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**The Egyptian Revolution Goes Viral:
Reading Categories of Tweets in the Twitter-created
Networked Public Sphere**

A Capstone Project Submitted in Partial Fulfillment of the
Requirements of the Renée Crown University Honors Program at
Syracuse University

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Honors Capstone Project in Political Science

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Abstract

The expansion of online social media (OSM) and networked information technology (NIT) use has coincided with reinvigorated democratic movements around the world, including the toppling of authoritarian governments in Tunisia and Egypt in 2011. This paper examines the variety of uses for Twitter during the Egyptian revolution, as Hosni Mubarak's regime collapsed in less than three weeks after 30 years in power.

To achieve this analysis, this paper first divided the revolution into Fisk's four stages of political crisis. Next, the authors extracted 37,634 tweets containing key words from an archive of 16 million tweets collected from January 23-February 8, 2011. It then identified 14 categories of tweets (including Call to Action, Information Sharing, Expression of Support, and Opinion) by manually annotating a randomly selected sample of nearly 6,000 sent during the uprising. This manual annotation allowed the authors to develop category-specific patterns. After entering these patterns into a Java program, the authors ran an Automatic Content Analysis that tallied the number of tweets in each category per stage of political crisis. By correlating the Content Analysis results with the known chronology of the revolution, the results provide the answers to several questions regarding the use of Twitter during the political crisis.

Throughout the revolution, Twitter was primarily used as an information-sharing tool, distributing news, updates, and critical information to protesters. As the crisis progressed, however the uses of Twitter adapted to various government policies and developments in the uprising. This examination of Twitter use can also serve as a stepping stone for other political or information scientists interested in studying the networked public sphere (NPS) and how the use of technology affects political movements.

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Introduction

Since December 17, 2010, the world has closely followed the series of uprisings in countries across the Middle East and North Africa (MENA), collectively known, and popularly described, as the Arab Spring.

Persistent demonstrations ousted two of the region's most established authoritarian leaders, Tunisia's Zine el Abidine Ben Ali and Egypt's Hosni Mubarak, in under two months, laying the foundations for democratic reform. Though the international media has consistently praised the critical role played by networked information technologies (NITs) including the Internet, mobile phones, and online social media (OSM) in the organization of the protests, there is little quantitative evidence to support these claims. Due to the relative youth of NITs, few studies have empirically examined the effectiveness of NITs as mobilization or information-sharing tools, especially during this particular political crisis. The 18-day revolution in Egypt provides an ideal opportunity to corroborate the alleged role of Twitter in the Arab Spring as well as to enhance our understanding of the functions and nature of the networked public sphere (NPS), an emerging public forum "composed of a seamless web of analog and digital, wired and wireless technologies"

that together create a platform for discussion and information-sharing (Han, 2012).

This paper analyzes how the various uses of Twitter contributed to the unprecedented mobilization of protesters and the collapse of Mubarak's authoritarian regime. It does this by first applying Fisk's theory of the four stages of political crisis (Prodrome, Outbreak, Chronic, and Resolution)¹ as a framework for the Egyptian uprising. To examine the role of Twitter in each of these stages, this paper downloaded and analyzed the content of 37,613 relevant tweets collected from January 23 to February 8, 2011, from the NIST's *Tweets2011* archive. By manually annotating a randomly-collected sample of 5,312 tweets, twelve categories of Twitter use were identified. Based on these categories, an Automatic Content Analysis program was developed to account for how the Twitter-created NPS was used in the revolution. This paper expects the results of the Automatic Content Analysis to answer the following questions:

- 1) What kinds of roles did Twitter play in the collapse of Mubarak's regime in Egypt?
- 2) What kinds of information were shared over the Twitter-created NPS during the Egyptian political crisis?

¹ Han (2009, 2011) applied Fisk's theory of four stages in political crises into his analysis on how Korea's youth attempted to impeach President Lee's decision to resume the importation of American beef, which was known for "mad cow disease" in the NIT-created NPS

- 3) What kinds of actions were called for over the Twitter-created NPS?
- 4) Was the Egyptian government's implementation of a total Internet blackout an effective policy? How did Twitter users adapt to the policy?
- 5) How did demonstration effects from the Tunisian revolution affect Twitter use in the Egyptian case, given the movements' geographic and temporal proximities? How could the use of Twitter influence the Arab Spring in other countries?
- 6) Is the Twitter-created NPS inherently interactive or one-sided in nature?

This paper finds that Twitter served as a diverse and interactive tool for communication, facilitating the expression of general information, critical information for and actual calls to action, and opinions. Furthermore, this study provides significant insight as to how Twitter can affect politics in authoritarian regimes where pro-democracy movements are likely to occur in the near future. More generally, due to the unprecedented amounts of data created daily by OSM, studies on the use of Twitter and other OSM

in political contexts will require the combined expertise of social and information scientists. The analyses and conclusions provided in this paper are meant to be a step toward a deeper understanding of the Twitter-created NPS and our understanding of its political implications.

Young Generations and Life Politics in Egypt

A factor commonly cited in the success of the Arab Spring was the primary role of youths in the initial series of critical demonstrations that led to the collapse of the regime in Egypt. Mervat Madkour, a professor at Cairo University, explained that the crowds in Tahrir Square, the epicenter of the protests, were made largely of young Egyptians who organized themselves online (Madkour, 4/15/2012). These protests were initially called for on Facebook, marking January 25, the National Police holiday, as the date of anti-government demonstrations. Yet many Egyptians were uncertain of the seriousness and legitimacy of the protests. Fathya Eldakhakhny, a journalist in Egypt during the revolution, has stated that if no one had participated on the first day of planned protests, then the movement would likely have amounted to nothing (Eldakhakhny 4/15/2012). Yet these fears were proven to be unfounded when thousands of young Egyptians poured into the streets of Cairo, Alexandria, and other major cities. Once the movement gained momentum, other Egyptians, most notably the poor and disadvantaged who were not technologically literate, saw an opportunity to create change in their society. Essentially,

the protests began in the NPS and took on a life of their own once they were actualized in the streets.

But how critical were the young generations' contributions and why did the movement succeed? Previous generations had attempted to enact democratic and political reform, yet were unsuccessful. This uprising was unique in both in its rapidity and its leaderless nature. This paper finds that the use of NITs, specifically Twitter, was a major element in both of these unique factors, by facilitating the spreading of information and the mobilization of protesters. It focuses on two key factors that contextualize the role of Twitter during the revolution, highlighting how their interactions brought on the political crisis. These factors are the emergence of:

- 1) A large, technologically-savvy young generation in Arab societies, and
- 2) Life politics as a new motivation of social and political actions among this young generations.

In 2011, 61% of Egypt's 82 million people were under age 40, with the country's median age at 24.3 years old, according to the U.S. Census Bureau's International Database (See Table 1 on page 11). This large percentage of the population had known no other leader than Mubarak,

and was growing dissatisfied with Egypt under his repressive regime. Historically, Egyptian presidents Nasser and Sadat had both led the country with dynamic national visions. Under Mubarak, as Tarek Osman states, “the new generation never fought (or witnessed) a war; never lived with a national project; [or] grew up at a time in which the country was undergoing a surgical transformation” (Osman, 2010: 203). Mubarak emphasized national security and economic liberalization policies upon entering the office in 1981, but his harsh repression of dissent and other political tactics were not legitimized by a unifying national vision that had permitted his predecessors to take similarly repressive actions.

The failure of Mubarak’s security-based strategy was not necessarily reflective of his policy, but rather of the shift in political motivations from emancipatory politics to life politics (Giddens 1991, Han 2011). Throughout Egypt’s history, emancipatory politics dominated the political landscape, through such movements as drives for independence and nationalist ideals. Under Nasser, for example, major political dissent disappeared for the sake of national unity, progress, and independence from Great Britain. Most Egyptians accepted this intrusion of liberty as long as it clearly served the goals of the state in the early phase of nation building. Emancipatory politics were driven by powerful individuals whose personal lives mirrored the nation’s struggles and served as an inspiration to the society. Today, however, while political ideologies and charismatic figures are still relevant and influential, the driving force

behind modern political movements has changed to life politics, the set of issues that directly disrupt the life of an individual or that individual's network of acquaintances (Han 2011). Contemporary political movements founded in life politics can include complaints over issues of corruption, socioeconomic deterioration, and a lack of freedoms, among others.

In Egypt, ordinary citizens suffered as a result of an unequal or underperforming economy and social issues affecting individuals in their lives. Table 1 shows Egypt's performance in a number of categories relating to life politics:

Table 1 – Life Politics Indicators in Egypt

Median Age	GDP Per Capita PPP (2010)	Youth Unemployment (2007)	Inflation (2010)	Youth Literacy Rate (2005-10)	Corruption Score (2011)
24.3	\$6,200	24.8%	11.10%	82% (Female) 88% (Male)	3.8

Data sources: CIA World Factbook, UNICEF, Transparency International

The first indicator is GDP per capita (with purchasing power parity). In 2010, Egypt ranked 137th out of 227 countries and territories as calculated by the Central Intelligence Agency. Having had the authority to implement an effective policy for economic liberalization since 1981, Mubarak failed to improve Egypt's economy in a substantially beneficial way. Though the economy was improving overall, many citizens felt

alienated because they did not personally experience the benefits of this improvement.

