

Between a Rock and a Cell Phone: Communication and Information Technology Use during the 2011 Egyptian Uprising

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ABSTRACT

Many observers heralded the use of social media during recent political uprisings in the Middle East even dubbing Iran's post election protests a "Twitter Revolution". We seek to put into perspective the use of social media in Egypt during the mass political demonstrations in 2011. We draw on innovation diffusion theory to argue that these media could have had an impact beyond their low adoption rates due to other factors related to demographics and social networks. We supplement our social media data analysis with survey data we collected in June 2011 from an opportunity sample of Egyptian youth. We conclude that in addition to the contextual factors noted above, the individuals within Egypt who used Twitter during the uprising have the characteristics of opinion leaders. These findings contribute to knowledge regarding the role of opinion leaders and social media, especially Twitter, during violent political demonstrations.

Keywords

social media, mobile phones, Middle East, social networks, innovation diffusion.

THE ROLE OF SOCIAL MEDIA IN POLITICAL CRISES

Protesters took to the streets with "a rock in one hand, a cell phone in the other," according to Rochdi Horchani – a relative of Mohamed Bouazizi, the 26-year-old Tunisian street vendor who set himself on fire in December 2010 to protest police harassment and corruption (Ryan, 2011). Bouazizi's death in early January 2011 as a result of his burns triggered riots leading to the downfall in mid-January of the 23-year reign of Tunisia's President Ben Ali. A wave of protests against Middle East authoritarian governments followed in Egypt, Libya, Bahrain, Algeria, and Syria, and came to be dubbed the 'Arab Spring'. Starting in July 2010, prior to the uprising, WikiLeaks began to release confidential State Department cables indicating that the US did not much admire the authoritarian leaders in many of these countries – a development played out via a set of online documents that certainly may have contributed to Arabs' confidence in protesting. In addition, much credit has been given to the role played by social media used by citizens to share with each other and with international media the news of what was happening in the streets.

On June 13, 2009, the day the Iranian government announced controversial results in Iran's June 12, 2009 Presidential elections, hundreds of thousands of protesters came to Azadi (Freedom) Square in Tehran. In the protests that continued despite a number of deaths and injuries, the Western media declared this a 'Twitter Revolution' (Grossman, 2009; Schleifer, 2009). The role of Twitter and other social media in mass political protests has been heralded in the Arab Spring, as well. In Tunisia, Facebook became the medium of choice among social media, because Twitter adoption was very low and the (now former) Ben Ali government blocked

Flickr and YouTube (Lotan, Graeff, Ananny, Gaffney, Pearce and boyd, 2011; Saletan, 2011). In Egypt Facebook was also more widely adopted than Twitter, but Twitter is more resilient to Internet blockage by government. That is, Twitter can still be used over cell phones, which have a very high adoption rate throughout Egypt, Tunisia and Iran as well as the rest of the Middle East (described below). Egypt is the most populous Arab country with 84.5 million inhabitants in 2010, according to The World Bank (IBRD, 2010). Massive protests of corruption and unemployment over 18 days between January 25 and February 11, 2011 (primarily in the two largest cities, Cairo and Alexandria) led to the end of the 30-year reign of President Hosni Mubarak. To constrain the flow of cell phone communications from areas of Tehran where post-election protests were taking place, e.g., Azadi and Ferdowsi Squares and along Vali Asr Street, the Iranian government appeared to have restricted bandwidth on cell phone towers (Sohrabi-Haghighat and Mansouri, 2010). The authors also heard (through hearsay not verified) that to communicate without depending on the cell towers during demonstrations, people would sometimes pass messages to nearby fellow demonstrators using Bluetooth technology between cell phones. The Egyptian government also restricted cell phone traffic in areas of Cairo (Tahrir Square) and Alexandria during demonstrations, and cut off Internet access completely (Singel, 2011) for several days in January 2011. This type of government restriction of traffic on cell towers was also reported in the mass street protests over disputed elections in Belarus (Morozov, 2011; Zuckerman, 2009).

