Purposive Sampling on Twitter: A Case Study

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Abstract

Recruiting populations for research is problematic and utilizing online social network tools may facilitate the recruitment process. This research examines recruitment through Twitter’s @reply mechanism and compares the results to other survey recruitment methods. Four methods were used to recruit survey takers to a survey about social networking sites; Twitter recruitment, Facebook recruitment for a pre-test, self-selected survey takers, and a retweet by an influential Twitter user. A total of 7,327 recruitment tweets were sent to Twitter users, 2,865 users started the survey and 1,544 users completed it which yielded an overall completion rate of 21.3 percent. The research presents the techniques used to make recruitment through Twitter successful. These results indicate that recruitment through online social network sites like Twitter is a viable recruitment method and may be helpful to understand emerging Internet-based phenomena.

1. Introduction

Surveys are a useful and efficient tool used to learn about people’s opinions and behaviors [7]. Surveys have changed over the years in how they are conducted and the modes that are available to researchers. Surveys can be conducted over the phone, mail, personal interview, and over the Internet. Survey recruitment and distribution techniques have changed over the last two decades to follow technology and application advancements. This case study outlines the approach of a large survey (N = 1,544) where the recruitment was conducted on Twitter. The approach adapts Dillman et al. [7] to the constraints of Twitter where a survey recruitment message is limited to 140 characters. A comparison is made between four different methods for recruitment to the survey: Twitter-based recruitment, Facebook-based recruitment conducted for a pre-test, a tweet about the survey from an influential Twitter user (9,000 followers) and self-selected survey takers who took the survey with no intervention from the recruiters.

Recruitment through Twitter may be appropriate for many research questions to gain insight into the behavior of users. There are many modes to recruit survey participants and Twitter may be a viable alternative to other methods. The case study discusses the advantages and disadvantages of using this approach and can inform researchers about the lessons learned from this case study. The case study details how recruitment was conducted for a study about unfriending on Facebook. Recruitment through Twitter will not be a replacement for probability-based sampling techniques but may be used in an exploratory manner to understand emerging phenomena.

2. Literature Review

2.1. Survey methodology

Survey methodology identifies the principles of design, collection, processing and analysis of surveys that are linked to the cost and quality of survey estimates [12]. Technology impacts the way surveys are conducted as new modes become available. Survey modes today include the phone, mail, personal interview, and over the Internet. Dillman et al. [7] discusses several changes to the survey process from the 1960s to present day. Interviewers are less involved today than in the past and that has lowered the sense of trust that survey respondents have in the survey because of the possibility that a survey is fake or potentially harmful. Less personal attention is given to survey respondents today because a common mode to attain respondents is through e-mail. Potential survey respondents have more control over access to their presence; technologies such as caller ID, call blocking, e-mail filters and spam filters makes it increasingly difficult to contact respondents. Respondents can exercise more control over the interaction because more disclosures are made to respondents and the mode in which surveys are conducted has changed to more technology-based modes (phone, mail, Internet vs. interview) and respondents can stop the survey process by hanging up the phone, not responding to mail or simply closing a web-browser. Response rates to in-
Sampling techniques have impacts on a variety of attributes beyond the representativeness of the sample including cost, time and accessibility considerations [5, 23]. *Purposive* sampling (e.g. judgment and quota) is an approach where members conform to certain criteria for selection. In judgment sampling a researcher may only want to survey those who meet a certain criteria. Judgment sampling is also appropriate in early stages of research where selection is made based on screening criteria. *Quota* sampling is used to improve the representativeness of a sample to ensure that the relevant characteristics are present in sufficient quantities [5, 23]. If the sample has the same distribution as the known population then it is likely to be representative of the study population. Quota sampling is often used in opinion research because it often has reduced costs and requires less time than probability sampling [5, 23]. Often researchers must make decisions from a set of imperfect options about how conduct their research based on the pros and cons of the options [12]. Researchers should choose the sampling technique they employ based on the subject population, the fit with their research constraints (time, money, etc.) the stage (confirmatory or exploratory) at which their research is being conducted and the intended use of the results.

