

## CAN SOCIAL CAPITAL BE TRANSFERRED CROSS THE BOUNDARY OF THE REAL AND VIRTUAL WORLDS? AN EMPIRICAL INVESTIGATION OF TWITTER

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### ABSTRACT

Micro-blogs like Twitter are playing increasingly important roles in social life. Some key users of Twitter have drawn huge attention from other people. Their opinions have had significant influence on the rest of Twitter users. In other words, these people are highly reputable and have more social capital in the Twitter world. But what factors contribute to the social capital in a part of the virtual world like Twitter is still largely unknown. This paper investigates the source of social capital in the Twitter world. We identify two types of sources that influence a user's social capital in the Twitter world: (1) inherited capital from outside the Twitter world; and (2) social activities conducted within the Twitter world. The results show that both inherited capital from outside, and activities within, the Twitter world, have positive influence on a user's social capital in the Twitter world. Our results suggest that social capital can be transferred from the real world to the virtual one. Meanwhile the inherited social capital of a user from outside the Twitter world significantly impacts the level of activities the user undertakes in the Twitter world. For ordinary people, inherited social capital positively associates with the level of their social activities in the Twitter world. But for the most well known Twitter users, who are usually celebrities, this relationship is negative. Implications for research and practice are further discussed.

Keywords: social network, social capital transference, Twitter, Google

### 1. Introduction

The emergence of a group of Internet-based Web 2.0 technologies, often referred to as social media, has made individuals more connected than ever before. Individuals are enjoying, and are empowered by, these technologies, including benefits resulting from extensive communication, self-expression, information and knowledge sharing and enhanced collaboration. Importance and usage of micro-blogging, a broadcast medium in the form of blogging [Wikipedia 2011], have been growing. Micro-blogging "allows users to exchange small elements of content such as short sentences, individual images, or video links" [Kaplan & Michael 2011]. Numerous micro-blogging websites have been established, the most popular of which is Twitter. It integrates social networking and micro-blogging [Thompson 2007] and has achieved an impressive growth rate in terms of number of unique visitors. As an efficient diffusion channel, Twitter has been used to broadcast health information [Chew & Eysenbach 2010; Scanfeld et al.

2010], product information [Jansen et al. 2009; Zhao & Rosson 2009] and information about natural disasters [Takeshi et al. 2010], besides numerous other types of information. Twitter is also an instrumental tool for teaching and [Jensen et al. 2010] for users to collaborate with others in social networks [Grossec & Holotescu 2008].

Individuals' virtual social networks are often many times larger than their real-world social networks. As social capital is a kind of valuable resource embedded within the relationships among people within a social network, this emerging Twitter phenomenon and the relationships between Twitterers' (i.e., those who tweet, Twitter users) virtual and the real worlds provoke many interesting questions. For example, "What makes one user more famous or reputable than others in the Twitter world?"; "Why do some users have more followers than others in the Twitter world?"; and "Can a user transfer his or her social capital in the real world to the Twitter world?" To answer these questions, this study explores the mechanisms of social capital formation in the Twitter world. Based on data from 1,943 users of Twitter and 1,000 most popular users from TwitterHolic,<sup>a</sup> we identify the key factors that contribute to top Twitter users' social capital and discuss important implications for those who use or intend to use Twitter.

## 2. Background and Hypotheses Development

### 2.1. Social Media and Twitter

With the rapid development of Web 2.0 technology, social media is playing an increasingly important role in the present day society. As a channel for communication, social media is "a group of Internet-based application that builds on the ideological and technological foundations of Web 2.0" [Kaplan & Haenlein 2010: pp61]. Sharing information via social media is efficient, and it is essential for communication under some particular circumstances like disasters [Palen et al. 2009] and health related events [Chou et al. 2009]. This feature also promotes efficient communication within a company as well as between a company and its customers, which usually results in better firm performance [Kane et al. 2009]. Plenty of social media sites have been established. Different social media sites provide contents that are substantially different, though addressing the same basic issue. For example, in health-related web resources, weblogs mainly focus on diseases and medications, while Wiki pays more attention to anatomy and procedures [Denecke & Nejdl 2009]. As a result, people can obtain various kinds of information from different social media, thereby making lives easier [Xiang & Gretzel 2010; Kozinets et al 2010]. Besides sharing information, social media can also be used to maintain social relationships with one's friends and other actors in his or her existing social networks, as well as to develop new relationships with a vast population of unknown people in the world [Waters et al. 2009].