In this paper we seek to put the use of social media, especially the micro-blogging service Twitter, into the larger perspective of diverse information sources during the political uprising in Egypt that led to the resignation and departure of President Mubarak on February 11, 2011. We compare social media use in Egypt with that of Tunisia (leading to the ouster of the 23-year reign of President Ben Ali) and of Iran (a non-Arab Middle Eastern country) during contested presidential elections in June 2009. We see similar technology adoption, demographic and social patterns in Egypt, Iran, and Tunisia where the Internet, cell phones, and most recently social media have been used to contribute to political uprisings (Kavanaugh, 1994, 1998, 1999, 2004). We use the theoretical framework of diffusion of innovation (Rogers, 1986, 1995) to argue in this paper that while adoption of social media, such as social networking sites (SNS) and Twitter, are generally very low in the region, they could have had an impact beyond their numbers due to a combination of related factors. These factors specifically are: concentration of Internet and especially social media adoption among young people, a disproportionately large number of young adults in the population, and the frequent sharing of information among social network members. While sharing information is fundamental to social networks (Stanley, 2005; Wellman and Berkowitz, 1988), social ties in Middle East societies tend to be strong and communication among members is frequent (Bayat, 2011). We collected and analyzed SNS and Twitter data in Egypt and Tunisia, and supplemented these with survey data we collected from an opportunity sample of young adults (specifically, public and private university students) in Alexandria, Egypt. We also draw on our own observations as eyewitnesses of demonstrations in Iran in 2009 and Egypt in 2011.

We consider the use of social media during potentially violent political uprisings similar to their use during natural and man-made disasters (Kavanaugh, Yang, Sheetz, Li and Fox, 2011). That is, people use social network systems, twitter and blogs to communicate situation awareness and other information during disaster conditions or conditions of social convergence, such as mass rallies and political demonstrations (Hughes, Palen, Sutton, Liu and Vieweg, 2008; Hughes and Palen, 2009). This is part of a growing research area known as *crisis informatics*, so named by Hagar (Hagar, 2007) and extended by Palen, Hughes, and colleagues (Hughes, et al., 2008; Palen, Vieweg, Liu and Hughes, 2009; Starbird and Palen, 2011), among others. Crisis informatics pertains to the use of communication channels and messages to coordinate activity and convey information among citizens, rescue workers, government agencies, and others in situations of disaster and of social convergence. The recent literature on crisis informatics includes analyses of information seeking behavior following such disasters as 9/11 (Schneider and Foot, 2004), Hurricane Katrina (James and Rashed, 2006), the Virginia Tech shooting tragedy on April 16, 2007 (Palen, et al., 2009; Sheetz, Kavanaugh, Quek, Kim and Lu, 2010; Vieweg, Palen, Liu, Hughes and Sutton, 2008), the Haiti earthquake, and the Japanese tsunami, among many others. We draw on methods and findings from these and other crisis informatics studies.

Conditions during some mass political uprisings, including those of the Middle East, are crises both for citizens and governments. For citizens, there is potential and actual violence, resulting in fear, injury, or death among participants at the hands of government forces or rival groups (e.g., several hundred deaths were reported from the initial crackdown by pro-Mubarak forces). For governments, there is the threat of instability and sometimes there is actual collapse (as in Egypt and Tunisia, but not Iran). In this paper, we focus on information sharing during the uprisings among the general public as opposed to rescue personnel or government officials.

DEMOGRAPHICS IN EGYPT, TUNISIA, AND IRAN

Young people (aged 15-29) make up the largest proportion of the total population in most of the Middle East (Dhillon and Youssef, 2009). They are about a third of the total population in Egypt (29%) and Iran (35%) (Assaad and Barsoum, 2009; Salehi-Isfahani and Egel, 2009). Young people are often both relatively well educated, as mandatory primary education has led to significant education attainment in the past three decades, and unemployed, as it is difficult for the labor market to absorb the youth bulge (Assaad and Barsoum, 2009). The lack of good job opportunities for young people, together with their large numbers, has contributed to the rising sense of frustration and anti-government sentiment (Dhillon and Youssef, 2009). It has been well established that Egypt, Tunisia, and Iran are characterized, like many countries in the Middle East, as authoritarian, with varying levels of censorship over broadcast media, such as newspapers and TV (Moore and Springborg, 2010; Richards and Waterbury, 2007). While some elections are held at the parliamentary and presidential levels, candidates are carefully vetted and elections have been marked by allegations of fraud.

