

The Twitter Ties that Retweet:
Information Diffusion in Social Movements

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Social movements, such as labor union protests or human rights demonstrations, face challenging communication goals. They must bring people together, mobilize participants, shape coalitions, and confront opponents.

Analyzing the social network structure of movement participants can provide valuable insight into how movements achieve their communication goals. This approach emphasizes the relationships that people actually have (as opposed to other factors such as a person's attitudes, his/her background or where s/he lives) and the ability of those social ties to expose a person to participation opportunities and to stimulate him/her into action (Wellman, 1999; McAdam & Paulsen, 1993; Snow, Zurcher & Eklund-Olson, 1980). How do people first learn about a social movement? How are potential participants likely to come into contact with and be recruited into a social movement? Once they hear about a social movement, what motivates and persuades them to participate?

Online social networking sites offer a powerful and useful opportunity to directly observe the flow of communication about social movements. Users of these sites publicly articulate their connections with other users (by becoming a "friend," "contact" or "follower" depending on the nomenclature of the service) and then share information (such as a short snippet of text about what they are doing, photos, and hyperlinks) with these connections. Unlike the social connections one might articulate in the offline world, the connections among online social network users are not differentiated. Thus, there is no difference between a close family member and an acquaintance one just met—both are considered a "friend," "follower," "contact," etc.

In this paper, I will focus on Twitter, the microblogging and social networking

site, because it offers three unique advantages over other social networking tools such as Facebook or LinkedIn. First, unlike other sites, all Twitter messages and connections are publicly viewable to any Internet user—by default. This makes Twitter a particularly useful and accessible tool for researchers. Analyzing all the content on Twitter, however, may seem analogous to drinking water from a fire hose. Twitter does handle a massive volume of data: over 175 million users send approximately 50 million tweets each day (Miller, 2010). Second, unlike other sites, a connection between any two Twitter users may not necessarily be reciprocated. These asymmetric connections means if you follow me, I do not have to follow you. Thus, the connections on Twitter may depend less on in-person contact, local proximity or other factors that typically form the basis for social relations (Gruzd, Wellman, Takhteyev 2010; Cottle, 2007; Bennett, 2003). Finally, with the facility of retweeting, Twitter offers a way to directly examine the diffusion of messages through its network. Retweeting is the act of taking a Twitter message someone else has posted and republishing that same message to your own followers. Some have compared it to email forwarding (boyd, Golder & Lotan, 2010; Gruzd, Wellman & Takhteyev, 2010). By retweeting, you are in effect casting your vote for what you think is interesting content. Thus, retweets have the power of amplification and endorsement. The more something is retweeted, the more audible it can become in the Twitter community. For example, retweeting is an important factor of Twitter’s “Trending Topics” algorithm. Trending Topics are prominently featured on the Twitter homepage and tell users what topics are “immediately popular,” including the “most breaking” news stories across the world. Trending Topics have included a wide range of subjects such as Michael Jackson’s death, the launch of the iPad and the Gulf of Mexico oil spill (“About Trending

Topics,” 2010).

In this paper, I will examine the network structure of the connections or ties among Twitter users who posted messages about the Transportation Security Administration (TSA) and National Opt-Out Day during the month of November 2010. During this time, TSA implemented new security procedures, which included full body pat-downs and new body scanning technology, and caused an uproar among travelers who felt the procedures were too invasive, violated people’s sense of privacy and were ineffective. In response, outraged travelers organized an online protest called National Opt-Out Day on Wednesday, November 24, the day before Thanksgiving and one of the busiest travel days of the year. Participants of National Opt-Out Day refused to submit to body scans and aimed to clog airports in protest of the new security measures.

I seek to understand how the strength of an individual’s connection to others in a movement may promote or hinder that individual’s awareness of and participation in the cause. In my analysis, rather than treating all ties as equal, I will determine if the strength of ties—whether they are strong or weak— influences the flow of information in the network. I will pay particular attention to the network of retweets on TSA and National Opt-Out Day since retweets explicitly describe the communication path that messages followed. By examining the social network structure of tweets, I hope to gain valuable insight into how social ties influence the communication of social movements.

Theoretical background: Types of social ties

When studying social networks, scholars identify two types of ties that can

exist between members: (1) strong ties and (2) weak ties. Strong ties refer to the close, interpersonal relations you have with family and friends. They are reciprocated relationships that tend to involve frequent communication, large time commitments, intimacy, and emotional intensity (Donath & boyd, 2004; Jablin & Putnam, 2001; Granovetter, 1973). Strong ties also tend to exist between those who are similar to one another—a concept known as homophily (Rogers, 1995; Granovetter, 1973; Lazarsfeld & Merton, 1964). When two individuals have a strong tie, there is likely to be a high overlap in their friendship circles (Granovetter, 1973). Since individuals with strong ties share common beliefs and meanings, communication is more likely to be effective than when individuals have differences in social status, language or technical competence (Rogers, 1995). This may be because individuals with strong ties communicate using what linguist Basil Bernstein called “restricted codes” (1971, p. 79). Restricted codes make meanings more implicit because speakers know one another and little effort is needed to understand one another (Bernstein, 1971, p. 79).

