

Networked Creativity on the Censored Web 2.0: Chinese Users' Twitter-based Activities on the Issue of Internet Censorship

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In most of the world, the current trend in information technology is for open data movement that promotes transparency and equal access. An opposite trend is observed in China, which has the world's largest Internet population. The country has implemented sophisticated cyber-infrastructure and practices under the name of The Golden Shield Project (commonly referred to as the Great Firewall) to limit access to popular international web services and to filter traffic containing 'undesirable' political content. Increasingly, tech-savvy Chinese bypass this firewall and use Twitter to share knowledge on censorship circumvention and encryption to collectively troubleshoot firewall evasion methods, and even mobilize actions that border on activism. Using a mixed mythological approach, the current study addresses such networked knowledge sharing among citizens in a restricted web ecosystem. On the theoretical front, this study uses webometric approaches to understand change agents and positive deviant in the diffusion of censorship circumvention technology. On policy-level, the study provides insights for Internet regulators and digital rights groups to help best utilize communication networks of positive deviants to counter Internet control.

Keywords: Network analysis, Twitter, Internet censorship

Social media for social change: slacktivism or activism?

Many have viewed the Internet as a positive force for social changes (Papacharissi, 2002). Recently, from the Arab Spring to the Occupy Wall Street movement, social media have played an unequivocal role in galvanizing public action (Skinner, 2011). However, the enthusiasm for the idea that *revolutions will be tweeted* has met with criticism over slacktivism—the notion that online actions do not translate into offline impact (Christensen, 2011; Morozov, 2009). Amidst the contrasting arguments, Van Laer and Van Aelst (2009) note some convergence of online and offline public spheres and a blurring of lines between online influence and offline outcomes. The Internet affords various forms of virtual participation in activism. Whereas some of these virtual

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actions, such as email ‘bombing’, virtual sit-ins and petitioning, have low thresholds for participation and entail little or no political and legal risks (Van Laer & Van Aelst, 2009), some actions, such as culture jamming (e.g. virtual graffiti, parody, ironic and artistic alteration to challenge the authority) and hacking, require technological and cultural sophistication and risk-taking (Powell, 2011; Van Laer & Van Aelst, 2009). These virtual actions utilize the Internet’s *creative function* to expand traditional tactics used in social movements (Powell, 2011; Van Laer & Van Aelst, 2009). Such creative use of internet’s interactive features to challenge institutions of power is also referred to as *technical activist actions* (TAA) by Powell (2011). TAA is widely used in digital activism around technology-related policy issues such as Stop Online Piracy Act (SOPA) (Powell, 2011). Powell (2011) notes TAA users are likely to be tech-savvy and young. To revisit the debate regarding activism vs. slacktivism, virtual actions may not produce offline activism, but are nevertheless important in that they reflect Internet users’ creativity in adapting to and altering Internet technology and culture for collective goals.

However, the current studies of virtual collective actions have yet taken into consideration two factors. The first factor is that Web 2.0 platforms enable ‘word-of-mouth’ diffusion based on weak-tie connections and such infrastructure builds an online community for virtual actions to propagate and progress (Katona, Zubcsek, & Sarvary, 2011). It is less known how social media users utilize its networked nature within the community for virtual actions. The second factor concerns a restrictive internet environment underlying a Web 2.0 community. That is, what happens if the Internet infrastructure is severely restricted and disrupted by a controlling authority such as a government? How would Internet users adjust their actions to adapt to a restricted web environment? The two factors have led us to consider the context of Chinese Twitter users’ collective actions in the face of Internet censorship by the Chinese government.

Internet censorship in China: grassroots adaptation and activism

Internet censorship is a common practice of information control in authoritarian regimes. According to OpenNet Initiative (2011), over 40 countries implement various degrees of Internet censorship. In Iran, for instance, the government implements “halal Internet” that shields the country from Western cultural influence (Shirazi, 2014). In Russia, the government maintains a blacklist of banned websites, and requires that all Russian user data be stored within the country for monitoring (Tselikov, 2014). The most well-known case is China’s ‘Great Firewall’ (GFW). The GFW blocks access to websites deemed politically sensitive or having the potential for facilitating social movements (Feng & Guo, 2012). Blocked websites include popular social networking services such as Facebook and Twitter, and search engines like Google (Reuters, 2014). The GFW also conducts keyword filtering to police Internet traffic (Freedom House, 2013). Although the GFW has been widely criticized as a threat to Internet freedom, China’s moves to regulate the Internet are accompanied by beefed-up rhetoric about cybersecurity and national defense (South China Morning Post, 2014). Furthermore, amidst Edward Snowden’s revelations about U.S. eavesdropping on global communications and monitoring of terrorist organizations’ use of social media for recruitment and propaganda, there have been calls for “Internet sovereignty”—the idea that national governments should regulate and manage domestic cyberspace (The Diplomat, 2014).

Despite draconian Internet control, the online public sphere in China is teeming with opinions, including opinions critical of the government (Yang, 2013). On several occasions, collective action and public sentiment have resulted in legislative changes and the downfall of high-

ranking government officials (Yang, 2013). The empowering role of the Internet in the country's societal development is made possible by Internet users' creative virtual actions that allow them to bypass censorship (Yang, 2014). Their virtual actions fall under two domains: cultural tactics and technological tactics. As to cultural tactics, to get around keyword filtering, Internet users create code words and images to replace sensitive words used in politically sensitive discussions (Yang, 2014). For example, 'Grass Mud Horse', is an invented Chinese word with a shape similar to an alpaca, and its pronunciation is similar to a profane Chinese phrase. It was created to refer to China's Internet censorship and has become an Internet meme in China. This word is used as a symbol of defiance and protest over the government's Internet censorship (Meng, 2011). As to technological tactics, users adopt and alter various technologies to circumvent censorship. Business applications such as Virtual Private Networks (VPNs), the Google App Engine and cloud computing services provided by Amazon and Microsoft have been used as censorship circumvention tools (Mou, Wu, & Atkin 2014; OpenITP, 2013). Using both the cultural and technological tactics, a sizable number of Chinese users are able to bypass the GFW. Reportedly, 35.5 million domestic Chinese users were active on Twitter in 2013 (Forbes, 2013), and domestic Chinese users of Facebook were estimated at 63.5 million in 2012 (Bloomberg, 2012). These numbers are intriguing considering China's ban on both platforms. Even on domestic websites, some discussions of sensitive topics, including the issue of Internet censorship, slip past censors (Carter, 2013).

Social media empower users' creative adaptation to Internet censorship. Web 2.0 platforms provide a connected online community for tech-savvy users to share insights and mobilize actions. On Twitter, for instance, hashtags such as #f**kgfw and #gfw are used to disseminate information about circumvention and encryption and issues related to Internet freedom (China Digital Times, 2009). Petition websites are used for launching activism targeted at the GFW. In 2013, an online petition was circulating on the U.S. White House's petition website "We the People" (Global Times, 2013). The petition asked the U.S. government to deny visas to the developers of China's Golden Shield Project.