INFORMATION COMMUNICATION TECHNOLOGY (ICT) ADOPTION IN EGYPT, TUNISIA, AND IRAN

The adoption of information and communication technology (ICT) includes satellite television, private television networks, mobile phones, and the Internet, as well as social media (e.g., Facebook, Twitter). The diffusion of satellite communications (requiring the purchase of a satellite dish) and of privately owned broadcast (over-the-air) networks with Middle East news, talk shows, and political discussion has laid a foundation for rising expectations among citizens, businesses and other organizations (Alterman, 1998). The London-based Middle East Broadcast Corporation introduced Arab news and entertainment programming in 1991. Since 1996, Al-Jazeera TV, based in Qatar, covered Arab news and feature stories, and has expanded to global news and multiple languages (i.e., Arabic, Turkish, Persian, and English). Al-Jazeera has offered programming that is often critical of Middle East regimes and national or regional policies (Ghareeb, 2000). Although banned, satellite dishes in Iran are owned by many in the middle class, a segment of the population that has doubled in the past 15 years (Salehi-Isfahani and Egel, 2009). Internet adoption throughout the Middle East is quite variable; based on 2010 data from the International Telecommunications Union (ITU, 2010), World Internet Stats (<http://www.internetworldstats.com/stats5.htm>), and the OpenNet Initiative (<http://opennet.net>), Internet adoption in Tunisia and Iran were higher than Egypt at 36.8%, 35%, and 26.7%, respectively. Iran's Internet adoption has been growing on average 48% annually over the past 8 years, despite government constraints and censorship. It is helpful to compare these percentages with those for cell phone (2010), Facebook (FB), and Twitter adoption (2011), as shown in Table 1.

Table 1. Internet, Facebook, Twitter and Mobile Phone Adoption (per 100 inhabitants)

	Population (2010)	Internet (2010)	Facebook (FB) (2010)	Twitter (2011)	Cell Phone (2010)
Egypt	84.5 million	26.7%	5.5%	0.15%	87.1%
Tunisia	10.5 million	36.8%	17.6%	0.34%	95%
Iran	73.9 million	35%	0.22%	0.05%	91.3%

The most common SNS in many Middle Eastern states is Facebook (FB), but even FB usage is limited in the region. The highest adoption levels in January 2011 were in the UAE (45%) and Israel (43%), with both Bahrain and Qatar at 34%, according to the FB Statistics portal Socialbakers (<http://socialbakers.com>) and the Dubai School of Government (Mourtada and Salem, 2011). At 17.5%, however, Tunisia is among the next highest (after Lebanon at 23% and Kuwait at 21%). In Egypt, only 5.5% of the population was using FB at the outset of the uprising, and in Iran less than 1% (an estimated 0.22%). The Iranian government has frequently blocked the site for long periods, although many Iranians have been able to use proxy websites to access FB. Changes in FB adoption since the uprising are shown in Table 2 (IBRD, 2010; ITU, 2010; Mourtada and Salem, 2011).

Table 2. Changes in Facebook (FB) Adoption since the Uprising

	FB Adoption (Jan 2011)	FB Adoption (April 2011)	FB Adoption (August 2011)	FB Adoption % growth (Jan-Apr 2011)	FB New Users (Jan-Apr 2011) % total population
Egypt	5.5%	7.7%	10.5%	42%	2.3%
Tunisia	17.6%	22.5%	24.7%	29%	5.1%

Not only do young people (15-29 years old) make up about a third of the population in many countries of the Middle East, including Egypt, Tunisia, and Iran, but young people are also the highest proportion of Internet

users and of social media in particular (Mourtada and Salem, 2011, 2011). Youth make up about 70% of FB users in the Arab region generally, and make up 75% of FB users in Egypt and Tunisia (Mourtada and Salem, 2011). Twitter adoption was very low across the Arab region in 2011, with less than 1% in Tunisia (0.34%), Egypt (0.15%), and Iran (0.05%). A 2009 study by the Web Ecology Project (WEP) analyzed over 2 million twitter posts (tweets) on the Iran elections between June 7 (just before the election) and June 26, 2009 (Beilin, Blake, Cowell, Fisher, Gilbert, Hanson, Hwang and Leavitt, 2009). The WEP analyses include tweets both inside and outside Iran, with the vast majority of tweets being posted from outside Iran. For users inside Iran, it was difficult to browse the web, because the Internet was extremely slow during the weeks leading up to and following the elections. The government restricted Internet services and blocked social websites, including Twitter and FB. Mobile phone adoption throughout the region is much higher across the total population than the Internet and FB. It is close to full adoption in Tunisia (95%), followed by Iran (71%) and Egypt (67%). Lowest are Yemen (35%) and the Palestinian territories (29%). Mobile phone adoption is key to communications in the streets not only for voice and short message systems (SMS), including Twitter, but also for capturing images and video on cell phones, despite blockages and bandwidth restrictions.