Table 1. Unique Visitors of some Social Network Sites (ComScore, 2011)

| Site           | Unique Visitors in Feb 2011 | Unique Visitors in March 2011 | Growth |
|----------------|-----------------------------|-------------------------------|--------|
| Twitter        | 112,229                     | 129,439                       | 15.33% |
| MySpace        | 62,635                      | 62,581                        | -0.09% |
| Facebook       | 676,733                     | 692,998                       | 2.40%  |
| Total Internet | 1,339,496                   | 1,350,539                     | 0.82%  |

Among the numerous social media websites, Twitter is among the most successful ones (see Table 1). Founded in 2006, Twitter "is a free social networking and micro-blogging service that enables its users to send and read messages through either fixed desktops or mobile devices such as laptops, cell phones, PDAs, and the like. These messages in the Twitter world, known as *tweets*, are text-based posts of up to 140 characters displayed on an author's profile page and delivered to the author's subscribers, known as *followers*".<sup>b</sup> Tweets can cover a wide variety of content, including updates of daily activities or thoughts, casual chats with friends, or hot events and stories worldwide [Java et al. 2007]. The limit of 140 characters for micro-blogging ensures that Twitter users' messages (i.e., tweets) can be transmitted from and delivered to mobile devices via short message service (SMS). This unique feature of micro-blogging has tremendously reduced the need for having desktops or laptops, which were traditionally required for creating or reading blogs online. At the same time, this has increased the ease and convenience for users to exchange messages anywhere anytime.

The main reason for using Twitter is to access information in order to learn about activities in which one's friends, famous people, or companies/associations are engaged or interested in [Java et al. 2007; Parry 2008; Thompson 2007]. In this vein, the Twitter term *follow* is synonymous with subscribe. When user A chooses to

<sup>a</sup> <http://twitaholic.com/>

<sup>b</sup> Wikipedia, "Twitter," <http://en.wikipedia.org/wiki/Twitter> (Accessed on December 6th 2009).

follow, or subscribes to, user B, a note is sent to user B.<sup>c</sup> User B has the authority to reject or accept user A's request to be a follower. Upon user B's approval, user A can see the messages that user B publishes on Twitter (i.e., every tweet from user B). Note that this is only a one-way relationship; only user A will see user B's updates but not the other way around unless user B also subscribes to user A and user A approves the subscription.

According to Twitter, people all over the world follow individuals or organizations that are most relevant or of interest to them. In general, famous individuals, such as politicians, movie or sports stars, and reputable professionals attract more followers in the Twitter world than ordinary people do. For example, as shown in Figure 1, U.S. President Barack Obama had 12,006,871 people following him in the Twitter world as of January 2012.

A screenshot of Barack Obama's Twitter profile page. The profile picture is a portrait of him smiling. The username is @BarackObama, located in Washington, DC. The bio states: "This account is run by #Obama2012 campaign staff. Tweets from the President are signed -BO. http://www.barackobama.com". Below the bio, there is a green 'Following' button with a checkmark. To the right of the button are icons for direct message, reply, and favorite. Below the button is a text input field with the placeholder "Tweet to @BarackObama". Underneath the input field are navigation links: Tweets, Favorites, Following, Followers, and Lists. Three tweets are listed: 
 1. "Stand with the President's decision on the Keystone XL oil pipeline: OFA.BO/aSvKEJ" posted 9 hours ago.
 2. "Turn #SOTU2012 into an opportunity to grow this campaign in your own neighborhood—sign up to attend a watch party: OFA.BO/D4izXL" posted 11 hours ago.
 3. "Read the President's full statement on the Keystone XL Pipeline: OFA.BO/fc5rdA" posted 16 hours ago.
 To the right of the profile section, there is a sidebar with the title "About @BarackObama". It shows statistics: 2,544 Tweets, 683,558 Following, 12,006,871 Followers, and 162,985 Listed. Below the stats are sections for "Recent images" (with four thumbnail images), "You and @BarackObama" (with a note about following), "Similar to @BarackObama" (listing TEDchris, Kevin Rose, and StateDept), and "Following" (with a link to view all).

Figure 1: Barack Obama's Twitter Account (as of 19 January 2012)

## 2.2. Social Capital

The notion of social capital has been studied for many years by scholars in various disciplines (e.g., sociology, economics, psychology, and marketing). As a special form of capital, social capital is a kind of capital embedded in social relations. A classical view of social capital is resources embedded in a social structure which are accessed and/or mobilized through purposive actions. People can get returns from social capital by certain social actions [Lin 1999]. Different social actions result in different returns. Social actions can be divided into two general categories – instrumental action and expressive action [Lin & Dumin 1986]. Instrumental activities can generate instrumental returns like wealth, power and reputation, while expressive activities can lead to expressive returns like physical health, mental health and life satisfaction [Lin 1999]. As social capital can be measured by social returns [Lin 1999], one's reputation can represent one form of social capital the individual has [Lin 1999]. The typical view is that reputation consists of personal attributes, such as one's personal characteristics, professional competence, or other trusting beliefs, based on either direct observations, interactions with the focal person, or even hearsay [McKnight 1998]. However, in a globally connected virtual network, a person forms impressions, beliefs, and evaluations about another individual, especially a non-friend with whom one cannot personally interact, mostly through information available online. Therefore, the collection of online impressions, beliefs, and evaluations of a person held by people at large can be approximately deemed to be that person's social capital in a virtual world [Craik 2009]. Thus, in the Twitter context, the number of other users that follow a particular Twitter user (i.e., followers) represents the individual's popularity on Twitter, which can be denoted as a kind of social capital in this social space.