In contrast, weak ties refer to the distant, indirect relations you have with acquaintances and friends of friends. They may or may not be reciprocated relationships and they tend to involve infrequent communication, small time commitment, low intimacy and low emotional intensity (Granovetter, 1973; Jablin & Putnam, 2001). Weak ties tend to exist between those who are dissimilar to one another—a concept known as heterophily (Lazarsfeld & Merton, 1964; Granovetter, 1973; Rogers, 1995). When two individuals have a weak tie, there is generally very little overlap in their friendship circles (Granovetter, 1973). Since individuals with weak ties do not share common beliefs and meanings, communication may cause confusion or even cognitive dissonance (the

uncomfortable feeling one experiences when holding conflicting viewpoints at the same time) because an individual is receiving messages that may be inconsistent with existing beliefs (Rogers, 1995). Since weak-tie communication crosses large social distances, individuals use what Bernstein called “elaborated codes” (1971, p. 79). Elaborated codes require more thought and generally have more universal meaning since there is a larger communication difference between the speaker and those to whom the speech is addressed (Bernstein, 1971, p. 79).

Figure 1 below summarizes the differences between strong and weak ties.

Figure 1: Differences between strong and weak ties

	Strong ties	Weak ties
Refers to	friends, family	acquaintances, friends of friends
Symmetry in communication	reciprocal	low or non-existent
Association with others is	homophilous	heterophilous
Communication code is	restricted	elaborated
Frequency of communication is	high	low
Overlap in friendship is	high	low
Network density	tightly-bounded	loosely-knit

Social Ties and the Communication of Social Movements

When it comes to communicating information about social movements, strong ties can provide solidarity among people who know and trust one another. In particular, strong ties can play an important role by passing on influence and credibility (Weimann 1994). Communication in homogeneous, strong-tie groups is often interpersonal, involving a face-to-face exchange between two or more individuals. People prefer to

compare their thoughts and validate them by discussing with those they have strong ties to, such as significant others or other like-minded individuals (Klandermans, 1992). This kind of intimate communication among homogeneous contacts is more likely to persuade an individual to adopt a new idea or behavior (Rogers, 1995). Several studies have found that participation in a social movement was strongly influenced by a preexisting, strong, interpersonal tie linking an individual to another participant (McAdam & Paulsen, 1993; Snow, Zurcher & Eklund-Olson, 1980). For example, sociologist Doug McAdam found that the 1960 Freedom Summer activists were intimately connected to one another as friends, roommates or members of local community organizations. Building on McAdam's work, author Malcolm Gladwell argues high-risk activism is a "strong-tie phenomenon" that requires "discipline and strategy" and "is not for the faint of heart" (2010).

But strong ties have several limitations. Strong ties can cause social isolation at the group level when a set of individuals form a "clique" with few or no direct links to other groups and constitutes a closed network or "insulated system" (Granovetter, 1973, p. 1374; Snow, Zurcher & Eklund-Olson, 1980). Group isolation is one important network structural factor that explains why in the 1970's, the membership of the Nichiren Shoshu Buddhist movement grew to 250,000 while the Hare Krishna movement never hovered above 4,000 (Snow, Zurcher & Eklund-Olson, 1980). Both are active, proselytizing movements, but Hare Krishna requires members to follow a rigorous communal lifestyle and to break off interpersonal ties with those outside of the movement, which may have limited its ability to attract new members. Group isolation and fragmentation may also explain why Boston's West End neighborhood, a

predominantly Italian neighborhood, struggled to resist a redevelopment project. Each West End resident was “tied to every other in his clique and to none outside” (Granovetter, 1973, p. 1373). As a result, the West End was poorly connected politically and the fragmented network structure made it very difficult for the residents to mobilize and to articulate their objections. Thus, communication within homogeneous, strong-tie groups can diffuse information quickly, “but limits the spread... to individuals connected in the same network” (Rogers, 1995, p. 287-88).

Weak ties are important for the wide diffusion of new ideas and information. Only weak (not strong) ties can serve as social bridges, connecting two densely knit clumps of close friends. A bridge is a “line in a network which provides the only path between two points” and all bridges are weak ties, therefore, without the bridge, those clumps would not be connected at all (Granovetter, 1973, p. 1364). Since weak ties can serve bridging functions, they provide people with access to information and resources beyond those available in their own social circles (Ellison, Steinfield, & Lampe, 2007; Wellman, 1999; Granovetter, 1983). Strong ties may encourage members of a particular social circle or “clique” to join a cause, but “without weak ties, any momentum generated in this way does not spread beyond the clique” (Granovetter, 1983, p. 202). In his research on labor markets, Granovetter found that individuals were more likely to find jobs through their weak ties than through strong ties or formal job listings (Granovetter, 1983). In their bridging function, weak ties are very effective in reaching “socially distant and unknown targets” and even “high-status individuals” (Granovetter, 1983, p. 215; Lin, Ensel & Vaughn, 1981).