Adoption of ICT, like other innovations, is typically led by opinion leaders, i.e., individuals from all social backgrounds who are interested in new ideas, products and information, and are respected by members of their social networks who turn to them for advice (Rogers, 1986). Standard measures of opinion leadership include higher education (even among low socio-economic groups), greater exposure to media, greater talkativeness and sharing of information among social networks. Opinion leaders (also called influentials) play a central role in finding and evaluating information from mass media and other sources, and sharing it actively with people in their social circles (Keller and Berry, 2003). In this way, social networks are essential to innovation diffusion. The essential role played by opinion leaders in innovation diffusion is the basis of the two-step communication flow model (Katz and Lazarsfeld, 1955). Katz and Lazarsfeld specified a model in which communications from mass media (i.e., newspapers, TV, and Internet) are received and evaluated by influentials who then share their interpretation of that information to members of their social networks and sometimes the interested public. Various studies of Twitter have attempted to identify influence and influentials among twitterers on a given topic or domain area (Gomez-Rodriguez, Leskovec and Krause, 2010; Mustafaraj, Finn, Whitlock and Metaxas, 2011). To evaluate Egyptian twitterers for opinion leadership characteristics, we used the same measures employed by some researchers, such as number of followers and biographical cues for ‘elite’ types of actors, such as mainstream media employees, political actors, activists, and researchers (Leavitt, Burchard, Fisher and Gilbert, 2009; Lotan, *et al.*, 2011).

METHODS

Our methods are comprised of the collection and analyses of Twitter data from Tunisia and Egypt, and survey data from an opportunity sample of young people in Egypt. We draw on our experiences, expertise, and observations in these countries and Iran in our conclusions and discussion of results.

Twitter Analyses

For the Twitter collections we used several tools, including Desktop Archivist, online (web) Archivist, and 140kit.com (Yang and Kavanaugh, 2011). We typed in key words or phrases and these tools collected tweets (i.e., short micro-blog messages or posts made by twitterers using the Twitter system) continuously for a given period of time. The tools also gave basic analyses for the data (i.e., how many people posted, their locations, language used, and some data visualizations). To identify opinion leaders, we used relevant data in our tweet collection, including the tweet ID (unique account name), tweet content, date posted, language, followers and user profile. User profiles give self-reported information about location and user bio (e.g., organization name, individual’s hobby or interests) although users do not always tweet from the location in their profile or match their bio. We distinguished organizations from individual influentials, and used number of followers to measure centrality of twitterer, in combination with bio data to identify type of actor information (Lotan, *et al.*, 2011).

For Egypt, we collected tweets from January 28 through February 2011 that used one of a variety of hashtags, including: #jan 25, #Egypt, #Mubarak, #elbaradei, #Tahrir #Tunisia, or #Yemen. Most tweets included multiple hashtags related to the Middle East protests. For this paper, we focused our analysis on 514,782 tweets posted during the days just before, until just after, Mubarak’s resignation, that is, the week of February 7 – 14, 2011. For Tunisia, we collected 65,784 tweets with multiple hashtags (#tunisia, #benali, #sidibouid) from January 1 through February 1, 2011. We used visualizations produced by the Desktop Archivist and web-based Archivist.

To analyze the data further, we examined profile information, including twitterer ‘status’ (profession or other self-identifying terms, some of which are not accurate or informative, such as “superman”), and location (e.g.,

country, city or region, sometimes not accurate or informative, such as “earth”). For location, we separated Twitter data whose profiles self-reported a location inside Egypt and those that self-reported locations outside Egypt, or locations were not usable (e.g., “nowhere”). In analyzing Twitter data to investigate the possibility that a disproportionate number of twitterers were opinion leaders, we focused on tweets that self-reported their location as within Egypt. We were not able to analyze further the location based on content analysis (Starbird and Palen, 2012), so our results are only an approximation regarding location. To identify individual influentials within Egypt from influential organizations (e.g., news media tweets) we separated tweets by organizations from tweets by individuals. We manually examined the profile ‘status’ of the top 10% of all 3675 individual twitterers inside Egypt whose tweets we collected between February 7 and 14, 2011. Although some studies use time data to measure the influence of twitterers (Gomez-Rodriguez, *et al.*, 2010), we followed other studies that used measures of ‘centrality’, including the number of followers and profile bios (i.e., ‘elite types of status’) to evaluate opinion leadership and influence (Lotan, *et al.*, 2011).

