

## A tool for dynamic measurement of social capital embedded in Online Social Networks

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### Abstract

This paper suggests a methodological improvement to study social capital in online social networks. We have designed a measurement tool based on Lin's theory of social resources. It is named Social Village and can be accessed in (<http://socialvillage.me>). By this tool, we are getting access to profile and friendship data of users of online social networks (Facebook and Google Plus). To access this data, we ask for users' permission by social login and we have designed a gamified and interesting social survey that helps users get an in-depth knowledge of their online life. This tool combines three structural generators for social capital data (name, position and resource generators) and it has been developed in three languages (English, French and Persian) enabling us to conduct comparative studies. Based on our preliminary results presented in this paper, 412 users in sample of our study know who they are connected with in online social networks, they know their friends' socio-economic positions and they are providing or receiving various resources through their online friendships. Gamified social survey used in this tool helped us gain a four times more response rate than existing online surveys. In this paper, we present, reviewed literature, theoretical framework, methodology of constructing the tool and results obtained.

**Keywords:** Social Capital; Online Social networks; Measurement tool; Social network analysis; Facebook; Google plus

## Introduction

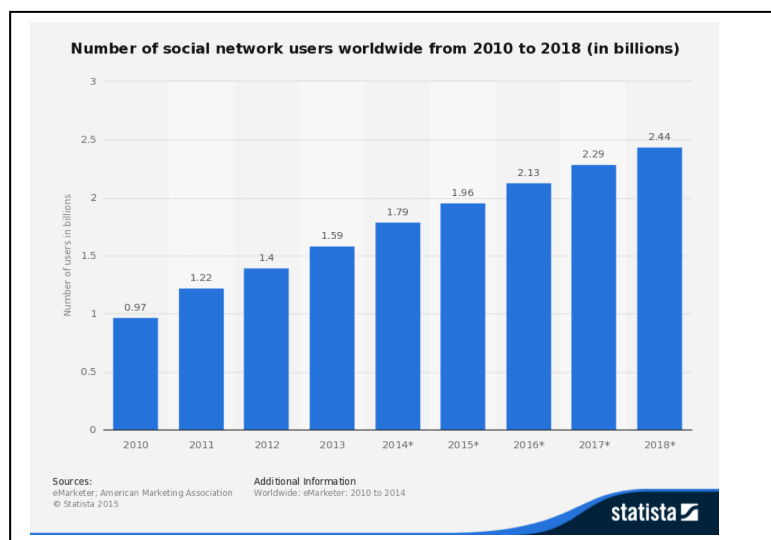
It is normal that when we are in need, we go to our friends and known people to seek advice or help. Instead we may prefer to reach out to organizational or institutional helps available in our society. Decision to use our social relationships or to seek help from institutions rely heavily on our society's situation, how much help are available out there that we can count on? Despite level of institutional helps, human beings tend to build, improve and sustain relationships with other people and sometimes these relationships yield some benefits. In an effort to study how people are seeking help from their personal networks, we can utilize different terms and theoretical concepts of various scientific fields. Social capital is one of the most known concepts in social sciences that can help in describing uses and benefits of social relationships for individuals. There has been lots of researches on concept of social capital and how people benefit from their relationships and personal networks (Lin, 1999; 2001; Van der Gaag M. , 2005). We have adopted definition of social capital that Lin (1999) proposed based on social resources theory: "investment in social relations with expected returns". He believes that this simple notion is common among different theoretical efforts about social capital, whether they are looking to this concept from structural or individual aspect.

Online social networks are growing fast (based on statistics in fig.1 (Pew Research Center, 2015; Statista, 2015)); and there has been a growing body of research on these online social networks. As an example, Wilson et al (2012) reviewed 412 articles that have been written with a focus on Facebook, as the most populated online social network that has ever existed (Backstrom, Boldi, Rosa, Ugander, & Vigna, 2012). Wilson et al have divided these researches into 5 categories: descriptive analysis of users, motivations for using Facebook, identity presentation, the role of Facebook in social interactions, and privacy and information disclosure. Another example of this fast growing body of research on online social networks is studies reviewed by Capua (2012); his work is another attempt to categorize researches being done about online social networks.

Nevertheless research activities in above mentioned reviews, there has been less focus on what people gain, by being connected to online social networks. Beyond users' motivations to be online, we can ask, do they receive some kind of

“resources” from their online contacts? Is it possible for people to use their online contacts to get access to some resources otherwise not available to them? And does this online connections and their embedded resources have an impact on people’s online or offline activities/outcomes? These are some questions that we have tried to address in a research project. During this research project and based on the literature reviewed, we realized that, as Van Der Gaag (2005) and others (Lin, 1999; Snijders, 1999) have stated, there is a “lack of standardized, reliable, theory-driven measurement instruments” for assessing social capital. And by taking into account relative novelty of online social networks, this lack of measurement instruments is more prevailing and effective on research results about online social networks. So, we noticed that there is a need for a methodological improvement in how to measure social capital through online social networks. We tried to respond to this need by building a new tool. In this paper we have discussed this tool and how it helps in measuring social capital in online social networks. The rest of this article is organized as follows: in Section 2 a review of literature is presented that helped us to construct our framework of cyber social capital measurement, based on Lin's theory (Lin, 1999; 2001; 2005), in Section 3 we describe methodology to implement this framework, and in Section 4, we present implementation of the tool constructed based on this methodology. Section 5 presents some preliminary results we have had so far thanks to this tool. We discuss consequences of this work, its limits and future research in a conclusive Section 6.

Fig.1 – Statistics of social network users' rapid growth



## **Review of literature**

### ***About cyber social capital***

As Vander Gaag (2005) has stated:

“Theorists in the field of social capital all seem to agree on the definition that social capital comprises “expected returns to social relationships”; relationships with and between others help individuals to accomplish goals they cannot achieve on their own.”

But exact definition of these returns, and situations where these returns happen or don't happen, are matter of debate, especially when considering “online relationships”. When we discuss online relationships, we should divide two different generations of Internet users. First, older people and generation who has born before Internet was innovated or people in developing countries that have lived before internet gets this much popular. They are now persuasively or willingly Internet users because of increasing presence of Information Communication Technologies (ICTs) in our everyday life. By emergence of online social networks, they have adopted well to this newer kinds of ICTs. But, main part of their relationships and connections still exist in real world, they mainly use Internet and in particular online social networks to connect to people they know in their real life. So we can consider a partial overlap between their online and offline relationships, and we can see that they know some people just in their offline life and they don't have a relationship with them through Internet or online social networks. Second are younger people who have been born after emergence of Internet and/or online social networks. These technologies have a more obvious role in their lives comparing to the first group. In some cases they are more online than offline. As an example imagine how many young people you have seen without a smart phone or a kind of device that connects them permanently to Internet? That is one of the reasons that in some researches it is stated that we cannot call some of these interactions and relationships solely online or offline, in this case, individuals use different tools and contexts to maintain their interactions in a permanent manner (Wellman, et al., 1996). In this paper we are not trying to compare online and offline relationships of people, instead we are merely focused on online relationships that have been point of some controversies among researchers.