Categories of communications channels

Beyond social ties, the communication channel used can influence the flow of information. A channel refers to the “means by which a message gets from the source to the receiver” (Rogers 1995, p. 194). In this paper, I will distinguish among three major types of communication channels: mass media, interpersonal, and online. Each channel facilitates different forms of communication, allows the speaker to reach different audiences, and influences how easily information can be passed on to others.

Mass media channels typically involve a technology or “an institutional communication mechanism” such as a radio, television or newspaper to enable a source of one or a few individuals to rapidly reach a large and widely distributed audience (Snow, Zurcher & Ekland-Olson, 1980, p. 790; Rucht, 2004; Rogers, 1995). The communication is one-way, which means mass media are a means of transmitting messages to a large audience with weak or no ties to the original source (Myers, 1994).

Mass media are particularly effective channels for information exchange because of low communication proximity (very few individuals in the audience have “overlapping personal communication networks”) and high heterophily since individuals are socially different from one another (Rogers, 1995, p. 310). Mass media can reach a large audience quickly, spread information and lead to changes in weakly held attitudes (Rucht, 2004; Rogers, 1995). This is what happened in the late eighteenth and early nineteenth centuries, according to Sidney Tarrow: “the loose ties created by print and association, by newspapers, pamphlets, and informal social networks, made possible a degree of coordinated collective action across groups and classes that the supposedly

‘strong ties’ of social class seldom accomplished” (1998, p. 51).

For reaching large audiences, mass media are a relatively inexpensive and effective communications channel: “If movements could transmit their messages to millions of people across the airwaves, encouraging some to follow their example and larger numbers to take sympathetic notice of their claims, it was possible to create a movement without incurring the costs of building and maintaining mass organizations” (Tarrow, 1998, p. 131). At the same time, however, mass media includes “the ‘waste’ of communicating with people who are not potential contributors” (Marwell & Oliver 1993, p. 35). To gain the attention of mass media, it may be necessary for activists to resort to “radical behavior” which causes them to lose control over the movement’s message (Myers, 1994, p. 255; Cottle, 2007).

By covering social movements, mass media play a “status conferral” function, “bestow[ing] prestige and enhanc[ing] the authority of individuals and groups by legitimizing their status” (Lazarsfeld & Merton, 1948). Through the popular press, people hear about rebellions, petitions and protests from other locations and the idea of defying authority becomes “conceivable” to them (Tarrow 1998, p. 47). Thus, mass media “did not so much make rebellion heroic as make it ordinary” (Tarrow, 1998, p. 47). It may contribute to what Gerald Marwell and Pamela Oliver (1993) call “interdependence,” which is behavior that “takes account of the effect of one’s participation in collective action on the participation of others” (p. 9). Interdependence can happen on a micro-level where an office worker might consider the possibility her contribution to a charitable organization will increase the social pressure on others to contribute as well. It can also happen on a macro-level where people may read about or view participants in a strike on

television and feel motivated to join the cause. Marwell and Oliver (1993) suggest that motivation may come from believing the protesting group has a chance at success:

“People join groups involved in collective pursuits not only out of perceived common interests, but also because they regard the groups or individuals organization the action as in some sense efficacious... for most people, the most prominent and convincing evidence of a group’s efficacy is probably the group’s size and command over resources” (p. 9-10).

Through mass media, individuals can develop a sense of community with people they do not know directly. In the nineteenth century, printed newspapers provided common stories for the general populace: “If a man could read about a great event on the same day as thousands of others he didn’t know, he and they became part of the same invisible community of readers” (Tarrow 1998, p. 46).

In contrast, interpersonal channels involve directed, two-way communication between two or more individuals. Communication often occurs face-to-face and among a small group of individuals in close proximity, which means any individual can easily ask for clarification or additional information (Baxter & Braithwaite, 2008; Rogers, 1995). It has been suggested that the two-way exchange of information makes interpersonal channels better suited to overcome the psychological barriers of selective exposure (when individuals select information that is consistent with their attitudes and beliefs), selective perception (when individuals interpret information that reinforces their existing beliefs) and selective retention (when individuals only retain information that they agree with) (Rogers, 1995; Baxter & Braithwaite, 2008). Interpersonal communication is also more likely to occur between individuals with strong ties to one another (Baxter & Braithwaite, 2008; Klandermans, 1992).

Interpersonal channels can play a critical role in persuasive communications. In their two-step flow model, Katz and Lazarsfeld first suggested that interpersonal relationships served as an “intervening variable” in the communications process (1955, p. 30). Since then, scholars have closely examined how an audience may take a message to be more effective and more powerful due to the influence of peers. Many have found that interpersonal communication plays a moderating role by changing the extent to which mass media messages influence their audiences (Scheufele, 2000; Baxter & Braithwaite, 2008). After hearing about social movements, individuals evaluate the cause by discussing it with people in their immediate environment. The movement’s messages are judged in relation to the collective beliefs of the group with which the individual identifies and communicates. These collective beliefs are “created by individuals not in isolation but in the course of communication and cooperation: in routine social exchanges, in conversations in pubs, at parties, in meeting rooms... within these interpersonal life circles, populated with relatives, friends and acquaintances, events and new information are discussed, interpreted, and commented on” (Klandermans, 1992, p. 83). Some scholars have suggested it is the combined intensity, intimacy, and frequency of interpersonal communication that makes it the primary way “humans negotiate meanings, identity, and relationships” (Baxter & Braithwaite, 2008, p. 4).