In order to begin to put the use of social media in perspective with other sources of information used by Egyptians during the uprising we developed and administered a survey for an opportunity sample of Egyptian young people. Our sample was drawn from the student pool at Alexandria University. We cannot therefore generalize the results to the whole population, but rather we can only infer a pattern of information acquisition and dissemination based on the attitudes and behavior of a subset of Egyptian youth, and their friends and families. The Virginia Tech Institutional Review Board for Research Involving Human Subjects approved all procedures and instruments used in the study design, and the survey administration and analysis.

We transcribed the survey into Arabic and recruited participants from Alexandria University in Egypt. Specifically, we recruited 398 undergraduate students of one of the authors, Professor Elmongui. The students were from two programs: normal public programs (PP) and special scientific programs (SSP) students. The tuition and fees of the SSP students are orders of magnitude higher than the PP students. Professor Elmongui provided the students with a link to the online survey at the end of the semester. We hosted the survey online on a server managed by one of the authors. We adapted the survey from previous questionnaires of our own and other researchers who have been investigating the use of the Internet, and social media in particular, regardless of geographic location (Kraut, Kiesler, Bonka, Cummings, Helgeson and Crawford, 2002). We added questions about diverse information sources that respondents might have used during the uprising, including various television and radio stations (e.g., Egyptian and Arabic channels), newspapers, and face-to-face communications with family, friends, acquaintances, and the public.

RESULTS

Our results lie in the collection and analysis of Twitter data primarily (in Egypt and Tunisia) and web crawls we conducted with seed words, to track and document events as they unfolded during the period between early January through March 2011. Further results are derived from the survey questionnaire we administered to university students in Alexandria, Egypt in June 2011.

Twitter Analyses

We collected and analyzed 65,748 tweets using multiple hashtags including #sidibouid, #tunisia, and #tunileaks, from January 1 to February 1, 2011 that produced visualizations using Desktop Archivist and web-based Archivist. Tweet volume over the month of January (frequency of tweets per day) displayed clear peaks in the volume of tweets on January 9th, 10th, 12th, and 14th that correspond to key events and rallies leading up to the departure of President Ben Ali from Tunisia to Saudi Arabia on January 14, 2011. The sources of tweets are quite diverse, but predominantly come from the web. Additional sources include smart phones, as indicated by ‘Twitter for iPhone’ and ‘Twitter for Blackberry’. Other sources include tweet search aggregator programs, such as Tweetdeck and Hootsuite. These programs allow users to monitor a set of specific Twitter accounts they are following. Almost two-thirds (63%) of the tweets during the month of January were retweets (i.e., original tweets that are copied by other twitterers and sent out under their Twitter account as ‘retweets’). These tend to be news flashes rather than opinions or reflections. The protests in Tunisia inspired similar street demonstrations across the Middle East, the largest of which have been in Egypt. During the unrest in Libya and Syria that continued throughout the summer and fall of 2011 there was a near blackout of communication media of all kinds in both countries.

The Egyptian government cut off access to the Internet and restricted the flow of cell phone network traffic on several occasions during the uprising. A ReTweet (RT) on the day of the million man march (February 1) for example says, “RT @[DK]: Mobiles around Tahrir Square are not working any more. Blocked too. Like internet #egypt #jan25 #cairo”. Nonetheless, a stream of communications, including tweets, found their way out of the

country. We analyzed 514,782 tweets posted during the days just before until just after Mubarak's resignation, that is, the week of February 7-14, 2011. This was a critical week of demonstrations and political developments, and correspondingly, Twitter activity showed clear spikes during key events.

