American Behavioral Scientist
57(7) 871–898

DOI: 10.1177/0002764213479374
abs.sagepub.com
SAGE

The Arab Spring and Social Media Audiences: English and Arabic Twitter Users and Their Networks

Axel Bruns[1], Tim Highfield[1] and Jean Burgess[1]

Abstract

Although popular media narratives about the role of social media in driving the events of the 2011 "Arab Spring" are likely to overstate the impact of Facebook and Twitter on these uprisings, it is nonetheless true that protests and unrest in countries from Tunisia to Syria generated a substantial amount of social media activity. On Twitter alone, several millions of tweets containing the hashtags #libya or #egypt were generated during 2011, both by directly affected citizens of these countries and by onlookers from further afield. What remains unclear, though, is the extent to which there was any direct interaction between these two groups (especially considering potential language barriers between them). Building on hashtag data sets gathered between January and November 2011, this article compares patterns of Twitter usage during the popular revolution in Egypt and the civil war in Libya. Using custom-made tools for processing "big data," we examine the volume of tweets sent by English-, Arabic-, and mixed-language Twitter users over time and examine the networks of interaction (variously through @replying, retweeting, or both) between these groups as they developed and shifted over the course of these uprisings. Examining @reply and retweet traffic, we identify general patterns of information flow between the English- and Arabic-speaking sides of the Twittersphere and highlight the roles played by users bridging both language spheres.

Keywords

Twitter, Arab Spring, language networks, Egypt, Libya

[1]Queensland University of Technology, Brisbane, Australia

Corresponding author:
Axel Bruns, ARC Centre of Excellence for Creative Industries and Innovation, Queensland University of Technology, Z1-515, Creative Industries Precinct, Musk Ave, Kelvin Grove 4059, Australia.
Email: a.bruns@qut.edu.au

The "Arab Spring" uprisings in 2011 saw widespread antigovernment protests, and some regime changes, in many Middle Eastern and North African (MENA) countries, from Libya and Tunisia to Bahrain and Syria. Social media were among the tools used by protesters to organize themselves and to disseminate footage from rallies. These not only were used by local activists, but also attracted comments from a worldwide media audience, for example, in Twitter hashtag conversations such as #egypt and #libya. These hashtags were used to mediate a wide range of practices of political participation among a diverse group of social media users—from distanced observation and information sharing in a globalized "ambient journalism" (Hermida, 2010) environment through to narration of direct experience and even coordination of on-the-ground activities. However, there is no reason to assume that these diverse activities were really "connected" via the hashtag or that one geographically or culturally distinct group of users ever encountered another, hence highlighting the question of whether social media, in such contexts, facilitates the flow of information across social boundaries. This article addresses these questions via an analysis of language differences in social media communication focused on the Arab Spring, in doing so describing new methods for the analysis of large-scale Twitter data.

We focus on discussions on Twitter concerning the uprisings in Egypt and Libya, tracked between January and November 2011. These two cases, showing citizen opposition to long-serving leaders, ultimately took different forms in their pursuit of revolution. The Egyptian uprising initially saw a short series of large protests in January and February 2011, resulting in the ouster of President Hosni Mubarak. In Libya, antigovernment protests quickly transformed into a civil war, resulting in months of bloodshed before the capture and death of Libyan leader Colonel Gaddafi. In both cases, developments were accompanied by widespread discussion on Twitter, in both Arabic and English. Our focus in this article is on the relative levels of activity in Arabic, English, and mixed-language tweets featuring the #egypt and #libya hashtags and on the interactions between these different linguistic groups. This enables us to track the changing circumstances of these revolutionary conflicts and to examine the relative contributions of different language groups to their discussion.

Context, Background, and Approach

The organization and coverage of public protests is one of many purposes for which Twitter has been used; many other social, political, and educational functions have also been identified (Crawford, 2009). However, the specific contribution made by the platform remains debatable. In June 2009, Twitter was viewed as the medium of choice for activists, both local and international, to dispute the Iranian election result using the #iranelection hashtag (Burns & Eltham, 2009; Gaffney, 2010), to the point that the Iranian protests were dubbed an (ultimately unsuccessful) "Twitter revolution." At the same time, opinions remain divided about the extent to which these and other protests were in a narrower sense *led* by activists using social media to express their views and orchestrate resistance (Axford, 2011; El Hamamsy, 2011; Gladwell, 2011; Morozov,

2011). On the evidence available, it appears that social media were *additional* communication tools for activists, rather than drivers of the demonstrations themselves (Gladwell, 2010). The Arab Spring uprisings have attracted similar descriptions, as social media are used to share details about protests and generate support for movements, in a highly hybridized media environment (Chadwick, 2011) in which Twitter has achieved increased uptake both in the population at large and among news organizations and journalists themselves. Although the Egyptian and Libyan governments attempted to block domestic Internet access during the uprisings, protestors used workarounds to post to Twitter (York, 2011). Once the Egyptian blackout was lifted, mobile phone videos were uploaded directly from the demonstrations to YouTube (El Hamamsy, 2011) and shared through social media. The volume of tweets hashtagged #egypt or #libya highlights the attention that the uprisings received from Twitter users both domestic and further afield; however, there are questions about whether Twitter was a stable means of coordinating demonstrations on the ground or primarily a channel for international observers to discuss the uprisings (Barrons, 2012).

Either way, coverage of the Arab Spring on Twitter provides important examples for the formation of issue publics through shared hashtags. By including "#egypt" or "#libya" in their tweets, Twitter users are connecting their comments to a wider discussion. Bruns and Burgess (2011) argue that these conversations on common topics can create ad hoc issue publics, which can "respond with great speed to emerging issues and acute events." Such events include crises and emergencies, including civil unrest and natural disasters (Starbird & Stamberger, 2010); hashtags have been used to concentrate the flow of information from emergency authorities in such cases as the earthquakes in Christchurch, New Zealand (#eqnz), and the floods in Queensland, Australia (#qldfloods), both in 2011 (Bruns & Burgess, 2012; Bruns, Burgess, Crawford, & Shaw, 2012). Indeed, the convention of using hashtags to mark topical tweets first spread (before becoming fully integrated into Twitter architecture) following their use in the coverage of wildfires in San Diego in 2007 (Messina, 2007; Starbird & Stamberger, 2010).

Hashtagged discussions emerge without being controlled by any one organization or user. Politicians, journalists, and emergency authorities may all be contributing to the ongoing coverage and may indeed be central figures to these discussions, but any account is able to use, or ignore, hashtags in their own tweets. Any Twitter user could include #egypt or #libya in his or her tweets, regardless of the user's proximity to the uprisings or involvement in the protests (the range of participants discussing #egypt is studied by Lotan et al., 2011). Discussion of events in Egypt, for example, also used the #Jan25 hashtag, signifying the "Day of Revolt" against President Hosni Mubarak. Although this hashtag was widely used, it is not studied here (tweets containing #Jan25 as well as #egypt are present within the data set, however). In the present context it should be especially noted that the use of these hashtags was not limited to English speakers, in spite of the use of the English names of these countries as hashtags. At the time of the uprisings, Arabic speakers were forced to use hashtags in Latin characters: although Twitter supports the use of non-Latin characters in tweets themselves, as of

January 2012 it was still testing its official support for right-to-left languages, especially regarding hashtags (Twitter, 2012). A key reason that many Arab Spring tweets combined Arabic text with an English hashtag was that the platform could not yet support right-to-left hashtags; left-to-right hashtags, by contrast, are automatically converted on publication to links to Twitter searches for those tags, providing easy access to the wider discussion on the topic. Therefore, a substantial volume of tweets mainly in English (as the international lingua franca), using Latin characters, was united with an at times equally significant volume of tweets in Arabic (as the common language of the MENA region), using Arabic characters, under the #egypt and #libya hashtags.

An additional technological innovation, in response to local Internet restrictions, can also explain some of the crossover between Arabic tweets and the English hashtag #egypt; the Speak2Tweet tool provided by Google and Twitter enabled users to tweet by calling an international telephone number and leaving a voice message, which was subsequently turned into a tweet and automatically accompanied by the #egypt hashtag (Singh, 2011). Here, too, comments in various languages were combined with an English hashtag, thus aggregating multilingual tweets about the Egyptian revolution, although this does not necessarily translate to greater links between linguistic groups.

The resulting heterogeneous, bi- or multilingual nature of these hashtags immediately raises questions about the structure of their participant communities. Were there two or more separate groups of commenters, writing in Arabic and English but using the same hashtag? To what extent were bilingual users acting as boundary riders, connecting different language communities and facilitating information flows between them? Previous studies of blogging within the MENA region have noted the presence of blogs written in English alongside sites in Arabic, leading Zuckerman (2008) to suggest that some of these sites may act as "bridgeblogs," intended to inform readers "from a different nation, religion, or culture" (p. 48). Similarly, a study of Arabic language blogs found a group of sites from across the Levant acting as an "English bridge," writing in both English and Arabic (Etling, Kelly, Faris, & Palfrey, 2010). Although Egyptian bloggers did not necessarily act in this way, they played "key roles in movement politics" (p. 1240), using the Internet to circumvent the regulation of political organization offline.

Indeed, prior to the uprisings, Egyptian blogging was credited as having "intensified current trends in politics and media," following media outlets' increasingly critical coverage of the Mubarak regime (Isherwood, 2008, p. 13). Blogs became publishers of commentary or reports that could not be featured in the traditional media, even those opposed to Mubarak. As an active Egyptian blogosphere developed, the bloggers involved formed activist networks, in Egypt and abroad, and with international journalists and other foreign bloggers. These links enable the wider spread of information, sharing reports in Egypt and with a more distributed worldwide audience (p. 9).

But writing in different languages does not automatically mean that an individual is acting as a bridge between different groups of users. Herring et al.'s (2007) study of language networks on *LiveJournal* found that English, and other languages, would be featured within journal entries "in formulaic or emblematic uses," connecting users of

different linguistic backgrounds even without a thorough understanding of the languages concerned (p. 9). The intent—or result—of using another language on *LiveJournal* is not to reach a new international audience, like Zuckerman's bridge-bloggers, but to participate extensively within *LiveJournal*'s "cosmopolitan environment." Within the MENA region, bloggers will use both Arabic and English, or Arabic and French, in their posts, so that these languages are strongly interconnected, rather than used by distinct groups of bloggers (Etling et al., 2010, p. 1229).