A second indicator is unemployment among youths age 15-24. Unemployment is perhaps the most obvious of life politics indicators, given that it provides individuals with an income and ability to perform a duty and support a family. The rate of 24.8% is very high, especially considering that the overall unemployment rate is 9%. That the rate is higher among youths is not unusual, yet with nearly one quarter of Egypt's young people unemployed, frustration over this fundamental life politics issue was certain to decrease satisfaction with Mubarak's economic policy.

Additionally, it must be noted that inflation was one of the most influential factors in the Egyptian uprising was inflation. According to the CIA, Egypt had an inflation rate in 2010 of 11.10%, and was ranked 205th out of 222 countries and territories. The rising cost of food and other goods further complicated and disoriented those who were unemployed.

A higher literacy rate has traditionally been considered an asset to economic development and an improvement in a country's life politics conditions, but in Egypt, as the increased literacy rate among the young generation actually worsened the impending crisis. Though a gender gap exists in Egyptian education, the age gap is much more notable. The overall literacy rate in Egypt is 66%, according to UNICEF data, but among youths that number increases to 88% for males and 82% for

females. The enormous disparity in education between the youth and the older generations gave young people the intellectual means to understand the extent of Mubarak's failures on issues of life politics. Additionally, the number of college graduates increased greatly in Egypt. With a free education system, Egypt had created a young generation of "highly Westernized...youths from disadvantaged backgrounds...exposed to the world in ways that expand aspirations and ambitions" (Osman, 2010: 222). The dismal post-graduate unemployment opportunities increased frustration among the young generation.

The final life politics indicator examined in this paper is corruption. Transparency International's Corruption Perception Index measures and ranks the countries of the world on a scale of 0-10, according to how corrupt their public sectors are perceived to be. North Korea and Somalia have the most corrupt governments, with a score of 1.0. New Zealand and Denmark have the least corrupt governments, with scores of 9.5 and 9.4 respectively. Egypt is ranked 112th of 164 countries, with a score of 2.9. This indicates that the public sector is perceived as very corrupt. This corruption further undermined the perceptions of the Mubarak regime as a legitimate authority acting in the best interest of the Egyptian people.

Ultimately, Mubarak's regime failed to satisfy the basic needs of its people. These needs were previously ignored in favor of nationalist pride under the traditional social, religious, and cultural foundations of

older Arabic societies. In fact, his emphasis on telecommunications policy as a means of economic improvement served to undermine his own legitimacy by providing young generations with the ability to communicate and share these life politics struggles. According to the Egyptian government's May 2011 report "The Future of Internet Economy," people under age 18 made up 35% of Internet users, and those aged 18-34 made up an additional 43% of Internet use meaning that 78% of users were under the age of 34.² With so many issues disproportionately affecting youth, the consolidation of public opinion against the regime was developed through shared reactions and sentiments to specific events. In Egypt, several incidents facilitated connections and trust between activists and their supporters, through both demonstration effects and Fisk's Prodrome stage, which will both be explained in the following sections.

Through the development of NITs as a tool for communication among the young, educated population, the underlying causes of the Egyptian revolution evolved into a consolidated effort to bring down the Mubarak regime in 2011. How did NITs become an actor in political movements? To answer this question, this paper examines several previous cases of political crises instigated by a young generation and NIT use that provided demonstration effects for the Egyptians in Tahrir Square and elsewhere.

² <http://mcit.gov.eg/Upcont/Documents/TheFutureofInternetEconomyIII.pdf>

Demonstration Effects: Twitter Revolutions in Tunisia, Moldova, and Iran

Han (2009) describes the demonstration effect as a series of five steps that allow a large number of individuals to realize the power of collective action as a result of previous actions, especially in the context of the networked public sphere. First, there must be a non-political event that garners a great deal of attention among NIT-users. Second, public discussions over the NPS serve as an alternative to traditional media. Third, the results of those discussions are expressed through both new and traditional media. Fourth, the movements become political as activists consolidate and increase their understanding of the power they wield through test-run mobilizations. Finally, the process ends with the construction of a “generational identity and consensus” (Han, 2007). Han uses demonstration effects to explain how small groups of devoted and motivated activists can be catalysts for action by larger groups, a framework that can directly apply to the Egyptian case in 2011. Both the Moldovan and Iranian uprisings in 2009 likely provided demonstration

effects for Arab youths due to both the temporal proximity and the similar use of OSM as an effective mobilization tool.

In his analysis, Han (2007) describes how the demonstration effect transformed previously apolitical and disparate young generations in South Korea into a politically cohesive unit through a series of non-political test-run mobilizations in 2002. After watching the disqualification of a Korean athlete in the 2002 Olympics, angry Korean youths brought down the official website of the Utah Winter Olympics by flooding the website with traffic. This development was then covered by global new media outlets such as CNN, BBC, and the New York Times (Han, 2007). Realizing the power they could wield as a group, young Koreans and the politicization of their social networks led to inherently political actions and campaigns. Given the youth's dominant use of NITs, particularly Twitter and other OSM, the Moldovan and Iranian precedents served as test-run mobilizations for the 2011 Arab Spring uprisings in both Tunisia and Egypt. The Tunisian revolution almost certainly informed the activists in Egypt on how to use OSM effectively to enact political change. The direct effect is evident in that the Egyptian revolution began less than two weeks after Ben Ali's departure from the Tunisian presidency.

On April 6, 2009, the Communist Party in Moldova declared victory in parliamentary elections, despite pre-election projections of a close result. Opposition groups Hyde Park and ThinkMoldova, alleged a fraudulent election and met to discuss a demonstration for the following

day. According to the New York Times³, organizers were surprised by the sudden gathering of 10,000 protesters, having hastily disseminated information through text messages and social media. The demonstrations turned to riots as protestors set fire to government buildings. An election recount was taken, though the results remained ultimately unchanged. This spontaneous unrest demonstrated to Twitter users that NITs could be legitimate and potentially powerful mobilization tools.

It was another case of election fraud in Iran just two months later that ignited a torrent of political unrest. Incumbent President Mahmoud Ahmadinejad declared victory only hours after polls closed. Opposition figures and activists complained immediately, calling for protests and a fair election. Protesters filled the streets, garnering international media attention due to the country's size and regional influence. For the next two months, the Iranian government tempered media coverage of the unrest, while pro-Ahmadinejad militias enforced stability⁴. Videos and images captured by citizen journalists reached major media outlets through NITs like Twitter and Facebook, increasing awareness of the repression as well as intensifying international pressure on the Iranian regime. Though ultimately unsuccessful, the revolutionary unrest in Iran provided a precedent for NIT action in Tunisia, Egypt, and other countries.

³ <http://www.nytimes.com/2009/04/08/world/europe/08moldova.html?pagewanted=all>

⁴ http://articles.cnn.com/2009-07-25/world/iran.world.protests_1_iranian-american-president-mahmoud-ahmadinejad-iranian-embassy?_s=PM:WORLD

The 2011 Tunisian revolution directly inspired Egyptians to action and provided demonstration effects for the Egyptian activists. In the wake of the Tunileaks scandal, in which diplomatic cables exposing the opulence of Ben Ali's family were stolen and released online, Tunisians were very aware of the disconnect between the regime and its people. On December 17, 2010, Mohamed Bouazizi, the 26-year-old street vendor, lit himself on fire outside of the local government building in Sidi Bouzid, Tunisia⁵. Locals protested and called for rallies in solidarity with Bouazizi, whose misfortunes and complaints were widely shared by other young Tunisians. As the government struggled to control the dispersal of information over NITs and attempted an ill-fated publicity campaign, the protests spread. Using the keyword #Sidibouzid, protesters relayed revolution-related materials to both fellow protesters and the outside world. Ben Ali made several televised statements, instituting minor reforms and using traditional state-controlled media to threaten to apply the law "in all firmness" with regard to silencing the unrest.⁶ Protests continued to grow despite Ben Ali's best efforts, and by January 8, the country had become dangerously unstable. Resorting to violence, security forces fired on protesters, killing several protesters. By January 13, the crackdown ended, and Ben Ali declared a state of emergency before

⁵<http://topics.nytimes.com/top/news/international/countriesandterritories/tunisia/index.html>

⁶ <http://www.guardian.co.uk/world/2011/jan/01/egypt-bomb-kills-new-year-churchgoers>

fleeing the country with his family the following day.⁷ The success of the Tunisian revolution provided a direct and immediate example of a country using OSM such as Twitter to bring about democratic change in a country that had known only authoritarian leadership since its independence from France in 1956. Interestingly, the Tunisian case also adhered to Fisk's four stages of political crisis that this paper also applies to the movement in Egypt starting less than two weeks later.