Nowadays, popular blogging sites provide very convenient platforms for self-expression and self-fashioning. Compared to more traditional blogging sites, micro-blogging sites like Twitter minimize the effort required to contact others and enhance overall communication, thereby better fulfilling the purposes of self-expression and self-fashioning. Meanwhile, as users' online behaviors seem to shift from utilitarian to hedonic purposes [Craik 2009], many Twitter users tend to follow, collect information about, and add their own opinions with regard to other

<sup>c</sup> Both individuals and organizations can have Twitter accounts.

Twitter users in whom they are interested. They may then spread this information to their friends. They also take actions to enhance or establish relationships with others provided there are expected returns in these relationships [Flap 2002]. The social capital of people in this virtual world is, therefore, socially constructed.

As shown in Figure 2, two possible sources may contribute to a Twitter user's social capital (i.e., number of followers) in the Twitter space. One is a user's activity in the Twitter world that influences the user's social capital. The other is the social capital that the user may bring from outside Twitter to the Twitter space in the form of attracting more Twitter followers. We treat the second type of capital as inherited capital. Whether the inherited social capital can be transferred in to social capital in the Twitter space is one of the focuses of this study.

Famous people are typically individuals with more social capital in the real world. A famous person is likely to have many followers or fans who care about his or her activities or thoughts. If a celebrity starts a Twitter account, many fans may follow, or subscribe to, the celebrity. In such cases, social capital inherent in one space (i.e., the real world) can be transferred to social capital in another space (i.e., the Twitter world) [Resnick 2001]. Towards this end, this study identifies two measures of inherited social capital of a Twitter user. One possible measure of a user's reputation or social capital in the real world can be represented by the number of search results of the user's name via search engines like Google [Bagrow et al. 2004]. Usually, the name of a famous person yields more search results from search engines than the names of ordinary people. In addition, Twitter offers a service named *Verified User*, which displays a verified icon in users' personal pages if they are verified to be celebrities in the real world [Twitter.com 2012], as we can see the tick icon on the right side of "Barack Obama" in Figure 1. Thus, being verified is a thread that suggests a user's status (level of social capital) in real world. And a verified user, relative to non-verified users, usually has higher social capital in real world than others. Based on the above discussions, we propose the following hypotheses:

**H1a:** A user whose name yields more search results in Google has more Twitter followers.

**H1b:** Verified Twitter users have more followers than non-verified users.

Another factor that may influence Twitter users' social capital is their activities in the Twitter world. There are four types of Twitter activities that can be captured publicly: publishing tweets (number of tweets), following other users (number of followings), earliness in joining Twitter (date of joining) and privacy protection (whether protected or not). Users who tweet more frequently, compared to those who tweet less frequently, are more likely to attract more followers [Tremayne et al. 2006]. In addition, if a user has registered his or her twitter account early, he or she may gain social capital benefit by having more followers because of early mover advantage [Kerin et al. 1992]. It has also been shown that linking to other blogs from a focal blog can increase the number of incoming links from other bloggers to the focal blog because of friendship or reciprocity [Nardi et al. 2004]. In this vein, a Twitter user A who chooses to follow another user B increases the chance of being followed by user B in the future. Moreover, Twitter provides a feature which allows Twitter users to set their information as invisible to unauthorized users. Once a Twitter user activates, or turns on, this feature, only approved users can access the information of the focal user. In other words, Twitter users can enable privacy protection to avoid information being acquired by strangers. This action can shield a twitter user's activity from the public. However, this activity may negatively impact social capital, attracting fewer Twitter followers. The above discussions lead to the following hypotheses:

**H2a:** Publishing tweets frequently has a positive effect on one's social capital in the Twitter world.

**H2b:** Early joining has a positive effect on one's social capital in the Twitter world.

**H2c:** Following others has a positive effect on one's social capital in the Twitter world.

**H2d:** Enabling privacy protection has a negative effect on one's social capital in the Twitter world.

Social capital can be accessed by social actions. People with more social capital tend to engage more in social activities [Lin 1999]. Following this line of reasoning, we argue that people with higher social capital in the real world have more proactive social activities and less preventive activities (e.g., enabling privacy protection) in the Twitter world, leading to the following hypotheses:

**H3a:** Users with higher social capital in the real world publish Tweets more frequently.

**H3b:** Users with higher social capital in the real world join Twitter earlier.

**H3c:** Users with higher social capital in the real world are more likely to follow others in the Twitter world.

**H3d:** Users with higher social capital in the real world are less likely to enable privacy protection.

According to the above hypotheses, our general model can be described as in Figure 2. From that model, we can see the relationships among Twitter activities, Twitter social capital, and inherited capital (from outside Twitter), which is social capital in the real world in this research.