Organizations and informal social groups, such as universities and churches, have often provided a sympathetic environment in which interpersonal communication about social movements can take place. These groups facilitate communication among like-minded individuals and together, they can make sense of their grievances—a concept referred to as the “social construction of protest” (Klandermans, 1992, p. 78). In 1851,

thousands of French republicans loyal to President Louis Napoleon launched a coup d'état across 30 different localities. The groups were not “random collections of rural hooligans” but had been “incubated in local chambrées and drinking clubs” (Tarrow, 1998, p. 125). Similarly, many participants of the 1960's civil rights movement conversed with one another at black churches throughout the South and those churches eventually played critical roles in the organization of the movement (Gladwell, 2010).

Finally, new Internet tools offer enhanced capabilities for social movement communication. There has been a recent growth of global activism including large-scale demonstrations and publicity campaigns against organizations. Many of these movements have been supported by the Internet, which dramatically improves communication through the speed and ease of information transfer. Information can be transmitted to millions of nodes all over the world in literally seconds with little effort and low cost. The advantages of speed and cost present a significant advance over previous systems of communication (Bennett, 2003; Myers, 1994). The Internet augments the tendency for social connections to be “nonlocal” and for “communication [to be] divorced from transportation,” a trend which started with the telegraph and railroad in the 19th century and has continued thanks to cars, planes, and phones (Wellman, 2001, p. 233). Thus, new online tools “enable people to organize politics in ways that overcome limits of time, space, identity and ideology, resulting in the expansion and coordination of activities that would not likely occur by other means” (Bennett, 2003, p. 20).

The fast and cheap communication afforded by Internet communication also lowers the barrier for people to create and maintain social connections. Studies show that Internet users keep in touch with an unprecedentedly large number of people (Ellison,

Steinfeld & Lampe, 2007; Donath & boyd, 2004; Bennett, 2003).

Not all online social connections are the same though the same terminology such as “friend,” “follower,” or “contact” is be used by social networking sites to describe everyone who is tied to you. Some researchers argue online social networks are primarily based on weak ties because they make it possible for users to gain access to a wide range of individuals (Ellison, Steinfeld & Lampe, 2007; Donath & boyd, 2004). This quality is particularly useful if your objective is to rally a large mass of people behind a shared interest, such as a social movement (Jablin & Putnam, 2001; Wellman, 2001). Through weak contacts, people may become aware of and participate in movements. But there is also much evidence that shows how online social networks help individuals find spouses and business partners and provide deep emotional support—qualities that are more typical of strong ties (Donath & boyd, 2004; Wright, Rains & Banas, 2010).

Online communication, however, is not just about the quantity or quality of connections one maintains. It has been suggested the Internet combines the wide reach of mass media with the personalized style of interpersonal communication (Wellman, 2001). The online audience can customize its exposure to certain websites, people, and topics of their own choosing. Similarly, users that which to share information can choose to broadcast their messages to all users, such as through a blog or a webpage, or target their messages to specific audiences, such as through email or posting on the wall of a Facebook friend. As a result, a speaker’s audience is highly individualized and is defined socially—not spatially or by some other criteria typically used to define a set of people. Thus, it may be more appropriate to consider Internet communication as *socially-mediated online communication*. This is a variation of sociologist Barry Wellman’s

concept of “networked individualism,” which recognizes that because of computer and mobile communication, “It is the individual... that is the primary unit of connectivity” (2001, p. 236). An important consequence of networked individualism is that people have more specialized relationships. They do not get support, companionship or information from the same group of people, but fluidly move among their social connections whenever and however they please. Their levels of involvement may also vary in different communities “participating actively in some, occasionally in others, and being silent ‘lurkers’ in still others” (Wellman, 2001, p. 243).

Figure 2 belows summarizes the differences among the three communications channels of mass media, interpersonal, and online.

Figure 2: Differences among the three categories of communications channels

	Mass media	Interpersonal	Online (Socially-mediated)
Examples of media used	Radio, television, newspapers	Face-to-face	Social networking sites
Communication is	One-way	Two-way	Two-way
Reach: source to receiver	Small to many	Small to small	Many to many
Audience is	Widely distributed	In close proximity	Individualized

Research Questions and Hypotheses

As has been demonstrated, successful social movements must exploit all their communication resources in order to mobilize and organize participants. For this study, I will focus on the communication resources provided by Twitter. As a social networking

site, Twitter allows its users to send and read short (140 characters-long) messages known as “tweets” to a network of others. On Twitter, connections between users are directed, which means users choose specific Twitter accounts to “follow” and each user has his/her own group of “followers.” The connection between any two Twitter users may not necessarily be reciprocated.

In this paper, I study the relationship between the type of social connections among Twitter users and the diffusion of information about social movements. As stated earlier, I will focus on retweeting because it provides a way to directly examine the diffusion of messages through the Twitter network. Specifically, I analyze whether weak or strong ties contributed more to encourage Twitter users to retweet messages about TSA or National Opt-Out Day.