Use of English or Arabic may also be affected by the topics discussed in posts and by the intended audience. Jansen's (2010) study of digital activism in the Middle East found that in Syria, Arabic was employed for discussion of "more general issues like government, unemployment, and poverty," whereas English was used for comments on specific activist issues, including individual cases of arrest or harassment (p. 48). Jansen argues that blogging in English may be aimed at drawing more, global attention to particular issues. In their analysis of #sidibouzid tweets around the Tunisian revolution, Poell and Darmoni (2012) found that the most active users would post in multiple languages, tailoring their content for different audiences and acting to connect groups of users commenting on the uprising in Arabic, English, and French. Although determining the subjects of tweets written in Arabic and English during the Arab Spring is beyond the scope of this article, the two languages (and others) may have been employed in different tweets by individual users for similar purposes (for a content analysis of #egypt tweets written in English, see Papacharissi & de Fatima Oliveira, 2012).

Although the different languages represented in the data sets used here do not map onto distinct geographic regions, it is important to distinguish the patterns of social media use around the Arab Spring originating from local and international users. Howard et al. (2011), examining tweets containing geolocational data as well as the #egypt hashtag, found that the early discussions were led by users found outside Egypt and its neighbors. In the weeks leading up to Mubarak's resignation, a greater proportion of tweets came from local users (and from users who did not provide location information; pp. 16-17). In addition, Freelon's (2011) analysis of several Arab Spring hashtag data sets found that spikes in Twitter activity in most discussions were led by international users, rather than those within the MENA region. Although language is not in itself an accurate means of determining location, comparing the use of English and Arabic tweets over the same period allows us to examine whether spikes in activity are led by particular linguistic groups.

In this study, we investigated the following questions through our comparison of Latin and non-Latin tweets:

1. Do tweets containing Latin and non-Latin characters follow similar patterns in responding to the events of the Arab Spring?

Based on previous research into online communication in the region, we expected that the use of English (and other Latin languages) would be prominent within the #egypt and #libya hashtags, however:

2. Is this use consistent throughout the uprisings, or does the volume of tweets from different language groups follow more varied patterns of troughs and spikes in response to specific events?

And finally,

3. Are the different language groups (Latin and non-Latin) interconnected; and is there evidence of bridging between these groups of Twitter users?

The presence of bridges in other online contexts suggests that an examination of user interactions in the #egypt and #libya hashtags would find some users acting as bridges between Arabic and English speakers. These hashtags also provide an automatic tie between the groups, through Twitter's conversion of hashtags into hyperlinks. However, this does not necessarily mean that bridging is taking place; we examine the networks of @replies and retweets within the data sets to identify connections between users tweeting in Latin and non-Latin languages. As part of this examination, this study also establishes methods for identifying, and comparing, the languages used within large data sets of tweets, which have applications for further research into multilingual social media discussions.

Method

Our data sets were collected through the Twitter Application Programming Interface (API). Using a modified version of the open source tool yourTwapperkeeper (see Bruns, 2011), we tracked #egypt and #libya from early 2011 (January 23, 2011, for #egypt; February 16, 2011, for #libya); for the purposes of our analysis, our data collection period terminates on November 30, 2011. Because of the vagaries of collecting data from the Twitter API, we cannot expect to have gathered a fully comprehensive data set for either hashtag: Given the long time frame of data collection, unavoidable outages both on Twitter's side and on our side will have combined to create several brief gaps in the archives. Furthermore, as the API is the only sanctioned access point to Twitter data at scale, it is impossible to independently verify exactly how much data may have been excluded from collection: Short of comparing data sets with other researchers tracking these hashtags over the same period, there is no reliable method for finding gaps in the data (see also Freelon, 2011, on similar limits to his study). This is a fundamental problem of all research drawing on third-party APIs; it is an unavoidable aspect of doing "big data" research (boyd & Crawford, 2012).

At the same time, the overall volume of tweets that we did capture is immense and sufficient as a basis for the examination of broad patterns in Twitter activity. A chronological overview of the data points to obvious gaps: For #egypt, we received no tweets at all on January 31, February 5-7, March 31, April 1 and 2, August 2-4, September 15, October 16, and November 23, 26, 27, and 29, 2011; for #libya, we are missing data for March 31, April 1, April 15, August 2-4, September 15, October 16 and 21, and

November 26 and 29, 2011.[1] This means that for #egypt, we missed 16 days in more than 10 months of data collection; for #libya, we missed 11 days in 9.5 months.

YourTwapperkeeper data sets are available in simple comma- or tab-separated value (CSV/TSV) formats, containing the tweets themselves and a range of additional metadata; most important, these metadata include the numerical Twitter ID and user name of the sender, as well as the exact time stamp of the tweet. Further metadata can be extracted from the tweets: Chiefly, these include the user names of any Twitter users mentioned (through @replies or retweets) and the—usually shortened—URLs of any links included with the tweet. Further processing also reveals the specific type of tweet: By parsing its syntax, it is possible to distinguish between simple @replies and retweets (in the form "RT @user . . . ," "MT @user . . . ," "via @user . . . ," or "@user . . ."—that is, enclosing the original tweet in quotation marks), or to identify tweets as *original* tweets that neither @reply to nor retweet another user.

In the present context, it is especially important to distinguish between tweets in different languages. The Twitter API itself does not provide sufficient information to make immediate distinctions: Although among the metadata returned by the API is a language code for each tweet, that code is simply inherited from the language setting made globally by the tweet sender and does not reflect the specific language of the tweet itself. Tweets by an Egyptian user, tweeting in Arabic, who left his or her global Twitter profile setting at the English default would be marked as "English"; tweets by a French user who set his or her profile to French but converses in English and Arabic would be marked as French. The specific language of tweets can be ascertained only by individually analyzing each tweet itself, then.

For the purposes of the present analysis, working with data sets that largely contain tweets in English and other European languages on one hand and in Arabic on the other, this analysis can be considerably simplified: A useful approach to distinguishing these two groups is to examine whether tweets are written in Latin or non-Latin characters. Although the non-Latin group will also contain tweets in various other scripts (Chinese, Japanese, Korean, etc.), the presence of such languages in our present data sets is negligible in comparison to Arabic script; in addition, in an analysis of conversational networks between Twitter users, such third language groups should form distinct conversational networks at a distance from the dominant Arabic and English groups. Similarly, any major distinctions in the Latin group should indicate the presence of various European languages.

Since all standard Latin characters and punctuation marks have been assigned ASCII character codes below 128, a simple method for coding tweets as "Latin" or "non-Latin" is to count the number of characters with a code above 127 in a tweet. Should that number pass a certain threshold, the tweet is coded as "non-Latin." Through a trial and tuning process,[2] we determined that a threshold of 10 non-Latin characters results in a reliable distinction between Latin and non-Latin tweets. This threshold value is preferable to a strict zero as it allows for the presence of several accented characters as they are common in various European languages (äöüß, áéíóú, etc.) as well as for "fancy" punctuation marks (“ instead of ”, etc.), all of which have also been assigned character codes above 127.

Such automated coding of tweets was implemented using Gawk, a programmable command-line tool for processing CSV/TSV data files (Bruns, 2012e). In addition to coding the tweets themselves, we can also calculate a cumulative language score for each Twitter user participating in these data sets, indicating what percentage of their tweets was in non-Latin scripts. This can be used to distinguish different Twitter user groups: those posting mainly in Latin characters (in the present context, mainly in English), those posting mainly in non-Latin characters (mainly in Arabic), and those using a mixture of scripts (and thus perhaps acting as information brokers between different language communities). Similarly, we can calculate the ratio of Latin and non-Latin tweets across all users per time frame (e.g., per day or hour) to show when different language communities were especially active.

Beyond this coding of language, we also extracted a range of other metrics from the Twitter data sets (for an extended discussion of these metrics and the methods used to obtain them, see Bruns, 2012a, 2012b, 2012c, 2012d): We track the number of tweets made (also broken down into tweet categories including original tweets, @replies, retweets, and tweets containing URLs) as well as the number of active users per time frame; furthermore, for each user we determine the number of hashtagged tweets sent and received (again also broken down into the different tweet categories).

Finally, following the 1/9/90 rule, which has become an unofficial standard for analyses of user communities where activity broadly follows a "long tail" distribution (Anderson, 2004, 2006; Tedjamulia, Dean, Olsen, & Albrecht, 2005), we divide the user base of active contributors into three groups: one group of lead users, which contains the most active 1% of participants; a second group of highly engaged users, which contains the next 9% of active participants; and a third group comprising the remaining 90% of least active users. These divisions are determined by ranking users on the basis of the number of tweets they have contributed to the hashtag: The top 1% of users on this ranked list are included in the first group, the next 9% in the second group, and the remaining user base in the third group. Finally, a fourth group contains all those whose user names are mentioned in @replies and retweets, but who did not themselves post to the hashtag. For each of the first three groups, we again track their contribution to the hashtag over time and determine overall patterns of activity such as their relative use of original tweets, @replies, retweets, or tweets containing URLs.

Overall Patterns

Based on this methodology, we are able to determine overall patterns for both #egypt and #libya, over the total period covered by each data set—January 23 to November 30, 2011, for #egypt, February 16 to November 30, 2011, for #libya.