The Egyptian Revolution

It took less than 20 days for Mubarak to transition from one of the most stable political leaders in the MENA region to a defeated dictator. The revolution can be divided into several clearly defined stages that follow Fisk's four stages of political crisis: Prodrone, Outbreak, Chronic, and Resolution. Before this paper analyzes the contents of the tweets exchanged during each stage, it explores what happened with regards to the major events and mobilizations that brought about the end of Mubarak's regime. Despite the similarities between the Tunisian and Egyptian revolutions, there are several notable differences. First, it must be noted that the Egyptian military was much more involved in decision-making than was its Tunisian counterpart. Mubarak's departure was part of a coup conducted by the military establishment reacting to the protests. During the later stages of the crisis, the army also played an important role

⁷ <http://www.guardian.co.uk/world/2011/jan/14/tunisian-president-flees-country-protests>

in stabilizing the protests in Tahrir Square. Also, the motivations of the Egyptian uprising were more immediately political, given Ben Ali's recent departure. Egyptian activists capitalized on the momentum begun in Tunisia, mobilizing their educated cohorts over life politics issues and general dissatisfaction.

Prodrome

Keeping these two ideas in mind, this section examines four major events as important indicators of the Prodrome stage. This stage consists of the series of events that signal an impending political crisis. In April 2008, Internet organizers created the *April 6 Youth Movement*, a Facebook group that served as a forum for complaints and revolutionary ideas. Leaders of this group were often arrested or intimidated by the Mubarak regime. The second event was the murder of blogger and activist Khaled Said in the summer of 2010, which resulted in public outrage and protests against police brutality. Third was the destabilizing Alexandria church bombing on January 1, 2011, and fourth was the success of the Tunisian revolution on January 14.

On April 6, 2008, a massive protest by workers in Mahalla al-Kobra, Egypt, was suppressed by security forces.⁸ Four protesters were

⁸ <http://www.pbs.org/wgbh/pages/frontline/revolution-in-cairo/inside-april6-movement/>

killed and 400 arrested. On March 23, the *April 6 Youth Movement* was created on Facebook to gather support for the protests. According to research by PBS, the expansion of the group was viral. “The group invited about 300 people to join its Facebook page; within a day it had 3,000 members and within a few weeks, 70,000 had joined the call for strikes across Egypt in support of Mahalla’s workers” (Inside the April 6 Movement, PBS). The group remained active in calling for anti-government strikes and actions through the 2011 revolution. The creation of this group indicates both the existence of demonstration effects and the Prodome stage of the political crisis.

The extent of the corruption and police brutality in Egypt was manifested in the case of Khaled Said, a young Internet activist who had posted videos of corrupt police activity online. According to reports, in June 2010, Said was confronted by police officers in an Alexandria Internet café, taken outside, and beaten. He later died of the severe wounds inflicted by the officers. His family, upon seeing his body, captured a cell phone image of his injuries and posted the picture online. Young Egyptians were outraged, and Wael Ghonim, an Egyptian Google Executive helped found a Facebook group named *We Are All Khaled Said*.⁹ The group raised awareness of Said’s death and expressed solidarity with his family. Along with the *April 6 Youth Movement* Facebook group, *We Are All Khaled Said* served as a major mobilization

⁹ <http://www.egyptindependent.com/node/61266>

tool during the revolution. Though the detainment of dissidents and the censorship of NITs was not uncommon in Egypt, Said's death contributed to the anti-government momentum that would converge on January 25, 2011.

After the public outrage over Said's death had largely subsided, another Prodrome incident occurred, further heightening dissatisfaction with the government. On January 1, 2011, a bomb exploded outside a Coptic Church, killing 21 people. According to *The Guardian*, hundreds of the Christian sect's members protested in the streets. President Hosni Mubarak made a statement on state television promising to "cut off the hands of terrorists and those plotting against Egypt's security."¹⁰ This issue was interesting for two reasons. First, it created actual unrest and demonstrations, indicating that an outbreak event was going to arrive soon. Second, it was a perfect representation of why young Egyptians did not support Mubarak. His regime depended so heavily on security policy that when it briefly failed, it exposed his weakness in the areas of life politics.

The final Prodrome event was the Tunisian Revolution. Egyptian activists followed the Tunisian case with great interest, having suffered from many of the same life politics deficiencies. The protesters' victory in Tunisia provided both the framework and inspiration necessary for Egyptian activists to call for their own protests. Using the Twitter hash

¹⁰ <http://www.guardian.co.uk/world/2011/jan/01/egypt-bomb-kills-new-year-churchgoers>

tag #Jan25 (representing the day of the planned protest), activists knew that successful protests were possible. It was this first planned day of protests that propelled the political crisis into Fisk's second stage.

Outbreak

The outbreak of the Egyptian crisis began on January 25, the country's national police holiday, as thousands of protesters gathered in various locations around Egypt, marching toward Tahrir Square. Many prominent opposition groups had announced their intentions to participate in the protests. The organizers were unsure of how successful their plans would be, with journalist Fathya Eldakhakhny going as far as to say that if no one had fulfilled their commitments on the first day, the revolution would likely never have begun (Eldakhakhny, 4/15/2012). In Cairo, small protests converged in Tahrir Square, which became the epicenter of the revolution. The protests remained relatively peaceful, although sporadic clashes led to the deaths of three protesters and one police officer, according to Egypt's Interior Minister. Despite the early political aspirations of the protesters, there was no widely accepted set of demands and goals.

On January 26 and 27, the protests persisted. A violent police response in Suez increased fears and uncertainty around the movement. Access to OSM was limited in an attempt to isolate protesters. Police used tear gas and rubber bullets in an attempt to disperse demonstrators, as

Tahrir Square became a popular destination for protests. According to *The Guardian*, foreign journalists were intimidated and beaten to prevent the international community from accessing accurate and unbiased information related to the protests.¹¹ Anticipation was building for even larger protests called for January 28. The protests were on the verge of entering Fisk's chronic stage, in when the unrest extends from a single outbreak event into a prolonged political crisis with potentially devastating results.

Chronic

The chronic stage began in the first minutes of January 28, when each of Egypt's five major Internet Service Providers had shut off their services entirely within half an hour. Only one ISP, Noor, maintained service for another two days due to its important role in the Egyptian economy. These developments led to international confusion and fears of a massacre. As fragments of information escaped, Internet activist groups like Anonymous published and distributed lists of strategies to circumvent the Internet block.¹²

While some clashes broke out on the January 28 "Day of Departure", no extensive violence marred the movement. On this day, Mubarak fired his government, promising reforms and appointing Omar

¹¹ <http://www.guardian.co.uk/world/2011/jan/27/egypt-riot-security-force-action>

¹² <http://www.abdolian.com/thoughts/?p=4699>

Suleiman as Vice President.¹³ While this was intended as a concession, Suleiman was a well-known security advisor and strongly disliked by protesters. As anti-Mubarak demonstrations intensified, the Egyptian military intervened to provide security, serving mainly to deter violence in Tahrir Square. On February 1, organizers called for a “March of a Million” that was intended to force Mubarak from office. Masses of protesters spilled into Tahrir Square, only to hear Mubarak announce his intention to step down after overseeing a transition of power.

The momentum shifted away from protesters on February 2, when violent clashes broke out across the country. Internet service was restored throughout the day on February 1, and Vodafone reported that its services had been forced to send pro-Mubarak messages. These messages reportedly called for a final assault on the anti-Mubarak demonstrators in Tahrir. Later on February 2, heavily-armed pro-Mubarak activists, some on camel and horseback, fought with opposing protesters as the military watched.¹⁴ Foreign journalists were attacked as the regime blamed external influences for the violence. The seemingly organized violence did not last, and the Tahrir movement was not defeated. Vice President Suleiman began negotiations with opposition representatives on February

¹³ <http://www.guardian.co.uk/world/2011/jan/30/egypt-protests-hosni-mubarak-power>

¹⁴ <http://www.guardian.co.uk/world/2011/feb/02/hosni-mubarak-supporters-violence-cairo>

6, resulting in several concessions including a 15% wage increase for public sector employees.¹⁵

A final momentum shift occurred with the February 7 release of Wael Ghonim, who had been detained during the first days of the revolution.¹⁶ Pressure continued to build on Mubarak as he continued to concede minor political reforms to the protesters. On February 10, rumors spread that Mubarak would step down after U.S. President Barack Obama's call for an immediate transfer of power to a democratic regime. However, Mubarak's much-anticipated speech stubbornly repeated his intention to step down at the end of his term. With the momentum on the side of the protests, the resolution of the crisis was near.

Resolution

On February 11, just one later, Vice President Suleiman appeared on state television, announcing Mubarak's resignation.¹⁷ The demonstrators in Tahrir Square and around the country celebrated as the Supreme Council of the Armed Forces took power from Mubarak. Human Rights Watch reported that over 300 Egyptians were killed throughout the country since

¹⁵ <http://www.guardian.co.uk/world/2011/feb/07/egypt-cabinet-announces-salaries-pensions-rise>

¹⁶ <http://www.guardian.co.uk/world/2011/feb/08/wael-ghonim-tahrir-square>

¹⁷ <http://www.guardian.co.uk/world/2011/feb/11/hosni-mubarak-resigns-egypt-cairo>

the beginning of the revolution.¹⁸ Though Mubarak fled to Saudi Arabia, the military has maintained the preeminent role in decision-making. The institution's reluctance to relinquish power has led to protests that continued long after the resolution of this particular crisis. By correlating the results of the Twitter content analysis with Egypt's chronology according to Fisk's four stages allows us to obtain a clearer picture of the role that the Twitter-created NPS can play in future revolutionary movements.