Chinese Internet users' creative approach to resist Internet censorship has increasingly received scholarly attention. Some researchers summarize the counter-censorship technologies adopted by Chinese users (see Burnett & Feamster, 2013; Leberknight, Chiang, Poor, & Wong, 2012), and more recent studies examine how Chinese users bypass the GFW for seeking information seeking, socializing and entertainment (Yang & Liu, 2014). Chinese Internet users' adoption of anti-censorship tools is predicated on an array of factors, including attitude towards censorship, willingness to self-censor, political and media trust, and digital literacy (Mou, Wu, & Atkin, 2014). Some scholars offer *thick description* of Chinese users' creative cultural adaptation. Meng (2011) considers online spoofs as alternative political discourse but argues that online spoofs are not rational debates and do not lead to concrete political consequences. Nevertheless, online spoofs do convey political criticism and provide emotional bonding for users. Yang (2014) suggests that the use of code words and images to convey sensitive political information is a *cultural response* to censorship and "resistance" against institutional power. The current study adds to this body of work by providing an integrated framework to examine three elements in users' creative collective actions targeting censorship. The three elements are *users*, *relationships* and *messages*, and all of these constitute the web ecosystem that supports collective actions.

The emphasis on these three elements is informed by webometrics, which is the study of quantitative aspects of web communication to explore the characteristics of online information

diffusion and social interactions (Thelwall, 2009). Webometric approaches are commonly used in studying online activism (Introna & Gibbons, 2009) and public discussions (Woo-young & Park, 2012; Shapiro & Park, 2014). Along with these three elements, webometrics examines the characteristics of Internet users based on profile information self-disclosed on social media, in particular, information concerning political affiliation (Park et. al., 2011; Xu, Sang, Blasiola, & Park, 2014). Concerning *relationship*, webometrics uses social network analysis (SNA) to study the structure of social networks based on studying social ties from forged from friendships, conversations, and endorsements, affiliations and joint activities (Park and Leydesdorff, 2013). Network structure and positions in the network reveal paths of influence and coordination in collective actions and social movements (Huang & Sun, 2014; Xu, Sang, Blasiola, & Park, 2014) and in the formation of collective identity (Ackland & O’Neil, 2011). In information diffusion, for instance, the size of a network, and the density and clustering of relationships can influence the speed and scope of message propagation (Haythornthwaite, 1996). Occupying different positions in a network’s social hierarchy, users play different roles in fomenting collective actions. with users in central network positions tending to have considerable reach and influence over others (Xu, Sang, Blasiola, & Park, 2014). Additionally, users who connect two otherwise disconnected groups of people act as influence brokers across different social spheres (Gruzd, Wellman, & Takhteyev, 2011; Theocharis, 2013). Concerning the *message*, webometrics identifies important themes and linguistic features in public conversations. For example, based on social movement action repertoires (Van Laer and Van Aelst’s, 2010), Choi and Park (2013) find that online political groups use massive “retweeting” and “culture jamming” to enhance solidarity.

In the context of the current Internet censorship in China, these three elements may be applied to describe Chinese users who bypass the GFW to engage in collective actions against Internet censorship as *positive deviants* – innovators who challenge the establishment and norms, who evangelize for and embrace alternative approaches for resisting censorship (Pascale, Sternin, & Sternin, 2010). Although there is a lack of credible sources for estimating the number of censorship-evading users in China, the snowball sample used in a recent OpenITP (2013) report shows that 90% of surveyed respondents were male users – young and highly-educated with 80% having university degrees, and two thirds of them working or studying in information technology fields. The demographic profile of these respondents is consistent with an earlier survey by Jason Ng, an entrepreneur and activist in Beijing (2010). The censorship-evading users clearly deviate from the general demographic of Chinese Internet users reported by CNNIC (2014). Thus, the first research question of this study is on individual user characteristics:

RQ1: What are the demographic and behavioral characteristics of the users involved in Twitter-based discussion and mobilization on the issue of Internet censorship in China?

Bonded by a shared interest and concern, these users use the interactive features of social media to foster online communities. For example, on Twitter, they use the ‘retweet’ function to pass along information they deem valuable. Massive retweeting, as discussed earlier, is a form of collective action for creating solidarity (Choi & Park, 2014). It is also a form of crowd sourced gatekeeping used to raise valuable voices above the ‘noise’ inherent in user-generated content (Meraz & Papacharissi, 2013). Users also leverage Twitter’s reply feature for directed conversation. Twitter reply is interpersonal, thus likely leading to interpersonal relationships (Xu & Feng, 2014). More importantly, these communication features interconnect users through the flow of information, mutual association and joint activities (Nam, Lee & Park, 2013). Study of users’

social networks reveals salient participants and their influence. It has been noted that influential users can be agents of change who sway national political discourse and media reporting on censorship (Qiang, 2012). Overall, the patterns of interactions and social connections can indicate whether an online ecosystem provides enough momentum for collective actions. Thus, the second question of this study is about the characteristics of the social networks of users involved in collective actions against censorship.

RQ2: What are the characteristics of peer interactions among the users involved in Twitter-based discussion and mobilization on the issue of Internet censorship?

Lastly, following previous studies that identify unique actions and tactics used in online activism (Choi & Park, 2014; Powell, 2011), the current study aims to identify a typology of virtual actions in the context of Internet censorship.

RQ3: What virtual collective actions are used by the users involved in Twitter-based discussions and mobilization on the issue of Internet censorship?

Table 1. Selected hashtags

Hashtag name	Hashtag definition	Type
#GFW	Discussions related to GFW (the Great Firewall of China)	Issue-based
#F***GFW	Discussions related to GFW (the Great Firewall of China)	Issue-based
#翻墙	Discussions related to “climbing the wall,” a Chinese phrase referring to censorship evasion	Issue-based
#真理部	Discussions related to <i>the Ministry of Truth</i> , a term originated from George Orwell’s novel <i>1984</i> , used to mock China’s censors	Issue-based
#方滨兴	Discussion related to Fang Binxing, the father of GFW	Issue-based
#goagent	Discussions related to GoAgent, an open-source circumvention tool.	technical
#shadowsocks	Discussions related to the circumvention tool called shadowsocks	technical
#vpn	Discussions related to VPN technologies used for evading censorship	technical