#egypt

In total, we captured some 7.48 million #egypt tweets from more than 445,000 unique users between January 23 and November 30, 2011. Twitter activity for #egypt peaks at

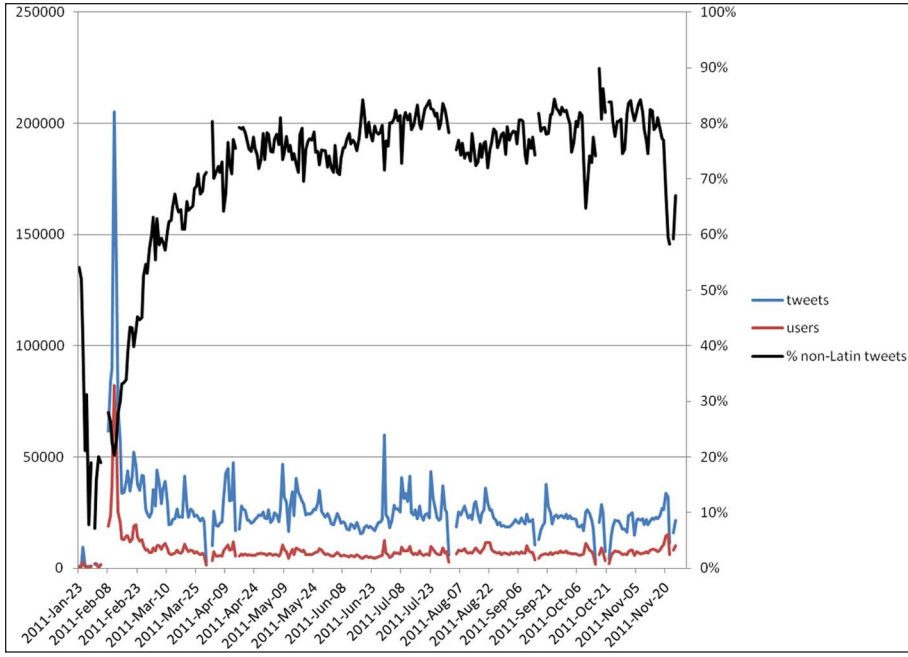

Figure 1. #egypt tweets and unique users per day, compared with daily percentage of non-Latin tweets.

a significantly higher level during the early stages of the revolution than at any other subsequent point (Figure 1). Although unfortunately data for several days in this early period (January 31, February 5-7) are missing from our overall data set (visible as gaps in the graphs that follow), the resignation of President Mubarak on February 11 has the greatest resonance in the available data: We recorded more than 205,000 #egypt tweets from more than 82,000 unique users during this day. During this early stage the composition of the Twitter community is also markedly different from that recorded during the majority of the overall period: Throughout almost all of February, tweets using Latin characters retain the majority; it is only on February 26 that the balance first swings toward non-Latin tweets. From then on, the situation is markedly different: From March 1 to November 30, an average of more than 75% of the #egypt tweets sent each day are composed in non-Latin characters.

This demonstrates a substantial shift in attention: Although during the first month, and especially around the key days of regime change, a significant number of non-Arabic-speaking users participate, their interest dissipates as the situation moves from outright revolution to a more long-term reshaping of the political system; the remaining #egypt user base (an average of more than 7,000 unique users per day, posting nearly 24,000 tweets per day during the March 1 to November 30 period) is likely to

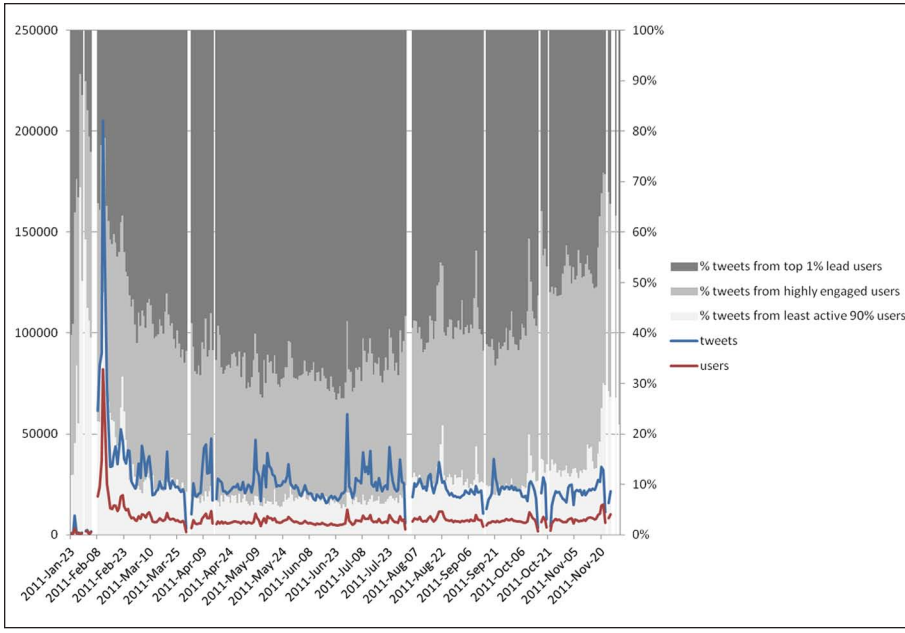

Figure 2. #egypt tweets and unique users per day, compared with daily contributions by different user groups.

be composed largely of Egyptian locals and expatriates with a more direct interest in the continuing process of change.

One additional possible explanation for these changes is the existence of the alternative hashtags #Jan25, referring to the so-called "Day of Revolt" that ignited the protest movement against the Mubarak regime. Notably, our data record only a relatively minor spike of fewer than 9,500 #egypt tweets on January 25, substantially fewer than the more than 205,000 tweets on February 11; it is conceivable that the majority of early Twitter activity around the Egyptian protests took place under the #Jan25 hashtag, shifting to #egypt only once the initial aim of the protests (Mubarak's resignation) was achieved and as the further passage of time made the #Jan25 tag seem anachronistic. The #Jan25 tag may also have had substantially greater resonance with directly involved local users, participating in or closely following the January 25 protests, than with onlookers further afield; it is possible, therefore, that #25Jan hashtag activities attracted a proportionally larger number of Egyptian (and generally Arabic-speaking) Twitter users, in turn leaving #egypt to be dominated by English speakers, and that this imbalance changed only once a greater number of Arabic speakers transitioned to #egypt.

Such shifts in the user base can also be traced by examining the relative contributions made by each of the three user groups outlined above. Figure 2 indicates the percentage of all daily tweets contributed by the three groups and shows significant

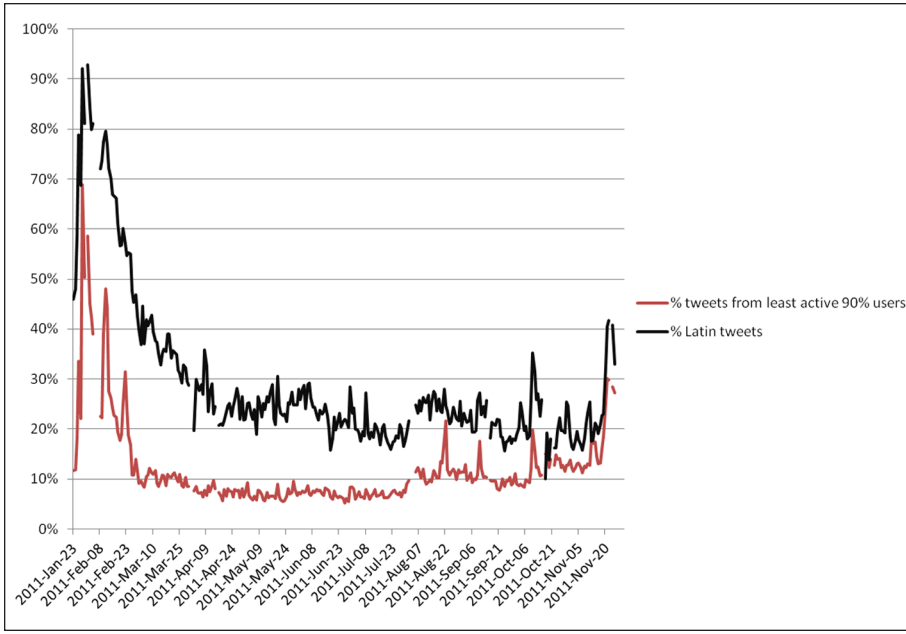

Figure 3. Daily percentage of Latin tweets, compared with percentage of tweets from least active users.

activity by the normally less active groups especially during the first stage: Until the end of February, the lead users contributed only an average of 36% of all tweets per day; from March onward, the same group accounts for an average of 60% of all tweets each day. In other words, this early stage saw a substantially larger presence of—in the long term—less engaged users; when these users exit the hashtag conversation as the "hot" phase of the revolution comes to an end, the two user groups who have a more long-term commitment to discussing political change in Egypt increasingly come to dominate the conversation. But it should also be noted that from July onward, lead users are again pushed back, in favor of a greater contribution especially from the second group of users: This may point both to the growing frustration with the slow pace of changeover from the Supreme Council of the Armed Forces to a civilian administration, which began to be voiced at this time, and to the building anticipation of popular elections, which began on November 28, 2011. It is interesting to note that although the balance of contributions by the three groups gradually shifts from mid-year, the total volume of #egypt tweets remains relatively stable.

For further illustration, Figure 3 specifically compares the daily contributions made by the least active group with the daily percentage of tweets in a Latin character set and points to a strong correlation between these metrics. Especially during the early stage of the revolution, the presence of a large number of normally relatively inactive users also coincides with a large number of Latin (i.e., mainly English) tweets; this implies that Arabic-language users are especially well represented in the leading

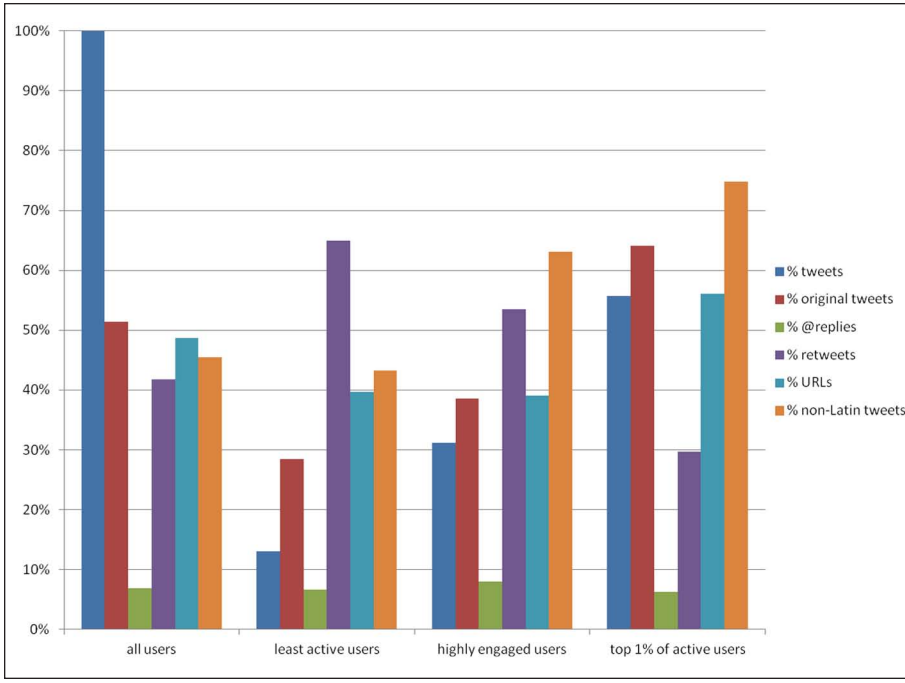

Figure 4. #egypt contribution patterns across the different user groups.

groups of most active contributors to #egypt, whereas less active contributors are more likely to be from non-Arabic backgrounds and may have been attracted to the #egypt discussion largely because of the widespread media coverage of the revolution, but have limited interest in the longer-term process of political change.