The five most common hashtags and their frequency in our 514,782-tweet collection were #jan25, #egypt, #tahrir, #mubarak, and #cairo. To get a sense of where users were tweeting from, we collected data from user profiles and collapsed all locations within geographic category, shown for the sake of clarity and comparison; users indicate their location in multiple ways (e.g., the category "Egypt" includes all designations such as: Egypt; Cairo, Egypt; Cairo; Alexandria, Egypt). The highest number of twitterers identified their location as Egypt (73,272), but this does not count locations given in Arabic script, followed by users whose location is unspecified or unknowable, e.g., "here" (57068). The next highest number of tweets by location was the United Kingdom (UK) and Europe (22,650), North America (37,268), and the Middle East and North Africa (31,507), excluding Egypt. The locations that are given in user profiles can be different from the location where the actual tweets were posted, since users travel. What is important to note is that the highest frequency of tweets appears to be within Egypt, whereas in the case of Iran during the June 2009 post-election demonstrations, studies estimated that there were fewer than 100 twitterers inside Iran with the vast majority outside (Beilin, *et al.*, 2009; Gaffney, 2010). Users outside Iran were tweeting about events there, and often re-tweeting posts from users inside the country.

To evaluate opinion leadership among our collection of Egyptian twitterers, we first separated tweets by location (inside versus outside Egypt) based on profile data. We had over 500,000 total tweets in the one-week collection, with 79,000 unique users and 4701 twitterers inside Egypt. Of the 4701 in Egypt, we further distinguished organizations from individuals to focus on individuals as influentials. We identified 26 organizations (e.g., Egyptian newspapers, TV channels, mobile service providers, travel agents) and 3675 individuals tweeting from Egypt. As noted, based on measures employed by other studies, we evaluated influentials by several measures, most notably, number of followers and profile bios.

The top 10% of all 3675 individual twitterers within Egypt (i.e., 365 users with highest number of followers) had between 500 and 27,000 followers; the information users provide in their bios is generally consistent with the type of actor ("elite") in other studies of opinion leadership on Twitter. For example, at the very top, nine individuals had between 10,000 and 27,000 followers; another ten individuals have between 5000 and 9000 followers. Their bios include: correspondent for Al-Jazeera news, blogger/activist, award winning journalist, co-founder/marketing executive, actor/filmmaker, social activist, writer/reporter, lawyer/executive director, veterinarian, and social media consultant. These are high status or high activism individuals with a large number of followers. There are similar bio profiles scattered throughout the rest of the top 10% (367 twitterers). There is a long tail of 3308 twitterers who have fewer than 500 followers.

Survey of Egyptian Youth

We report here the descriptive statistics of our survey of public and private university students. Our host server registered a total of 255 collected surveys; we had to eliminate 14 surveys that were blank, giving a total of 241 usable surveys (a 60% response rate). In all the results, the percentages we report are valid frequencies.

Demographics of Respondents: There were slightly more female respondents (53%) than male respondents (47%); almost all (97%) were single. They all lived in the city of Alexandria or nearby towns. There was some confusion about the question we asked regarding the year respondents were born, so the data is not usable for many subjects. However, as these were upper level undergraduate university students, and 60% of responses were between (birth year) 1988 and 1993, we have confidence that the bulk of respondents were in the range of 19-24 years old.

Sources of Information and Communication during the Uprising: Among their sources of information and communication used during the uprising, respondents' family members and friends figure prominently. Two-thirds of respondents (66.1%) reported face-to-face communication with their family and friends; an even higher proportion (80.2%) reported using their home phone or cell phone for voice or text communication with family members and friends. Only about a third (34.7%) reported face-to-face communication with people in the streets, shopkeepers, taxi drivers, or newspaper sellers as a source of information during the uprising.

Among broadcast media, the most popular TV channel was ON TV (87.5%), followed by Dream (83.5%), and Egyptian channels 1 and 2 (59.7%), plus foreign channels (46.0%), such as, French TV, CNN, and Voice of America. Also popular were other Arabic channels, including Al Arabiya (39.5%), Al Jazeera (31.9%), and Hora (29.4%). A large proportion of respondents (41.9%) wrote in names of other television channels, including ABC News, Al Yawm, Al Hayah, Al Alm News (Iranian), Al Mostagela, TV 5 Russia Today, and CNN. Most respondents (84.5%) reported they did not listen to the radio; this might be because they were watching and

listening to television channels instead. Of the few who did report they listened to the radio, they used FM channels (6.9%), Middle East channels (4.9%), Cairo channel (3.7%), and other (2.9%). About two-thirds of respondents (69.8%) reported reading newspapers (offline). Online newspapers were among the most popular type of Internet sites visited by these participants (see next section) during the uprising.