My goal is to answer the following research questions: (1) How does information about social movements diffuse through the Twitter network? Via weak or strong ties? (2) Why do Twitter users retweet? Does it make a difference if someone to whom they have a strong tie posted the message? What if they had a weak tie to the author? (3) Of the most popular retweeted users, how many strong ties do they have? How many weak ties do they have?

These research questions lead me to the following three hypotheses:

- Hypothesis 1: There are more weak than strong ties in the Twitter network of users who posted messages about TSA and National Opt-Out Day
- Hypothesis 2: Users who retweeted messages about TSA and National Opt-Out Day have weak ties to the original authors
- Hypothesis 3: The most retweeted users have more weak ties than strong ties

Method and Results

The data used for this project was collected using NodeXL (a software extension for Microsoft Excel for viewing and analyzing network graphs developed by Smith, Milic-Frayling, Shneiderman, Capone, Mendes Rodrigues, Leskovec, & Dunne) and through direct communication with Twitter users. NodeXL will be used to analyze the network structure of the Twitter users. User interviews will be used to better understand the relationship between those who retweet and those that are retweeted and to uncover the motivations behind retweeting behavior.

Network structure

I programmed NodeXL, which uses Twitter's search API, to extract tweets with the keywords "tsa" or "national opt out day" (and variations such as "opt out day") for the week surrounding the online protest known as National Opt-Out Day (November 21, 2010 to November 27, 2010). In addition to the content of the tweet, NodeXL collected other basic data including the time it was posted, the user who posted it, the user's profile, the people who follow that user, and the people that user follows. Data was retrieved for each day and then consolidated into a single batch. To keep the volume of data as manageable as possible, I used NodeXL to only collect tweets from approximately 200 users each day (defined as the first 200 or so users returned by the Twitter Search API and subject to its rate limit, which restricts the number of requests to

the API service to 150 per hour).

To understand how information about TSA and National Opt-Out Day diffused through these social ties, I closely examined retweeting behavior, which shows how messages were reposted or forwarded in the community. Retweeting is defined as a tweet that follows the syntax of “RT @user.” In the case of multiple retweets, such as “RT @user1 RT user2”, it will be treated as two retweets. In recent studies, retweeting has been used as an indicator of influence in the Twitter community (Gruzd, Wellman & Takhteyev, 2010).

User interviews

To find out what caused Twitter users to retweet a message, I asked them directly. I sent direct messages and @replies to the users who retweeted at least one of the top 4 most retweeted messages. I then gave them the option of communicating with me further by direct message on Twitter, email or phone. My questions included: “What is your relationship with the author who posted this message to you?”, “What caused you to retweet this particular message?” “How do you personally feel about the TSA controversy?” and “Who do you retweet for?”

My goal is to understand if the strength of one’s relationship to the author of a tweet changes the motivation of users to retweet. In other words, when users retweet, are they consciously aware of the people they follow and those who follow them or are they concerned about other issues? The interview process I used was inspired by the research of Alice Marwick and danah boyd (2010) who interviewed Twitter users about who they

imagine their audience to be when they tweet.

Results: Network Structure

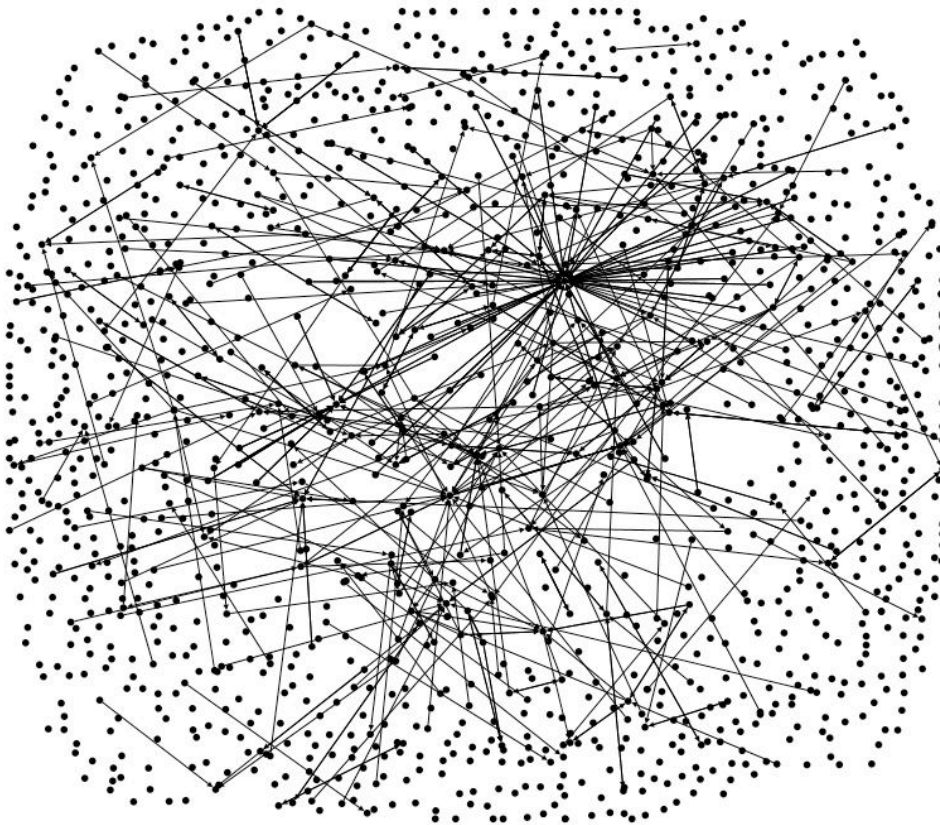
The complete dataset included 1,369 unique users (known as “vertices” in network theory) and 371 unique connections (or “edges”) among them. A connection was said to exist if there was a “follow” (e.g. user A follows user B) relationship between two users as publicly articulated on a user’s Twitter profile. (Note: user B does not necessarily have to follow back user A for a connection to exist.)