These differences also become apparent from a further examination of the activity patterns for each of the three groups (Figure 4). As is to be expected, the lead users are responsible for a disproportionate percentage of all #egypt tweets; this 1% of most active users contributed nearly 56% of all tweets. Their tweets are also substantially more likely to be original tweets (i.e., neither @replies nor retweets—64% of their tweets fall into this category); by contrast, the majority of the tweets contributed by the least active user group—65%—are retweets. The leading user group is also most likely to share URLs: Some 56% of this group's tweets contain hyperlinks to external resources, compared with less than 40% for each of the other two groups.

A further striking difference between these three groups is evident from their language preferences. For the lead group, an average of nearly 75% of their tweets use non-Latin characters; this reduces to 63% for the highly engaged users and drops to 43% for the large group of least engaged users. This means that Arabic speakers are relatively overrepresented among the most engaged groups, whereas the least engaged group of users contains a substantially larger number of non-Arabic speakers.

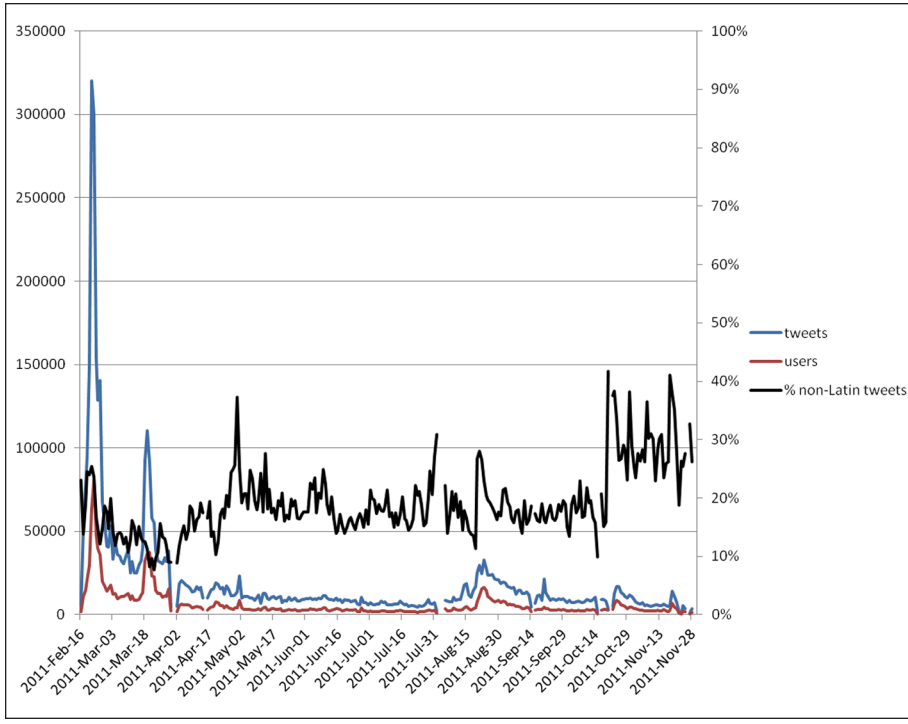

Figure 5. #libya tweets and unique users per day, compared with daily percentage of non-Latin tweets.

#libya

Patterns in the #libya data set are somewhat different from those for #egypt, as Figure 5 indicates. Over the course of the data collection period, we captured more than 5.27 million tweets originating from more than 476,000 users. Total usage of the hashtag spikes early on at more than 320,000 tweets per day on February 21, 2011, as first reports of unrest are covered by world media, but after this relatively brief moment of heightened activity the #libya hashtag continues to operate at a much lower volume: From the start of April, the daily average remains at a comparatively low 10,500 tweets. As in #egypt, the number of unique users contributing to the hashtag each day generally correlates with the number of tweets; it peaks at more than 80,000 on February 22, but reaches only an average of 3,600 for the period after April 1.

A notable difference from #egypt emerges with the percentage of Arabic (i.e., non-Latin) tweets per day: Here, #libya shows a surprisingly limited number of tweets using non-Latin characters. From February 16 to October 15, the average percentage of non-Latin tweets remains at a lowly 18%; it rises to 29% only during the last one and a half months. Contrary to #egypt, fluctuations in language use cannot be traced

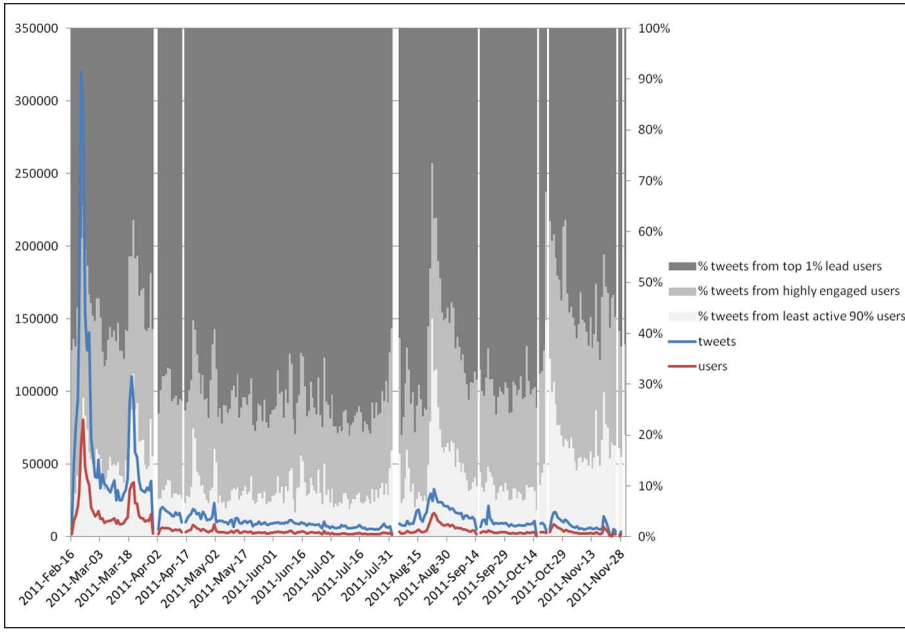

Figure 6. #libya tweets and unique users per day, compared with daily contributions by different user groups.

back to the relative contributions made by the different user groups: At 23%, the percentage of non-Latin tweets posted by the top 1% group of lead users over the entire period differs little from that of the least active group, at 27%.

Rather, an explanation for the generally comparatively low number of Arabic tweets in the #libya data set must be sought in the user demographics and in the nature of the conflict. In Egypt, where protests were centered on demonstrations in the urban setting of Cairo, significant use of Twitter in covering the crisis may well have been considerably more likely than in Libya, where regime change was achieved only after a long military campaign unfolding across the country; in addition, differing Internet and social media take-up and subsequent blocking of access to such communication tools are likely to have influenced the respective level of domestic Twitter use in these countries. Media reports during the Libyan civil war, suggesting that the Gaddafi regime attempted to block Libya's access to the global Internet, would explain the low number of Arabic tweets in the #libya data set; furthermore, the substantial rise in Arabic tweets from October 20, 2011, may indicate that such restrictions were lifted as the regime fell (Gaddafi himself was killed on that day).

Figure 6 again compares overall daily activity with the respective contributions made by the three user groups. As before, the top 1% of most active users is generally responsible for the vast majority of all tweets; over the entire period, they contribute

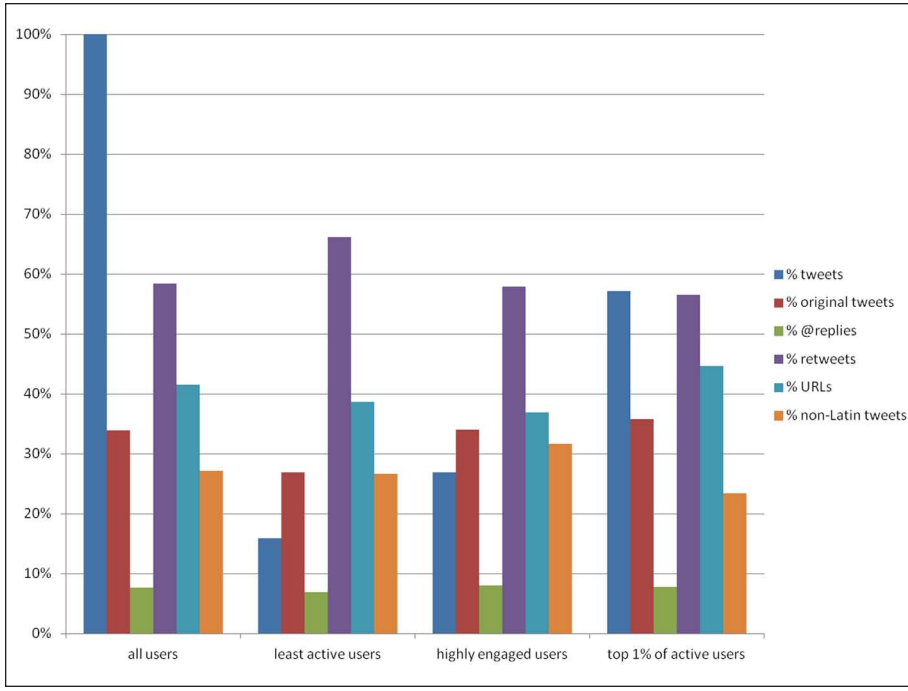

Figure 7. #libya contribution patterns across the different user groups.

some 57% of all tweets, whereas the least active group contributes only 16% of all tweets. Again, however, the contribution of the less active user groups also rises considerably when the overall number of tweets peaks; on August 23, for example, the lead user group accounts for less than 27% of all tweets, with the other two groups driving overall hashtag activity on that day (the day rebels overran Gaddafi's Bab al-Azizia compound in central Tripoli).