All respondents reported having cell phones. The major use, as expected, was to make or receive phone calls (92.6%), but many respondents (65.2%) also reported using them to send or receive text messages, browse the Internet (49.2%), and take pictures (38.5%) and videos (33.2%).

Internet Use during the Uprising: The vast majority of respondents (94.5%) reported they used the Internet during the uprising (January-March 2011). Of those using the Internet, most respondents (96.8%) were using the Internet everyday (89.1% were using the Internet several times a day). Respondents accessed the Internet from multiple locations, but the most common location was home (98.4%), followed by public places (36.7%), such as Internet cafes, and another person's house (29.4%). Only about a fifth (22.2%) accessed the Internet from work, and even fewer (14.5%) from school. On a typical day during the uprising, on average, respondents reported spending just over 7 hours per day on the Internet; the median number of hours a day was 6. Most respondents (76.9%) used English when they were using the Internet (including social network sites or Twitter). Although users can write their tweets in any language, the Twitter website (i.e., screen) did not have an Arabic language interface during the period of the uprising, although one was planned for release later in 2011. After English, more respondents (65.6%) reported writing in 'Franco-Arabic' (Arabic words using Latin script) than writing in Arabic (57.1%) or other languages (2.4%). (We did not include 'Franco-Arabic' tweets in our analysis of profile data of twitterers.) Newspaper websites were among the most popular websites visited (79.5%), followed by FB pages on the uprising (e.g., "We are all Khaled Said") (78.3%), FB News organization pages e.g., RNN (68.4%), News websites (e.g., Masarawy) (44.7%), and television news channel websites (28.7%).

Social Media Use during the Uprising: The vast majority of respondents (97.9%) reported that they used a social network site (e.g., FB) during the uprising, and most of them (90.9%) used it everyday (79.3% used it several times a day). The most frequently reported activity on an SNS was reading other people's posts (76.3%), followed by posting comments (71%), looking at site information of others (53.1%), posting pictures or videos (49.4%), joining groups (42.3%), and updating their own status (36.5%). Almost a third of respondents (31.8%) reported using Twitter (i.e., micro-blogging) during the uprising, with about a quarter (26.3%) using it at least once a week. Half of respondents (50.4%) were reading blogs; only a small proportion (5%) was writing blogs. Almost half of respondents (45%) were reading or writing blogs at least once a week. Most respondents (73.3%) were using some kind of Internet communication services such as Skype, MSN, or Yahoo messenger every day. The vast majority of respondents (95.1%) accessed video or photo sharing websites such as YouTube, Flickr, or FB, with 78.5% of the respondents using those sites everyday.

Differences between Twitter and non-Twitter Users: Several differences exist between respondents that used Twitter versus those that use social networking, but not Twitter. Twitter users reported they used the Internet for more years than others (8.8 years versus 7.1, $p=.039$), and used the Internet from more locations (2.36 locations vs 1.93, $p=.021$). Twitter users also were significantly more likely to view videos on the Internet (6.39 versus 5.93, $p=.035$), write blogs (3.23 versus 2.43, $p=.04$), and use more features of social networking sites (3.86 versus 3.38, $p=.088$), than respondents that used social networking sites but not Twitter.

Interestingly, Twitter users also are somewhat different from others offline, watching a larger variety of TV stations than others (5.09 rather than 4.22, $p=0.001$) and using more of the features on their cell phones than others (3.73 versus 2.93, $p=0.002$). Finally, Twitter users are more likely to receive information in face-to-face communications (2.08 versus 1.74, $p=0.002$) and to share more information with family and friends in face-to-face situations (6.14, 5.64, $p=.030$). Overall, these results suggest that Twitter users were more involved with both technology and people during the uprisings than users that did not use Twitter.

Respondents' Friends and Family: The majority of respondents reported that their friends and family members had access to the Internet (87.6%), were using social network sites (82.9%), such as FB, and were looking at video or photo sharing websites (84.1%). About a third (35.7%) of respondents' reported their families and friends were reading or writing blogs. A vast majority (92.6%) had cell phones. The great majority of respondents (90.1%) communicated face-to-face at least once a week with family and friends; over two-thirds (69.3%) communicated face-to-face every day. A large majority of the respondents used social networking sites such as FB (83.3%) every day with friends and family, and communicated by cell phone (70.5%) daily with friends and family; over a third communicated daily by email (36.9%) or home phone (37.8%), and instant messaging services, such as MSN or Yahoo messenger (63.5%), daily with friends and family. The vast majority of respondents (93.5%) reported that they shared information they obtained from the Internet with their friends and family. A similar majority (94.3%) reported that their family members and friends shared with them information they obtained from the Internet (including FB, YouTube, and Twitter).