Regarding the impact of Internet on social capital (Van der Gaag & Snijders, 2005; Williams, 2006), some studies suggested that Internet increases social capital (Wellman, Haase, Witte, & Hampton, 2001) when others did not (Williams, 2006). These latter works usually see social capital only or mainly in real world relationships. And because they are focused on offline relationships of people or they are comparing online and offline relationships with each other, they conclude that whenever someone is more online, it means, that person is less offline so s/he has less time to interact with others in his life. An obvious result of their point of view is: people who are more active on online social networks, should have less social capital. But in this paper, as suggested by Williams (2006), we are seeing cyber social capital and online relationships as a kind of relationship that can be regarded as supplementary resources of social capital for a person. And we don't consider this cyber social capital as an alternative to real world relationships. We see these relationships as a different and separated means of communication through computer assisted technologies that can provide some other outcomes and supports for person that is not completely the same as real world relationships and social capital.

But, more generally, this debate between online and offline capital is rooted in the more general debate of what social capital is, and how to measure it. Differences are generated as a result of theories each research has adopted, we briefly present here notions of social capital stated by Putnam and Bourdieu as two examples of these differences.

Putnam (2000) sees roots of social capital in voluntary memberships in different social groups or individual's political participations. Because of that, some articles based on his theory have concluded that online presence (participations and membership in online social networks) can be considered as a kind of voluntary action that can help individuals gain more social capital.

There has been some other research efforts to measure social capital based on Bourdieu's notion of social capital. They tend to see social capital at individual level or in comparison to other types of capital that Bourdieu has noted like economic, cultural and symbolic capital. They consider that social capital is mainly helpful in individual goal attainment, and it is something that can work in

conjunction with or instead of personal resources (Van der Gaag & Snijders, 2005; Lin, 1999; 2001; 2005; Lin & Dumin, 1986) (Lin, Fu, & Hsung, 2001).

Each research has adopted a special theory of social capital and based on social capital theory adopted, the research has given a different answer to question of what resources people earn from their social networks. Van der Gaag (2005) and Lin (1999) have gathered two in-depth reviews of social capital theories and measurements. They have pointed out differences among these tools and points of views. Lin (1999), in his discussion of theoretical viewpoints and measurement of social capital, points out some controversies of previous theories or measurement efforts such as dichotomy of social capital being collective or individual asset in Coleman and Putnam's work. Or trying to see differences of social capital in closure or open networks like Bourdieu, Coleman and Putnam. And also function-centered definition of social capital by Coleman that has been considered as a tautology. Or notions that social capital is not quantifiable. Some previous attempts to measure social capital like ones mentioned in Lin (1999) and Jeong (2008) are focused on structural aspect of relationships saying that social capital is mainly defined by one's position in structure of network of people. As an example, someone with a bridge role in structure can manage flow of information among two distant parts of network and as a result of this management s/he would have access to a more important position and possibly higher authority among the network members. Some other attempts to measure social capital has been focused on memberships and affiliations of individual to different groups that help in getting access to resources (Lin, 1999). Others like (Lin, 1999 b) have been focused on individuals' actions and socioeconomic status that help person to have an opportunity to be a more valuable asset for social group. Being a member of this group is partially based on person's previous socio-economic status. After being accepted, the person would be able to use group's resources that has been not accessible to him before this membership and these resources could help in improving his future socioeconomic status. After stating these controversies or theoretical shortcomings like two separate efforts to see social capital as assets in networks shown in table 1, Lin (1999) proposes a mixture of these different viewpoints. He describes how we can

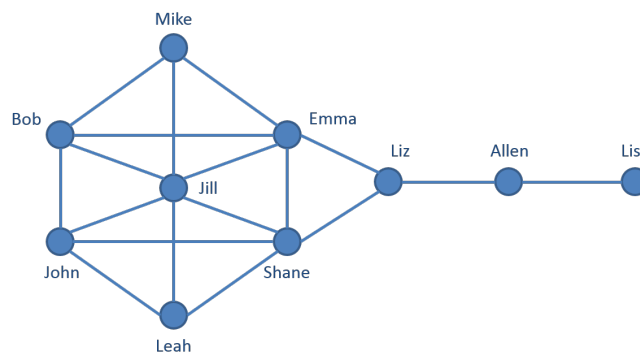
measure social capital in both individual and structural levels and how to see social capital as resources embedded in social networks.

Table 1 – Lin’s (1999) review of previous efforts to see social capital as assets in networks

Focus	Measurement
Embedded Resources	Network Resources
	Contact statuses
Network Locations	Bridge to access bridge
	Strength of tie

Looking at an exemplar network structure like Fig 2, one can be focused on structural positions each individual occupy; in this example Liz has a bottleneck position and she can control the flow of information in the network, or she can access to some information from two different and distant sides of the network. On the other hand, we can pay attention to resources each individual possess and how they are reaching out to each other to access those resources. As a third way, we can be focused at both structure of this network and resources members possess and share with each other.

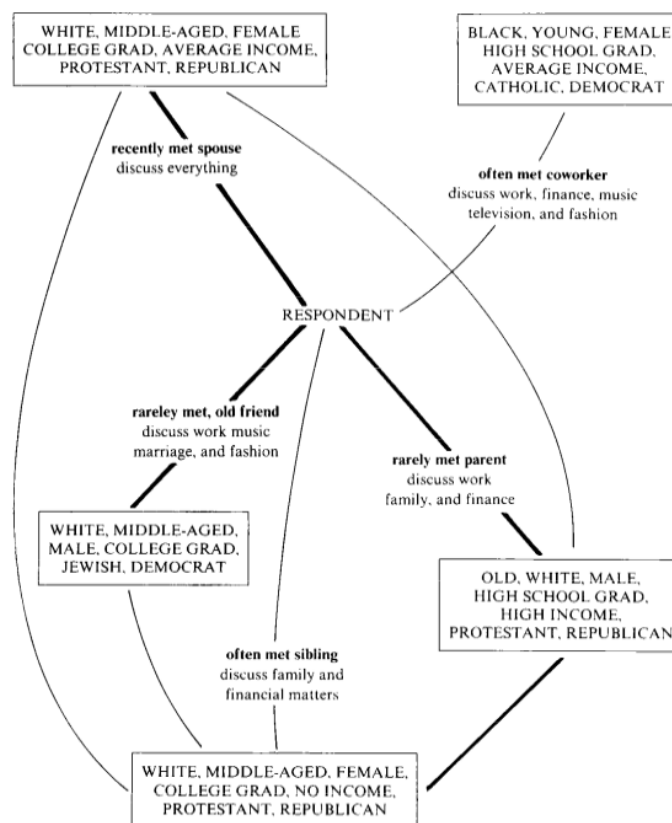
Fig 2 – an exemplar network structure



Beside these points of views, there has been some visualization efforts to mix structural positions and contact resources in integrated graphs that shows who

connects to whom and also help inducing more information about what are the underlying factors to bring those people together. As an early example of these visualization efforts that had an effect in how we designed our online research application is Burt's (1984) work on General Social Survey (GSS) data. As we can see in Fig 3, he tried to show socioeconomic properties of ego and alters added to alter to alter ties. We have presented a sample of extracted data from our online research application in results section that shows how we have tried to make this kind of visualization happen based on online social networks friendship data added to respondents' answers to our questions.