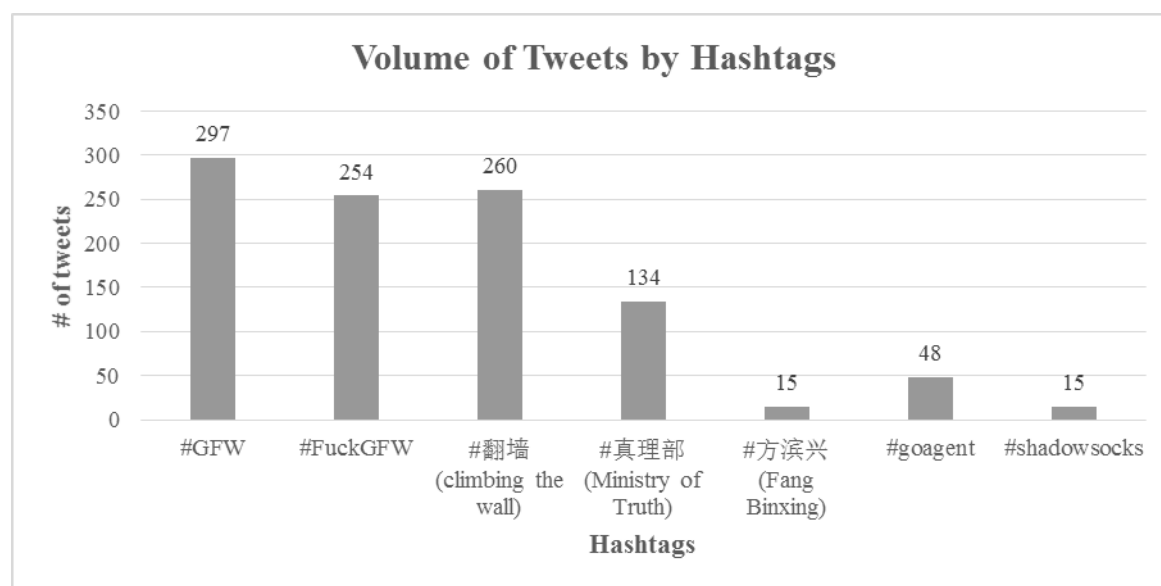
Methods

Data collection

Tweets that include hashtags related to China’s Internet censorship were download from the Twitter API. Eight hashtags were selected, among them five are general issue-based, and three

hashtags named for specific censorship circumvention technologies (see Table 1). The selection represents a broad array of topics and technologies related to the issue. Tweets sent during the months of June, July and August of 2014 were included. Several censorship-related events occurred during this time period, including the blocking of the Internet services company Google, the instant messaging (IM) tool Line, and the online storage service OneDrive, and the implementation of a stricter law targeting domestic IM users (Storify, 2014). The raw dataset includes 160,605 tweets sent between June 11 and August 17, 2014. Several iterations of data-cleaning³ were performed to delete tweets not related to the issue. Given our focus on Chinese Twitter users, Non-Chinese tweets were excluded, resulting in a sample of 60,232 tweets.

Figure 1. A breakdown of tweet volume by hashtag



With the current study addressing the networked aspect of public actions on censorship, we only include tweets that seek to form social ties between users. Therefore, tweets not directed at specific users are excluded. Directed tweets embody three Twitter features—retweet, mention, and reply (Boyd, Golder, & Lotan, 2010). All of these are indicated by the symbol @, but each has different underlying communication motivations and goals (Xu & Feng, 2014). For this study, we distinguish between mention/reply and retweet because retweet is an act of forwarding an other’s message, meant to agree and acknowledge (Xu, Sang, Blasiola, & Park, 2014), whereas mention/reply is meant to engage targeted users in conversations (Xu & Feng, 2014). There are 866 directed tweets in the final sample. 94% (n=816) are retweets, and 6% (n=50) are mention/reply. The directed tweets were sent by 577 unique users, targeting 162 unique users. Most Twitter activities were driven by issue-based hashtags (see Figure 1).

Profile analysis

For RQ1, user characteristics were inferred from Twitter user profiles. Three types of profiles were included in profile coding: Twitter bio, location, and profile images. Profile information is organized into three dimensions: *the degree of self-disclosure*, *the nature of self-disclosure*, and

³ Detailed data cleaning procedure is available upon request.

the tactics of self-disclosure. First, the degree of self-disclosure is gauged by the variety of revealed personal information. An inductive analysis shows that users typically disclose information in the following areas: name (N), occupation (O), location (L), political opinion (PO), personality and lifestyle (P) and contact information (C). The nature of self-disclosure notes whether users reveal political ideology and viewpoints in profiles, and whether they express interest or involvement in Internet technology.

Table 2. Profile coding scheme

	Categories	Definition/Note
The degree of self-disclosure	<i>Name (N)</i>	not including pseudonym
	<i>Location (L)</i>	Specifying different types of location information: (a) China-base users' location detailed to province or city-level; (b) general location information without identifiable province or city name, or latitude information; (c) locations outside of Mainland China, including Chinese territories of Hong Kong, and Taiwan where Chinese censorship law does not apply
	<i>Occupation (O)</i>	
	<i>Political opinion/identity (PO)</i>	
	<i>Personality and lifestyle (P)</i>	A user's hobbies, tastes and lifestyle
	<i>Contact information</i>	Email address, phone number, IM accounts, profiles on other social networking sites
The nature of self-disclosure	<i>Expressed political identity, interest and involvement</i>	
	<i>Expressed interest and involvement in technology</i>	
Tactics of self-disclosure	<i>Creative expressions of identities and opinions</i>	The use of sarcasm, parody, spoof, code language/image

The rationale for focusing on the political and technology-related disclosure is because censorship is a politicized technology issue. The tactics of self-disclosure is an open coding category used to identify creative ways of expressing personal identity. Table 2 presents a detailed coding of categories with definitions. Two authors coded all available profiles along the three disclosure dimensions and the agreement percentage is 91.6% for intercoder reliability.

Table 3. Content coding scheme

Dimension	Category	Definition
Technological	<i>Reporting</i>	Describing technological problems and processes of troubleshooting the problems
	<i>Sentiment</i>	Expression of frustration and anger
	<i>Commentary</i>	Expressing opinions about a technology issue
	<i>Solution</i>	Providing tips and how-to guide to solve a technological problem involving censorship evasion
	<i>Mobilization</i>	Engaging others to join an event or collective actions on a technologic problem
Political	<i>Sharing news</i>	Forwarding news articles
	<i>Commentary</i>	Expressing opinions about a political issue
	<i>Mobilization</i>	Engaging others to join a political cause
Creative expression		The use of code words to for discussions of sensitive events and topics