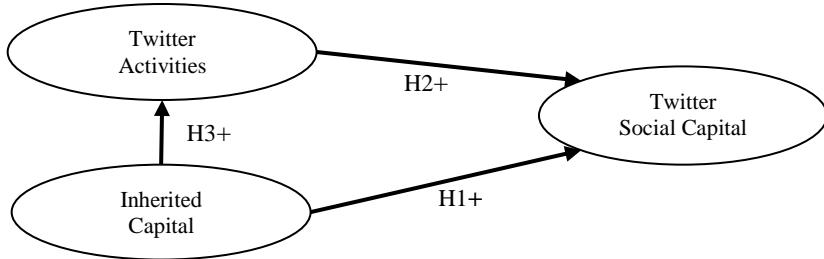


Figure 2: General Model

### 3. Methodology

#### 3.1. Data

From Figure 1, it can be clearly seen that several numbers are displayed on Obama's personal page; these numbers are also shown on other Twitter users' pages. These numbers describe four key elements: number of tweets published, number of other users following the focal user, number of other users the focal user is following, and the tick icon close to the focal user's name. The tick icon is a sign of being a verified user, which means this user has been validated by Twitter. Mostly verified users are celebrities, and names displayed in their personal page on Twitter are familiar to the public, i.e. names that can represent themselves. If they do not use names that can be identified by the public, their accounts are not verified. And the left part of the page presents recent tweets published by the user. Anyone who visits this page is able to see these elements if the user does not have privacy protection activated. Privacy protection can be enabled by a user if the user do not want strangers (who have not been permitted by the focal user to follow him or her) to see his or her information.

##### 3.1.1 Data by Random Online Retrieval

A JAVA based online crawler using Twitter API was developed for online data retrieval. 26 Twitter users were manually selected as seed samples. In order to acquire more users by rolling these seeds, all of these 26 seeds were celebrities (because celebrities usually have more followers) and were selected from a list of top ranking users offered by Twitter.com. These 26 seed Twitter users include comedians, politicians, and sports stars, etc. General profiles of them are listed in Table 1. Then the programme retrieved the first 50 followers and the first 50 being followed by each user (if some user had less than 50 followers or followed less than 50 users, we retrieved all followers and those followed). Finally, 1,943 Twitter users were added to the sample set after eliminating some duplicate users. We then retrieved information of the 1,943 Twitter users by another JAVA programme, with Twitter API. The information of each Twitter user included real name, number of followers, number of tweets (activity: Tweet), number of users followed (activity: following others) and number of days since the user joined Twitter. At the same time, we used a programme for searching users' real names on google.com, and recorded the number of results that google.com returned. Following Bagrow [Bagrow et al. 2004], the number of Google search results based on Twitter users' real names were used to represent their social capital in the real world. Table 2 presents description of the cross-sectional data for these users, collected on 8 Dec. 2010.

Table 1. Demographics of the 26 seed Twitterers

|             | Mean      | Min.   | Max.      | Std. Dev. |
|-------------|-----------|--------|-----------|-----------|
| Followers   | 1,448,182 | 47,496 | 5,728,199 | 1,112,670 |
| Followings  | 31,725.81 | 0      | 711,523   | 139,212.4 |
| Joined_Days | 722.3462  | 248    | 1,564     | 306.4499  |
| Updates     | 2,974     | 96     | 12,396    | 3,585.061 |
| Protect     | 0         | 0      | 0         | 0         |
| Verified    | 1         | 1      | 1         | 0         |

##### 3.1.2 Data from TwitterHolic

We also retrieved data from TwitterHolic in Aug. 2009. TwitterHolic maintains a ranking list of Twitter users. The ranking is based on number of followers that a Twitter user has. Information of the most popular Twitter users from TwitterHolic (see Figure 3) was collected, and the number of Google search results based on each user's name was also recorded. Descriptive statistics of this dataset are shown in Table 3 (We got a list of 1000 twitterer accounts,

but one account in the list is obviously not a common Twitter user. We, therefore, retained only 999 twitterers in this study). Followers\_Rank represents the ranking of a user in TwitterHolic; higher ranking suggests more followers.

Table 2. Description of Data of Randomly Selected Users Collected via Twitter API

|                     | N     | Minimum | Maximum       | Mean          | Std. Deviation |
|---------------------|-------|---------|---------------|---------------|----------------|
| Twitter_Followers   | 1,943 | 0       | 7,305,072     | 89,982.96     | 446,729.746    |
| Twitter_Followings  | 1,943 | 0       | 708,494       | 1,650.0       | 18,891.994     |
| Twitter_Updates     | 1,943 | 0       | 97,727        | 1,934.49      | 5,634.355      |
| Twitter_Days Joined | 1,943 | 43      | 1,723         | 434.68        | 336.39         |
| Google Results      | 1,943 | 0       | 8,790,000,000 | 26,470,778.66 | 270,116,279    |

Table 3. Data of the most popular Twitter users collected from TwitterHolic

|                     | N   | Minimum | Maximum       | Mean          | Std. Deviation  |
|---------------------|-----|---------|---------------|---------------|-----------------|
| Twitter_Followers   | 999 | 43,107  | 3,387,046     | 311,258.53    | 448,118.159     |
| Twitter_Followings  | 999 | 0       | 760,702       | 19,939.44     | 48,710.121      |
| Twitter_Updates     | 999 | 0       | 124,581       | 3,278.06      | 6,988.703       |
| Twitter_Days Joined | 999 | 0       | 14,490        | 412.81        | 816.062         |
| Google Results      | 999 | 0       | 1,650,000,000 | 31,041,964.39 | 110,854,982.671 |
| Followers_Rank      | 999 | 1       | 999           | 500.00        | 288.531         |