Fig 3 – Burt (1984) visualization based on GSS data



So, to be brief, there is two structural and individual levels in these theoretical efforts to define and evaluate social capital. Structural framework can either limit or empower individual's actions. At the individual level, that can be considered as

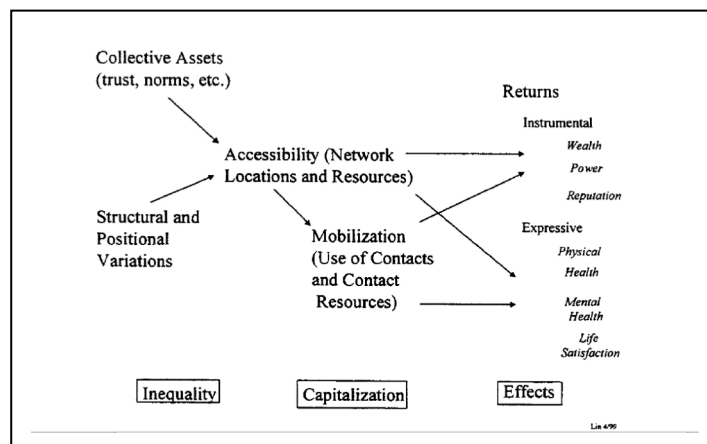


individual agent's role whether to try to utilize this structural resources toward goal attainment or change this structural situation toward more freedom in future actions. To our knowledge, one of the successful efforts to join and mix these individual and structural variables in an integrated model to measure social capital is Lin's model (fig 4), we will describe it in the following section of the paper.

**Lin's theory of Social Capital**

Lin's model (1999; 2001; 2005) of social capital measurement is shown in fig.4. This model considers social capital as a collective asset that people possess by mobilizing their accessible and potential social capital. He considers three different phases, first inequality in people's access to structural positions and resources, second, process of capitalization that takes into account individual agents' action and third, outcomes that shows whether this social capital is working and effective or not.

Fig.4 – Lin's model of Social Capital measurement



Accessible and potential social capital is in a vast amount affected by person's structural location and position in social network and his/her socio-economic status between his personal network members. These are the structural variables that affect one's level of potential access to resources. Like resources someone receives by just being a member of a special group like a tribe or blood-based kinship structure. On the other hand, at individual level, this is the person who

decides and tries to mobilize this potential access. As an example of individual's role in this mobilization, imagine two brothers, obviously they have similar kinship memberships, one of them tries hard to sustain this relationships and improve them and utilizes this relationship from time to time to attain his goals, and the other one isolates himself from this kin relationships and tries to reach his goals by his personal efforts and not with requesting help of others.

After this mobilization process or so called capitalization, individuals who has successfully mobilized their potential capital will have access to two different types of instrumental and expressive outcomes such as wealth, power and reputation as former kind and physical health, mental health and life satisfaction as latter. This outcomes are so alike to outcomes that are mentioned in other works on social capital like helps this social capital can provide in finding a job (Lin & Dumin, 1986; Lin, 1999; Granovetter, 1973; Van der Gaag M. , 2005) or other works about social capital's impact on mental and physical health (Lin & Dumin, 1986; Van der Gaag M. , 2005; Lin, 1999; 2001; 2005). Instrumental outcomes are resources that are not possessed by individual right now and they are only accessible through person's network members. But expressive outcomes are current resources of the person that being connected to other people and interacting with them help him not to lose this resources like his level of mental and physical health and quality of life. In third phase of Lin's model, and by studying this outcomes, we can try to know if this mobilization of social capital has been effective or not.

Based on our review of social capital theories, we have come to conclude that Lin's model could be applied to online social networks, as his methodological approach to measure positions and resources associated with these positions. So we have tried to see what a person is gaining by being connected to other people who possess special resources.

But along with Lin's model, we have considered some other outcomes like fun, entertainment and etc. that is specially associated with online social networks and are specific to being a citizen in networked world or as stated in some researches being a Netizen (MacKinnon, 2012). So we have tried to operationalize Lin's model concepts and also we have tried to build a scale to measure this Netizenship and provide a score that could be comparable among different users

from different nationalities and countries. To reach to these variation in users we have developed our measurement tool in three languages of English, French and Persian.

## **Methodology**

### ***Data Collection Strategy***

As Lin (1999) has pointed out, there are some shortcomings in different measurement and sampling techniques in studying social capital. Saturation survey and complete mapping of networks are only feasible in limited and small networks, like the case of organizational settings or small communities. So this complete mappings cannot be effective or even doable in case of huge networks like online social networks. The only example of an effort to analyze whole graph of relationships in Facebook is Backstrom et al (2012) work that has been done with support of Facebook in providing data.

There has been different structural tools to measure social capital in real world context like Name, Position (Lin & Dumin, 1986; Lin, 2001) and Resource generators (Van der Gaag & Snijders, 2005; Van der Gaag M. , 2005). In utilizing Name generator, researchers try to ask people who they are mostly connected with. Then they try to ask about context and texture of this relationships like interpretive and alter related question or alter to alter ties; they do so in order to explore ego's personal network and to enrich it with attribution data of this personal network's members. In some other situations like small communities or organizational settings, researchers try to provide a list of all members/employees. They request respondent to choose and say that to whom s/he is more connected among all list members. In newer kinds of structural generators, researchers provide a list of socio-economic positions and request respondents to say that who they know which possess one of this positions and what kind of relationships they have with each other (Griffiths & Lambert, 2012). Or researchers try to ask about ego's personal network resources and they provide a list of resources and ask respondents to say that do they know someone with that particular resource or not (Lin, 1999; Wellman, et al., 2006; Van der Gaag M. , 2005). In some of resource generator questions, researcher describes an imaginary situation of need and ask respondents to imagine

themselves in that particular situation, and to choose to whom they would prefer to go to ask for help.