To better understand the connections between users in this sample, I distinguished between strong and weak ties. I defined a strong tie as a mutual or reciprocal relationship between two users—i.e. user A follows user B and user B follows user A. My assumption is that users who follow each other are better able to keep track of each other’s messages and are more likely to have frequent communication with one another. Any unreciprocated connection between two users is considered a weak tie, thus if user A follows user B, but user B does not follow user A, there is a weak tie between them.

In this sample, there were 37 strong ties (almost 10 percent of the total) and 263 weak ties (almost 71 percent). Weak ties outnumbered strong ties 7 to 1, confirming my first hypothesis. In addition to weak and strong ties, there were 71 connections (approximately 19 percent of total) between users where one user mentioned the username of another, but neither user follows the other. I will refer to this as a “mentions, no follow” relationship. There was also a conspicuously high number of users with *no ties* to anyone, meaning they did not mention another user in the dataset, they do not

follow anyone in the dataset and no other user in the dataset follows them. Of the 1,369 total users, 980 users (nearly 72 percent of total) were not connected to any other users in this network (see Figure 3 below). As a result, the network graph density is practically zero (0.000225), indicating there is very little interconnectedness among the users in this network. (A network density of 0 means there are no connections between any two members while a network with density of 1 means all members are connected to one another.) In Figure 3 below, users with no ties are represented as dots with no lines connecting them to other dots.

Figure 3: Network structure of Twitter users who posted messages on “tsa” or “national opt-out day”



Created by NodeXL (<http://nodexl.codeplex.com/>)

Retweeting represented a sizeable part of the communication activity that occurred in the Twitter network. A total of 1,400 tweets were collected in this sample and 583 of them were retweets (nearly 42 percent). 70 users (just over 5 percent of the total users in the sample) were retweeted by 173 users (nearly 13 percent).

Among the users that retweeted, there were a total of 191 ties, 8 were strong (4 percent) while 87 were weak (46 percent). Thus, most of the users who retweeted had weak ties to the original author of the tweet, confirming my second hypothesis. In addition to weak and strong ties, there were 96 “mentions, no follow” connections, representing 50 percent of the total ties in the retweet network.

To evaluate my third hypothesis, I extracted the top 4 most retweeted messages and examined their reposting patterns. Overall, no retweeters had strong ties to the original author while 46 retweeters (or 66 percent) had weak ties, thus most retweets were attributed to weak ties to the original authors, confirming my third hypothesis. In addition, there were 24 retweeters who had “mentions, no follow” ties to the original authors (approximately 34 percent of total ties).

It is important to note that, among the top most retweeted messages, the frequency of retweeting varied considerably. The top most retweeted message originally posted by *lupeiasco* was retweeted by 45 users while the messages of *mikefoster*, *kateesackhoff* and *mparent777722* and were only retweeted by 9, 8 and 8 users respectively (see Figure 4 below). These top retweeted users have a large number of followers (as of November 27, 2010), which they may have accumulated through their own unique areas of expertise and popularity. In this dataset, user *lupeiasco* had 279,482 followers and is a popular American rapper and producer, who announced in October a new album and concert tour

for early 2011. User kateesackhoff is an actress with 15,481 followers and played leading and supporting roles on the television series *Battlestar Galactica* and *24*. User mikefoster had a more modest group of followers (7,816). He leads People of the Second Chance, an organization that helps individuals move on after personal failure and is the author of *Graceonomics: Unleash the Power of Second Chance Living* (published in September 2010). And finally, user mparent77772 is a self-described “Blogger-Interwebber” with 82,719 followers and frequently writes on issues at the intersection of politics, government and media.

Figure 4 below summarizes the top most retweeted users and the types of ties connecting them to other users in the dataset.

Figure 4: Top 4 most retweeted messages on TSA and National Opt-Out Day

Username	Twitter post	Total retweets	Retweeters with <i>strong</i> ties to original author	Retweeters with <i>weak</i> ties to original author
lupefiasco	Niggaz look and be like "aww shit ninjas!!!" the ninjas be like "yeah y'all know what time it is! TSA can't scan or detect an asswhoopin!"	45	0	35
kateesackhoff	I would happily be pat down by anyone from TSA if they get me on my flt!!!	9	0	9
mparent777722	In its nine years of existence, TSA has not once caught a terrorist during a preflight screening http://bit.ly/gfdJd3	8	0	1
mikefoster	cant see London...cant see France...unless we see your underpants. #TSA	8	0	1
		70	0	46

Results: User Interviews

I sent inquiries to 36 users and received 10 responses. I communicated with 8 of

the users through direct messages on Twitter and with 2 of the users by email.