### The Twitaholic.com Top 100 Twitterholics based on Followers

| #  | Name (Screen Name)              | Location   | URL   | Followers | Following | Updates | Joined        |
|----|---------------------------------|--|---|-----------|-----------|---------|---------------|
| 1. | Lady Gaga (@ladygaga)           | New York, NY   | <a href="http://www.ladygaga.com">http://www.ladygaga.com</a>                         | 17517392  | 140490    | 1208    | 46 months ago |
| 2. | Justin Bieber (@justinbieber)   | The World  | <a href="http://www.youtube.com/justinbieber">http://www.youtube.com/justinbieber</a> | 15992479  | 119408    | 12695   | 34 months ago |
| 3. | Katy Perry (@katyperry)         | Underneath a palm tree... <a href="http://www.katyperry.com">http://www.katyperry.com</a>                  |   | 13398390  | 83        | 3633    | 35 months ago |
| 4. | Kim Kardashian (@KimKardashian) | where I'm meant to be... <a href="http://kimkardashian.celebuzz.com">http://kimkardashian.celebuzz.com</a> |   | 12239250  | 161       | 9934    | 34 months ago |

Figure 3: TwitterHolic Website

### 3.2. Research Models

The number of other users being followed by a particular user and the number of Tweets this user generates can be treated as a sign of how active the user is on Twitter since these two actions are driven by users. The number of days for which a user account has joined Twitter also represents the user's activity level, as the longer a user has been using Twitter, the more actions the user may have taken. Whether a user enables privacy protection too can be included in users' activities. If a user enables privacy protection, his/her Tweets would not be seen by others unless specifically allowed. Hence we first use cross-sectional data to test our hypotheses by regression Model I, as follows.

$$\begin{aligned} \ln\_Followers_i = & \beta_0 + \beta_1 \ln\_Google_i + \beta_2 \text{Verified}_i + \beta_3 \ln\_Friends_i \\ & + \beta_4 \ln\_Updates_i + \beta_5 \ln\_JoinedDays_i + \beta_6 \text{Protect}_i + \varepsilon_i \end{aligned} \quad \text{-Model I}$$

Next, we introduce four models (i.e., Models II to V) to validate whether social capital in the real world has a positive effect on users' activities in the virtual world:

$$\ln\_Updates_i = \beta_0 + \beta_1 \ln\_Google_i + \beta_2 \text{Verified}_i + \varepsilon_i \quad \text{-Model II}$$

$$\ln\_JoinedDays_i = \beta_0 + \beta_1 \ln\_Google_i + \beta_2 \text{Verified}_i + \varepsilon_i \quad \text{-Model III}$$

$$\ln\_Friends_i = \beta_0 + \beta_1 \ln\_Google_i + \beta_2 \text{Verified}_i + \varepsilon_i \quad \text{-Model IV}$$

$$\text{Protect}_i = \beta_0 + \beta_1 \ln\_Google_i + \beta_2 \text{Verified}_i + \varepsilon_i \quad \text{-Model V}$$

We test all these models based on both the random Twitter data and the TwitterHolic data. Due to the lack of Verified and Privacy Protection measures in TwitterHolic data, we excluded these two variables from regression models when analyzing the TwitterHolic data. Variables included in the above models are listed in Table 4, along with their descriptions. Most of the variables are log-transformed to reduce data variation, except the two dummy variables, Verified and Protect.

Table 4. Variables and Descriptions

| Variables            | Descriptions  |
|----------------------|---|
| <i>Ln_Followers</i>  | Number of other users that follow the user.   |
| <i>Ln_Google</i>     | Number of results that Google returns based on search for the user's real name.                 |
| <i>Ln_Friends</i>    | Number of other users followed by the user.   |
| <i>Ln_Updates</i>    | Number of Tweets published by the user.   |
| <i>Ln_JoinedDays</i> | Total number of days from the user created the account to the day we retrieved the information. |
| <i>Verified</i>      | Dummy variable, whether the user is verified by the website; if verified, value is 1.           |
| <i>Protect</i>       | Dummy variable, whether the user has enabled privacy protection; if enabled, value is 1.        |

## 4. Results

### 4.1. Effects of Activities and Inherited Capital

Tables 5 and 6 list the correlations between variables of these two data sets.