Each of these tools has its own pros and cons. In case of name generator, relying too much on respondents' memory or self-report that has possibility of personal networks being reported with mistakes or simply it is probable that ego doesn't have accurate information of alters as an example about their political views and s/he is reporting her image of alters (Marsden, 1990; Hsieh, 2015; Wejnert, 2010) that could be probably different from what is happening in reality. In case of Position generator, there is a possibility that respondents are forced to select one or two of their known personal network members. These are probably ones with stronger relationships that come to mind first. As a result of that, weaker relationships are somehow being ignored, despite the fact that, as Granovetter (1973) has stated, in some cases these weak relationships could be a valuable source of support. Number of positions that a researcher could mention in position generator questions and number of respondents' friends allowed to be mentioned for each position are limited, therefore, there is a probability that persons and positions that respondent had connected more often wouldn't be mentioned in questions and relationships would be extracted different than reality. Or as Hsieh (2015) suggested, it is possible that positions are reported based on what respondent remembers or assumes about his friends and this reports could change by help of ICTs or referring to respondent's phonebook. Or as another example of this phenomenon, as Brashears and Quintane (2015) studied, it is probable that people recall networks and relationships between their friends based on the structure of these relationships as a triad and they maybe neglect dyads or smaller number of their friends. So, when we are talking about measuring this social capital that is embedded in online social networks, and by considering one's personal contacts in online social networks, we can say that there has been less efforts to adapt measurement tools to this sphere (Williams, 2006). To our knowledge, there has not been a similar online application to measure social capital embedded in online social networks in real time and provide a basis for dynamic study of changing nature of relationships and also help us to see these relationships in more than one context; in this tool, we have provided possibility for respondents to report more than one of their online social

networks profile and be able to answer resource and position generator questions about those online social networks separately.

We have tried to overpass these limitations by proposing an online application that sees cyber social capital measurement in a new way. In constructing this application, we have tried to combine a name generator that uses recorded data of relationships in online social networks and then we ask some interpretive questions in form of a position generator and a resource generator. We have tried to specify type of relationships and also evaluate this extracted data with subjective understanding of respondents from their personal network. Utilizing recorded data of relationships and interactions among people, enables us to measure social capital more accurately and more close to reality. To be able to capture data about strong, moderate and weak ties of respondents we built some indexes for level of closeness and online interactions between ego (our respondent) and each alter (respondent's friends). These indexes include number of mutual friends between ego and each alter, how many likes each alter gave to egos contents posted on online social network, how many comments each alter put on contents posted on ego's profile on online social network and how many likes alters gave to comments that are already posted under ego's contents. Based on these four indexes our application calculates a relevance score for each friend of ego in real-time and then in next phase that is interpretive questions about alters, we used this relevance scores to select 5 friends of ego that 2 of them have most relevance scores, 2 of them have least relevance scores and 1 of them was selected randomly among all ego's friends. This way we tried to avoid getting information about only strong ties and most closest friends of respondents and we wanted to see if respondents are receiving resources from their most distant friends with least relevance scores or not. Then in next phase, by asking users to evaluate these recorded relationships and extracted personal networks based on their subjective image of what is happening in their online life, we have tried to validate recorded data that we have used.

### ***Construction of variables***

In methodological terms, we can divide these three phases of Lin's model into two levels, structural and individual. First a structural level that required us to gather relational data about who is connected to whom. That is similar to what a

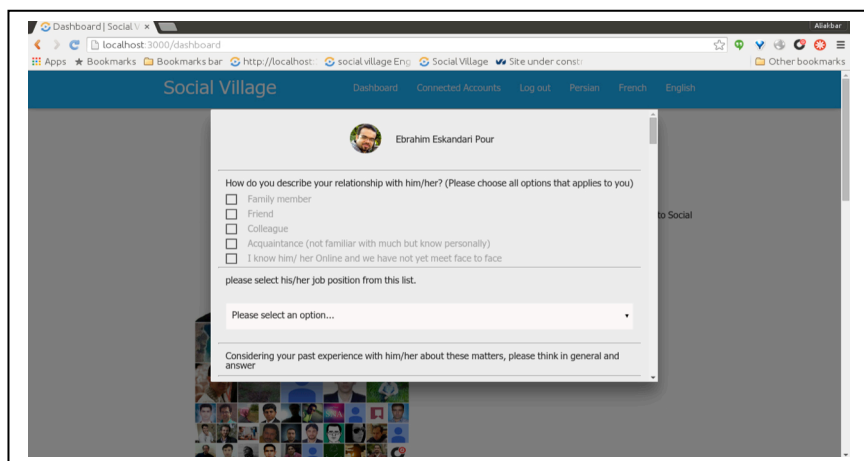
name generator does, but as an alternative to popular name generators, we used recorded data of users' friend lists. Using recorded data, we tried not to be biased in extracting ego networks based on respondents' memory and answers. Our other goal was to be able to capture strong and weak ties simultaneously. To do so, by utilizing social login, we requested online social networks users' permission to gather data about their relationships and personal friend lists on Facebook and Google plus.

Once structural data of relationships has been gathered, we asked questions about our intended variables at individual level. This social survey helped us to attach some attribution data to structural and relational data we have gathered in first phase. These attribution data enabled us to enrich socio-graph of whole network and helped us to address the second and third phases of Lin's model, capitalization process and outcomes of this social capital.

We used 4 questionnaires to carry out social surveys at individual level; first questions includes position and resource generator questions about each of 5 friends of our respondent, these friends were selected based on earlier described relevance scores. We have seen well-known position and resource generator questions and beside our questions, we have adopted and customized some questions of previously used generators like Wellman et al (2006), Bos & Van der Gaag (2010), Van der Gaag and Snijders (2005) and Lin (2001). Final 24 questions were about socio-economic position of each of these 5 friends on a question with 13 options including higher and lower rank jobs and options like "None of the above options" and "I do not know" because it is possible that respondents doesn't know their online friends that much. Other questions dealt with different types of resources they have provided for each other like lending and borrowing money, information, job opportunities and advices and etc. Questions include both some imaginary situations and some real situations in past where they have or have not helped each other out. This way of asking questions about a particular friend of our respondent, by showing his/her profile name and picture in online social network is shown in fig.5. Within these questions we embedded different aspects equivalent to wealth, power and reputation as long as other types of resources people could have gain through

their personal networks; these aspects are all extracted from Lin's theoretical model.

Fig.5 – Sample of Social Capital questions about particular friend of our respondent



In addition to questionnaire about respondent's friends, we add three questionnaires (personal, netizenship and quality of life) about our respondent himself. They mainly aimed to gather data on the third phase of Lin's model that relates to outcomes and shows how much social capital has been mobilized and effective.