Reading Categories of Tweets from the Egyptian Revolution

Dataset

The NIST *Tweets2011* archive is comprised of 16 million tweets collected from January 23 to February 8, 2011. The tweets serve as a primary account of the Egyptian revolution, and a content analysis helps us verify the chronology as well as explain how Twitter was used during the uprising. This paper created a database of 37,613 chronologically ordered tweets identified by major hash tags used by protest organizers (#Sidibouziid, #Tunisia, #Jan25, #Egypt) and others that commonly appeared alongside them (#Tunisie, #Tahrir, #Cairo, #Mubarak,

¹⁸ <http://www.hrw.org/news/2011/02/08/egypt-documented-death-toll-protests-tops-300>

#Revolution, #Arabspring). #Sidibouzi and #Jan25 were used by protest organizers to identify tweets relating to the Jasmine Revolution protests in Tunisia and Egypt respectively. The information contained in the database reveals the date and time the tweet was sent, a specific Twitter ID, and the message content of the tweet itself.

Natural Language Processing and Automatic Content Analysis

To get the most information out of this dataset, this paper conducts an Automatic Content Analysis of the 37,613-tweet database (Han, 2012). This entails the creation of a Java program that identified tweets based on extracted key patterns (or micro-expressions) within a tweet's actual message. While this research strategy was based off of Han's (2012) analysis of the Twitter-created NPS and its response to Obama's health care initiative, it attempts a slightly different and more nuanced approach. In Han's automatic content analysis, patterns were collected and used for two purposes: 1) to identify the sentiment of tweets, whether in support of or against the health care bill, and 2) to analyze tweets in a single "Call-to-Action" category. The research in this paper attempts to conduct a more complicated automatic content analysis, looking at a variety of categories and how their fluctuations can expound upon the existing chronology in Egypt. Also, the sentiment of Twitter users was so overwhelmingly favorable toward the anti-Mubarak protesters that a sentiment analysis would not provide useful information.

Automatic content analysis is just one strategy within the larger method of analyzing the Twitter-created NPS known as natural language processing (NLP). NLP involves the creation of a computer program that can automatically identify the sentiment of tweets and categorize them, according to multiple languages, the intention of sender, and additional factors. Although this will likely be an effective way to conduct research related to the Twitter-created NPS in the future, this paper did not have access to sophisticated natural language processing technology. By developing its own patterns to be used for an automatic content analysis, this paper was able to adapt the analytical strategy to this particular case, the Egyptian revolution. This research can provide some insight into the use of Twitter in this specific case while also serving as a stepping-stone to future NLP research.

Creating Analytical Categories

The first step toward performing an automatic content analysis was to identify key categories and patterns that would be used to differentiate between those categories. This was achieved through the manual annotation of tweet samples. The researchers extracted random samples of tweets from each of the political crisis stages reflected in the archive (see Table 2):

Table 2 – Tweets Manually Annotated for Category Development

Political Crisis Stage	Dates	Manually Annotated	Total Tweets
Prodrome	Jan. 23-24	339	339
Outbreak	Jan. 25-27	1,958	4,534
Chronic (Blackout)	Jan. 28-Feb. 1	1,533	15,939
Chronic (Post-Blackout)	Feb. 2-Feb. 8	1,482	16,827
Total	Jan. 23-Feb. 8	5,312	37,639

The Prodrome stage includes tweets from January 23 and 24, given that the archive began collecting tweets on January 23 and the Outbreak stage began on January 25. This accounts for the relatively small sample size in the Prodrome stage. The Outbreak stage would last for three days, until January 28. The Chronic stage was divided into two sections: Blackout and Post-Blackout. On January 28, the Chronic stage began when Mubarak's Internet censorship policy was implemented while the largest protests yet flooded major city centers. The Chronic (Blackout) stage lasted until the end of February 1, when Internet and mobile phone service were restored. The Chronic (Post-Blackout) stage lasted until the end of the archive on February 8. This division is unique to the Egyptian case and was used to examine the effects of Mubarak's unprecedented censorship policy. It must be noted that the dataset excluded the Resolution stage because the crisis was resolved on February 11. Random samples were annotated from each of the three stages: 313 from the Prodrome stage, 1,958 from the Outbreak stage, 1,533 from the Chronic (Blackout) stage and 1,482 from the Chronic (Post-Blackout) stage.

Each of these samples was physically annotated by the researchers to develop relevant and distinct categories. Manual annotation also

provides a more intimate and accurate understanding of the tweet's primary intention than would a computer program. Therefore, the results of this manual annotation should accurately reflect Twitter use during the uprising. From the manual annotation, 6 major categories were developed (See Table 3).

1.0 The first major category, Information Sharing (IS) involves tweets that are intended to inform others of events or updates regarding the revolution. This is a broad category, and therefore is divided up into four subcategories: General Information Sharing and Updates, Critical Information for Call to Action, Demonstration Effects, and Request for Information.

1.1 The first subcategory is General Information Sharing and Update, or (GIS/UP). This category is used for the most basic information sharing that could either express general facts or situational updates. It also contains updates from CNN, Reuters, Al Jazeera, or other traditional media organizations that covered the Egyptian uprising. This GIS/UP tweet, from the prodromal stage, provides an update regarding the protests in Tunisia that reemerged after Ben Ali's departure.

“Confirmed sources report #libya military deployed to #tunisia border. More info will be posted as it comes in #sidibouzyd #war”

1.2 The second subcategory is Critical Information for Call to Action (CICTA). This category includes tweets intended to directly share actionable information with demonstrators. For example, many tweets discussed locations of particular protests, police tactics, or strategies for circumventing the Internet blackout. By providing the IP numbers at which these websites were accessible, this tweet directly helped protesters access updates about the progress of the uprising:

“RT @mimistim Please RT: #Egypt only blocking DNS. For

Twitter: <http://128.242.245.248> For Facebook: <http://69.63.189.11>”

Table 3 – Titles and Definitions of Analytical Categories
Table 3 – Titles and

1. Information Sharing	IS	
1.1 General Info Sharing/Update	GIS/UP	Provide non-specific info about protests for the purpose of informing readers
1.2 Critical Info for Call To Action	CICTA	Mention specific location and activities, tactical or safety info with the intent of helping protesters
1.3 Demonstration Effect 1	DEMO	Specify about the relationship between the Egyptian Revolution and other events, past, present, and future events that have influenced or been influenced by the unrest
1.4 Request for Information	REQ	Questions regarding events, opinions, and responses
2. Call To Action	CTA	
2.1 Direct CTA	DIR	Ask individuals to perform physical actions to either support or participate in protests
2.2 Retweet/Internet Action	RET	Requesting interactive Internet action (ie. Share, Follow, Spread)
2.3 Link/Video/Photo	LINK	Requesting non-interactive action by providing link to photos, videos, or articles
2.4 Call for Support	CS	Requesting assistance or calling for international action
3. Expression of Support	ES	Statement with pro-demonstrator sentiment
4. Opinion	O	Individual perspectives on events
5. Irrelevant	IR	Unrelated or non-Arabic foreign language
6. Arabic	ARB	Relevant and in Arabic language

third subcategory is Demonstration Effect (DEMO). This contains tweets that relate the revolution in Egypt to unrest in countries around the world. In terms of previous demonstrations, this mostly includes tweets regarding the Tunisian revolution, but also commonly included the 1988 Tianamen Square democracy protests in China. Many of the tweets related to other Jasmine Revolution protests include the names of countries where unrest was occurring, such as Yemen, Sudan, and Libya. An example of a DEMO category tweet is:

“RT @AfriNomad: “Yesterday we were all Tunisian. Today we are all Egyptian. Tomorrow we’ll all be free” #jan25 #Egypt”

1.4 The final information sharing subcategory is Request for Information (REQ). This includes any questions Twitter users asked regarding events in Egypt during the revolution. There is a large variety of requests, ranging in specificity. One example of a tweet from REQ category is:

“Is it confirmed? RT @nmoawad #Twitter was blocked in #Egypt”

2.0 The next major category is Call to Action (CTA). These types of tweets ask readers to perform a variety of actions, from demonstrating in the streets to pressuring their own governments. This category is also divided into four subcategories: Direct Call to Action, Retweet and Internet Action, Link/Video/Photo, and Call for Support.