Table 5. Correlation between Variables in Data Set of Random Twitter Users

|                      | <i>Ln_Followers</i> | <i>Ln_Google</i> | <i>Ln_Friends</i> | <i>Ln_Updates</i> | <i>Ln_JoinedDays</i> | <i>Protect</i> | <i>Verified</i> |
|----------------------|---------------------|------------------|-------------------|-------------------|----------------------|----------------|-----------------|
| <i>Ln_Followers</i>  | 1.0000              | —                | —                 | —                 | —                    | —              | —               |
| <i>Ln_Google</i>     | 0.2507***           | 1.0000           | —                 | —                 | —                    | —              | —               |
| <i>Ln_Friends</i>    | 0.4426***           | 0.0813***        | 1.0000            | —                 | —                    | —              | —               |
| <i>Ln_Updates</i>    | 0.7332***           | 0.1773***        | 0.5649***         | 1.0000            | —                    | —              | —               |
| <i>Ln_JoinedDays</i> | 0.5857***           | 0.1457***        | 0.3213***         | 0.6055***         | 1.0000               | —              | —               |
| <i>Protect</i>       | -0.2054***          | -0.0239          | -0.067***         | -0.1369***        | -0.0575**            | 1.0000         | —               |
| <i>Verified</i>      | 0.6109***           | 0.1901***        | 0.0708***         | 0.2722***         | 0.2155***            | -0.0984***     | 1.0000          |

\*p<0.1, \*\*p<0.05, \*\*\*p<0.01

Table 6. Correlations between Variables in Data Set of the most Popular Twitter Users

|                      | <i>Ln_Followers</i> | <i>Ln_Google</i> | <i>Ln_Friends</i> | <i>Ln_Updates</i> | <i>Ln_JoinedDays</i> |
|----------------------|---------------------|------------------|-------------------|-------------------|----------------------|
| <i>Ln_Followers</i>  | 1.000               | —                | —                 | —                 | —                    |
| <i>Ln_Google</i>     | 0.162***            | 1.000            | —                 | —                 | —                    |
| <i>Ln_Friends</i>    | -0.220***           | -0.207***        | 1.000             | —                 | —                    |
| <i>Ln_Updates</i>    | -0.014              | -0.121***        | 0.479***          | 1.000             | —                    |
| <i>Ln_JoinedDays</i> | 0.064**             | -0.044           | 0.276***          | 0.317***          | 1.000                |

\*p<0.1, \*\*p<0.05, \*\*\*p<0.01

Table 7 shows results of regression Model I. From Table 7, we can see models' F-test results are statistically significant, suggesting reliable results.

Table 7. Effects of Inherited Capital and Activities

| <i>Ln_Followers<sub>i</sub></i>  | Twitter   |      | TwitterHolic |      |
|----------------------------------|-----------|------|--------------|------|
|                                  | Beta      | VIF  | Beta         | VIF  |
| <i>Ln_Google<sub>i</sub></i>     | 0.056***  | 1.06 | 0.123***     | 1.05 |
| <i>Verified</i>                  | 0.429***  | 1.12 |              |      |
| <i>Ln_Friends<sub>i</sub></i>    | 0.103***  | 1.49 | -0.287***    | 1.37 |
| <i>Ln_Updates<sub>i</sub></i>    | 0.418***  | 2.22 | 0.132***     | 1.36 |
| <i>Ln_JoinedDays<sub>i</sub></i> | 0.196***  | 1.59 | 0.107***     | 1.14 |
| <i>Protect<sub>i</sub></i>       | -0.086*** | 1.02 |              |      |
| Adj R -square                    | 0.560     |      | 0.088        |      |
| F Sig.                           | 0.000     |      | 0.000        |      |
| N                                | 1943      |      | 999          |      |

\*p<0.1, \*\*p<0.05, \*\*\*p<0.01

Also in both data sets, users' activities, such as number of Tweets and the total number of days the user has joined in Twitter, have significant positive effect on the number of followers. These evidences suggest that frequent and early-mover activities have positive effects on social capital building in the Twitter world; therefore, H2a and H2b are supported. In Model I, as expected, users' privacy protection has a significant negative effect on number of followers. H2d is thus supported. Meanwhile, there is a significant positive relationship between number of Google search results and number of followers. Verified also has a significant positive effect on the number of followers; it can, therefore, be deduced that social capital can be transferred from the real world to the Twitter world, supporting H1a and H1b. Surprisingly, there are mixed results about Friends, which has a significant positive effect in the Twitter data set but a significant negative one in the TwitterHolic data set; these differences may be because of sampling difference between the two data sets; hence, H2c is only partially supported.

#### 4.2 Relationship between Inherited Capital and Activities

Table 8 presents the results of Models II, III, IV and V. According to this table, we can see that all activities, including publishing Tweets, following others, and early joining are positively affected by inherited social capital in the Twitter data set. Surprisingly, all activities are negatively affected by inherited social capital in TwitterHolic data set, except *JoinedDays*, which is not significantly influenced. The above differential results may, again, be attributed to differences between the two data sets. In the Twitter data set, users have a wide range of numbers of followers, while only top 1,000 users are included in the TwitterHolic data set. This means all users from TwitterHolic are celebrities with high social capital in the virtual world, and according to our hypothesis, they are famous people in the real world in general. It is reasonable to assume that celebrities do not have to take numerous actions to access resources generated by relationships to earn reputation, as they have already had high reputation and their need for esteem has already been satisfied. What celebrities may want to satisfy is even higher level needs like self actualization. However, for the general public, as shown in the Twitter data set, higher social capital in the real world indeed results in more social activities in the Twitter world.