2.2. Data Collection Modes

Traditional approaches to survey subjects include mailing paper questionnaires to subjects, calling subjects on the telephone and sending interviewers to a person’s home, office or gathering place to administer the survey face-to-face [12]. Computer-based surveys have increased in usage and evolved from sending computer discs in the mail, to email and web-based methods over time [7, 12, 6]. The various modes have different degrees of interview involvement, interaction with the respondent, privacy, media richness, social presence and technology use [12]. Andrews et al. [2] examined methods of posting to online communities to survey hard-to-involve Internet users. One of the reasons for increasing the use of technology for survey data collection is that past research in the differences between personal interviews and telephone interviews for large randomly selected survey respondents has shown little difference in results [12]. The choices involve trade-offs and compromises between the various qualities and researchers need to determine which qualities they want and choose an appropriate method for their purposes [12].

2.3. Techniques to Increase Response Rates

Researchers have attempted to understand the general psychology of survey respondents to determine why some will take a survey. Subjects can be motivated to complete a survey by both extrinsic and intrinsic factors. Market-based surveys sometimes focus on economic incentives for completed surveys; research into incentives has shown that often small token cash incentives given in advance are more likely to induce a response compared to more substantial payments post-completion [7]. Dillman et al. [7] use social exchange theory as a framework to increase the likelihood of a response. In social exchange theory, a person’s voluntary actions (*costs*) are motivated by the return these actions are expected to bring from others (*rewards*) [3]. A social exchange requires *trust* that the other party will provide the reward in the future, although not necessarily directly to the person.

Dillman et al. [7] provides many techniques that researchers can use to increase the response rate to a survey. Dillman et al. believes that researchers should provide information about the survey and how the results will be used to benefit them. Asking for help or advice from the survey respondent can increase participation; it may encourage the person to respond because there is a social tendency to help those in need. Showing *positive regard* toward the respondent can encourage participation e.g. the person’s opinion is important. Support for a group’s values can increase the response rate, e.g. survey respondent may respond more positively to student surveys if the respondent supports education. A well-designed interesting survey can increase response rates and surveys that are developed about salient topics can induce respondents to complete a survey. Providing social validation that others have responded to the survey encourages people to participate e.g. stating “join the hundreds who have already given their opinions” in the request. Establishing trust is important in the social exchange so respondents can believe there is some benefit to completing the survey. One way to increase trust is to show sponsorship from a well-regarded institution, e.g.
2.4. Social Networks

boyd and Ellison [4] defined social network sites based on three system capabilities. The systems: “allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system” [4, p. 211]. After users join a site they are asked to identify others in the network with whom they have an existing relationship. The links that are generated between individuals become visible to others in the local subspace. There are general social network sites (Facebook) and others that are content focused. Social network site LinkedIn is a network of professional contacts and YouTube connects people who are interested in video content [4].

Twitter is a social network microblogging site started in October, 2006 [15]. Twitter is a microblogging site designed around Short Message Service (SMS) and allows users to post messages limited to 140 characters [17, 15]. The terms follow and follower are used when a user subscribes to tweets from that person (i.e. A follows B when A subscribes to tweets from B and A is a follower of B) [15]. The relationship, generally, does not require agreement in the dyad for A to follow B; i.e. B does not need to grant permission to A so that A can follow B under the default privacy settings [19]. A minority of relationships on Twitter are reciprocal (22.1%); in this case reciprocity means that A follows B and B follows A [19]. Twitter users adopt the default privacy settings 99% of the time which makes it more open than many social networks such as Facebook [18].

Researchers have categorized Twitter users using a variety of methods and have developed labels for their classifications. Two research organizations, Krishnamurthy et al. [17] and Java et al. [15] used similar labels to characterize three types of twitter users. Krishnamurthy et al. [17] labeled these types: broadcasters, acquaintances and miscreants or evangelists and Java et al. [15] used similar categories with slightly differently terms: Information Sources, Friends and Information Seeker. Broadcasters/information sources have many more followers than they themselves follow. Acquaintances/friends tend to exhibit reciprocity in the relationship - they respond to the tweets of those that they follow. Miscreants or evangelists/information seekers follow many people and some do so with the hope that they will be followed back. Naaman et al. [22] classified users into two large categories - those who talk about themselves (meformers 80% of Twitter users) and those who inform others (informers - 20% of Twitter users). Meformers talked about themselves in 48% of their tweets and informers provided some level of information in 53% of their tweets.

Twitter research covers a variety of areas. Research interests include classification of Twitter users [17, 15, 22], conversation and collaboration characteristics [13, 14, 22], social network structure [17, 14, 19], the nature of trending topics and the diffusion of information [19], user ranking algorithms [19], politics [11] and privacy concerns [18].