2.1 The Direct Call to Action subcategory (DIR) includes tweets that ask others to participate in physical actions. This mostly included calling for protests in Egypt, but solidarity protests in other countries were also advertised on Twitter. The following tweet clearly states a time and location for a physical action, inviting the readers to participate in the action:

“Please spread this as much as possible; any1 that gives anyother locations tell them all 2 head 2 ta7reer [Tahrir Square] we’ll meet there at 12 #jan25”

2.2 The second subcategory is Retweet and Internet Action (RET). This entails tweets that ask for readers to participate in an interactive way. In the Twitter-created NPS, asking readers to “retweet” means to copy the message, enabling it to reach the maximum number of social networks. Tweets also called for readers to “spread the word” or “share with friends”. This is an inherently interactive CTA. For example:

“SMS ur friends, ppl are gathering in ElSa3a sqr! SMS and RT Quickly. #Jan25 #Egypt”

2.3 The third subcategory is Link/Video/Photo (LINK), which calls for actions that are not inherently interactive. They provide articles, videos or pictures from the protests that spread awareness of the events in Egypt. These tweets often explicitly state “Read this” or “Amazing picture.” For example:

“High quality pics of the demonstration <http://goo.gl/rJUxC> #Jan25 #Egypt #Tahrir”

2.4 Call for Support (CS) is the final CTA subcategory. Instead of asking the reader to perform a specific action, these tweets request direct and indirect support to help the protesters in Egypt. This can include asking for medical supplies to tend for the wounded or concise requests for help. For example:

“SUEZ IS A KILLING ZONE AND completely LOCKED
DOWN SAVE US (RT) #Jan25 #Egypt #25jan”

3.0 The third major category is Expression of Support (ES). This, as the name suggests, involves senders who are expressing solidarity with protesters. It ranges from criticisms of Mubarak to respect for the demonstrators. One example of the ES category:

“Good Morning, #Egypt. Love and solidarity coming your way from around the world as you prepare for #Jan25 protests. Be safe Be Free!”

4.0 The fourth category is Opinion (O). This category consists of tweets that contain phrases such as “I think” or “I believe”. An example of an O tweet is:

“US is clearly trying to play both sides: government & people. I think that means it believes uprising can topple Mubarak #jan25 #egypt”

5.0 The fifth category is reserved for those tweets that are irrelevant (IR). This includes tweets that are not related to the uprising as well as non-Arabic foreign language tweets. In the automatic content analysis, this category is represented by those tweets uncategorized by the program. The tweets have become essentially unrelated to the crisis, although a

more developed language processing program could shed light on the multilingual uses of Twitter during a political crisis. An example of an irrelevant tweet is:

“The cat in the hat in Egypt = the Sphinx. :)”

6.0 The sixth category is Arabic tweets (ARB). This category presents a problem for interpretation because the Automatic Content Analysis program could not read languages other than English. A small set of keywords was translated from English into Arabic. This set of words was then used to identify Arabic tweets related to the revolution. Due to the inability to translate large numbers of Arabic tweets, the ARB category does not provide directly actionable data. However, the quantity of tweets in each stage can provide some information to verify the chronology of the uprising.

Automatic Content Analysis Methodology

Having identified the twelve categories and subcategories that would be used to organize the dataset, the next step was to create a computer program capable of identifying categories. The program required patterns that differentiated each category. As stated previously, the patterns were obtained during the manual annotation and were expressed in the same format as those in Han’s (2012) Obama health care Twitter analysis (Han, 2012: 16). For example, the key patterns “gather yourselves”, “meet

here”, or “join us” are just a few that would indicate the DIR category, as they call for direct physical action. Each category was given a varying number of patterns determined by what was found during the manual annotation.

Next, the first set of patterns was put into the program, creating a rough draft of results. This initial draft was used to inform a second version, when more patterns were inserted to increase the accuracy and coverage of the program. For example, the DEMO category used the pattern “Tunisian effect” in the initial draft. After displaying negligible results, related patterns “Tunisian demonstration” and “domino effect” were added. This allowed the program to include more tweets in its analysis. Over- and underrepresentation for individual categories were consistent problems, being a byproduct of individual expression and the program’s level of sophistication.

After a preliminary version of the program was created, results were gathered and the program was tested for accuracy and coverage. Modeled after Han’s (2012) error sampling strategy, three samples of tweets were selected (100, 200, and 200 tweets) from the overall dataset (Han, 2012: 17). These samples were manually annotated and categorized according to the reader. Subsequently, the sample groups were run through the automatic content analysis program and the results of the two analyses were compared. After each iteration, revisions were made to

create a more inclusive program. Table 4 contains the results from the third error test.

Table 4 – Final Error Testing Results

	200M	200A	Accuracy
GIS/UP	50	49	98%
CICTA	13	50	26%
DEMO	2	7	29%
REQ	13	20	65%
DIR	2	0	0%
RET	6	17	35%
LINK	29	57	51%
CS	5	10	50%
ES	11	5	45%
O	22	10	45%
IR	15	0	0%
ARB	32	18	56%
Not Matched	0	48	N/A

As is clear from Table 4, issues regarding the program’s accuracy and coverage of the dataset were not effectively resolved during the revision process thus far. While some categories, such as GIS/UP, boast a very high accuracy rate (98%), the majority of the other categories are seriously flawed. This is likely a result of several factors. In addition to the language barrier, there are other limits to this research that must be addressed to help illuminate areas of improvement for future studies. First, determining the intentions of the sender is difficult, even during manual annotation, given that “tweeters express opinions by referring to persons or events, or by striving for originality of expression” (Han, 2012:

11). Though the intentions of many tweets are explicit, the categorization of tweets is often relatively subjective.

Also, this paper must further define the difference between tweets and patterns, and develop a program that can effectively differentiate between the two. While the manual annotation went through the tweets to find their primary goals (1 Tweet equals 1 Category), the automatic content analysis simply extracted patterns (1 Tweet can equal 1 or more Categories). This means that tweets containing multiple patterns were recorded more than once in the automatic content analysis. This is an issue because the program could not identify more specific information about these multiple-pattern tweets. One example of a manually annotated multiple-pattern tweet is:

“RETWEET RETWEET RETWEET SUEZ LIVE NEW VIDEOS
PRAY FOR EGYPT! <http://bit.ly/ftBjdX> #voiceleaks #egypt
#jan25 #we #the #people”

This individual tweet fits into the categories of Retweet/Internet action (RETWEET), support (PRAY FOR EGYPT!), and Link/Photo/Video (LIVE NEW VIDEOS). In this paper, multiple category tweets are included in each relevant category. Though marked as a RET tweet in the manual annotation, the automatic content analysis program would identify at least three categories from this single tweet. Though it is not possible to

glean information on the identity of individual tweets that belong to multiple categories, the number has been calculated.

Yet the inaccuracy of this paper's automatic content analysis program does not necessarily preclude this paper from examining important trends in Twitter use over the duration of a political crisis. By comparing the results of the initial manual annotation (Table 5) with the automatic content analysis results (Table 7), the trends are monitored and analyzed in the following section.

Presentation and Analysis of Results

The results of the manual annotation and automatic content analysis reveal that Twitter use does indeed reflect the progression of the political crisis from the Prodrome through the Chronic stage. This section presents an analysis of the Twitter-created NPS during the Egyptian Revolution. The interaction of the twelve categories can be used to explain the uprising in an as of yet unobserved way.

According to Table 5, there are a number of key trends that can be observed and explained both within each stage and throughout the duration of the Egyptian political crisis. During the Prodromal stage, from Jan. 23-24, the prevalence of information sharing is clear, making up nearly one-third of tweets annotated in this stage. Many of the updates are regarding either the recently deposed Tunisian leader Ben Ali or the January 1st church bombing in Alexandria. Also prominent is the DEMO

category, which contains examples of the Tunisian revolution and praises the role of social media in the success of the uprising in Tunisia.

Table 5 – Manual Annotation Results – Measured in Tweets

	Prodrome	Outbreak	Chronic (BO)	Chronic (Post-BO)	
	Jan. 23-24	Jan. 25-27	Jan. 28-Feb. 1	Feb. 2-Feb. 8	Total
1.0 IS					
1.1 GIS/UP	105 (18.5%)	482 (24.6%)	544 (35.6%)	396 (26.7%)	1,533 (27.7%)
1.2 CICTA	1 (0.2%)	102 (5.2%)	121 (7.9%)	113 (7.6%)	337 (6.1%)
1.3 DEMO	63 (10.9%)	68 (3.5%)	38 (2.4%)	30 (2.1%)	199 (3.6%)
1.4 REQ	7 (1.2%)	68 (3.5%)	44 (2.9%)	55 (3.7%)	174 (3.1%)
<i>Subtotal</i>	<i>176</i> <i>(30.8%)</i>	<i>720</i> <i>(36.8%)</i>	<i>747</i> <i>(48.8%)</i>	<i>594</i> <i>(40.1%)</i>	<i>2,243</i> <i>(40.5%)</i>
2.0 CTA					
2.1 DIR	4 (0.6%)	74 (3.8%)	38 (2.5%)	63 (4.2%)	179 (3.2%)
2.2 RET	12 (2.1%)	108 (5.5%)	68 (4.4%)	51 (3.4%)	239 (4.3%)
2.3 LINK	32 (5.2%)	129 (6.6%)	93 (6.1%)	140 (9.4%)	389 (7%)
2.4 CS	0 (0%)	39 (2%)	7 (0.5%)	18 (1.2%)	64 (1.2%)
<i>Subtotal</i>	<i>48</i> <i>(7.9%)</i>	<i>350</i> <i>(17.9%)</i>	<i>206</i> <i>(13.5%)</i>	<i>272</i> <i>(18.2%)</i>	<i>871</i> <i>(15.7%)</i>
3.0 ES	9 (1.6%)	191 (9.8%)	79 (5.2%)	122 (8.2%)	401 (7.2%)
4.0 O	25 (4.3%)	82 (4.2%)	168 (11%)	105 (7.1%)	380 (6.9%)
5.0 ARB	174 (30.1%)	584 (30%)	308 (20.1%)	337 (22.7%)	1,403 (25.3%)
6.0 IR	147 (25.4%)	31 (1.6%)	25 (1.6%)	52 (3.5%)	254 (4.6%)
TOTAL					
	579 (100%)	1,958 (100%)	1,533 (100%)	1,482 (100%)	5,552 (100%)

According to Table 5, there are a number of key trends that can be observed and explained both within each stage and throughout the duration of the Egyptian political crisis. During the Prodromal stage, from Jan. 23-24, the prevalence of information sharing is clear, making up nearly one-third of tweets annotated in this stage. Many of the updates are regarding either the recently deposed Tunisian leader Ben Ali or the January 1st church bombing in Alexandria. Also prominent is the DEMO category, which contains examples of the Tunisian revolution and praises the role of social media in the success of the uprising in Tunisia.