Table 8. Relationships between Activities and Inherited Capital

|                                    | <i>Ln_Updates</i>   |              | <i>Ln_Friends</i>    |              | <i>Ln_JoinedDays</i> |              | <i>Protect</i>     |
|------------------------------------|---------------------|--------------|----------------------|--------------|----------------------|--------------|--------------------|
|                                    | Twitter             | TwitterHolic | Twitter              | TwitterHolic | Twitter              | TwitterHolic | Twitter            |
| <i>Ln_Goog<br/>le<br/>Verified</i> | 0.070***<br>0.057** | -0.121***    | 0.130***<br>0.247*** | -0.206***    | 0.109***<br>0.191*** | -0.044       | -0.005<br>-0.97*** |
| Adj-R <sup>2</sup>                 | 0.009               | 0.014        | 0.090                | 0.042        | 0.055                | 0.001        | 0.009              |
| F Sig.                             | 0.000               | 0.000        | 0.000                | 0.000        | 0.000                | 0.169        | 0.000              |
| N                                  | 1943                | 999          | 1943                 | 999          | 1943                 | 999          | 1943               |

\*p<0.1, \*\*p<0.05, \*\*\*p<0.01

## 5. Discussions

Our results reveal that the number of Google search results of a Twitter user's name has a significant positive relationship with the user's social capital in the Twitter world. This suggests that one's social capital in the real world can indeed be transferred to a virtual world, such as Twitter. The results further illustrate that the number of updates posted by a Twitter user is positively associated with the user's social capital in the Twitter world, yielding evidence that frequent updating and information release on Twitter is likely to benefit one's social capital in this virtual world. Meanwhile, the number of other Twitter users a particular user follows also increases the user's social capital. Finally, our results show that early joining (i.e. the number of days since the user joined Twitter) has a positive impact on ranking. This suggests that early movers enjoy the advantage of social capital accumulation. Also the relationship between inherited social capital and activities is proved to be positive in Twitter data set. Though the hypotheses are not supported by the TwitterHolic data set, this may have been attributable to skewed samples that consist of extremely famous users. People with high social capital are willing to take actions in the virtual world to access social capital in general, while those with the highest social capital do not have interest in capturing resources in this way. Our findings are depicted in Figures 4 and 5.