Of the 10 respondents, 8 users retweeted lupefiasco and 2 users retweeted kateesackhoff. I was unable to get participation from the users who retweeted mparent777722 or mikefoster.

The respondents shared a range of explanations for retweeting. I have classified their responses into four categories: (1) message content, (2) impression of author (3) sharing information with others, and (4) indifference to the TSA controversy and National Opt-Out Day.

Message content

Among my respondents, humor was the universal motivation for retweeting. Some of the respondents who retweeted lupefiasco viewed his humor as intelligent and witty. One user said, “it was politically incorrect but extremely humorous... the Ninja substitute for nigga was clever.” Others thought the message described a comical scenario. One user said, “lupe’s idea of ninjas jackin a plane was funny” and another said, “It was hilarious” because “Lupe Fiasco added the element of marital arts to a problem Americans face with [airport] security.” For one user, the humor in the lupefiasco’s message played an instrumental role of adding variety to the user’s Twitter content: “it was a really funny tweet...it’s just nice to have some silly nonsense on your timeline every now and then.”

The respondents who retweeted kateesackhoff also cited humor as their primary reason for retweeting her message. One user wrote, “It was humorous that a woman

would gladly be ‘patted’ down to make a flight. I’m all about humor.”

Impression of author

Many of the users who retweeted lupeiasco claimed to be dedicated fans of Lupe Fiasco and his music. Lupe’s reputation for using “very clever” language in his rap music made one user say, “He’s a remarkable individual.” For fans, retweeting is a way to show support. One user said, “I am a huge lupe fiasco fan... I’ve retweeted him numerous times.” The same user recalled retweeting lupeiasco in July when he posted a link to his new Japanese Cartoon album. The user said he retweeted the message “out of appreciation of lupe’s music.” Another self-described “serious fan” of lupeiasco said she had retweeted him several times in the past. She retweeted him when he released his most recent album saying, “I know he had to go through a lot to make it happen.” Another user who also retweeted lupeiasco’s recent album said he did so “because I want others to buy and support his music.” This user also happens to be a rapper and said Lupe Fiasco is “one of my favorite artists.”

The users who retweeted kateesackhoff also claimed to be fans of the actress. One user started following her because he loves science fiction and in particular, the television show *Battlestar Galactica*. He recalls having retweeting a message of hers in the past to help “raise awareness” of a charity ride she was participating in.

Sharing

All respondents were conscious that by retweeting, they were sharing the message with their followers. For many of the respondents, they expected the message to cause the same reaction among their followers. In the case of lupefiasco's tweet, several users wanted to share the humor with their followers. One user said, "I wanted my followers to read it, too" and another had the same sentiment, "I retweeted it to share with my followers that may not have seen it to make them laugh, too."

Some respondents seemed to have a narrower set of users in mind when they retweet. One user retweeted lupefiasco's message "just for those who like 2 laugh." Another set of respondents had a difficult time articulating specific people with whom they wanted to share the message. One user said, "I knew a lot of my personal friends would find it funny because we all share the same sense of humor... but I didn't actually have a specific person in mind when I retweeted it." Another user said, "I just wanted other people who have similar opinions to be able to laugh at what I laugh at."

A few of the retweeters had a sense of performing for their followers. One user wrote, "I kind of see it as my duty to somewhat entertain the people who thought enough of it to follow me."

For one user, it was being a fan of Lupe Fiasco and wanting to share his fanaticism with others that encouraged him to retweet. He said, "I RT'd... for my followers to see lupe's humor!"

Indifference to National Opt-Out Day

Despite the volume of activity on Twitter about TSA and National Opt-Out Day,

very few of the respondents had any strong feelings about the changes in airport security. Users were frank about their indifference, saying “Can’t give a judgment on [TSA]... they have a job they have to execute, like anyone else ya know” and “don’t know or care about it honestly.” Another user wrote decisively, “TSA doesn’t affect me because I don’t fly at all.” Despite not caring about TSA, the same user said he retweeted “because [he] thought it would upset some of the overly opinionated assholes on twitter.”

The few who had any opinion about TSA or National Opt-Out Day did not express feeling part of any social movement. One user felt lupefiasco’s tweet showed how the issue had been exaggerated: “I feel that anything that needs to be done to ensure that everyone is safe should be done, whether people feel uncomfortable or not. His tweet just kind of reinforced the idea in my head that people sometimes make too big a deal out of things so it’s nice to laugh about that.”

It is ironic that the one user who expressed a strong opinion about the TSA controversy does not live in the United States and admitted it was difficult to directly experience the effects of increased airport security. That user said, “The TSA controversy shocks me! I think it’s a mad invasion of ppl’s privacy and I’m happy it’s not happenin in australia.”