3. Case Study on Twitter Recruitment Process

3.1. Recruitment selection

The general process for recruitment to the survey on Twitter for the case study began with a search for tweets that used specific words, then screened the results for suitability like language and context then sent an @reply to the user to request that the person take a survey. The recruitment process began with screening for certain terms that fit the research project for suitability and language issues. The research was to determine why Facebook users choose to unfriend others. In this case tweets were screened by using three related search terms: unfriend, unfriending and defriend. The three terms were used because there is not a common standard for unfriending and there are geographical differences for the preferred term. For example, In the United States unfriend is more common where in Britain defriend is more common. Both terms have the same meaning - The New Oxford American Dictionary1 defines the word as:

unfriend – verb – To remove someone as a ‘friend’ on a social networking site such as Facebook.

Once the set of relevant tweets were collected they were screened for additional attributes. The survey was written in English so only tweets written in English were sent requests. Many languages borrow the terms unfriend, unfriending and defriend into their own language and Twitter users who wrote in different languages were not invited to the survey. Additional screening was completed at the survey site itself to determine whether the person was 18 years old or older and whether they had a Facebook account.

Tweets were screened to determine whether a person was talking about unfriending a person not a TV show, a U.S. State, a politician, a celebrity, etc. Tweets

would often indicate the Twitter user was not discussing unfriending a person but would state, “I am going to unfriend American Idol,” or “I am going to unfriend the state of Arizona.” Twitter users who made jokes about unfriending were less likely to be recruited - but it depended on the context of the tweet. Generally speaking, people were recruited with more inclusion than less but it appeared unhelpful to recruit those who were not talking about a specific person. During the survey a tweet that was retweeted hundreds of times stated, “Asking me to friend your dog is the same as asking me to unfriend you.” These retweets were not included in the sample because they did not appear to be personal enough that the person was talking about unfriending a specific person and represented more of a general sentiment about unfriending and the nature of friend’s request.

A tweet was sent to the person’s Twitter account using the @reply mechanism after the tweets were screened for inclusion. An @reply allows a message to be sent from one user to a specific user (or set of users) through Twitter similar to the way e-mail sends messages to recipients. Twitter users can see who specifically sent them a message and the contents of the message through the Twitter interface and a variety of other services that work with Twitter data (e.g. TweetDeck). See Section 3 for details of the message sent to the user. Twitter has another method to send a person a tweet through the Message interface (previously called Direct Message) and the message is private and can only be seen by the recipient. Messages can only be sent to people who are followers of the person; i.e. A can send B a message if B follows A. Survey respondents did not have a previous relationship with the researcher, were not followers of the research Twitter account and thus the Message facility could not be used. All tweets for recruitment to the survey were sent through the @reply mechanism.

The research did not attempt to identify Twitter accounts who had large numbers of followers and ask those users to either tweet about the survey or retweet the survey link sent to them. There was no attempt to screen accounts based on the number of followers, number of accounts that the person was following, tweets sent, or measures of social influence (e.g. Klout.com). Some people who received the recruitment tweet would retweet it on their own volition. Occasionally a person would ask if it was acceptable to retweet the recruitment tweet or write their own tweet about the survey. The person was told that they could retweet the link to the survey if they felt it was appropriate. When Twitter users asked whether they could or should retweet or post about the survey permission was granted. This was relatively rare < 1% of people retweeted the survey; 63 people retweeted the survey recruitment sent to them out of 7,327 recruitment tweets. Thirty nine people decided to send their own tweet (the users did not use the retweet mechanism provided by Twitter) to tell their followers that a survey was being conducted about the topic and posted the link to the survey.

It is difficult to know the exact effect that others had on recruiting people to the survey. One influential person (Klout.com score of 67 - Klout scores range from 1 to 100) with approximately 9,000 Twitter followers and whose focus is on social media retweeted the survey link and the survey site was monitored. Approximately 35 people started the survey based on the retweet and 19 people completed the survey (about 54.3%) close to the average of the survey through the @reply mechanism (54.2%). But overall a very small percentage of this person’s Twitter followers came to the survey by the best approximation; approximately 0.4% of this influential person’s Twitter followers came to the survey. The survey site was monitored for a two days to see if there was an uptick in the number of people coming to the survey and the effect on completion rate but the peak of incoming surveys occurred within five hours of the influential person’s tweet. In other words, there was a short-term increase in survey users who completed the survey (19) but it appears unlikely that one person’s tweet is likely to have a long-term increase in survey recruitment.

