting with people at Rutgers makes me interested in things that happen outside of my town.
- 7.12 Interacting with people at Rutgers makes me want to try new things.
- 7.13 Interacting with people at Rutgers makes me interested in what people unlike me are thinking.
- 7.14 Talking with people at Rutgers makes me curious about other places in the world.
- 7.15 Interacting with people at Rutgers makes me feel like part of a larger community.
- 7.16 Interacting with people at Rutgers makes me feel connected to the bigger picture.
- 7.17 Interacting with people at Rutgers reminds me that everyone in the world is connected.
- 7.18 I am willing to spend time to support general Rutgers community activities.
- 7.19 Interacting with people at Rutgers gives me new people to talk to.
- 7.20 At Rutgers, I come in contact with new people all the time.
- 7.21 I feel I am part of the Rutgers community.
- 7.22 I am interested in what goes on at Rutgers.
- 7.23 Rutgers is a good place to be.
- 7.24 I would be willing to contribute money to Rutgers after graduation.

Q. 8. In the following questions, the response options are different for every item, so please read each item and its accompanying options carefully before responding. There are no right or wrong answers; everyone behaves and feels differently. Just answer as honestly as possible.

- 8.1 How often do you acknowledge the fact that you are a member of Rutgers? [Answer choices are: Never, Rarely, About half the time, Most of the time, Always]
- 8.2 How accurate would it be to describe you as a typical Rutgers student? [Answer choices are: Not at all accurate, Slightly accurate, Moderately accurate, Very accurate, Extremely accurate]
- 8.3 How important is belonging to Rutgers to you? [Answer choices are: Not at all important, Slightly important, Moderately important, Very important, Extremely important]
- 8.4 When you first meet people, how likely are you to mention Rutgers? [Answer choices are: Not at all likely, Slightly likely, Moderately likely, Very likely, Extremely likely]
- 8.5 How attached do you feel to Rutgers? [Answer choices are: Not at all attached, Slightly attached, Moderately attached, Very attached, Extremely attached]
- 8.6 How close do you feel to other members of the Rutgers community? [Answer choices are: Not at all close, Slightly close, Moderately close, Very close, Extremely close]
- 8.7 To what extent have members of Rutgers influenced your thoughts and behaviors? [Answer choices are: Not at all, Slightly, Moderately, Very, Extremely]
- 8.8 How many of your close friends come from Rutgers? [Answer choices are: None, Few, About half, Most, All]