Discussion

This study faced a few limitations. First, it was a small-scale study that may not have captured the full extent of the TSA and National Opt-Out Day protest. The terms #tsa and #nationaloptoutday were both Trending Topics on Twitter at various points,

creating close to 4,000 posts an hour by some accounts (Carr, 2010). Thus, my sample of 1,369 users and my interviews with 10 users represents a very small fraction of the total volume of tweets on the topic. Furthermore, my dataset was completely dependent on the Twitter Search API whose algorithm for releasing data is proprietary. It is not clear if the API randomly selected the user data it shared with me or if its algorithm contains some selection bias, which influenced the representativeness of my sample. Finally, more sophisticated calculations would help to establish the statistical significance of the results.

Second, National Opt-Out Day did not materialize into the widespread social movement that the news media, Twitterverse, blogosphere, and I expected it would be. By most accounts, the protest did not really happen. Though many travelers fervently complained online about the new body scanners and pat-down procedures, it seems few actually willingly dealt with the added hassle of getting pat-downs instead of body scans in the name of the protest (“What do air travelers,” 2010; Carr, 2010). For the organizers of National Opt-Out Day, however, the widespread media attention given to the topic of airport security was exactly what they sought. On their website, the organizers wrote, “With near daily headlines on the front page of newspapers and debates on television and radio news, the mission was accomplished – our voice was heard” (“National Opt-Out Day,” 2010). My interviews confirmed that Twitter users were not necessarily posting and retweeting about TSA because they wished to support a social movement, but more motivated to pass on interesting and humorous content to their followers. This finding emphasizes the value of qualitative interview work—a high volume of discussion on Twitter does not necessarily imply there is mobilization or organization of a social movement.

Despite these shortcomings, this study brings to light several new avenues for future research. The distinction between strong and weak ties offers a useful, but only preliminary, framework for analyzing a network of people. It does not tell the complete story of the social structure. There may be a third category, which I will call “no ties” to characterize the social structure of Twitter users. It is important to note that in this analysis, having no ties simply means a user did not publicly articulate a “follow” nor mentioned any other users in the sample and at the point in time when the data was collected. It is possible that the small sample size may have limited the view of those users’ Twitter connections and that those users might have offline, social connections which are not visible on Twitter. Further research is needed to determine to what extent those users are truly isolated from others and what significance (if any) their isolation has on the diffusion of information on Twitter and on participation in social movements.

The high prevalence of “mentions, no follow” connections offers another area of further inquiry. One explanation their high prevalence is that many tweets referred to users who were outside of the collected sample. However, it is also important to consider if these connections should be classified as strong, weak or some other category of social tie. User interviews demonstrate the uncertain nature of the “mentions, no follow” connections. On one hand, user A might mention user B in a message, but it represents a singular event and does not imply any interest in referencing or communicating with user B in the future. On the other hand, user A might mention user B, representing a first contact event that inspires the user A to deepen the interaction by following user B. One user who retweeted *lupefiasco* admitted to following him in the past, but stopped because “his tweets were starting to get pretty boring.” However, his tweet on TSA inspired her to

follow him again. More research is needed to better characterize this type of connection.

My research also identifies the need to define subcategories of strong and weak ties. While the strong-weak tie distinction demonstrates that not all ties are equal, it is also true that not all strong ties and not all weak ties are the same. As defined in this study, weak ties were shown to be very prevalent among Twitter users, however, some weak ties seem to have exerted more influence than others. In particular, weak ties to celebrities played a critical role in getting messages about TSA to spread across Twitter. This finding calls into question the popular belief that Twitter is a tool that levels the playing field, allowing any user to build a reputation on his/her own merit. Researchers have explored the role of celebrities as opinion leaders and influencers in advertising, political campaigning and consumerism. Some sociologists believe very popular individuals may act as “high centers” and play the role of “community builders and information sources” on Twitter (Gruzd, Wellman & Takhteyev, 2010). The celebrities in this study, however, did not necessarily have the widespread popularity and name recognition that typically makes celebrities influential. Further research is needed to define who a celebrity is (on Twitter, it may be defined by the number of followers s/he has, by perceived expertise on certain topic or by reputation) and to what extent celebrities can promote or discourage participation in a social movement.

User interviews also revealed the importance of message content in motivating a retweet. While most users referenced both the message content and the original author as the reasons they retweeted, it may be valuable to determine which of the two factors plays a stronger role in getting a message to spread on Twitter.

And finally, I have argued that online communication is socially mediated and as

a consequence, people have more specialized relationships. Thus, the social ties in this sample represent only a part of the users' lives. For many users, the information in this sample was more representative of their interests in a popular rapper and actress than of their attitudes towards airport security. It is important that future research does not to define online communication simply in terms of the technologies used to send and receive messages, but in terms of the specialized communication it facilitates. The current body of scholarly research does not adequately distinguish online communication from other channels of communication in this way.

Conclusion

This paper demonstrates the importance of social connections in the diffusion of information on Twitter. Though the controversy around TSA and National Opt-Out Day did not evolve into a widespread social movement, I was able to use a combination of quantitative network analysis and qualitative user interviews to demonstrate the importance of weak ties in the diffusion of information. My results also raised several areas for further research in network analysis, communication, and sociology.

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