Social network analysis

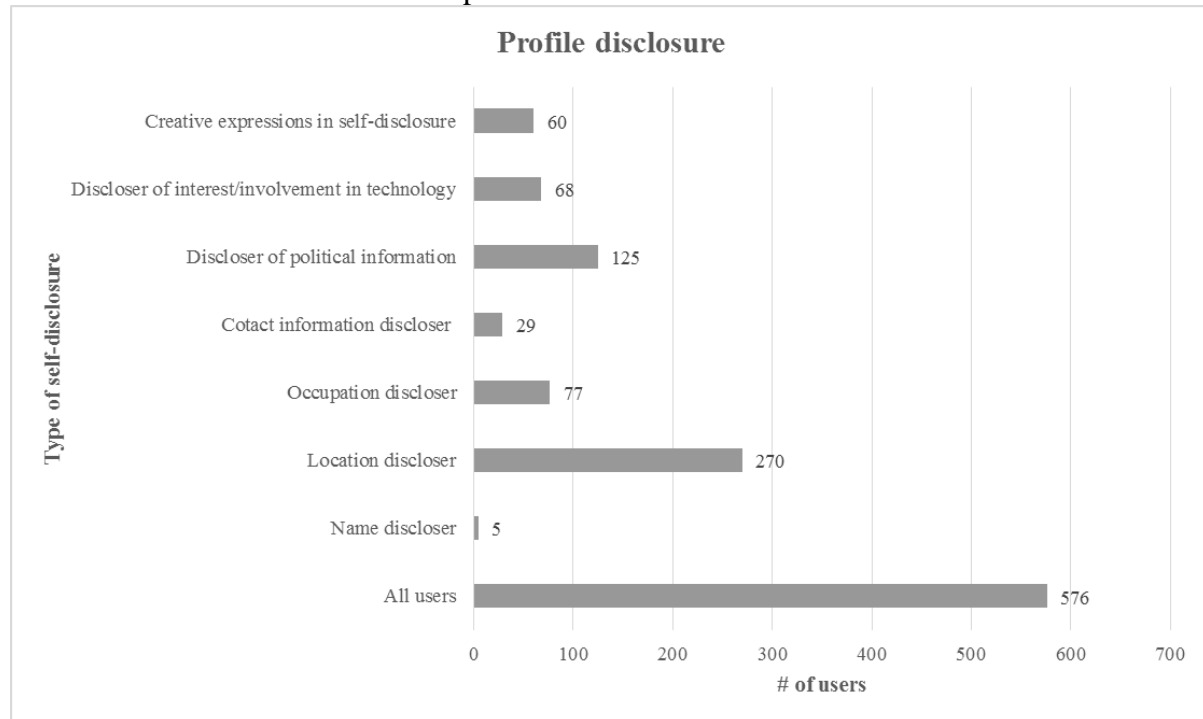
For RQ2, three types of network are considered: a global Twitter network including both the retweet and mention/reply Twitter features, a retweet network based on flows of acknowledgment, and a reply network based on conversation flows. In the networks, participating users are the *nodes*, connected with other users by ties emanating from retweet and mention/reply. If User A retweets/mentions/replies to User B, we set up a tie from A to B. When a sender targets multiple users in a tweet, it is treated as multiple ties originating from the sender. Social network analysis (SNA) is used to examine the structure and users' positions in the networks (Haythornthwaite, 1996). Using the SNA programs NodeXL and UCINET, nodal-level information is extracted to identify salient and influential users. Specifically, in-degree centrality is used to sort out users frequently retweeted by other users or targeted in conversations for feedback. High in-degree centrality indicates opinion leadership and importance recognized by other users (Xu, Chiu, Chen, & Mukherjee, 2014). Out-degree centrality identifies users who are active in for-

warding others' messages and in starting or replying conversations. On the network level, centralization is used to show the distribution of power/engagement in conversations and information diffusion (Freeman, 1979). A highly centralized network means that a small group of people dominate the discussion and diffusion. Density measure is used to examine whether users are well connected with one another to form a cohesive community (Borgatti, Mehra, Brass, & Labianc, 2009). Additionally, K-core was used to identify a cluster of closely connected users (Seidman, 1983).

Content analysis

To answer RQ3, content analysis is conducted to draw the typology of actions used in the Twitter discussions. A pilot coding reveals various themes, leading to the development of a final coding scheme that centers on three areas of actions: technological actions, political actions, and creative actions. Under each, specific coding categories are developed to reflect actions with various levels of participation threshold and potential consequence. Table 3 presents the content coding scheme.

Table 3. Self-disclosure on Twitter profiles



Results

To address RQ1 which deals with user characteristics (see Table 3), among 576 senders in the discussions, 68% (n=389) disclosed at least one element of personal information. On average, a user discloses one item ($mean = 1.13$; $s.d. = 1.02$). Among the disclosers, about 70% disclosed location information, of which 230 users disclosed location information as detailed as a Chinese province or city or even a geographic coordinate. The location information reveals that 40 of the users are identified as living outside of Mainland China (that is People's Republic of China, excluding Taiwan, Hong Kong and Macau--three regions with a political system different from the

rest of China). The second most frequently disclosed item, political identity and opinion, is 32.13%. More private personal information such as name and contact information are revealed less often. Only five users reveal name and 29 users disclose contact information. In addition, creative expressions of identity are found in 60 profiles.

Figure 3. Visualization of the global network of retweet and mention/reply

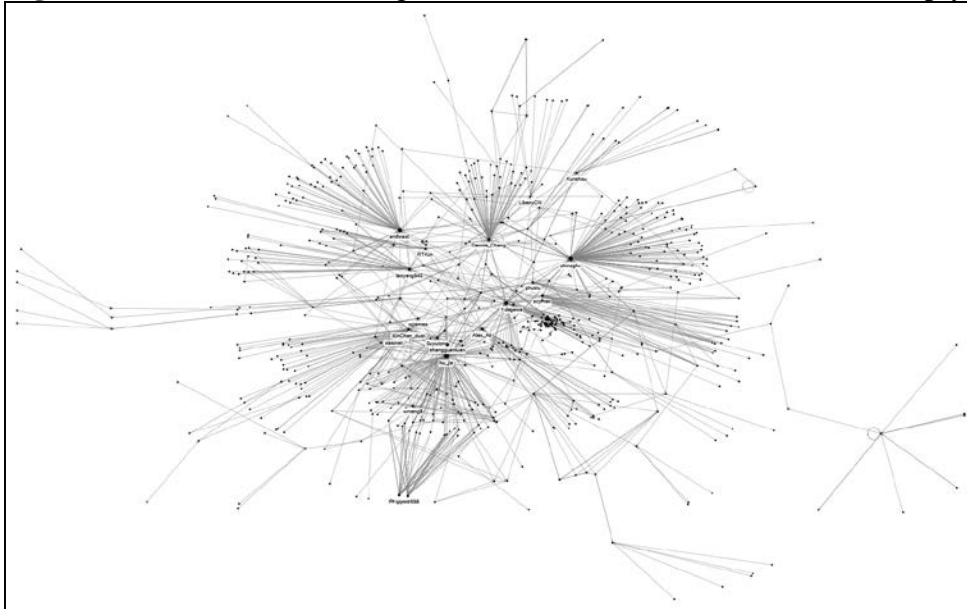
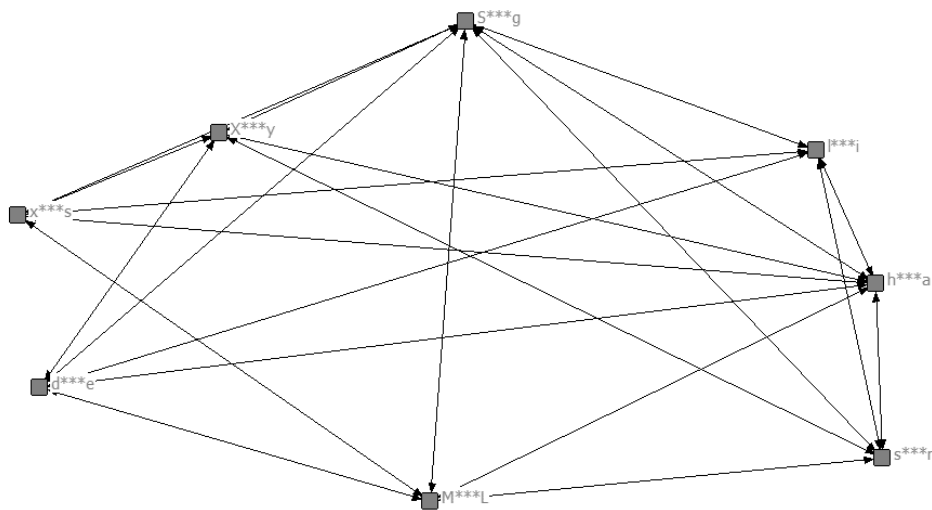


Figure 4. 5K-core



To address RQ2, the network based on Twitter retweet and mention/reply consists of 677 users, including 576 unique senders and 164 unique receivers. These users created 1,263 ties. Figure 3

is a visualization of the Twitter network. Table 4a and 4b present a list of top users by in-degree and out-degree centrality. This global network is decentralized, judged by the 0.5 threshold for centralized/decentralized network (in-degree & out-degree centralization = 0.17) and sparse (density = 0.02).