Among the CTA subcategories, LINK is by far the most popular, with 5.1% of the total. Links, photos, and videos are helpful ways for Twitter users to share a story longer than can fit in one 140-character Twitter message. During this stage, many of the links connected the reader to articles regarding the issues highlighted in the information sharing tweets. As mentioned previously, the IR tweets, which contain languages other than Arabic and English, were relatively high in this stage because the manual sample was so small that it required the researchers to include tweets with an expanded set of keywords to analyze properly. The number of Arabic tweets was also fairly high, making up over 21% of the Prodromal stage. This is to be expected, however, as the lack of language technology prevents further analysis and division of Arabic tweets by their contents.

The Outbreak stage saw several changes in category prevalence. While GIS/UP maintained the most prominent role in the Twitter-created NPS, fluctuations among other categories provide some insight into how Twitter use changed. CICTA rose to 5.2%, a sizeable increase from its .2% in the Prodromal stage. This increase is not surprising, given the necessity of important information in the early stages of a political crisis. These tweets often expressed the locations of protests or police, undoubtedly assisting other protesters and their participation in the January 25 events. Call to Action tweets also increased greatly during the Prodromal stage. DIR, RET, and LINK all increased, indicating the emergence of a large interactive movement on the ground that was reflected through Twitter use. Finally, while the DEMO, DOM, CS, and O categories remained relatively low, tweets expressing support for the protesters jumped from 2.9% in the Prodromal stage to 9.8%. ES tweets encouraged the protesters in Egypt to persist in their drive for democracy, assuring them that they were not alone in the struggle.

Mubarak had just initiated the Internet blackout when the Chronic stage began on January 28. By isolating his country from the NPS, several changes occurred in Twitter use. Information sharing categories rose to higher levels than before, with GIS/UP accounting for over 35% of the tweets. Many of these tweets involved informing others around the world of the Internet shutdown, raising awareness and galvanizing Internet users from around the world. Also, the CICTA category continued to rise.

Much of this critical information consisted of advice on how to access the Internet or circumvent the blackout in other ways, from dial-up connections to ham radios and satellite phones. Additionally, LINK tweets continued to be the most common CTA category, though the blackout limited the amounts of pictures and videos that could escape from Egypt. ES tweets fell to 5.2%, while opinion tweets rose nearly 7% as stunned Internet users around the world reacted to Egypt's Internet censorship. Most telling, the number of Arabic tweets dropped dramatically. While some international companies worked to provide Internet services to Egyptians, the shutdown policy was effective in silencing most online voices inside Egypt. However, the policy was counterproductive in that it consolidated public opinion outside of Egypt and also cost the Egyptian government tens of millions of dollars in lost business.

The blackout was lifted on the morning of February 2, but this was not an indication of Mubarak's impending resignation. As pro-Mubarak demonstrators poured into Tahrir Square in Cairo, clashing with the anti-government protesters, the relationships between the categories changed once again. GIS/UP remained the highest category, with over 26% of the tweets manually annotated during this stage. LINK and ES experienced increases, as pictures and videos emerged from Egypt for the first time since the Outbreak stage. In the midst of the violence on February 2, call for support tweets increased with protesters asking for medical assistance

as well as international pressure on the regime. Solidarity protests were planned at Egyptian embassies around the world, indicated by the increase of DIR tweets from 2.5% to 4.2%.

Overall, it is clear that GIS/UP dominated the Twitter-created NPS during the Egyptian political crisis, making up over 27% of the total manually annotated tweets. Foreign language and Arabic tweets make up the next largest segment with the whole variety of categories indeterminate from each other. The second tier of readable categories consists of CICTA, RET, ES, and O. This result is interesting because it suggests that the Twitter-created NPS is not so much a tool for physical mobilization, but rather one for Internet action and solidarity. While only CICTA and RET could provide any real assistance for people in Egypt, ES and O tweets provided confidence to the protesters. The sense of solidarity encouraged the protesters to continue pursuing their democratic interests despite the power of the regime.

But would the results of the automatic content analysis reflect a similar progression of Twitter use throughout the crisis? Despite the aforementioned inaccuracies and issues, there were similarities between the results. First, the prevalence on information sharing remains clear. To correctly interpret the data from the automatic content analysis, it is important to refer to Table 6, which explains the number of tweets put through the program.

Table 6 – Total numbers of tweets read by Automatic Content Analysis Program

	Prodrome	Outbreak	Chronic (Blackout)	Chronic (Post-Blackout)	Total
Total Entered	313	4,534	15,939	16,827	37,639
Matched	190	3,240	11,390	12,497	27,336
Number of Category Hits	295	4,939	17,819	19,757	42,844

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The first row contains the total number of tweets present in the hash-tag filtered dataset for each political crisis stage. There were 313 tweets in the Prodromal stage, 4,534 in the Outbreak, 15,939 in the Chronic (Blackout), and 16,827 in the Chronic (Post-Blackout). This creates a total of 37,613 tweets in the dataset. The second row explains how many tweets were matched into categories by the program. This value does not take into account the possibility of multiple category tweets. In the Prodromal stage, for example, 190 of the 313 overall tweets were matched to one or more of the categories, while in the Outbreak stage, 3,240 of the 4,534 overall tweets were matched to one or more of the categories.

Though our program could not identify the specific categories involved in multiple category tweets, the third row provides insight as to how many tweets fit into multiple categories. For example, in the Prodromal stage, while only 190 tweets were matched, 295 patterns were recognized. This implies that 105 patterns were a part of multiple category tweets. And in the Outbreak stage, though only 3,240 actual tweets were matched, 4,939 patterns were recognized, implying that 1,699 patterns were a part of multiple category tweets. Overall, though only

27,336 of the 37,613 tweets in the dataset were matched, 42,844 patterns were recognized. This means that 15,508 patterns were part of multiple category tweets. This explains why the number of total category hits exceeds both the number of matched tweets and the number of tweets.

Table 7 – Automatic Content Analysis Results for Patterns Recognized

	Jan. 23-24	Jan. 25-27	Jan. 28-Feb. 1	Feb. 2-Feb. 8	Total
1.0 IS					
1.1 GIS/UP	48 (25.3%)	717 (22.1%)	3,904 (34.3%)	3,243 (26.0%)	7,916 (29.0%)
1.2 CICTA	19 (10%)	799 (24.7%)	3,052 (27.0%)	5,033 (40.3%)	8,904 (32.6%)
1.3 DEMO	8 (4.2%)	140 (4.3%)	589 (5.2%)	505 (4.0%)	1,245 (4.5%)
1.4 REQ	25 (13.2%)	296 (9.1%)	1,258 (11.0%)	1,346 (10.8%)	2,926 (10.7%)
<i>Subtotal</i>	<i>100</i> (52.6%)	<i>1,952</i> (60.2%)	<i>8,803</i> (77.3%)	<i>10,127</i> (81.0%)	<i>20,991</i> (76.8%)
2.0 CTA					
2.1 DIR	0 (0%)	20 (0.6%)	21 (0.2%)	12 (0.1%)	53 (0.2%)
2.2 RET	26 (13.7%)	584 (18.0%)	1,544 (13.6%)	1,479 (11.8%)	3,634 (13.3%)
2.3 LINK	115 (60.5%)	1,252 (38.6%)	4,569 (40.1%)	4,773 (38.2%)	10,725 (39.2%)
2.4 CS	6 (3.2%)	182 (5.6%)	657 (5.8%)	805 (6.4%)	1,651 (6.0%)
<i>Subtotal</i>	<i>147</i> (77.4%)	<i>2,038</i> (62.9%)	<i>6,791</i> (59.6%)	<i>7,069</i> (56.6%)	<i>16,063</i> (58.8%)
3.0 ES					
3.0 ES	4 (2.1%)	105 (3.2%)	546 (4.8%)	540 (4.3%)	1,195 (4.4%)
4.0 O					
4.0 O	9 (4.7%)	305 (9.4%)	944 (8.3%)	978 (7.8%)	2,237 (8.2%)
5.0 ARB					
5.0 ARB	35 (18.4%)	539 (16.6%)	735 (6.5%)	1,043 (8.3%)	2,358 (8.6%)
Total Category Hits	295 (100%)	4,939 (100%)	17,819 (100%)	19,757 (100%)	42,844 (100%)

Table 7 displays the results of the automatic content analysis. As in the manual annotation, IS remains the most popular category, with 49% of patterns matched belonging to that major category. Yet the emergence of CICTA as a major subcategory during the Outbreak stage and its persistence throughout the crisis is notable. CICTA rose from 6.4% to 16.2% during the Outbreak stage, and increased even more as tweets informed Egyptians on how to gain Internet access, avoid police, or even treat wounds. The percentage of DEMO and REQ tweets remained approximately the same throughout the crisis.