Compared to #egypt, the activity patterns for these different user groups in #libya (Figure 7) show few notable trends. There is, as expected, a marked difference in the overall level of contributions made by the three groups; the lead users are also somewhat less likely to send retweets (56% of their tweets were retweets, compared to 66% of the tweets made by the least active group) and more likely to post original tweets (36% compared to 27%). There also is no clear pattern in the relative use of Latin or non-Latin scripts; differences between the groups are relatively minor.

This is remarkably different from #egypt, where lead users were substantially more likely to post original tweets (65% of their messages were neither @replies nor retweets) and to do so in Arabic (nearly 75% of their tweets used non-Latin script). What these observations strongly suggest is the relative absence—because of Internet blockages or a more limited take-up of Twitter—of a domestic elite of Libyan Twitter users reporting on the latest developments, as well as of an active ex-pat community

to take up and disseminate their messages further. Twitter as a communications tool *was* used to document and discuss the unfolding events of the Libyan civil war—but more so by interested onlookers outside of the country, mainly using English to communicate, than by Libyan locals and their compatriots abroad.

Interactions Between Language Groups

There are clear differences in the Twitter audiences for the #egypt and #libya streams, and the makeup of these groups changes substantially over the course of 2011. Of particular interest is the presence of different language groups and the potential for interactions between them: Our interest is in determining to what extent information originating from predominantly Arabic-speaking Twitter participants is able to reach English-speaking users, and vice versa. Such interactions can be traced by examining the flow of @replies and retweets (collectively, @mentions) between participating accounts; for both #egypt and #libya they consist largely of retweets since (as Figures 4 and 7 have demonstrated) fewer than 10% of all tweets are genuine @replies. For our analysis, this is useful: Retweets are generally used by Twitter contributors to pass along incoming information to their own networks of followers; where we find evidence of significant connection between Arabic- and English-language users, we may assume that information is transmitted across language boundaries.

To examine these questions, we focus on four distinct periods selected from the overall Twitter feeds for #egypt and #libya. For #egypt, we examine the period of February 1-28, which sees the major spike in Twitter activity and is characterized by a relatively high number of users (many from the less engaged groups) tweeting in Latin characters, and the period of June 15 to September 15, marked by a steady but less spectacular daily volume of tweets and a predominance of non-Latin tweets. For #libya, we examine February 16 to March 15, a comparable one-month period during the early stages of the uprising, reaching daily volumes surpassing even those seen in #egypt but notable for the comparative absence of non-Latin tweets, and August 1 to September 30, with steady levels of activity and a slightly higher incidence of non-Latin tweets. For each of these periods, we again divide participating users into the three groups of lead users, highly engaged users, and least active users, as well as a final group of passive Twitter accounts whose user names are mentioned in hashtagged tweets but who do not themselves post hashtagged tweets during the period.

We also calculate for each user the percentage of his or her tweets that use more than our threshold value of 10 non-Latin characters. On this basis, we divide the overall user base along new lines: into groups using predominantly Latin characters (less than 33% of their tweets pass the non-Latin threshold), predominantly non-Latin characters (more than 66% of their tweets are non-Latin), and mixing both Latin and non-Latin tweets (between 33% and 66% of their tweets are using non-Latin characters). Such distinctions can be made only for active contributors to the hashtags, of course; for the group of passive accounts that are merely mentioned, we are unable to determine their position across the language divide. In the network graphs that follow, accounts with predominantly Latin (i.e., mostly English-language) tweets are shown

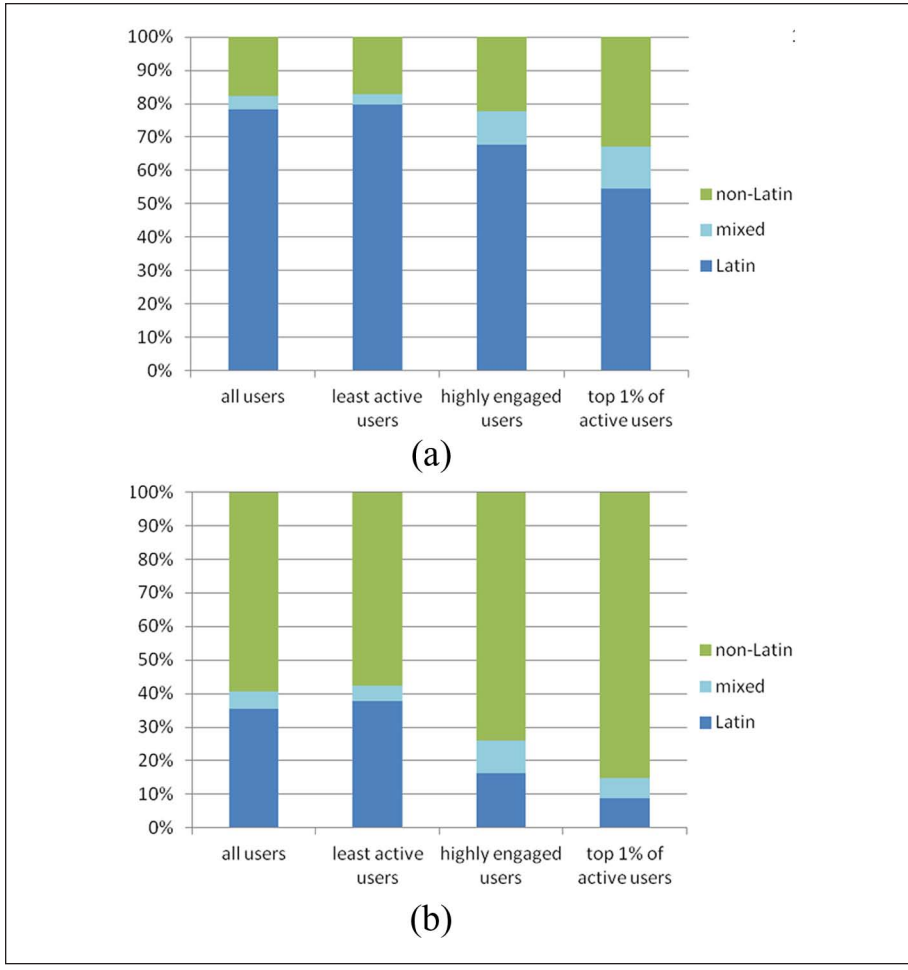

Figure 8. #egypt language groups as percentage of total user base, (a) February 1-28 and (b) June 15 to September 15.

in blue, those with mainly non-Latin (i.e., Arabic) tweets are in green, users posting a mixture of Latin and non-Latin tweets are marked in an intermediate color that reflects that mix, and passive accounts, finally, are shown in gray. Connections between users are shown in the color of the originating user.

#egypt

The two periods in the overall #egypt data set that we examine here are marked by a substantial shift in the language mix, from a substantial majority of Latin tweets to an even more significant predominance of non-Latin tweets. Figure 8 shows the relative

presence of the three different language groups within the total community of users, as well as within the groups of more and less active users.

During the February 1-28 period, users tweeting predominantly in Latin characters clearly dominate: More than 78% of all users fall into that category, whereas only 4% and 18%, respectively, belong to the mixed and non-Latin groups. The distribution within the least active user group largely matches this distribution. Toward the more active end, however, the distribution changes considerably: Only 67% of the highly active group and only 55% of the lead users tweet predominantly in Latin characters, whereas the presence of non-Latin users grows to 22% and 33%. The most remarkable difference is for the mixed-language group, however: Constituting only 3% of the least active group, they account for 10% of the highly active group and make up nearly 13% of the lead user group. This indicates a considerable difference in commitment to the #egypt discussion: Although larger numbers of English speakers may be interested enough to tweet or retweet the occasional message relating to the situation in Egypt, even at this early stage Arabic-speaking Twitter users are prepared to participate in significantly more depth.

Several months later, similar patterns persist, but the balance has shifted much further toward the non-Latin group. They now constitute nearly 60% of the total user base and are again considerably overrepresented among the more engaged groups; more than 85% of all lead users tweet predominantly in non-Latin characters. Similar to the earlier period, too, mixed-language contributors are disproportionately represented among the more active groups; here, however, they constitute a larger proportion of the second, highly engaged group (at nearly 10%), but only 6% of the lead user group. One explanation for this shift may be that the mixed group is more likely to include native Arabic speakers who use English as a second language than native English speakers with some knowledge of Arabic; as the overall stream of the #egypt discussion shifts more toward the use of Arabic in these later months, users who were in the mixed group during the earlier phase of the uprising may now be posting Arabic-language tweets so frequently that they have moved into the non-Latin group as we have defined it.