3.2. Selecting Twitter for Recruitment

Twitter was used to recruit survey participants for several reasons: Twitter has a large user population where the majority of users have publicly accessible messages, Twitter users had a good fit with research (social network sites), it is a simple process to contact a person on Twitter through the @reply mechanism, and the tweets can be screened for recruitment purposes. Of those who came to the survey from the recruitment tweet only 1.3% said that they did not have a Facebook account so the community was actively engaged in the social network site under investigation. Twitter acts as a realtime tool where conversations between users can occur fluidly. The recruitment tweet to the survey was always sent using the @reply mechanism that Twitter supports so the user could see that the recruitment tweet was made because of a specific message and identify that message if needed. When users sent a question via Twitter about the recruitment the researcher could promptly reply. This allowed the users to perceive that the recruitment was not mass spam but that the researchers targeted individuals for recruitment based on their specific tweet.

The researcher screened tweets prior to the start
of the survey to determine whether Twitter would be suitable for recruitment. The Twitter community discussed the topic of interest, unfriending, often enough to provide a viable sample. There were, on average, 48 recruitment tweets sent per day to Twitter users after the screening process. Of the 48 recruitment tweets, on average, 19 survey respondents started the survey and, on average, 10 people completed the survey. A minority of the tweets sent per day were non-recruitment in nature, answering questions about the survey or the research; on average, 18 tweets were sent per day outside of recruitment. The recruitment tweet was sent in a single tweet of 140 characters and provided enough information to the Twitter user to take the survey. It was not considered unduly burdensome by the researcher or the Institutional Review Board (IRB) to send a single request to the Twitter user to take a survey. While the total number of recruitment tweets may be perceived as spam based on the frequency of similar messages to users, the account was never flagged by Twitter as a spam account. Replies were made to those who had questions about the survey and the recruitment. Many people over the course of the study asked whether there were real researchers behind the account to ascertain the veracity of the survey. A quick reply would be made to indicate that the recruitment was sincere and the research was genuine. All tweets were screened and replied to by a human and no automated messages were sent for recruitment.

3.3. Twitter Profile

Twitter profiles have several components that allow Twitter users to identify the account. A Twitter profile can show the following, depending on whether the Twitter user filled in the information: the Twitter account name, a name of the account owner, a profile picture, geographic location, a brief description about the person or account, a URL link, an articulated list of followers, accounts the user is following, lists that the account appears on and tweets sent. A snapshot of the profile on the last day of recruitment is shown in Figure 1. The account for this study was generated specifically for recruiting to the survey so there was not an extensive list of followers or those following the research account. The recruitment account followed one user to indicate that the account was genuine and no accounts were following the recruitment account at the start of the survey. Other Twitter accounts were added to the followers list so users could message the recruitment account privately. Recruits would ask for more direct and private access to the investigator and it was granted at the recruit’s request. The account name was chosen with an intention revealing name - UnfriendStudy - so that users might perceive the intention of the account by its name alone. The account listed the real name of the researcher, along with the university program in which he is enrolled and the university affiliation (Information Systems PhD student, University name) in the description field. The geographic location was also given to add authenticity (city, state). The URL link in the profile was a link to the survey.

The picture associated with the Twitter account was selected based on the input of three judges. The picture is one of the few pieces of the profile that show up next to the tweet message (unlike the list of followers, location, etc.). Three candid pictures were shown to three judges and they were asked to pick the picture from which they would be likely to take an academic survey. They were asked to pick a picture that was friendly, academic and appeared sincere. All three judges chose the same picture and that was the picture used for the account.

3.4. Purposive Sampling & Timing

The sampling process was intended to locate people who had experience with the particular event under investigation. Miller and Vega [21], found that just over half of general population (56%) of Facebook users had unfriended someone using a probability sample. The research was being conducted with a purposive sampling recruitment technique to find people who had unfriended others on Facebook. Of the survey subjects who came to the survey 89% had said they could identify a specific person that they unfriended and 64% said they could remember a specific person who unfriended them. By searching and screening tweets on Twitter, the recruitment was able to identify a much higher percentage (89% vs. 56%) of users who had unfriended someone and was able to reduce the amount of time recruiting people to the survey who could not provide meaningful input for the research. The recruitment was developed to find those who unfriended or were unfriended - not general Facebook users so the researchers would not waste survey respondent’s time and have responses that were meaningful to the research.