Yet according to the automatic content analysis, the CTA category was also very popular. This is largely due to the dominance of the LINK category, as it contains any patterns with an “http://” link as well as articles, photos, and videos of the protests that were not broadcast by Egyptian state television. DIR patterns consistently composed less than 1% of their respective stages. The RET category experienced a peak during the Outbreak stage with 11.8% of the total patterns, yet returned to approximately 8-9% during both Chronic stages. Many of the RET tweets from the Chronic (Blackout) stage call for mass distribution of information to raise awareness of Egypt’s blackout policy. However, Egyptians requesting Internet actions in the Post-Blackout Chronic stage likely replaced these. One popular RET during the post-blackout stage was regarding a journalist who had been arrested, and the hash-tag #freeayman was used to increase external pressure on the security forces. Mr. Ayman

was freed shortly after. The RET category provided a channel through which quick and easy interactive international action in support of the protesters could be taken.

The ES remained fairly low, though it reached its peak at 3.1% during the blackout. People outside of Egypt saw the extreme measures taken by Mubarak and wanted to offer support for the protesters. Opinion patterns peaked during the Outbreak stage at 6.2%, when Twitter users were excited about the possibility of Egyptian protests. Having just seen the success of the Tunisian crisis, Twitter users optimistically expressed their personal views on the emerging crisis in Egypt.

Relevant Arabic tweets provide some of the most interesting information for the use of Twitter by Egyptians. During the Prodrome, 11.9% of tweets contained relevant Arabic patterns, reflective of the hangover from the Tunisian case, and interest in planned Egyptian protests on January 25. In the Outbreak stage, the percentage of Arabic patterns dropped slightly to 10.9%, as non-Arabic speakers took notice of the massive mobilizations in Egypt. During the blackout, relevant Arabic patterns drop precipitously, to 4.1%. While still able to communicate, the blackout policy was largely effective in muting the reports from Egypt. In the wake of the blackout, the percentage of ARB patterns rose to 5.3%, still much lower than its peak. This perhaps represents the maturation of the uprising, from one primarily mobilized and organized online to one primarily actualized in the streets.

It is important to note that the IR category (Table 8) was calculated in a slightly different way to accommodate the data. In the case of the automatic content analysis, the IR tweets were counted as those not matched by the program. In the Prodrome, 190 of the 313 were matched, leaving 123 as IR. In the Outbreak stage, 3,240 of 4,534 were matched, resulting in 1,294 IR tweets. The Chronic (Blackout) stage contained 4,549 IR tweets, and the Post-Blackout stage contained 4,330. This left a total of 10,296 IR tweets, equivalent to 27.3% of the total dataset. This suggests the impact of the revolution on Twitter, given that the percentage of tweets related to the Egyptian unrest declines sharply after the Prodrome stage. This is logical given that the crisis had not yet begun, and few international English-speaking Twitter users were discussing the upcoming events.

Table 8 – IR/Unmatched Tweets, according to the Automatic Content Analysis

	Prodrome	Outbreak	Chronic (Blackout)	Chronic (Post-Blackout)	Total
6.0 IR/Not Matched	123 (39%)	1,294 (28.5%)	4,549 (28.5%)	4,330 (25.7%)	10,296 (27.3%)

r

Critical Information Sharing and the Egyptian Revolution

Despite the accuracy and overall detection problems regarding the Automatic Content Analysis program, the results of this paper's research is useful in determining the use of Twitter during the Egyptian revolution. The prevalence of Information sharing is notable. This implies that

Twitter was not primarily a tool for mobilization, but rather one for spreading information, both general and critical, to protesters and outside observers. The spreading of information is a vital component to any revolutionary movement. Considering that the government felt the need to shut down the Internet to hurriedly silence communication between protesters and the NPS, the effectiveness of Twitter and other OSM as tools for political change is clear. Without information, there would be no way for protesters to know where to go, find updates on the progress of the program, or even understand their level of personal safety. As Fathya Eldakhakhny explained, residents of Cairo were unsure of what was happening just outside of their houses (Eldakhakhny 4/15/2012). The national news was ignoring the movement, repeating the message of stability. Yet the people observed increasing chaos and instability. The revolution, which began as little more than a gathering of disenfranchised and educated youths to express complaints about police corruption and advocate for democratic reform in the aftermath of Tunisia's success, gained support once the demonstrations had a visible impact on government decision-making. The Internet shutdown encouraged those who were in their homes trying to remain informed about the events in their own city, the "Sofa Party" according to Mervat Madkour to participate in the movement (Madkour 4/15/2012).

There is another side to information sharing, however. Mubarak's regime maintained tight control over traditional media outlets. After the

protests became too large to ignore, the regime portrayed the demonstrators camped out in Tahrir Square as foreign dissidents or Iranians fomenting insurrection and instability. ISPs and mobile phone service providers like Vodafone later claimed that their services had been co-opted by the government to send out misinformation about the nationality and intentions of the Tahrir protesters. This was what encouraged pro-Mubarak protesters to enter Tahrir Square and attack the #Jan25 demonstrators. Although this was just one use of NITs by the government to disrupt the revolution, the overwhelming majority of Twitter was part of the “consolidated generational opinion” cited by Han (2011) in his description of demonstration effects.

Given that information sharing was the most prevalent category of Twitter use and the information provided to protesters was the most directly relevant to the success of the protests, this paper considers the most important category for examination of the Twitter-created NPS during the revolution was that of Critical Information for Calls to Action. Early on in the movement, this critical information was focused on helping protesters know that location or time of planned demonstrations. As January 25th wore on, however, the CICTA tweets shifted to providing information on updated locations as well as the police response. Later in the day, instructions follow on how to prevent physical damage from tear gas. The next series of tweets, beginning on January 27th, that serve as critical information sharing are regarding the lack of Internet access.

Some tweets report minor service outages, but as the transition to the Chronic (Blackout) stage begins, a huge number of tweets report major outages and indeed a near-complete shutdown. The one ISP that maintained service for most of the blackout was Noor, left alone largely due to its connections to the Egyptian stock market. Yet even leaving this one connection open served to undermine the blackout policy. Tweets at the beginning of the blackout allowed individual Noor customers to share or unlock their Internet service to allow public use. When the co-opting of Noor's service was no longer an option, international companies had developed strategies for providing service to protesters. CICTA tweets at this time gave satellite phone numbers or ways to relay information through Twitter by leaving a phone message, bypassing the need for an Internet connection at all. After Internet service was restored on February 2, critical information focused primarily on the safety of protesters in Tahrir Square, sending out the location of major street battles and dissidents arrested. The leaderless nature of the movement caused Mubarak's regime to arrest bloggers and activists, including Wael Ghonim of *We Are All Khaled Said*. Throughout the revolution, the CICTA category underscores the decentralized nature and importance of the networked public sphere. Further revisions of the Automatic Content Analysis program hope to more accurately and fully illuminate each category of tweets. Given the CICTA category's importance to the analysis, it was appropriate for this paper to analyze this category.

Examinations of each individual category will serve to provide more comprehensive information about the NPS, yet also require a more detailed and accurate data-gathering method to understand and properly interpret.

Conclusion

The increasing availability of large datasets and the capabilities to capture additional datasets have great potential for advancing humanities' understanding on the nature of NIT-created (NPS) which will have dynamic effects on both democracy and our society in general.

Recognizing the importance of the NPS, the National Science Foundation is soliciting a research proposal on how this NPS can enhance teaching and learning programs in our K-12 educational system, which includes improving student learning and engagement; optimizing personalized instruction; and supporting adaptive, rapid decision-making. As clearly expressed in NSF's solicitation, it requires multidisciplinary efforts of the consilience from pure science to humanities. This paper is an effort to combine a political inquiry on the unprecedented success of the young generation's political mobilization with empirical evidence on the Arabic youth's use of online social media and Twitter through an Automatic Content Analysis technique. Though manual annotation of a randomly selected and representative sample can provide insight into the use of Twitter, this paper believes that the development of a large NLP program

that is capable of identifying and categorizing tweets from various datasets can lead to a simpler and more efficient study of the Twitter-created NPS.

This paper presents a series of research results attempting to explain the various uses of the Twitter-created NPS during the Egyptian revolution in 2011. It is clear that the underlying sources of revolutionary fervor initially came from the policies of Mubarak and his failure to address the individual needs of ordinary Egyptians. Given Mubarak's emphasis on technological infrastructure for the purposes of economic development, the emergence of an active young NIT-savvy generation provided the mechanisms for mobilization. The Twitter revolutions in Moldova and Iran in 2009, as well as the 2011 Tunisian revolution, provided demonstration effects that inspired Egyptians to use the Internet as a tool against the regime. However, there is another side to NIT development. An increased infrastructure also provides oppressive regimes with more invasive tactics and intelligence with which they can consolidate and reinforce power.