Figure 9 compares the total network of Twitter exchanges between users through @ replies and retweets during these periods. Connections are depicted in the color of the originating user: @replies and retweets by Latin users are shown in blue, those by non-Latin users in green, and those by users tweeting in a mixture of character sets in the corresponding mixed color. The balance between predominantly blue (Latin) and green (non-Latin) regions in the network shifts substantially from the February 1-28 to the June 15 to September 15 period. During the former period, in fact, some 68% of all connections through @replies and retweets originate from the Latin user group, 10% from the mixed group, and 22% from the non-Latin group;[3] during the latter, the situation is reversed, and even more one-sided: Only 18% of all @mentions originate from Latin users, 9% from mixed users, and 73% from non-Latin participants. If the least active group of contributors is excluded from this calculation, the situation changes slightly: For the earlier period, the Latin group now accounts for a slightly

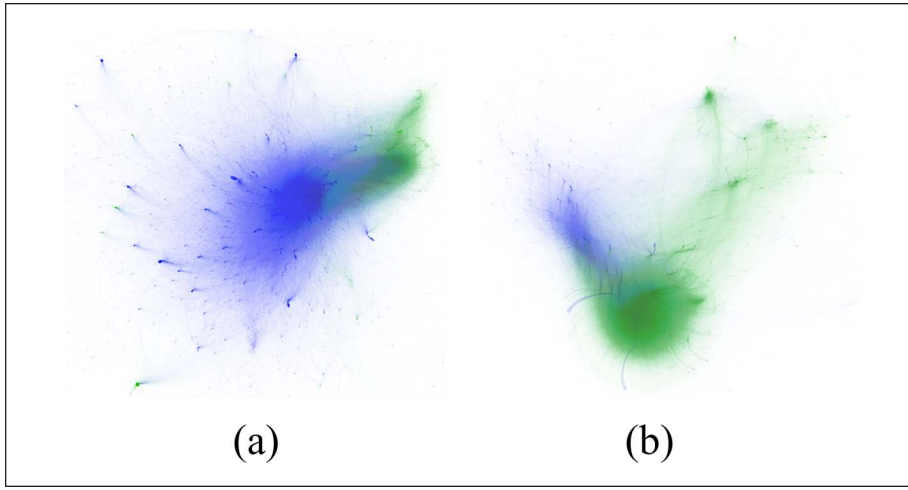

Figure 9. #egypt @reply/retweet networks, (a) February 1-28 and (b) June 15 to September 15.

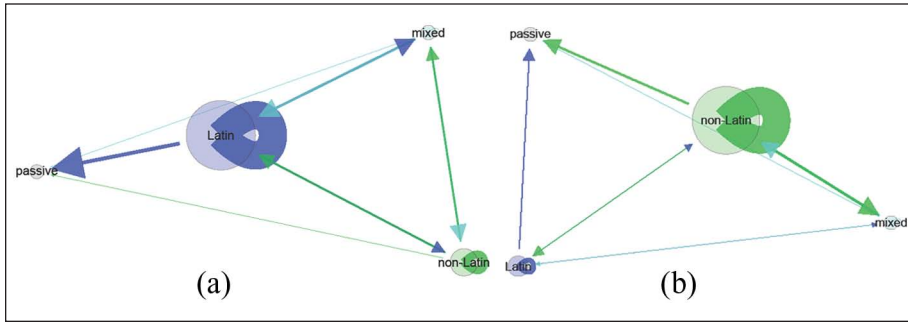

Figure 10. Aggregate #egypt @reply/retweet networks, (a) February 1-28 and (b) June 15 to September 15.

lower 64% of all @mentions; for the later period, however, the contribution of non-Latin users rises yet further, to more than 78% of all @mentions. Several outliers may be detected in these network graphs (especially among non-Latin users in the June-September period); it is likely that ideological, geographic, or other sociodemographic factors are responsible for their separation from the core of the network.

The overall flows of information across the network, for which @replies and retweets provide a proxy measure, can be examined further by visualizing aggregate flows (Figure 10). These graphs show that interaction by Latin and non-Latin groups during both periods is largely among themselves: The indicators of self-linking are considerably more prominent in Figure 10 than any connections across language

boundaries. During February, some 80% of all @replies and retweets by Latin users reference others in the same group; 65% of the @mentions by non-Latin users mention other non-Latin participants. For Latin users, in fact, the second most prominent source of information is "passive" accounts: 10% of their tweets reference those accounts (among which news organizations and other sources will play an important role), often likely retweeting information while adding the "#egypt" hashtag to the original messages. Where they look beyond their own group, by contrast, non-Latin users divide their attention almost equally between mixed (14%) and Latin (16%) sources; they draw on passive accounts for only 5% of their @mentions. The mixed group, finally, acts considerably differently: Only 15% of their @replies and retweets are directed at other mixed-language users, but 42% reference Latin accounts and 37% connect to non-Latin accounts. Although the overall contribution of the mixed group to #egypt is relatively minor, therefore, their main role appears to be an attempt to bridge the major language groups.

During the period of June 15 to September 15, the situation is reversed, and more: As originators of only 18% of all @mentions, Latin users now play an even lesser role than non-Latin users did during February. Due in part to their overall dominance, the non-Latin group is similarly self-focused: More than 82% of their tweets mention other non-Latin users, with between 4% and 7% mentioning each of the other three groups. Conversely, as #egypt is now predominantly a non-Latin Twitter stream, the remaining Latin users are also forced to look beyond their own group for more information: Although 56% of their tweets continue to reference other Latin participants, 11% draw on the mixed group, and 14% contain @mentions of non-Latin users. Indeed, if the 90% least active users are excluded from the analysis, the cross-language links from Latin to non-Latin users increase from 14% to more than 19% (and from 11% to 12% for links to the mixed group): Those Latin users who are among the most active overall contributors to #egypt are also significantly more likely to seek information beyond their own group. The Latin group also remains especially focused on "passive" accounts, however: Some 19% of their tweets continue to inject information from such nonparticipating accounts into the #egypt discussion, through retweeting. Finally, more so than during the earlier period, the mixed accounts have also accepted the dominance of non-Latin accounts: 53% of their @mentions reference those accounts, compared to only 21% referring to Latin users. Intragroup @mentions remain characteristically low for this group: Only 14% of their @mentions refer to fellow mixed-language accounts.

#libya

Dominated throughout by Latin users, the situation in the #libya hashtag differs considerably from that in #egypt. During the early phase of the revolution, the overall #libya user base presents what is nearly a mirror image of the situation in #egypt: Some 82% of all participating users during this time fall into the Latin category (Figure 11). However, when broken down into the groups of more or less engaged users, the

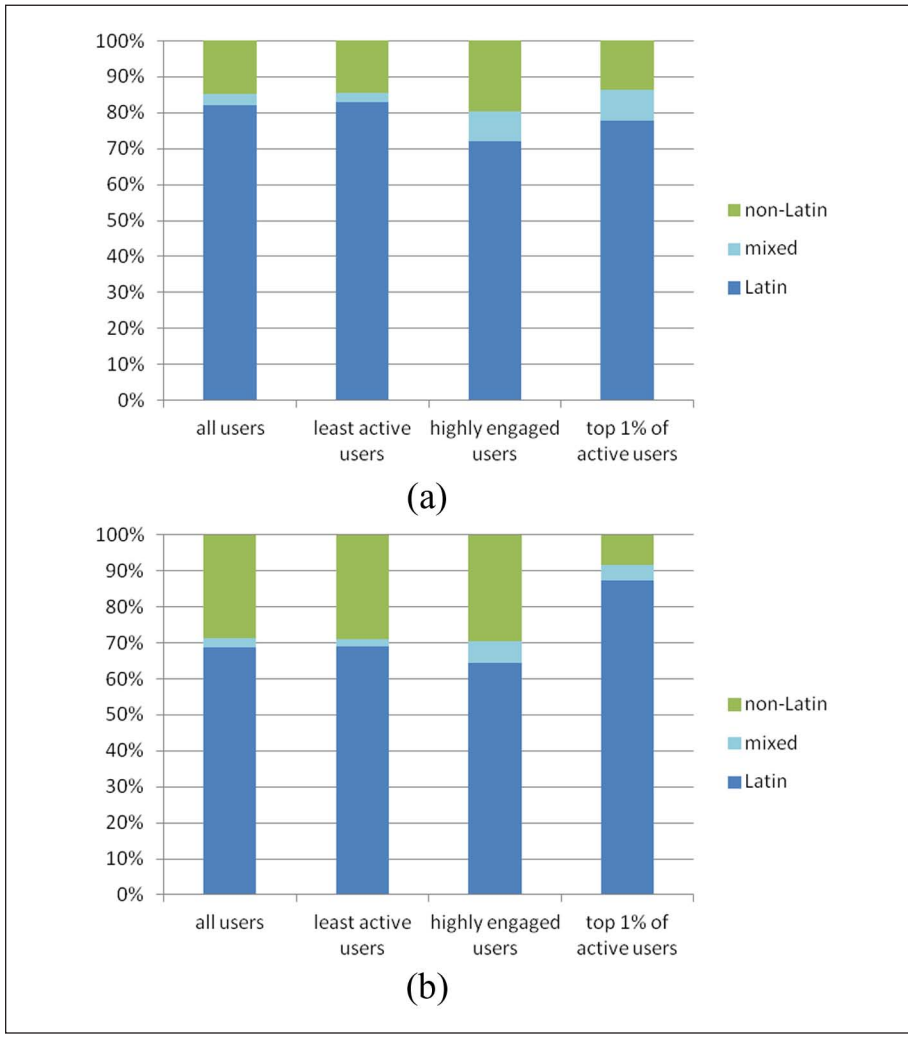

Figure 11. #libya language groups as percentage of total user base, (a) February 16 to March 15 and (b) August 1 to September 30.

distribution of language groups becomes more complicated: Although the second most active group again includes a larger number of non-Latin and mixed-language users, that trend is reversed again for the leading user group. Non-Latin users constitute 14% of the least active group, 20% of the second group of highly engaged users, but again only 14% of the lead group; by contrast, the mixed-language group accounts for only 3% of the least active group, 8% of the highly engaged group, and nearly 9% of the

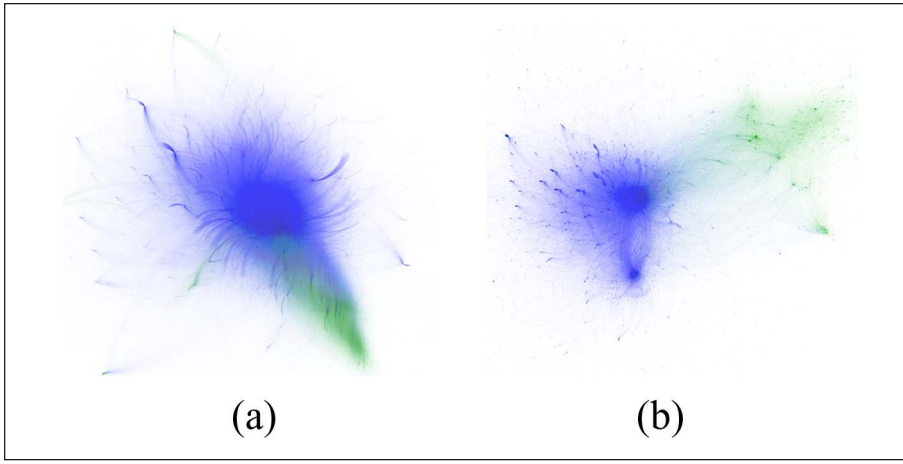

Figure 12. #libya @reply/retweet networks, (a) February 16 to March 15 and (b) August 1 to September 30.

leading group. It appears that, similar to #egypt, during this early phase the #libya hashtag attracted a substantial number of relatively random English-language commenters, a comparatively large number of fairly active Arabic-speaking users, but also a substantial number of very highly active English-language participants.