Table 4. Identity attributes of engaged users

Users identified by 5K-core	Identity attributes
H***a	Political dissident
L***i	A user who has expressed nostalgia towards Republic of China
S***n	Writer
x***s	Average user
M***L	A Chinese living in the U.S. with interest in politics and civil rights
S***g	A journalist working for a Western media
X***y	Political dissident
d***e	The Chinese page of a German news media

Table 4a. Top users by in-degree centrality in the global network of retweet/mention/reply

User screenname	In-degree centrality	Note on user profile
H***a	102	Political dissident
C***w	100	A research project about Chinese Internet censorship
A***0	67	A user with expressed interest in information security
O***x	53	A user with expressed interest in Internet censorship issue
I***5	50	Not disclosed
X***t	40	A user with expressed interest in Internet censorship issue
D***g	37	A user with expressed interest in Internet censorship issue
A***4	31	A user with expressed interest in technology
S***n	20	A user with expressed interest in Internet censorship issue
S***g	18	A reporter with expressed interest in politics
X***t	18	A user with expressed interest in Internet censorship issue
P***u	18	A user with expressed interest in technology

Yet, the network graph shows a set of core users being common recipients in Twitter retweeting and replying. This set of users is identified by K-core. Figure 4 of 5K-core shows a cluster of users connected to at least five other users (see Figure 4). Table 4 shows that this small set of engaged users are involved in politics and technology.

Table 4b. Top users by out-degree centrality in the global network of retweet/mention/reply

Screen name	Out-degree centrality	Note on user profile
H***a	21	Political dissident
D***g	17	A user with expressed interest in Internet censorship issue
L***i	15	A user who has expressed nostalgia towards Republic of China
O***x	10	A user with expressed interest in Internet censorship issue
F**6	10	Not disclosed
X***n	9	A user who expressed determination for justice in the society
G***9	9	Political dissent
M***L	8	A user expressed nationalist sentiment
C***a	7	A user with expressed interest in Internet censorship issue
D***n	7	Political dissent
M***i	7	A user with expressed interest in Internet censorship issue

Table 5a. Top users by in-degree centrality in the retweet network

Screen name	In-degree centrality	Note on user profile
H***a	102	Political dissident
C***w	100	A research project about Chinese Internet censorship
A***0	67	A user with expressed interest in information security
O***x	51	A user with expressed interest in Internet censorship issue
L***5	47	Not disclosed
X***t	39	A user with expressed interest in Internet censorship issue
D***g	36	A user with expressed interest in Internet censorship issue
A***4	30	A user with expressed interest in technology
S***n	19	A user with expressed interest in Internet censorship issue
S***g	18	A reporter with expressed interest in politics

Figure 5 visualizes the retweet network, consisting of 643 users with 1,194 ties. Tables 5a and 5b present top users by in-degree and out-degree centrality. In-degree centralization for the retweet network is .16 and out-degree centralization is .02. Density of the network is .002.

Table 5b. Top users by out-degree centrality in the retweet network

Screen name	Out-degree centrality	Note on user profile
H***a	17	Political dissident
L***i	15	A user who has expressed nostalgia towards Republic of China
F***6	10	Not disclosed
O***x	9	A user with expressed interest in Internet censorship issue
G***9	9	Political activist
D***g	8	A user with expressed interest in Internet censorship issue
X***n	8	A user who expressed determination for justice in the society
M***l	8	A user expressed nationalist sentiment
M***i	8	A user with expressed interest in Internet censorship issue
L***n	7	A user expressed nationalist sentiment

Table 6a. Top users by in-degree centrality in the mention/reply network

Screen name	In-degree centrality	Note on user profile
S***x	4	Programmer
L***5	3	Not disclosed
O***x	2	A user with expressed interest in Internet censorship issue
A***1	2	Not disclosed
C***q	2	A user who expressed political ideologies
C***4	2	A user with expressed interest in Internet censorship issue
S***a	2	A user with expressed interest in technology
D***g	2	A user with expressed interest in Internet censorship issue