Our second questionnaire was demographic questions. That includes some personal questions to help us have a better knowledge of who is using our research application. We added questions about socio-economic status of respondents that are variables to enable us to interpret trends of data more based on personal adjectives of respondents. Also to help us in answering this question that what socio-economic variables of each individual affects the level of access to potential social capital or can help in determining ego's level of success in mobilizing social capital.

Netizenship has been our third questionnaire. We developed this questionnaire based on possible activities in online social networks, in order to know what was most important motivators and reasons behind respondents' online presence. We tried to develop a scale to be able to compare level of usage of online social



networks among respondents of three languages, English, French and Persian. Because it has been suggested by previous studies (Bohn, Buchta, Hornik, & Mair, 2014) that this level of activity could cause a huge difference in level of supports and resources they can earn in online social network similar to real life. That is stated that in real life, based on effort people put in building, sustaining and improving their relationships and personal network, possibility of having more social capital increases (Wellman, Haase, Witte, & Hampton, 2001). So we tried to provide a basis to compare this notion in online social network.

Our fourth and last questionnaire was about quality of life. We reviewed different standard scales to measure quality of life. Based on our previous experience we have chosen WHO's questionnaire (Scale for quality of life (WHOQOL-Bref) 1996, 2015; European Social Survey, 2014). This scale enabled us to study four different dimensions in quality of life of respondent: physical health, psychological health, social relationships and level of happiness and satisfaction with them.

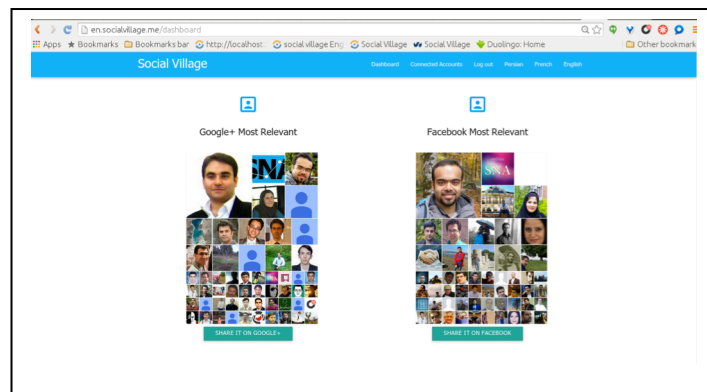
### ***Sample of study***

Sample of study in first methodological level of data gathering was consisting of volunteer and willing users who wanted to use our application to know more about their online life. In second level, sample included a proportion of the same sample in first step who have accepted to fill in research questionnaires in exchange for seeing their most relevant people's image in an interesting picture (fig.6) and also in exchange for knowing their scores in real time (fig.7). Information about number of the sample and some of their demographic properties are presented in results section.



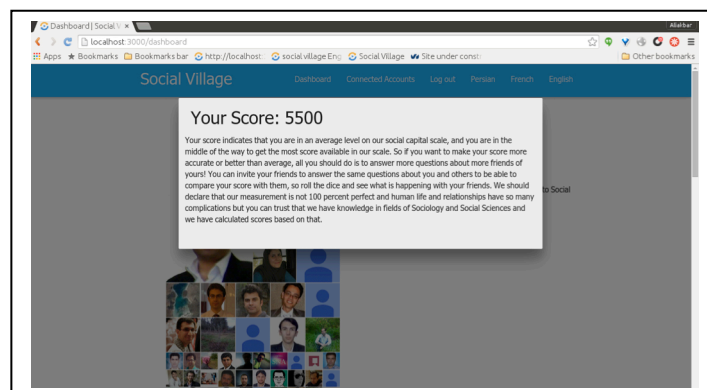
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Fig.6 – A sample of most relevant friends picture from both Facebook and Google plus for one respondent



We called this picture most relevant friends because they are respondent's friends with most interaction with his/her contents (like and comment on posts) and with most number of mutual friends. It includes 55 friends shown in order of relevance score from higher to lower. Pictures of friends with more relevance score is relatively bigger. Seeing real-time interpretations of social capital, netizenship and quality of life scores was another thing we offered our application's users to motivate them spread the word about this research and also that is a unique adjective of this application to connect scientifically justifiable work with providing practical information to users. This kind of real-time interpretation of scores is shown in fig.7. We selected Facebook and google plus as two mainly populated online social networks and in next version of this research application we intend to add LinkedIn and Twitter to have more variation in contexts of online interactions.

Fig.7 – Real-time interpretation of respondents' scores



## Results

There is two kinds of results generated by this research project: first, online application, Social Village, which has been developed based on goals of this research and it will be working as a research platform to let us and other researchers study cyber social capital longitudinally; second type of results of this research is data gathered in a 78 day period after launching this application.

### ***The application produced***

As noted before, our main goals in implementing this research application was to overcome the above mentioned methodological and measurement shortcomings in study of social capital. Our minor goals included testing adopted theoretical model. We have developed an integrated online application named as "Social Village" (it can be reached online at <http://socialvillage.me>) that helped us in study of three theoretical phases of Lin's model. We have developed this application in three languages of English, French and Persian to be able to compare possible differences among online social networks users of these three languages. In development process, we have used online social networks' API rules to utilize social login, and to be able to get users permission to access their profile data and friend lists. In first version social login for Facebook and Google plus are implemented and in next version we will add LinkedIn and Twitter. This application can be considered as a research platform that will function longitudinally to help us and other researchers study trends and changes in cyber social capital.

### ***Data collected***

We have launched first version of Social Village, in Persian language on February 17<sup>th</sup> 2015 and then after revising questions like educational levels and considering necessary cultural adaptations while ensuring consistency, English version was launched on March 13<sup>th</sup> 2015. We launched third language, French, on March 16<sup>th</sup> 2015. In order to avoid capturing some separated and isolated personal networks that has no connections to each other, we have designed a scenario including an interesting challenge. This kind of challenges are popular in these online social networks. We named it Most Relevant friends' challenge. We tried to encourage users to spread the word about this application among their friends and also we

used our team members' personal and professional profiles and connections to attract as many users as we can. In the online application, after submitting answers and receiving scores and interpretation, we gave respondents a possibility to share their most relevant friends picture (fig 6) on their online social network profiles, this way our snowball of users were growing faster and our respondents helped spread the word about Social Village.

In a period of 78 days from launch date of first language (Persian), we were able to have 412 users (table 2); in average 43.79 percent of them answered to whole or some parts of our questionnaires. This is four times more than usual response rate of online questionnaires, which is stated to be normally 10% of people who come to questionnaire page (surveygizmo, 2015).