This pattern is even more pronounced for the August-September period. By this time, users tweeting mainly in non-Latin characters have become substantially more active in the #libya community; they now account for 29% of the total user base and constitute 30% of the highly engaged user group. Surprisingly, however, they not only have failed to make any inroads into the lead user group, but also have indeed been pushed out of this group by an even more active English-language elite, to the point where they now constitute only 8% of that lead group. Furthermore, the mixed-language group also appear to have been squeezed out of the overall hashtag community by this increasing language polarization: Now accounting for only 2% of the total #libya user base, they also constitute only 6% of the highly engaged group and 4% of the lead user group.

Figure 12 again compares the overall network of @replies and retweets across the two periods we have chosen (February 16 to March 15 and August 1 to September 30, respectively) and shows a gradual thinning of and cluster formation in the network: Not only do connections between the predominantly Latin and non-Latin sections of the network weaken from the earlier to the latter period, but even within these sections themselves distinct, loosely connected clusters emerge (available space in this article does not permit us to examine the unifying traits of these distinct clusters). During the earlier period, nearly 80% of all connections through @mentions originated from the Latin group of users, whereas the non-Latin group accounted for just more than 13%; the mixed group contributed only 7% to the total number of @mentions. This

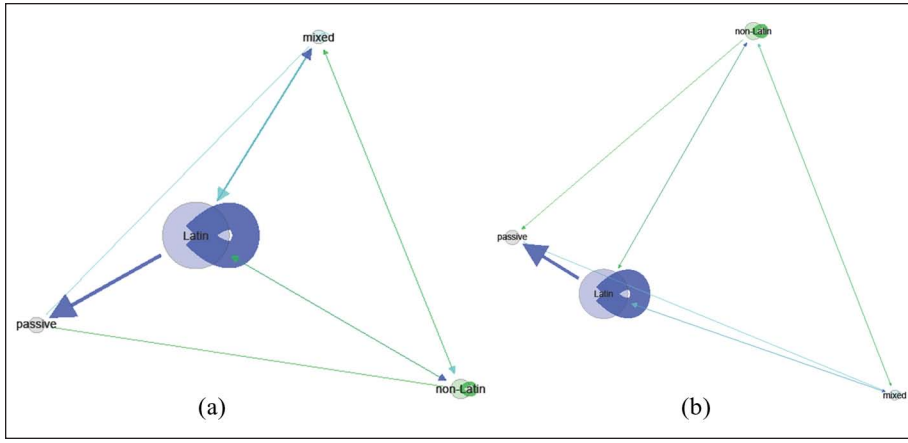

Figure 13. Aggregate #libya @reply/retweet networks, (a) February 16 to March 15 and (b) August 1 to September 30.

distribution remains steady once the least active 90% of users are removed from the network, too. In August and September, during the final battle for control of Tripoli, the situation becomes more polarized: Although at 79% the Latin dominance remains steady, the contribution of the mixed group drops to only 4%, and that of non-Latin users increases to nearly 17%; if only the top 10% of most active users are considered, however, the Latin group now accounts for more than 85% of all @mentions, and the non-Latin group drops back to just more than 10%.

An analysis of the aggregate flow of information further supports these observations. Figure 13 is clearly dominated by the presence of Latin users, who largely make intragroup @mentions (more than 85% of their @mentions are directed to other Latin participants, in both periods); where they connect outside their own group at all, they do so mainly to "passive" Twitter accounts (8% and 11% of their @mentions, respectively, are pointing to that group during the two periods, whereas @mentions of any of the other groups fail to account even for as little as 4% of the total @replies and retweets sent by Latin users).

Nonetheless, a small but internally active group of non-Latin users does remain: Respectively, during the two periods, 66% and 76% of the @mentions originating from non-Latin users are directed at other members of that group. During February/March, Latin users are the next most important information source for non-Latin users, at 16%, followed by mixed-language users at 11% and "passive" accounts at 6%; in August and September, however, external, "passive" sources become more important (at 9%), whereas @mentions of the Latin and mixed groups drop to 8% and 6%, respectively. Finally, although in #libya the efforts of the mixed group of users do not amount to a substantial level of activity, it is nonetheless notable that their information-sourcing processes do not reflect the balance of power that prevails within the #libya community: Although during both periods more than 50% of their @mentions refer to

Latin users, a similarly considerable more than 30% of their mentions are directed to the significantly smaller group of non-Latin users. This intermediary group of mixed-language users does continue to play a role in enabling an information flow across language boundaries, therefore, even if their more limited presence in the #libya hashtag means that direct connections between Latin and non-Latin users must play a greater role here, compared to #egypt.

Conclusion

Space available in this article has allowed us to examine only the broad patterns of Twitter usage by Arabic and English speakers in the Egyptian and Libyan uprisings, and to point to the relative presence of highly active elite users in each case; even this already highlights significant differences between the two cases. These differences are clearly aligned with sociodemographic and technological distinctions between the countries, as well as with the different course of events followed by each revolution.

We found that there is a substantially larger group of Arabic-speaking users participating in the #egypt discussion than in #libya; this observation supports research that found—albeit on the basis of geolocated tweets, which account for only a minute percentage of all messages on Twitter—that the Egyptian Twitter population is larger by an order of magnitude than the Libyan (Karanja, 2012). As a consequence, discussion under the #libya hashtag is likely to consist largely of outsiders looking in, rather than—as in #egypt—of locals and expatriates discussing the unfolding political crisis in their country.

Even in #egypt, however, we found a substantial shift over time, from a comparative dominance of users tweeting in Latin characters to an overwhelmingly Arabic-speaking user base. This shift may be driven in part by the early prominence of alternative hashtags—chiefly the #Jan25 hashtag, which referenced the date of the first major demonstrations, and which subsided thereafter. But our analysis has also shown the already considerable presence of an Arabic-speaking elite among the top 1% of most active contributors to #egypt even at this early stage; as other users shifted from #Jan25 to #egypt proper, and as long-term interest by international participants waned, this established elite became the nucleus around which a largely Arabic-language discussion unfolded.

Our analysis of activity patterns in #egypt and #libya provides a complement especially to Lotan et al.'s (2011) analysis of the activities of a small group of highly active Twitter users who commented on the uprisings in Tunisia and Egypt. Where that study traced patterns of dissemination for a limited number of high-profile examples, our research points to the degree to which information exchanges are able to bridge existing language divides. Though outside the scope of the present article, further work will be able to examine the relative prominence of specific news sources (as URLs cited in tweets and/or as major Twitter contributors themselves) in the English- and Arabic-language networks, and the extent to which such resources are shared across the language divide or specific to one or the other of these language communities; this will

shed further light onto the relative uses of Twitter for disseminating both mainstream and eyewitness accounts of the uprisings to local and international followers of these hashtags.

Such analyses also enable us to move beyond simplistic arguments about whether or not the events of the Arab Spring constituted "Twitter revolutions" (for examples of the opposing perspectives in this argument, see, e.g., Morozov, 2011; Sullivan, 2011). The differences we have found between the Egyptian and Libyan uprisings already point to the fact that the real situation is far more complex and not only highly dependent on national and regional specificities but also considerably changeable over time. The substantial level of Arabic tweets in the case of #egypt certainly points to the fact that Twitter—and, by extension, other online media—did play a role in informing, organizing, and reporting protest activities in the country (and most likely continue to do so now, as postelection unrest persists), but this does not necessarily translate into support for the popular narrative of Egypt as a social media revolution. In Libya, the situation is notably different—here, the consistent lack of local Twitter activity makes it difficult to escape the conclusion that other, more conventional forms of communication were significantly more important to the successful pursuit of regime change and that Twitter interest in the uprising was driven largely by onlookers from further afield. Future research will show whether—in the wake of these political transformations—Twitter and other online and social media will become established for the long term as tools for political communication in both countries.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by funding from the Media Ecologies and Methodological Innovation project in the ARC Centre of Excellence for Creative industries and Innovation (cci.edu.au) at Queensland University of Technology.

Notes

1. All dates and times here are in Cairo time.
2. See http://mappingonlinepublics.net/2012/01/28/creating-basic-twitter-language-metrics/ for details.
3. Here and throughout, these percentages refer to the relative *number* of connections (network edges) between users from these different language groups; we do not take into account the *frequency* with which such connections between any pair of participants may have been repeated during each time frame (i.e., the specific *weight* of each network edge).

References

Anderson, C. (2004). The long tail. *Wired*, *12*(10). Retrieved from http://www.wired.com/wired/archive/12.10/tail.html

Anderson, C. (2006). *The long tail: Why the future of business is selling less of more*. New York, NY: Hyperion.