Figure 5. Visualization of retweet network

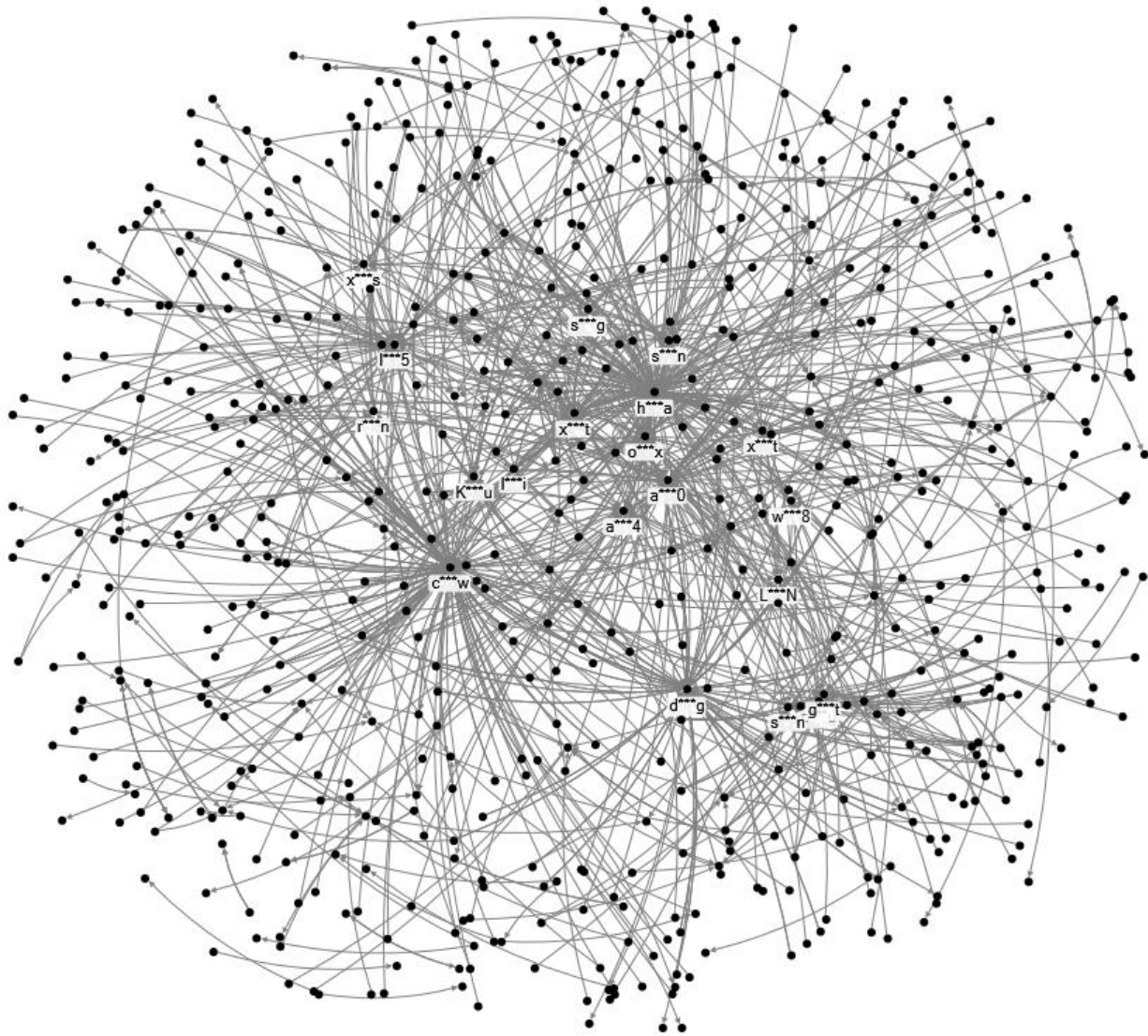


Table 6b. Top users by out-degree centrality in the mention/reply network

Screen name	In-degree centrality	Note on user profile
D***g	9	A user with expressed interest in Internet censorship issue
H***a	4	Political dissident
F***n	4	A user with expressed interest in politics
C***a	3	A user with expressed interest in Internet censorship issue
N***y	3	Not disclosed
O***x	2	A user with expressed interest in Internet censorship issue
X***s	2	Not disclosed
D***n	2	Political dissent
J***h	2	Not disclosed
F***0	2	Not disclosed

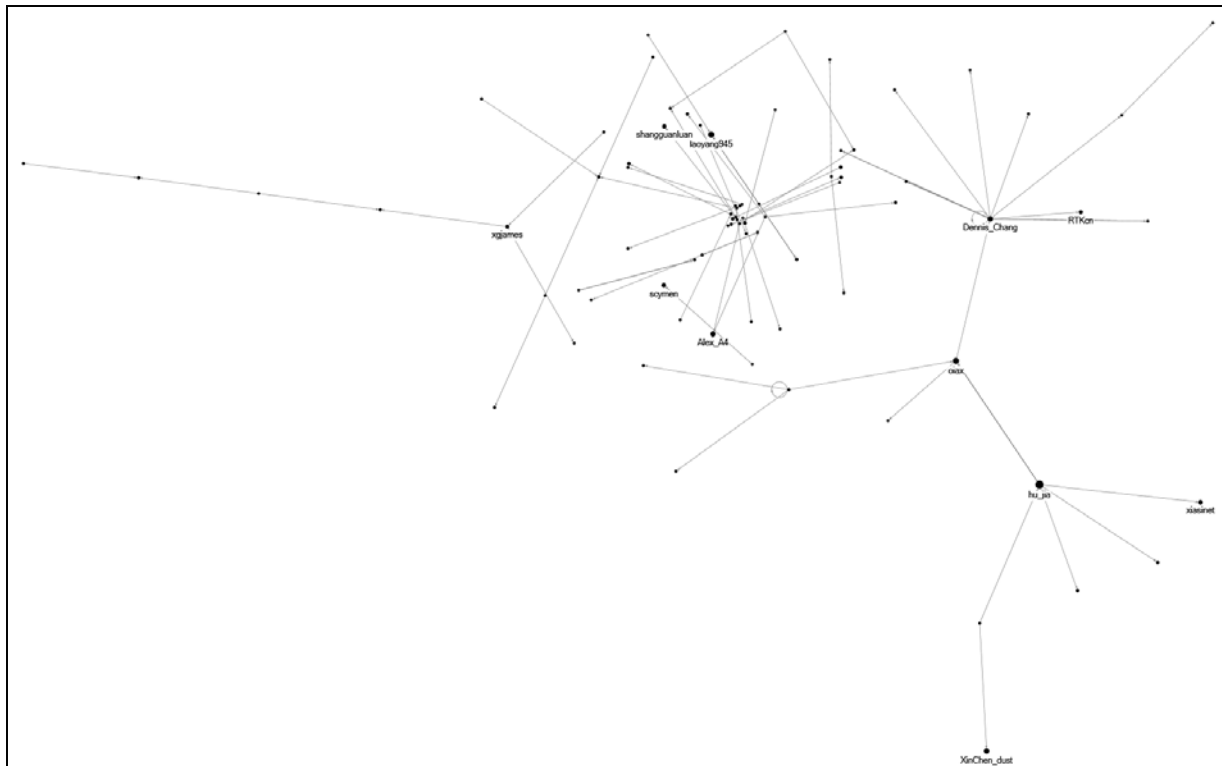
Figure 6 visualizes the mention/reply network. The network includes 81 users and 71 ties. Both in-degree and out-degree centralization are .10 and the network has a density of .02. Table 6a and 6b presents top users by in-degree and out-degree in the network.

Table 7. Distribution of actions and themes

Dimension	Category	No. of Tweets	No. of Retweets
Technological	<i>Reporting</i>	172	3702
	<i>Sentiment</i>	54	146
	<i>Commentary</i>	87	188
	<i>Solution</i>	273	7019
	<i>Mobilization</i>	20	212
Political	<i>Sharing news</i>	130	684
	<i>Commentary</i>	121	741
	<i>Mobilization</i>	7	69

To address RQ3, the majority of tweets deal with technical aspects of censorship (70%), despite the fact that most Twitter activities are driven by issue-based hashtags rather than technology-based hashtags. Among the technical contents, providing solutions is the most salient theme (n=273), followed by describing or reporting problems (n=172). For both technical and political content, only a small proportion deals with mobilization. Table 7 presents the distribution of actions and themes.

Figure 6. Visualization of mention/reply network



Discussion and Conclusion

Internet censorship and resistance to Internet censorship have increasingly provoked debate both inside and outside of authoritarian regimes. Over the past few years, it has been demonstrated that resistance can be enhanced by collective actions via social media platforms. China presents a compelling case for study on this issue due to the strong role the Chinese government plays in Internet censorship and because of the creativity exhibited by those who oppose this censorship. In exploring Chinese Twitter users' collective response to Internet censorship, this study shows how their collective response is supported by the social media networks and a variety of messaging strategies. We have documented that Chinese Internet users agilely adapt to the restricted web environment, not only by developing technological solutions to bypass blockage of certain services, but also by experimenting with creative means of self-expression and opinion sharing. Our analysis reveals the collective nature of their response by using an integrated webometric approach that examines three elements in a web ecosystem: users, relationship and user-generated content. Employing a mixed methodological approach allowed this study to focus on

the quantitative aspects of Twitter-based social networks and analyze the themes found in user-generated content. This approach further allowed in-depth qualitative interpretation of the symbols used in censorship-related discussion and to mobilize activism.