Table.2 Social Village languages and response rates

Social Village language	Response rate (%)
Persian (n=261)	49.80
English (n=66)	43.93
French (n=85)	37.64
Total users (n=412) average response rate	43.79

Based on respondents' feedbacks and our observations, we consider that this 4 time increase in response rate is mainly due to the gamified social survey we have implemented in this research application. The fact that this scientific work produces data and figures on social capital (fig 6, 7), which are easy to turn into scores, is something attractive to users<sup>1</sup>. In exchange for respondents' participation in our research, we have shown them an interesting picture of their most relevant people (fig 6) and their friends' rank in a list of 55 members; these all helped us in attracting more participation rates. This kind of gift giving is

<sup>1</sup>We presented their social capital, netizenship and quality of life scores, but also we helped them to know how much support they are gaining from their friends, or, in other words, how reliable their relationships are.

popular in face to face social surveys that seek to reach to more response and participation rates. In our next version, we have planned to reduce number of questions and make this participation experience even more attractive and enjoyable. And previous studies (Mastrandrea, Fournet, & Barrat, 2015; Cechanowicz, Gutwin, Brownell, & Goodfellow, 2013 October) show, designing researches with active involvement of respondents in different kind of data gathering procedures help in more reliable data gathering and more participation rates.

Here we have shown some preliminary and descriptive analysis of name, position and resource generator results, as an example of data that could be gathered with this tool. This results show how researchers can benefit from this online research platform to access real-time and dynamically gathered data of online social networks. It worth noticing that in the scenario we have designed, position and resource generator questions were obligatory for respondents in order for them to see their most relevant friends' picture (fig 6), but other three questionnaires (demographic, netizenship and quality of life) were not mandatory, as a result of this, response rate to position and resource generator questions were much higher than other three questionnaires and it proved same result as Microsoft News Center (2015), that when research provide users with valuable things as exchange for their personal data, people are willing to share their information and this information sharing increases with more tangible kinds of gifts and exchanges. In our case, users were willing to answer questions to see their most relevant friends picture, but after seeing the picture, their tendency to participate in answering other questionnaires decreased like case of ordinary online surveys that without interesting gifts or valuable exchanges, visitors of questionnaire's online page are not willing to participate much (surveygizmo, 2015; Cechanowicz, Gutwin, Brownell, & Goodfellow, 2013 October).

Our respondents include 346 individuals out of 412 users of our online research application, social village, who have answered at least one of our 4 questionnaires. Among all 412 users, 146 are males (66.7 %) and 73 females (33.3 %) and 193 out of 412 respondents didn't prefer to tell their sex. We have asked respondents how they describe their relationship with this particular friend. Our goal was to know people are connected to whom on online social networks;

we presented options like: "family member, friend, acquaintance, colleague, other and not face to face relationship"; respondents were able to choose more than one option in this question.

Table 3 – type of relationship between respondent and his/her 5 friends

Type of relationship with respondent	Frequency	Percent
Family member	174	10.18
friend	585	34.21
colleague	26	1.52
acquaintance	185	10.82
not face to face	621	36.32
other	119	6.96
<b>sum</b>	1710	100

It is shown in table 3 that highest frequency in sample of our study is "not face to face" relationship (36.32) with a slightly low difference of 2.11% from "friend" type of relationship.

Based on answers to question of socio-economic position of respondents' friends, as shown in table 4 we see that 864 positions has been accessed by our total 346 respondents and it is interesting that a small percentage (1.15 %) didn't know their friend's socio-economic position and chose "none of the above options" or "I don't know" that proves that our respondents know who they are connected with on online social network, we have discussed this further in conclusion.

Table 4 – socio-economic positions accessed by our respondents

<b>Respondent's friend position</b>	<b>Frequency</b>	<b>Percent</b>
craftsman, merchant, entrepreneur	16	1.85
Senior position / Executive, Intellectual profession	203	23.50
Own-account worker	28	3.24
Middle-level Profession / Intermediate Profession	169	19.56
Employee	51	5.90
Worker	14	1.62
Retired	5	0.58
pupil, student	298	34.49
Looking for a first job	3	0.35
Unemployed	35	4.05
housewife without a job	32	3.70
None of the above options	4	0.46
I do not know	6	0.69
<b>Total</b>	<b>864</b>	<b>100</b>

Frequencies of positions accessed by our respondents show that most accessed position by our study sample has been pupil/student status that is mainly because that our first users have been university students and after introducing the online application to their friends, based on usual trend of homophily between online social networks member that they tend to be friends with people similar to their socio-economic situation, so our broader sample were affected by early users of social village; we don't intend to generalize this result to online social network users.

Based on the preliminary results of resource generator questions that are shown in tables 5 and 6, we see that our respondents are receiving various kinds of resources from their friends in online social networks, we have discussed implications of this results further in conclusive section.

Table 5 – resources accessed by respondents of English and French languages of Social Village

Support type	Frequency	Percent
given advice about investing money	73	5.68
received advice about investing money	66	5.14
lend money	68	5.29
borrow money	67	5.21
receive health care	62	4.82
provide health care	63	4.90
receive professional advice	60	4.67
give professional advice	61	4.75
Help in job interview preparation	58	4.51
receive professional opportunities information	58	4.51
give professional opportunities information	59	4.59
be there to talk with	57	4.44
set you up with somebody	57	4.44
set him up with somebody	57	4.44
Do charity work based on my request	46	3.58
I have done charity work based on his request	51	3.97
discussed political matters with	57	4.44
I have impact on his voting behavior	45	3.50
Has impact on my voting behavior	54	4.20
knows a lawyer to help me in a necessary situation	41	3.19
I have introduced cultural goods to him	64	4.98
He has introduced cultural goods to me	61	4.75
<b>Sum</b>	<b>1285</b>	<b>100</b>

Based on this table, amongst 1285 incidents of providing or receiving resources, highest resource exchanged among our sample of study in English and French languages (n=151) is giving advice about how to invest money by our respondents to their friends and after that with a little difference, frequency of lending money by respondent to his/her friends is the second type of resources exchanged, but these has a slightly little difference with frequencies of other resources provided or received by our respondents.