It is also helpful to recruit people to the survey who had a recent experience with the matter for two important factors: (1) Those who experienced an event more recently may be able to provide more accurate answers because the event occurred recently. (2) Those had recently experienced an event may be more willing to take a survey about the topic because they may still be thinking about the topic. Experiences need to be reported immediately after they have happened in order to be remembered [7]. This survey was self-administered
which may provide barriers to motivation and completion [7]. Without the proper motivation survey respondents may ignore instructions, read questions carelessly, provide incomplete answers and simply abandon the survey. When the survey was pretested under observation some recruits had a difficult time remembering a specific person who they unfriended because the event was not recent even though they could remember whether they had unfriended someone. There were also survey respondents in the pretest who were uninterested in the topic in general because they did not hold any particular feeling about the topic. The recruits to the survey through Twitter were much more engaged in the topic of the survey and asked questions about the survey, the findings, and many offered their “thanks” and “good luck” to the researcher. The survey is 15 pages in length and took, on average, approximately 15 minutes to complete; it is helpful to find people who are interested in the topic to take longer surveys to increase completion rates.

3.5. Frequency of recruitment

Tweets would be screened typically every two to three hours from the hours of 7:00 AM to 11:00 PM for recruitment purposes. Human involvement was chosen because the recruitment screening process was complex and there are particular timing issues involved. The process was relatively straightforward, search for key words, screen for language, and for appropriateness and send an @reply to the tweet, then respond to any @replies sent to the recruitment Twitter account. Since the screening was done manually it meant that the researcher would monitor the Twitter account so that as messages were received they could be responded to promptly. This allowed more interactivity with the survey recruits to answer questions that the survey respondent may have about the survey. Answering the @replies sent to the research Twitter account after recruitment tweets were sent meant that individual tweets were at the top of Twitter account. Having unique tweets at the top of the account meant that any survey recruit who came to the research profile to see who is associated with the account would see individualized messages were sent by a person and not an automated system.

3.6. Recruit

Recruitment Tweet: Tweets were screened for selection to the survey and then an @reply was sent in response to the tweet. Below is a sample tweet that was picked at random and exemplifies a typical tweet seen by the researcher:

Screened tweet from Twitter user X sent to Twitter user Y:

@Y You can always defriend on Facebook, no? You should always have the option of correcting your mistakes. :P

Recruitment tweet from the research Twitter account UnfriendStudy to Twitter user X:

@X I saw your tweet about unfriending. I have a survey: http://www.surveymonkey.com/s/xxxxxxx Your input very important. PhD stdnt

The recruitment tweet was designed to follow the methodology of Dillman et al. [7] as much as possible within the constraints of Twitter. Dillman et al. [7] states that emails for survey recruitment should include the following sections: university sponsorship logo, header, etc., informative subject heading, current date, appeal for help, statement as to why the survey respondent was selected, usefulness of survey, directions on how to access survey, clickable link, individualized ID (for tracking),
statement of confidentiality and voluntary input, contact information about survey creator, expression of thanks, and indicate the survey respondent’s importance.

The recruitment tweet is limited to 140 characters so could only include a portion of the above information. Dillman et al. instructs survey researchers to keep email contacts for recruitment short and to the point to increase the likelihood that the request is completely read; this was easy to do in Twitter, given the limitations. See Figure 2 for details.

If the user clicked on the link then the user was taken to the survey site which included a cover letter that described the survey in detail. The survey asked an additional two screening questions to determine eligibility. The survey was only open to Facebook users who were 18 years old or over. No monetary incentives were provided to the survey respondents for completing the survey. Those who asked for the results of the research were told that the Twitter account would post a link to the research results if they were accepted for publication. The Twitter users could click on the profile information of the recruitment tweet and view the Twitter profile page to determine the veracity of the account and survey - see Section 3. Some users asked how they could determine whether the URL link was safe - and how could they determine that independently. The research account did not have existing relationships with those who were recruited to the survey so independent verification can be helpful. The Twitter user would receive a reply informing them that they could perform an Internet search on “survey” and SurveyMonkey.com is one of the top links shown. Twitter users were also told in the reply that the research is, in fact, genuine.