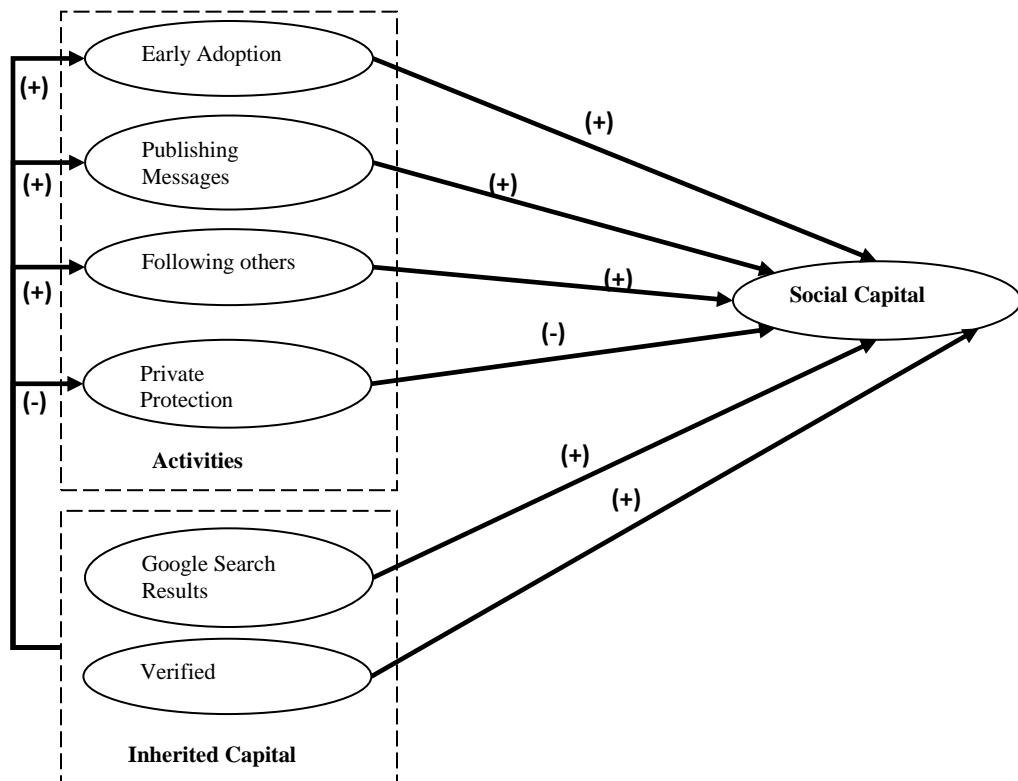


Figure 4: Results Based on Data of Random Twitter users

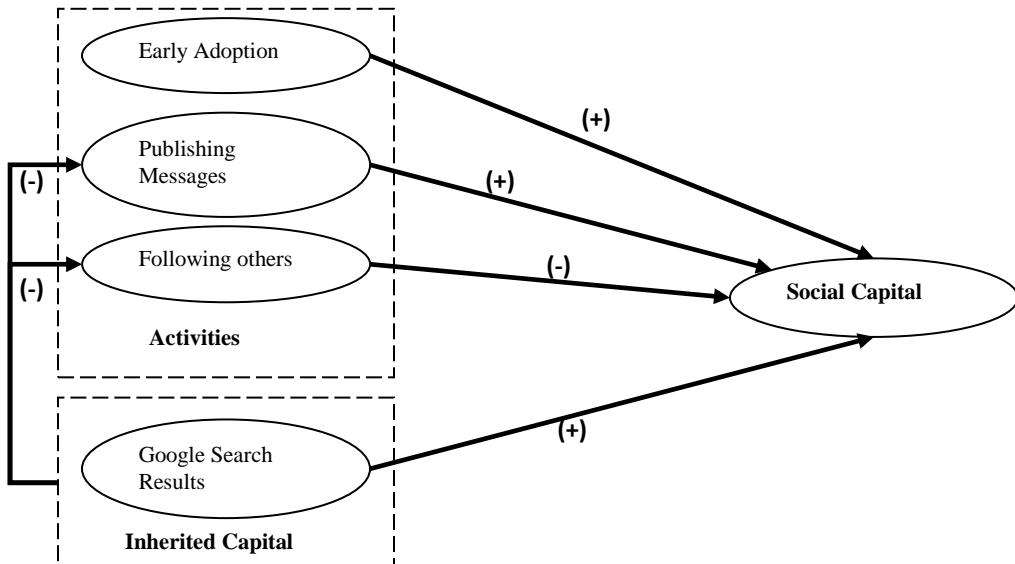


Figure 5: Results Based on Data of the most popular Twitter users from TwitterHolic

Our findings have important implications for practitioners. In light of the exciting wave of Twitter usage, some of the world's leading organizations have begun actively using this new technology, including Apple, IBM, Dell, and CNN. Some even designate executives to be responsible for conducting marketing and public relations activities through Twitter, such as building public awareness, improving communications with current customers, broadening potential customer base, and maintaining a positive company image [Ploof 2008]. Our findings suggest that the earlier an organization joins Twitter, the more likely it is to enjoy social capital benefits in the virtual world. Thus, organizations, especially those that emphasize high visibility and public recognition or whose targeted customers are likely to be Twitter users, should take action quickly if they want to take advantage of Twitter's social capital benefits. Posting tweets frequently is also proven to be instrumental in building social capital in the Twitter world, besides following other users. In this vein, providing useful content and frequently updating followers about the most current developments regarding an organization and its associated products and services may increase the organization's positive social capital even in the virtual world. Most intriguingly, our study highlights the transferability of social capital from real to the virtual world. While a high social capital in the real world can be translated into a high social capital in the virtual world, so is the case for a low social capital. Thus, a high social capital in the real world is still the cornerstone of a high social capital in the virtual world.

## 6. Conclusions

As far as we know, this is the first study that attempts to understand the transference of social capital from the real world to the virtual world based on data collected from Twitter and TwitterHolic. According to the results, it can be seen that inherited capital, which is users' social capital in the real world, can be transferred into the virtual world. Another source that influences users' social capital in the virtual world is frequency of activities in the virtual world. Specifically, frequency of providing updated information and following others, besides early participation, contribute to users' social capital. Not surprisingly, enabling privacy protection harms users' social capital, as this feature reduces exposure of a user's information to others.

Meanwhile, we examined the relationship between inherited capital and users' activities in the virtual world, and the results present a contradiction between the two data sets. In the Twitter data set, inherited social capital has a positive effect on users' activities in the virtual world, whereas it shows a negative effect in the TwitterHolic data set. This conflict may have been caused by skewness in samples as users in Twitter data set were selected by seeding while users in TwitterHolic data set include the top 999 most popular Twitter users, mostly celebrities. Thus, there are some differences between behaviors of random users and celebrities. As a result, it can be deduced that higher inherited capital promotes users' activities in the virtual world in general, but for celebrities, there is a negative relationship between inherited capital and activities.

The findings from this research are limited in several ways. First, the seed samples of Twitter data set were selected manually, which is not purely random. In the future, we would like to adopt an alternative method to select

samples randomly. Second, due to the time limit, we only collected cross-sectional data and, therefore, the results should be interpreted with caution. Future research may consider collecting time series data so as to examine the causality among these constructs. Third, using Google search results to measure an individual's real world social capital is certainly not the best way to measure one's social capital; we hence encourage interested scholars to propose better measures. Lastly, different type of twitterers may have different behavioral patterns. For example, a company user who intends to use Twitter to promote products will try to follow plenty of users, while a movie star who wants to distribute information via Twitter is less likely to follow too many. This is an interesting phenomenon that deserves more scholarly attention in future studies.

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