Table 6 – resources accessed by respondents of Persian languages of Social Village

<b>Support type</b>	<b>Frequency</b>	<b>Percent</b>
Provided occupational advice to me or job opportunity suggestion	345	17.22
Received economic advice from or borrowed money from	296	14.78
Received cultural goods suggestion or has set you up with somebody	363	18.12
Liked a charity's online page or helped a charity on my request	281	14.03
Political discussion or impact on my voting behavior	349	17.42
Received problem solving advice or received practical help to solve my problem	369	18.42
<b>Sum</b>	<b>2003</b>	<b>100</b>

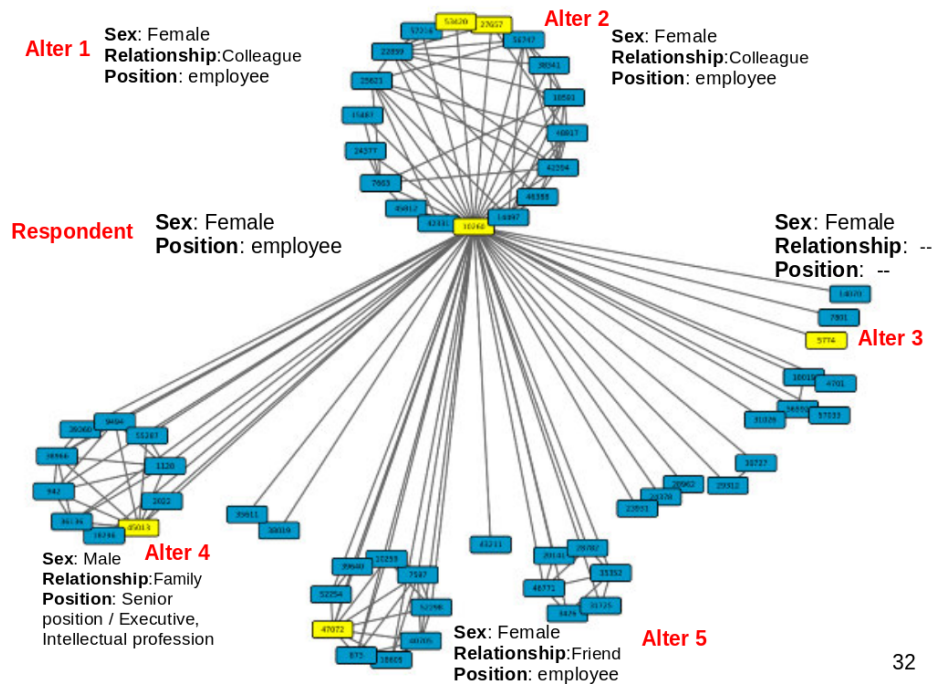
In case of our Persian language respondents and in 2003 incidents of providing or receiving resources, highest frequency is receiving advice or practical help in problem solving.

As the last part of preliminary results of Social Village, we have shown one of our respondent's ego-network on fig 8. This graph is visualized based on Burt's (1984) effort (fig 3) to add socio-economic and position and resource generator results to structural position of individual in network graph. This is possible through this online application to get this kind of integrated data to do further sociological analysis.

This graph includes her sex and socio-economic position and her structural position among her friends on Facebook. After that we have added her answers to position generator question about 5 of her Facebook friends. We see that these 5 friends include two of her colleagues (alter 1 and 2), they have employee position in our 13 item question. She has answered questions about one of her family members (alter 4) who has a senior position and one of her friends (alter 5) who has employee position. We see also that she doesn't know much about her other friend (alter 3) that we have chosen her randomly based on earlier described relevance scores among all her friends list and in structure of ego-network, we see that this person is not connected to her other friends.



fig 8 – one of our online application respondent’s ego-network with her position generator answers



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### Conclusive discussion

Main need that this research project and paper have tried to answer was to provide a tool to study some questions like these: What kind of resources and positions people access through their friendships in online social networks? Are their online friendships as fruitful as their offline ones? Do they achieve kinds of resources that we can call social capital? What theoretical frameworks can help in describing and explaining this access and use of resources embedded in online relationships? In order to answer these questions we reviewed literature on social capital measurement and effects of internet and online social networks on social capital. We observed that there is a lack of methodological tools enabling researchers to study online social capital dynamically through time. We tried to adopt Lin’s (1999) theoretical framework for social capital and structural data generators like name, position and resource generators that are well used tools to measure social capital. We integrated this theoretical framework and structural

generators in an online research application, Social Village<sup>2</sup>. Once an online social network member gives access to Social Village to his/her friendship and profile data, and when s/he answers our questions, s/he will see her scores and interpretations in real time in exchange for this participation. This participation is happening through a gamified social survey that challenges users to participate more and gain more interesting insights about their online life. We have encouraged respondents to share their scores with their friends and also spread the word about Social Village. These provide a basis for detailed analysis of online social networks' users' presence and enable us to see trends and changes in amount and type of cyber social capital during different time frames in order to analyze these changes dynamically.

Based on the preliminary results shown, and as Mastrandrea et al. (2015) stated in their results, if online friendship has a quite long-term background and lasted enough, it could be a good indicator of individual's offline relationships and comparing results obtained with different tools like wearable sensors, surveys, contact diaries and online friendship data, we can see that these data tend to converge and they can be used as complementary ways of gathering data. And as Wellman et al (1996) stated, we cannot call some interactions totally online or offline because individuals use these available tools and contexts to maintain their relationships in a somehow permanent fashion and this tools help them to overcome limits such as geographical or time limits. In our case, in results section we saw that respondents know their friends socio-economic positions, they are exchanging various kinds of resources with them. So one of our main conclusions is that we can use list of friends in online social networks as a reliable name generator to start with, and then researcher can ask interpretive questions about nature and details of these relationships; although it worth emphasizing that if possible, it would be more reliable to add user generated data like names generated during a face to face interview to this online friendship data to be more sure of validity and reliability of personal networks measurement. But, considering the fact that face to face interviews have numerous financial and time costs, so we are suggesting this research application as a solution to attract respondents with an interesting tool and enjoyable experience to assure a more

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<sup>2</sup> <http://socialvillage.me>

participation rate. At the same time we consider some facts about differences in online relationships nature and as it is declared based on results of Wilson et al. (2012), online friendship networks are different from online interaction networks, it means that individual is not interacting with all his online friends in the same manner and just being on someone's friends' list cannot be a good example of individual's relationships and interactions; based on this fact, we emphasize on possibility to use online friendship data as a good starting point and to try to nurture this data with respondents' answers to interpretive questions to explore this friendships more. By this methodology, and thanks to the tool we developed, a vast and nearly complete picture of what people are doing online can be generated. It will be clearer that what online social networks' users are expecting to gain from this online life and what they are gaining right now. Also causes and consequences of changes in people's level of cyber social capital during their membership in online social networks can be a subject for further studies.

Another point worth mentioning is that, in this research and practical work, we have tried to build a research platform that can function as a database for future studies on social capital and it can enable other researchers to see effects of cyber social capital in other aspects of people's life. Utilizing our scores for social capital, netizenship and quality of life, researchers can reduce cost and time needed for their research and they can focus on causes and effects of this social capital in relation to other variables. Also we have tried to be as practically useful as possible for social-media users as well, by providing real-time interpretations of scores and also by showing pictures of most relevant people to each user. In next version of this application, once social login of Twitter and LinkedIn will be added to this platform, there would be a possibility for users to compare their more serious and professional activities in LinkedIn with more general social networks like Facebook, google plus or Twitter, to have a sense of what is difference between supports and resources they gain access to in these various social networks.