Below is a sample interaction generated during the survey process where a recruitment tweet was sent and a rebuttal reply was received. Ultimately, this conversation successfully recruited the person to the survey (although unverified because the survey was anonymous).

@j I saw your tweet about unfriending. I have a survey: http://www.surveymonkey.com/s/unfriend-t Your input very important. PhD student
@UnfriendStudy I get paid to do surveys! :P
@j Yeah, I have no resources to pay you to take a survey. I do value your opinion.
@UnfriendStudy U are a good sales man! U just won my vote, mate! Brilliant!
@j What can I say, I have constraints, many people take the survey, I’m relying on people’s goodwill toward researchers.
@UnfriendStudy just completed it. It was very insightful!
@j Thanks for taking the survey. I truly appreciate your help. I rely on people like you to take it to get insight about the issue.

Not all interactions with Twitter users went well; approximately nine people who were sent recruitment tweets perceived that the recruitment was spam and inappropriate and sent a reply to the tweet stating their opinion. Individual replies were made to the Twitter user’s objection tweet in defense of the technique; however, the researcher was unable to convince these nine people that the recruitment technique was appropriate. The nine people felt inconvenienced by the recruitment tweet were a minority - only nine people out of 7,327 recruitment tweets sent (less than 0.15% of those recruited) voiced objections about the survey recruitment. The person would receive an apology tweet of the form, “I am sorry if I inconvenienced you in any way. Please accept my sincerest apologies.” The Twitter users may have not truly accepted the researcher’s apologies and may have doubted the researcher’s sincerity but they did not object to the apology tweet.

Results: Four different recruitment techniques were used to recruit subjects for the study: Facebook recruitment during the survey pre-test, Twitter recruitment for the main research, through a retweet by an influential Twitter user and Internet users who found the survey through no direct recruitment intervention. A summary of the results can be found in Table 1. The study used a convenience sample for the pre-test of the survey of Facebook participants by posting to five different Facebook profiles and asking friends to participate in the research. The estimated reach of the Facebook recruitment is 1,305 friends based on the number of friends the profiles had at the time the recruitment post was made. It is not known how many Facebook friends actually saw the recruitment posts. The Twitter recruitment was the main method for recruitment to the survey and was conducted between April 17th - September 15, 2010 for
151 total days. 9,901 tweets were sent from the Twitter account during that period, of which 7,327 were related to recruitment (73.1% of the tweets were focused on recruitment). The remaining tweets (2,574) were focused on answering questions about the survey, responding to tweets of thanks, questions about the nature of the research (was it real), etc. Many Twitter users asked whether this research was real and did not want to take the survey that they did not believe would help generate real results. A response to the users would be made stating that there is a real PhD student in information systems conducting the research. The retweet was sent independently by an influential person with approximately 9,000 followers and a small portion of followers took the survey. But those who did come had about the same breakoff rate as those who were individually recruited by the researcher.

Self-selected survey takers were users who took the survey on their own with no direct contact between the researchers and the participants. Twitter recruitment ended on September 15, 2010 and a press-release announcing the results was posted by the university on October 5, 2010 and subsequent media attention to the study was garnered. Web searches on “unfriending” or the researcher’s name could lead a person to the survey. It is not entirely clear how self-selected responders came to the survey but 330 people came after September 15th. These self-selected survey takers had a very high breakoff rate - 93% of the survey takers did not complete the survey.

The research compared the known distribution of the Facebook population and compared it to the population in the completed surveys so adjustments could be made in the subsequent analysis [23, 12] - Table 2. The survey distribution skewed to a younger population than the general Facebook population and had more female respondents compared to the known distribution. The analysis used MANCOVA with age and gender as covariates to remove the effect of the variables so age and gender do not have effects on the dependent variable under analysis. If other statistical techniques were required (e.g. multiple regression, structural equation modeling, etc.) covariates can be used to make adjustments if the known distribution is different from the sample population. The U.S. vs. non-U.S. population results are significantly different from the known population of Facebook. The non-U.S. population were recruited from Tweets that used English so the distribution will be different than the Facebook population in general.