This paper then establishes an analytical strategy to understand the use of Twitter during the crisis. Finding relevant tweets from the NIST *Tweets2011* archive, it used manual annotation to develop categories that could identify the various uses through the extraction of patterns within the tweets' content. The inaccuracy of the program, due to both the concept of personal expression, limited translation capabilities, and difficulty in acquiring specific data regarding multiple-category tweets,

led this paper to compare the results of the manual annotation to the automatic content analysis.

It is clear from both sets of results that Information Sharing (IS) is a dominant function of the Twitter-created NPS. The variety of information sharing includes general information, critical information for calls to action, demonstration effects, and requests for information. The DEMO subcategory suggests that the Egyptian movement was related to the Tunisian Revolution less than one month earlier, and also had a profound effect on other Arab Spring movements. The second most prevalent category was Call to Action (CTA), which consisted of tweets that urged the reader to perform a specific action. This was mainly due to the calls for Internet action, either interactive (represented by the Retweet (RET) category), or inherently one-sided (represented by the Link to articles, photos, or videos (LINK) category). The fluctuations of Arabic tweets indicates the effectiveness of Mubarak's Internet blackout policy, though it was unsustainable and led to economic failures and the consolidation of international support against his regime. Additionally, the decentralized nature of the NPS allowed some Egyptians to bypass the blackout, continuing to inform outsiders of the events in the country. Yet this decentralization also highlights the fact that the revolution brought together a variety of groups with a variety of goals. In Tahrir Square, the only common element among many the protesters was a desire to oust Mubarak. Some demonstrators were more Islamic-oriented, and others

were explicitly secular. Future studies of this dataset can try to take into account the sentiment and goals of Twitter users. Though the process for analyzing massive quantities of data created by NITs can undoubtedly be improved, this paper serves as a template for future studies wishing to examine the use of Twitter in a particular case.

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Honors Capstone Summary

The Egyptian Revolution in 2011 that ousted Hosni Mubarak from power represented a shift in the foundations of revolutionary politics. After having ruled Egypt for nearly 30 years, Mubarak resigned after 18 days of popular protests, lasting from January 25 to February 11, 2011. The movement was decentralized, and crowds emerged quickly in various places according to the protesters' use of online social media (OSM) such as Facebook, Youtube, and Twitter over the networked public sphere (NPS). The NPS is a web of connections composed of technologies such as cell phones and the Internet, as well as OSM. The government was unable to respond competently to the threat posed by Internet use, at one point even shutting off the country's Internet connection in a futile effort to quell the protesters. While the Western media was quick to label the uprising as another "Twitter Revolution," as they had in 2009 with Iran and Moldova, and earlier in the Arab Spring with Tunisia, little empirical evidence exists to support this claim. This paper hopes to provide some

insight into the use of Twitter during this political crisis, and does so by downloading and analyzing 37,613 tweets sent during the revolution. This led to several major questions: What roles did Twitter play in the revolution? What kinds of information were shared during this time? What kinds of actions were called for? Can evidence of the demonstration effect (which will be explained later) be found in the tweets sent? Is Twitter largely an interactive or non-interactive form of communication? How did Twitter use change during different stages of the revolution? Finally, what effects, if any, did Mubarak's total Internet shutdown have on the use of Twitter during the revolution that brought down his regime?

The first section of the paper discusses the variety of factors that contributed to the uprising in Egypt in order to properly contextualize the role of OSM and the NPS. Demographically, the emergence of a large young generation played an important role. The median age in Egypt, a country of 80 million people, is 24.3. 61% of the population is younger than 40. These people had grown up entirely under Mubarak's rule, and were not satisfied by the results of his policies after 30 years. Life politics (an idea put forward by Anthony Giddens in 1991) is the notion that political movements are no longer defined primarily by charismatic figures and anti-colonialist sentiment, but rather issues affecting the everyday lives of citizens. Mubarak's regime struggled with many of these "life politics" categories, with inflation at 11% (from 2010-2011), a 24% unemployment rate among youths, a GDP of \$6,200, and a score of 3.8 on

Transparency International's "Perceived Corruption Index" (scaled from 1-10 with 10 being the least corrupt). One factor in which Egypt was improving dramatically was the literacy rate. The overall literacy rate among Egyptians is 66%, yet among youths this jumps to 82% for females and 88% for males. While indicating an increased capacity for education, this figure does not take into account the inequality in educational services. Many young Egyptians, often in rural areas, remained uneducated, a segment of the young generation arose that was capable of understanding and communicating their complaints in a coherent fashion. This was the critical group that initiated the demonstrations during January and February 2011. The young generation at the center of the protest movements were also technologically literate, developing relationships with the virtual networked public sphere that they could not with the physical public sphere. The initial protests were, to some extent, mobilized, organized, and expedited by OSM, and that the actualization of these protests on the ground encouraged normally inactive citizens to participate in a drive for political change. In looking at the role of Twitter in the demonstrations, it was difficult to develop an effective analytical strategy due to the relative youth of the technology. We decided to use Han's (2012) strategy of Automatic Content Analysis, as will be described later.

In order to make Han's analysis feasible and relevant, obtaining a detailed chronology was important to set understand the nature of Twitter

use. The revolution was divided according to Fisk's Four Stages of Political Crises: Prodrome, Outbreak, Chronic, and Resolution. In the prodrome stage, events and sentiments build toward a breaking point. Egypt's prodrome was marked by smaller protests and the emergence of an online presence unafraid to discuss blatant police corruption, unemployment, or the Tunisian Revolution of 2011 that ousted another presumably established Arab leader. The prodromal problems culminated in an Outbreak, or major event that sparked the political crisis. In Egypt, the January 25 protests were the first major protests, called for online and realized in the streets. The protests persisted, with misinformation and confusion prevalent among the Egyptian population. The Chronic stage began on January 28, when Mubarak made the decision to cut off the Internet, hoping to silence communication between protesters. Ironically, this policy actually brought more Egyptians to the streets, as they no longer had computers to use. The shutdown was also ineffective because it damaged the Egyptian economy while encouraging the decentralized networked public sphere to find new and uncontrollable ways to share and receive information. International media providers voluntarily worked with Egyptians to improve service, with Google even enabling Speak2Tweet technology that allowed people to send out messages by leaving a voicemail. The flexibility of Twitter as a communication tool is another reason to analyze the content of the data sent. Violence broke out after the shutdown was lifted, marking the beginning of a Chronic (Post-

Blackout) stage, which is used for the analysis later. While the violence subsided, the crowds were still present in Cairo's Tahrir Square and many other locations, leading to Mubarak's resignation (the Resolution stage) on February 11.

In order to perform the aforementioned Automatic Content Analysis, Professor Han, myself, and graduate student Dong-yoon Han downloaded the National Institute of Statistics' *Tweets2011 Archive*, containing 16 million tweets collected between January 23 and February 8, 2011. Dong-yoon Han downloaded the tweets and began creating a program that could conduct the analysis that would correctly interpret this huge number of tweets. Of the 37,613-tweet database we found to contain hash tags related to the revolution, a random sample was taken from each stage represented in the archive (Prodrome, Outbreak, Chronic (Blackout), and Chronic (Post-Blackout)). These samples were manually annotated to create general categories that could be identified by key patterns or phrases in a computer program. These categories included, for example, Information Sharing (IS), Call to Action (CTA), Expression of Support (ES), and Opinion (O). Each of these categories was related to a series of key patterns that the Automatic Content Analysis program could identify and extract from the large tweet database, theoretically providing an accurate account of Twitter use during each stage.

Another benefit of the manual analysis is that the qualitative study of tweets is important, providing a nuanced and accurate analysis of that

small group of tweets. After all, Twitter is a form of personal expression, and, as was reinforced through this research, there are very few definitive categories related to individuality and personal expression. The most difficult aspect of creating an Automatic Content Analysis was developing an accurate program that identified and categorized a great number of tweets, and after several revisions, this still remains a problem. However, the error analysis strategy is slowly adding credibility to the program, and continued work will likely provide usable data and a framework for future Twitter research.

The tentative results as of the time of creating this Honors Capstone Project suggest that Information Sharing was the prominent use of Twitter throughout the revolution. Though calls for Internet activism were also prevalent, the primary purpose of Twitter during the political crisis was to inform readers. By providing general information, protesters could update those outside of Egypt on the events, and by providing critical information, protesters could learn of police tactics or new ways to circumvent the Internet blackout.

Though relatively raw, this type of research is incredibly important because as of now there are no standard methods for studying the massive quantities of data escaping from the networked public sphere. The technology is simply too new and the amount of data too great to deal with qualitatively (although this would be ideal due to the personal expression limitations mentioned above). By looking into the Egyptian revolution as a

case study, this paper hopes to increase awareness and strategies of Twitter researchers to benefit the future study of Twitter during political crises and other times.