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## References

- Backstrom, L., Boldi, P., Rosa, M., Ugander, J., & Vigna, S. (2012). Four Degrees of Separation. *In Proceedings of the 4th Annual ACM Web Science Conference* (págs. 33-42). ACM.
- Bohn, A., Buchta, C., Hornik, K., & Mair, P. (2014). Making friends and communicating on Facebook: Implications for the access to social capital. *Social Networks*, 37, 29-41.
- Bos, P., & Van der Gaag, M. (2010). *Resource Generator style measurement items for individual Social Capital of the long-term unemployed*. Obtenido de Measurement of individual social capital: <http://www.xs4all.nl/~gaag/work>
- Brashears, M. E., & Quintane, E. (2015). The microstructures of network recall: How social networks are encoded and represented in human memory. *Social Networks*, 41, 113-126.
- Burt, R. S. (1984). Network Items and the General Social Survey. *Social Networks*, 6, 293-339.
- Capua, I. D. (2012). A Literature Review of Research on Facebook Use. *The Open Communication Journal*, 6, 37-42.
- Cechanowicz, J., Gutwin, C., Brownell, B., & Goodfellow, L. (2013 October). Effects of gamification on participation and data quality in a real-world market research domain. *First International Conference on Gameful Design, Research, and Applications* (págs. 58-65). ACM.
- European Social Survey. (2014). *ESS Round 7 Source Questionnaire London: ESS ERIC Headquarters, Centre for Comparative Social Surveys*. London: City University London.
- Goudarzi, M., & Shakerinejad, M. (2011). Improvement of Social Capital through the Internet in Developing Countries: Case Study of Iran. *International Journal of Cyber Society and Education*, 4(2), 89-108.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 1360-1380.

Griffiths, D., & Lambert, P. (2012). Dimensions and boundaries: Comparative analysis of occupational structures using social network and social interaction distance analysis. *Sociological Research Online*, 17(2), 5.

Hsieh, Y. P. (2015). Check the phone book: Testing information and communication technology (ICT) recall aids for personal network surveys. *Social Networks*, 41, 101-112.

Jeong, S. (2008). *Assesing social capital and community involvement: social network analysis for the sustainable Amish community tourism development*.

Lin, N. (1999). Building a Network Theory of Social Capital. *CONNECTIONS*, 22(1), 28-51.

\_\_\_(1999 b). Social Networks and Status Attainment. *Annual Review of Sociology*, 25, 467-487.

\_\_\_(2001). *Social Capital, A Theory of Social Structure and Action*. Cambridge: Cambridge University Press.

\_\_\_(2005). A Network Theory of Social Capital. En D. Castiglione, J. Deth, & G. Wolleb. Oxford University Press.

Lin, N., & Dumin, M. (1986). Access to Occupations through Social Ties. *Social Networks*, 8, 365-385.

Lin, N., Fu, Y., & Hsung, R. (2001). The Position Generator: a measurement instrument for social capital. En N. Lin, K. Cook, & R. Burt, *Social Capital: Theory and Research* (págs. 57-81). New York: Aldine de Gruyter.

MacKinnon, R. (2012). The netizen. *Development*, 55(2), 201-204.

Marsden, P. (1990). Network data and measurement. *American Review of Sociology*, 16, 435-63.

Mastrandrea, R., Fournet, J., & Barrat, A. (2015). Contact patterns in a high school: a comparison between data collected using wearable sensors, contact diaries and friendship surveys. *arXiv preprint*, arXiv:1506.03645.

Microsoft News Center. (17 de August de 2015). *Microsoft Research reveals understanding gap in the brand-consumer data exchange*. Obtenido de Microsoft Asia Pacific News Center: <https://news.microsoft.com/apac/2015/06/03/microsoft-research-reveals-understanding-gap-in-the-brand-consumer-data-exchange/>

Pew Research Center. (15 de 4 de 2015). Obtenido de Social media site usage by year: [http://www.pewinternet.org/2015/01/09/social-media-update-2014/pi\\_2015-01-09\\_social-media\\_01/](http://www.pewinternet.org/2015/01/09/social-media-update-2014/pi_2015-01-09_social-media_01/)

Putnam, R. (2000). *Bowling alone*. NY: Simon & Schuster.

*Scale for quality of life (WHOQOL-Bref) 1996.* (15 de April de 2015). Obtenido de World Health Organization: [http://www.who.int/mental\\_health/publications/whoqol/en/](http://www.who.int/mental_health/publications/whoqol/en/)

Snijders, T. (1999). Prologue to the measurement of social capital. *La Revue Tocqueville*, 20, 27-44.

*Statista.* (15 de 4 de 2015). Obtenido de Number of social network users worldwide from 2010 to 2018: <http://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/>

Steinfeld, C., Ellison, N. B., & Lampe, C. (2008). Social capital, self-esteem, and use of online social network sites: A longitudinal analysis. *Journal of Applied Developmental Psychology*, 29, 434 - 445.

*surveygizmo.* (6 de May de 2015). Obtenido de <http://www.surveygizmo.com/survey-blog/survey-response-rates/>

Van der Gaag, M. (2005). *The measurement of individual social.* Groningen, PhD Dissertation.

Van der Gaag, M., & Snijders, T. (2005). The Resource Generator: measurement of individual social capital with concrete items. *Social Networks*, 27, 129.

Wejnert, C. (2010). Social network analysis with respondent-driven sampling data: A study of racial integration on campus. *Social Networks*, 32, 112-124.

Wellman, B., Haase, A., Witte, J., & Hampton, K. (2001). Does the Internet increase, decrease, or supplement social capital? Social networks, participation, and community commitment. *American Behavioral Scientist*, 45(3), 436-455.

Wellman, B., Hogan, B., Berg, K., Boase, J., Carrasco, J., Côté, R., & Tran, P. (2006). Connected Lives: The Project1. En *In Networked neighbourhoods* (págs. 161-216). London: Springer London.

Wellman, B., Salaff, J., Dimitrova, D., Garton, L., Gulia, M., & Haythornthwaite, C. (1996). Computer Networks as Social Networks: Collaborative Work, Telework, and Virtual Community. *Annual Review of Sociology*, 22, 213-238.

Williams, D. (2006). On and Off the 'Net: Scales for Social Capital in an Online Era. *Journal of Computer-Mediated Communication*, 11, 593-628.

Wilson, C., Sala, A., & Puttaswamy, K. P. (2012). Beyond Social Graphs: User Interactions in Online Social Networks and their Implications. *ACM Transactions on the Web*, 6(4), Article 17.

Wilson, R. E., Gosling, S. D., & Graham, L. T. (2012). A Review of Facebook Research in the Social Sciences. *Perspectives on Psychological Science*, 7(3), 203-220.