Regarding the characteristics of users, our findings reveal that collective response to Internet censorship in China has been prompted and promoted among a group of *engaged* and *experienced* individuals who identify themselves as enthusiasts of technology and politics. Such user characteristics have led to the question of whether the impact of such collective response could reach the general public, who lack the knowledge necessary to evade the ‘Great Firewall’. The engaged, tech savvy few represent *positive deviants* who could become change agents bringing counter-censorship technologies to achieve the ideal of an open Internet to the general public. However, the demographic composition of this *positive deviant* network alludes to a potential digital gap among Chinese Internet users, between the *haves* of unfettered Internet access and the *have-nots* of an Internet in government fetters.

Regarding the structure of user relationships, the findings from network analysis shows a relatively decentralized and sparse network. There are few dominant parties, and the involvement and enthusiasm for collective actions are most visible in a small set of users, consisting of political dissidents and technical activists. This group of users are active in starting and following up on conversations. Their messages are also widely retweeted, indicating their opinion leader status.

Regarding user-generated content, our analysis suggests that the majority of tweets focus on technical information sharing such as discussions on services, tools, problems, and counter-censorship solutions, among which the majority center on providing tips on bypassing censorship. Technical information is also frequently retweeted by the entire Twitterverse. In relation to Van Laer and Van Aelst’s (2010) digital action repertoire along the low/high threshold dimension, it can be argued that providing technological solutions generally requires a higher degree of technological sophistication than reporting and commenting on technological problems. Collective technical information sharing among the users is done in a conversational and timely fashion, featuring continuous Q&A and troubleshooting. This kind of information sharing likely reinforces technological solutions to censorship and further diffuses counter-censorship technologies. In the political domain, it is found that most tweets focus on sharing political news and opinions. This shows that users not only view Internet censorship as a technological issue, but an issue intertwined with Chinese politics. This potentially paves the way for the collective action on censorship to converge with political activism on other political issues.

While it may be hoped that the connectivity of social media enables users to engage in activism to address issues head-on, we find that tweets that touch on the theme of mobilization are minimal, particularly in the political domain. A very small portion of tweets, less than 1% in the current study, are devoted to discussions of mobilization. Engaging others in collectively addressing an issue requires certain level of influence, and likely a greater degree of risk, especially in China. This finding, interestingly, is similar to a previous study (King et al., 2014) showing that Chinese censors allows criticism of the government to some extent, but adopt more strict control over messages that call for collective actions in China. Among the content with mobilization themes, some offer direct paths toward action. For example, a tweet asks users to submit a form requesting government public information from Chinese regulators in probing the censorship of Google.

Despite the paucity of content on mobilization, the content revealed by users on their Twitter profiles indicates their creativity in resistance. There are many uses of sarcasm, parody,

spoofs, and code words in their profiles. Unexpectedly, location information on Twitter is politicized by the users. Some identify their location as the “old capital of the Republic of China,” as a way to show nostalgia for the pre-Communist era, and a way to voice their discontent toward the current government. Some use “West Korea” (west of North Korea) to mock China’s resemblance to North Korea in terms of speech control, and some use “enemy-occupied area” to express their hostility towards the current government. In Twitter bios, similarly, some use the line, “Across the Great Firewall we can reach every corner in the world.” A line originally used by China’s state media at the launch of China’s first email service in 1987 (Xinhua, 2012). It can be argued that these creative expressions of opinion do not necessarily represent a tactic to evade censorship since the users’ speech on Twitter does not fall under the jurisdiction of Chinese censors, but are a form of domestic Internet culture. These terms are developed and adopted by Chinese users, and used in environments with and without keyword censorship. In contrast to Chinese domestic web services which are heavily policed by keyword filtering, Twitter provides a platform for unfettered speech. There are bold statements expressing political ideals: in some profiles, users express willingness to sacrifice for liberal political ideologies such as ‘freedom’, ‘democracy’, ‘human rights’, and ‘justice.’ It can be argued that the creative and bold profile expressions indicating political ideals may represent a new way to respond to China’s Internet control. The politicization of the issue may foster the strong sense of citizenship necessary for social movement in the future. For the current research, the depth of self-disclosure varies among the users participating in the discussions on the issues examined in this study. In spite of the creative and discursive strategies they use to describe themselves, a sizable number of users have disclosed very detailed identity information, which may motivate others and foster a shared identity.

To relate the findings to the general debate on whether social media forges new forms of civil participation, we argue that social media provide infrastructure for networked activism, yet this potential is limited by the political power exercised over a country’s Internet openness. Despite this limitation, users develop new ways (e.g. using location information to express dissatisfaction) to voice dissent and call for collective action. To study collective action in an authoritarian society, one needs to consider the higher threshold required for and risks involved in participation in online discussion, debate, and protest. Content simply passing along political information or providing technological solution should be given equal weight with content that directly calls for action.

References

- Ackland, R., & O’Neil, M. (2011). Online collective identity: The case of the environmental movement. *Social Networks*, 33(3), 177-190.
- Bloomberg. (2012). Accessed on 01/13/2015 at: <http://www.bloomberg.com/news/2012-09-27/facebook-tops-63-million-users-in-china-despite-ban-report-says.html>
- boyd, D., Golder, S., & Lotan, G. (2010, January). Tweet, tweet, retweet: Conversational aspects of retweeting on twitter. In *System Sciences (HICSS), 2010 43rd Hawaii International Conference on* (pp. 1-10). IEEE.
- Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *science*, 323(5916), 892-895.
- Burnett, S., & Feamster, N. (2013). Making sense of Internet censorship: a new frontier for Internet measurement. *ACM SIGCOMM Computer Communication Review*, 43(3), 84-89.