Axford, B. (2011). Talk about a revolution: Social media and the MENA uprisings. *Globalizations*, *8*(5), 681-686. doi:10.1080/14747731.2011.621281

Barrons, G. (2012). "Suleiman: Mubarak decided to step down #egypt #jan25 OH MY GOD": Examining the use of social media in the 2011 Egyptian revolution. *Contemporary Arab Affairs*, *5*(1), 54-67. doi:10.1080/17550912.2012.645669

boyd, d., & Crawford, K. (2012). Critical questions for big data. *Information, Communication & Society*, *15*(5), 662-679. doi:10.1080:1369118X.2012.678878

Bruns, A. (2011, June 21). Switching from *Twapperkeeper* to *yourTwapperkeeper*. *Mapping Online Publics*. Retrieved from http://www.mappingonlinepublics.net/2011/06/21/switching-from-twapperkeeper-to-yourtwapperkeeper/

Bruns, A. (2012a, January 2). Taking Twitter metrics to a new level (Part 1). *Mapping Online Publics*. Retrieved from http://www.mappingonlinepublics.net/2012/01/02/taking-twitter-metrics-to-a-new-level-part-1/

Bruns, A. (2012b, January 2). Taking Twitter metrics to a new level (Part 2). *Mapping Online Publics*. Retrieved from http://www.mappingonlinepublics.net/2012/01/02/taking-twitter-metrics-to-a-new-level-part-2/

Bruns, A. (2012c, January 2). Taking Twitter metrics to a new level (Part 3). *Mapping Online Publics*. Retrieved from http://www.mappingonlinepublics.net/2012/01/02/taking-twitter-metrics-to-a-new-level-part-3/

Bruns, A. (2012d, January 2). Taking Twitter metrics to a new level (Part 4). *Mapping Online Publics*. Retrieved from http://www.mappingonlinepublics.net/2012/01/02/taking-twitter-metrics-to-a-new-level-part-4/

Bruns, A. (2012e, January 28). Creating basic Twitter language metrics. *Mapping Online Publics*. Retrieved from http://www.mappingonlinepublics.net/2012/01/28/creating-basic-twitter-language-metrics/

Bruns, A., & Burgess, J. (2011, August). *The use of Twitter hashtags in the formation of ad hoc publics*. Paper presented at the 6th European Consortium for Political Research General Conference, Reykjavík, Iceland. Retrieved from http://eprints.qut.edu.au/46515/

Bruns, A., & Burgess, J. (2012, April). *Local and global responses to disaster: #eqnz and the Christchurch earthquake*. Paper presented at Earth: Fire and Rain—Australian & New Zealand Disaster and Emergency Management Conference, Brisbane, Australia. Retrieved from http://eprints.qut.edu.au/50739/

Bruns, A., Burgess, J., Crawford, K., & Shaw, F. (2012). #qldfloods and @QPSMedia: Crisis communication on Twitter in the 2011 South East Queensland floods. Brisbane, Australia: ARC Centre of Excellence for Creative Industries and Innovation. Retrieved from http://cci.edu.au/floodsreport.pdf

Burns, A., & Eltham, B. (2009). Twitter free Iran: An evaluation of Twitter's role in public diplomacy and information operations in Iran's 2009 election crisis. In *Record of the Communications Policy & Research Forum 2009* (pp. 298-310). Retrieved from http://www.networkinsight.org/publications/record_of_the_2009_cprf.html/group/16

Chadwick, A. (2011, August). *The hybrid media system*. Paper presented at the 6th European Consortium for Political Research General Conference, Reykjavik, Iceland.

Crawford, K. (2009). Following you: Disciplines of listening in social media. *Continuum*, *23*(4), 525-535. doi:10.1080/10304310903003270

El Hamamsy, W. (2011). BB = BlackBerry or big brother: Digital media and the Egyptian revolution. *Journal of Postcolonial Writing*, *47*(4), 454-466. doi:10.1080/17449855.2011.590325

Etling, B., Kelly, J., Faris, R., & Palfrey, J. (2010). Mapping the Arabic blogosphere: Politics and dissent online. *New Media & Society*, *12*(8), 1225-1243. doi:10.1177/1461444810385096

Freelon, D. (2011, May 19). The MENA protests on Twitter: Some empirical data. *DFreelon.org*. Retrieved from http://dfreelon.org/2011/05/19/the-mena-protests-on-twitter-some-empirical-data/

Gaffney, D. (2010, April). *#IranElection: Quantifying online activism*. Paper presented at WebSci10, Raleigh, NC. Retrieved from http://journal.webscience.org/295

Gladwell, M. (2010, October 4). Twitter, Facebook, and social activism: Small change—Why the revolution will not be tweeted. *New Yorker*. Retrieved from http://www.newyorker.com/reporting/2010/10/04/101004fa_fact_gladwell?printable=true#ixzz10vnpdC2p

Gladwell, M. (2011, February 2). Does Egypt need Twitter? *New Yorker: News Desk*. Retrieved from http://www.newyorker.com/online/blogs/newsdesk/2011/02/does-egypt-need-twitter.html

Hermida, A. (2010). From TV to Twitter: How ambient news became ambient journalism. *M/C Journal*, *13*(2). Retrieved from http://journal.media-culture.org.au/index.php/mcjournal/article/view/220

Herring, S. C., Paolillo, J. C., Ramos-Vielba, I., Kouper, I., Wright, E., Stoerger, S., & Clark, B. (2007). Language networks on LiveJournal. In *Proceedings of the 40th Hawaii International Conference on System Sciences* (pp. 79c). Los Alamitos, CA: IEEE Press. doi:10.1109/HICSS.2007.320. Retrieved from http://www.computer.org/csdl/proceedings/hicss/2007/2755/00/27550079c-abs.html

Howard, P. N., Duffy, A., Freelon, D., Hussain, M., Mari, W., & Mazaid, M. (2011). *Opening closed régimes: What was the role of social media during the Arab Spring?* Retrieved from http://pitpi.org/?p=1051

Isherwood, T. (2008). A new direction or more of the same? Political blogging in Egypt. *Arab Media & Society*, *6*, 1-17. Retrieved from http://www.arabmediasociety.com/?article=693

Jansen, F. (2010). Digital activism in the Middle East: mapping issue networks in Egypt, Iran, Syria and Tunisia. *Knowledge Management for Development Journal*, *6*(1), 37-52. doi:10.1080/19474199.2010.493854

Karanja, B. (2012, January 26). New research reveals how Africa tweets. *African Arguments*. Retrieved from http://africanarguments.org/2012/01/26/new-research-reveals-how-africa-tweets-by-beatrice-karanja-portland-communications

Lotan, G., Graeff, E., Ananny, M., Gaffney, D., Pearce, I., & boyd, d. (2011). The revolutions were tweeted: Information flows during the 2011 Tunisian and Egyptian Revolutions. *International Journal of Communication*, *5*, 1375-1405. Retrieved from http://ijoc.org/ojs/index.php/ijoc/article/view/1246

Messina, C. (2007, October 22). Twitter hashtags for emergency coordination and disaster relief. *Factory City*. Retrieved from http://factoryjoe.com/blog/2007/10/22/twitter-hashtags-for-emergency-coordination-and-disaster-relief/

Morozov, E. (2011, March 7). Facebook and Twitter are just places revolutionaries go. *Guardian*. Retrieved from http://www.guardian.co.uk/commentisfree/2011/mar/07/facebook-twitter-revolutionaries-cyber-utopians

Papacharissi, Z., & de Fatima Oliveira, M. (2012). Affective news and networked publics: The rhythms of news storytelling on #Egypt. *Journal of Communication*, *62*, 266-282. doi:10.1111/j.1460-2466.2012.01630.x

Poell, T., & Darmoni, K. (2012). Twitter as a multilingual space: The articulation of the Tunisian revolution through #sidibouzid. *NECSUS: European Journal of Media Studies*, *1*(1). Retrieved from http://www.necsus-ejms.org/twitter-as-a-multilingual-space-the-articulation-of-the-tunisian-revolution-through-sidibouzid-by-thomas-poell-and-kaouthar-darmoni/

Singh, U. (2011, February 1). Some weekend work that will (hopefully) enable more Egyptians to be heard. *Google Blog*. Retrieved from http://googleblog.blogspot.com.au/2011/01/some-weekend-work-that-will-hopefully.html

Starbird, K., & Stamberger, J. (2010, May). *Tweak the tweet: Leveraging microblogging proliferation with a prescriptive syntax to support citizen reporting*. Paper presented at the 7th International ISCRAM Conference, Seattle, WA. Retrieved from http://repository.cmu.edu/silicon_valley/41/

Sullivan, A. (2011, January 13). Could Tunisia be the next Twitter Revolution? *Atlantic: The Daily Dish*. Retrieved from http://www.theatlantic.com/daily-dish/archive/2011/01/could-tunisia-be-the-next-twitter-revolution/177302/.

Tedjamulia, S. J. J., Dean, D. L., Olsen, D. R., & Albrecht, C. C. (2005). Motivating content contributions to online communities: Toward a more comprehensive theory. In *Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS)* (pp. 193b). Los Alamitos, CA: IEEE Press. doi:10.1109/HICSS.2005.444. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=1385630&tag=1

Twitter. (2012, January 25). Twitter translation center adds right-to-left languages. *Twitter Blog*. Retrieved from http://blog.twitter.com/2012/01/twitter-translation-center-adds-right.html

York, J. C. (2011, February 1). Egypt: A voice in the blackout, thanks to Google and Twitter. *Global Voices*. Retrieved from http://globalvoicesonline.org/2011/02/01/egypt-a-voice-in-the-blackout-thanks-to-google-and-twitter/

Zuckerman, E. (2008). Meet the Bridgebloggers. *Public Choice*, *134*(1-2), 47-65. doi:10.1007/s11127-007-9200-y

Author Biographies

Axel Bruns is an Associate Professor in the Creative Industries Faculty at Queensland University of Technology in Brisbane, Australia, and a Chief Investigator in the ARC Centre of Excellence for Creative Industries and Innovation. He is the author of *Blogs, Wikipedia, Second Life and Beyond: From Production to Produsage* (2008) and *Gatewatching: Collaborative Online News Production* (2005), and a co-editor of A Companion to New Media Dynamics (2012) and Uses of Blogs (2006).

Tim Highfield is a Research Fellow in the ARC Centre of Excellence for Creative Industries and Innovation at Queensland University of Technology. He was awarded his PhD in 2011 from Queensland University of Technology for research into political blogging in Australia and France.

Jean Burgess is Deputy Director of the ARC Centre of Excellence for Creative Industries & Innovation and Associate Professor, Digital Media in the Creative Industries Faculty at Queensland University of Technology. Her books include *YouTube: Online Video and Participatory Culture* (2009), *Studying Mobile Media: Cultural Technologies, Mobile Communication, and the iPhone* (2012) and *A Companion to New Media Dynamics* (2013).