### Table 1. Comparison of four recruitment methods

<table>
<thead>
<tr>
<th>Recruitment</th>
<th>Twitter</th>
<th>Facebook</th>
<th>Self-selected survey takers</th>
<th>RT by influential person</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7,327</td>
<td>1,305</td>
<td>330</td>
<td>9,000</td>
</tr>
<tr>
<td>Surveys started</td>
<td>2,865</td>
<td>135</td>
<td>330</td>
<td>35</td>
</tr>
<tr>
<td>Surveys completed</td>
<td>1,544</td>
<td>91</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Completion rate</td>
<td>21.3%</td>
<td>7.0%</td>
<td>7.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Start rate</td>
<td>39.6%</td>
<td>10.3%</td>
<td>100.0%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Completion by those who started</td>
<td>53.9%</td>
<td>67.4%</td>
<td>7.0%</td>
<td>54.3%</td>
</tr>
<tr>
<td>Breakoff rate</td>
<td>46.1%</td>
<td>32.6%</td>
<td>93%</td>
<td>45.7%</td>
</tr>
<tr>
<td># days</td>
<td>151</td>
<td>85</td>
<td>193</td>
<td>1</td>
</tr>
<tr>
<td>Recruitment tweets sent per day</td>
<td>47.9</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Non-recruitment tweets sent per day</td>
<td>17.6</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Surveys started per day</td>
<td>19.0</td>
<td>1.6</td>
<td>1.7</td>
<td>35</td>
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<tr>
<td>Surveys completed per day</td>
<td>10.2</td>
<td>1.1</td>
<td>0.1</td>
<td>19</td>
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</tbody>
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### Table 2. Comparison of known distributions to sample

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Valid %</th>
<th>US Facebook Users %</th>
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</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-17</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>18-25</td>
<td>343</td>
<td>22.2</td>
<td>29</td>
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<tr>
<td>26-34</td>
<td>663</td>
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<td>7.3</td>
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</tr>
<tr>
<td>&gt;55</td>
<td>28</td>
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<tr>
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<td>30.4</td>
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4. Limitations

Recruiting survey respondents through Twitter was highly effective for the research conducted but has several limitations. The survey was conducted with pur- posive sampling which is a non-probabilty sampling technique. The purpose of the recruitment was to find those who had unfriended someone or been unfriended by someone on the social network site Facebook. There was no subjective measure in the sample - the researchers did not personally know the Twitter users and Twitter users were recruited based on objective screening criteria not other profile measures. Probability based sampling techniques mean that there is a nonzero chance that a subject will be recruited to the sample - that is not the case with purposive sampling [5].

There can be coverage errors - the non-observational gap between the target population and the sampling frame with recruiting from Twitter for populations outside of Twitter [12, 7]. The sample found that 97.1% of the people recruited from Twitter had a Facebook account but it is unknown how many Facebook users do not have a Twitter account so estimates about coverage are difficult to ascertain. The survey also found that 88.7% of people recruited had unfriended someone on Facebook where probability sampling techniques by the Pew Internet Research group found that 56% of social network users unfriended someone [20]. The survey recruitment was based on a tweet about unfriending so it is expected that the two statistics (88.7% vs. 56%) are different. The analysis did not attempt to generalize the survey results about the percentage of Facebook users who unfriend to the general population. The analysis was conducted only on survey respondents who did unfriend so the analysis not rely on the this general population statistic. When the sampling frame misses the target population partially or entirely the researcher can - (1) redefine the target population to fit the frame better, or (2) admit the possibility of coverage error in statistics describing the original population [12]. In the survey conducted, the survey population are Twitter users and the sampling frame is Twitter who tweeted about unfriending, defriending, or unfriend, and met screening criteria (language, etc.). There will be coverage issues in the sample; however, due to the exploratory nature of the survey and a careful description of the population this type of compromise may be justified.

5. Conclusions

Recruitment through social network sites can be helpful in understanding emerging technology and social norms. Non-probability samples may be very helpful to under-
Recruiting survey participants on Twitter is another method to gain insight into the behavior of users. There are many modes in which to conduct survey research like phone, email, mail, etc. and recruitment through Twitter may be a viable alternative to these more established approaches. There are some advantages to recruiting on Twitter like finding participants who have experienced a particular event that is under investigation. As time continues there will be better ways to determine how well the sample population fits the population under study, just as there has been a transformation from in-person interviews to mailed surveys, to telephone surveys to email-based surveys today.

References