- Carter, L. (2013). *The Grass-Mud Horse Lexicon: Classic Netizen Language*. China Digital Times Inc.
- China Digital Times. (2009). Accessed on 01/13/2015 at: <http://chinadigitaltimes.net/2009/06/chinese-censors-cut-off-twitter-hotmail-and-flickr/>
- Choi, S., & Park, H. W. (2013). An exploratory approach to a Twitter-based community centered on a political goal in South Korea: Who organized it, what they shared, and how they acted. *New Media & Society*, 14(6), 1461-1488.
- Christensen, H. S. (2011). Political activities on the Internet: Slacktivism or political participation by other means?. *First Monday*, 16(2).
- CNNIC. (2014). Accessed on 01/13/2015 at: <http://www1.cnnic.cn/IDR/ReportDownloads/201411/P020141102574314897888.pdf>
- The Diplomat. (2014). Accessed on 01/13/2015 at <http://thediplomat.com/2014/06/chinas-sovereign-Internet/>
- Freedom House. (2013) Accessed on 01/13/2015 at <https://www.freedomhouse.org/report/freedom-net/freedom-net-2013>
- Freeman, L. C. (1979). Centrality in social networks conceptual clarification. *Social networks*, 1(3), 215-239.
- Forbes. (2013). Accessed on 01/13/2015 at: <http://www.forbes.com/sites/victorlipman/2013/05/01/the-worlds-most-active-twitter-country-hint-its-citizens-cant-use-twitter/>
- Global Times. (2013). <http://www.globaltimes.cn/content/758570.shtml>
- Gruzd, A., Wellman, B., & Takhteyev, Y. (2011). Imagining Twitter as an imagined community. *American Behavioral Scientist*, 55(10), 1294-1318.
- Haythornthwaite, C. (1996). Social network analysis: An approach and technique for the study of information exchange. *Library & information science research*, 18(4), 323-342.
- Huang, R., & Sun, X. (2014). Weibo network, information diffusion and implications for collective action in China. *Information, Communication & Society*, 17(1), 86-104.
- Introna, L. D., & Gibbons, A. (2009). Networks and Resistance: Investigating online advocacy networks as a modality for resisting state surveillance. *Surveillance & Society*, 6(3), 233-258.
- Katona, Z., Zubcsek, P. P., & Sarvary, M. (2011). Network effects and personal influences: The diffusion of an online social network. *Journal of Marketing Research*, 48(3), 425-443.
- Kenengba. (2010). Accessed on 01/13/2015 at: <https://kenengba.com/post/2920.html>
- King, G., Pan, J., & Roberts, M. E. (2013). How censorship in China allows government criticism but silences collective expression. *American Political Science Review*, 107(02), 326-343.
- Leberknight, C. S., Chiang, M., Poor, H. V., & Wong, F. (2012). A taxonomy of Internet censorship and anti-censorship.
- Meng, B. (2011). From steamed bun to grass mud horse: E Gao as alternative political discourse on the Chinese Internet. *Global Media and Communication*, 7(1), 33-51.
- Meraz, S., & Papacharissi, Z. (2013). Networked gatekeeping and networked framing on# Egypt. *The international journal of press/politics*, 14(01), 14-47.
- Morozov, E. (2009). Iran: Downside to the "twitter revolution". *Dissent*, 56(4), 10-14.
- Mou, Y., Wu, K., & Atkin, D. (2014). Understanding the use of circumvention tools to bypass online censorship. *New Media & Society*, 14(6), 1461-1488.

- Nam, Y., Lee, Y. O., & Park, H. W. (2013). Can web ecology provide a clearer understanding of people's information behavior during election campaigns?. *Social Science Information*, 52(1), 91-109.
- OpenITP. (2013). Accessed on 01/13/2015 at: <http://openitp.org/pdfs/CollateralFreedom.pdf>
- OpenNet Initiative. (2011) Accessed on 01/13/2015 at: <https://opennet.net/west-censoring-east-the-use-western-technologies-middle-east-censors-2010-2011>
- Papacharissi, Z. (2002). The virtual sphere: The Internet as a public sphere. *New media & society*, 4(1), 9-27.
- Park, H. W., & Leydesdorff, L. (2013). Decomposing social and semantic networks in emerging "big data" research. *Journal of Informetrics*, 7(3), 756-765.
- Park, S. J., Lim, Y. S., Sams, S., Nam, S. M., & Park, H. W. (2011). Networked politics on Cyworld: The text and sentiment of Korean political profiles. *Social Science Computer Review*, 29(3), 288-299.
- Pascale, R. T., Sternin, J., & Sternin, M. (2010). *The power of positive deviance: How unlikely innovators solve the world's toughest problems* (Vol. 1). Harvard Business Press.
- Powell, A. (2012). Assessing the Influence of Online Activism on Internet Policy-Making: The Case of SOPA/PIPA and ACTA. Available at SSRN: <http://ssrn.com/abstract=2031561> or <http://dx.doi.org/10.2139/ssrn.2031561>
- Reuters.(2014).Accessed on 01/13/2015 at: <http://www.reuters.com/article/2014/12/29/us-google-china-idUSKBN0K70BD20141229>
- Seidman, S. B. (1983). Network structure and minimum degree. *Social networks*, 5(3), 269-287.
- Shapiro, M. A., & Park, H. W. (2014). More than entertainment: YouTube and public responses to the science of global warming and climate change. *Social Science Information*, 0539018414554730.
- Shirazi, F. (2014). Interrogating Iran's restricted public cloud: An Actor Network Theory perspective. *Telematics and Informatics*, 31(2), 228-236.
- Skinner, J. (2011). Social media and revolution: The arab spring and the occupy movement as seen through three information studies paradigms.
- Storify. (2014). Accessed on 01/13/2015 at: <https://storify.com/iaskfq/2014-6>
- South China Morning Post. (2014). Accessed on 01/13/2015 at <http://www.scmp.com/news/china-insider/article/1437031/chinese-worried-about-more-censorship-xi-jinping-heads-new-web>
- Thelwall, M. (2009). Introduction to webometrics: Quantitative web research for the social sciences. *Synthesis lectures on information concepts, retrieval, and services*, 1(1), 1-116.
- Theocharis, Y. (2013). The wealth of (Occupation) networks? Communication patterns and information distribution in a Twitter protest network. *Journal of Information Technology & Politics*, 10(1), 35-56.
- Tselikov, A. (2014). The Tightening Web of Russian Internet Regulation. *Berkman Center Research Publication*, (2014-15).
- Van Laer, J., & Van Aelst, P. (2009). Cyber-protest and civil society: the Internet and action repertoires in social movements. *Handbook on Internet crime*, 230-254.
- Van Laer, J., & Van Aelst, P. (2010). Internet and social movement action repertoires: Opportunities and limitations. *Information, Communication & Society*, 13(8), 1146-1171.
- Woo-young, C., & Park, H. W. (2012). The network structure of the Korean blogosphere. *Journal of Computer-Mediated Communication*, 17(2), 216-230.

- Xinhua News. (2012). Accessed on 01/13/2015 at:
<http://zgws.xinhuanet.com/themeinfo.aspx?id=314>
- Xu, W. W., Chiu, I. H., Chen, Y., & Mukherjee, T. (2014). Twitter hashtags for health: applying network and content analyses to understand the health knowledge sharing in a Twitter-based community of practice. *Quality & Quantity*, 1-20.
- Xu, W. W., & Feng, M. (2014). Talking to the Broadcasters on Twitter: Networked Gatekeeping in Twitter Conversations with Journalists. *Journal of Broadcasting & Electronic Media*, 58(3), 420-437.
- Xu, W. W., Sang, Y., Blasiola, S., & Park, H. W. (2014). Predicting Opinion Leaders in Twitter Activism Networks The Case of the Wisconsin Recall Election. *American Behavioral Scientist*, 0002764214527091.
- Yang, G. (2013). *The power of the Internet in China: Citizen activism online*. Columbia University Press.
- Yang, F. (2014). Rethinking China's Internet censorship: The practice of recoding and the politics of visibility. *New Media & Society*, 1461444814555951.
- Yang, Q., & Liu, Y. (2014). What's on the other side of the great firewall? Chinese Web users' motivations for bypassing the Internet censorship. *Computers in Human Behavior*, 37, 249-257.