CONCLUSIONS

Many observers of the uprisings in Iran in 2009 and the Arab states in 2011 heralded the use of social media, such as social network sites, photo and video sharing sites and blogging or micro-blogging services. Some went so far as to declare the Iranian protests a ‘Twitter Revolution’ (Grossman, 2009; Grossman, 2009; Schleifer, 2009). The role of Twitter and other social media in mass political protests has been the focus of much attention in the Arab Spring, too. However, the adoption rates of social media in Iran, Tunisia and Egypt were very low. Could these media really have the important role in the uprisings that so many observers, officials and news media suggested? We employed a diffusion of innovation approach, including the role of social networks and opinion leaders, to analyze the adoption and use of social media during the Egyptian uprising in 2011. We have argued that despite their low adoption rates, social media could have had a disproportionate impact due to a combination of demographic, social network, and information and communication technology (ICT) adoption factors. We compared Egypt with the cases of Tunisia and Iran where the use of social media also had a seemingly disproportionate impact. There is a high percentage of young people (aged 15-29) among the total population in most Middle Eastern countries, and a high proportion of Internet and social media users among young people. These two factors allow this segment of the population to draw on many online sources of information besides the more widely used mainstream media of television and newspapers. Additionally, in Middle Eastern societies close friends, and family and extended family members tend to communicate with each other on a fairly regular basis whether face-to-face, by telephone, or online. Given these conditions, we expect young people routinely shared information they obtained from online sources with other family and friends. As diffusion theory has established, social networks are essential to the communication of new information and ideas. The two-step flow of communication model emphasizes the role of opinion leaders in sharing information they obtain from mass media with members of their social networks.

Our survey respondents’ use of the Internet and some social media (social network sites, especially FB and photo sharing sites) was quite high. This is not unexpected since our opportunity sample is taken from a population of university students. Use of Twitter was much less (just under one third). They all had cell phones and used them not only to send and receive phone calls, but also to send or receive texts, browse the Internet and to look at photos or videos. What we have tried to illustrate is that these young people shared information that they had obtained from various sources, including social media, with their friends and families. Moreover, the vast majority of respondents reported that their friends and families shared information that they had obtained from the Internet (including FB, YouTube, or Twitter) with them. The differences we found between survey respondents who used Twitter during the uprising and those that used social networking, but not Twitter, suggest consistent communication behavior of opinion leaders. Twitter users are significantly more experienced as Internet users and are more likely to view videos on the Internet, write blogs, and to use more features on SNS and on their cell phones than respondents that use social networking sites but not Twitter. Twitter users’ offline communication behavior is also significantly different from others, specifically, seeking more information sources from broadcast television and receiving and sharing information in face-to-face communications with family and friends. Twitter users were significantly more involved with both technology and people during the uprisings than users that did not use Twitter, consistent with the communication behavior of influentials.

Our analysis of Twitter posts from Egypt and user profile data also support the idea that individuals actively tweeting from Egypt showed characteristics of opinion leaders. Specifically, the top 10% of all 3675 individual twitterers within Egypt (i.e., 365 users with highest number of followers) have between 500 and 27,000 followers; the information users provided in their profile bio was generally consistent with the type of actor (“elite”) in other studies of opinion leadership on Twitter. While our sample is limited, it is possible to see at least trends from our survey data among a segment of the population in Egypt that is important for both its large proportion to the total population and its large proportion of Internet and social media users. Ultimately, it seems sufficient for a few young people within a household or extended family network to have access to online information and discussion for the broader population to become aware of information and ideas beyond the more traditional sources of information, such as, television, radio, and newspapers. What the social media add to the other Internet sources of information, such as online news sites, are the opportunities for users to discuss and compare information with trusted social network sources, such as FB friends and friends of friends, as well as Twitter users whom they choose to follow. In this way, from the few to the many, social media can have a larger role in informing society than its adoption levels across the entire population would suggest.

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