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Exploring Ways Social Media Data Inform Public Issues Communication: An Analysis of Twitter Conversation during the 2012-2013 Drought in Nebraska

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Research

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Abstract

Social networking sites often are used to maintain close social ties, but increasingly they are used for information and news dissemination, specifically about major events and crises. In 2012, a historic drought struck the Midwest, destroying or damaging portions of major field crops in major agricultural production states. By the end of August 2012, 90% of Nebraska was declared in extreme or exceptional drought, leading to bans on irrigation, damaged crops, and record-low yields as well as damaging the state's leading economic sector. This case study used social media monitoring and analysis to explore online Twitter conversations related to this historic drought in Nebraska during a one-year period.

Researchers determined Twitter conversations increased in quantity as drought conditions worsened, and agricultural issues, environmental impact, extreme weather, effects on the public, and proposals of solutions to address drought were dominant themes among conversations. Twitter served as a news outlet for information and updates about drought conditions, and it contained information from local, national and international sources. The researchers suggest an opportunity exists for educational institutions and organizations to serve as leaders on social media and in social networks to disseminate timely and relevant information related to important public issues, while also monitoring and participating in surrounding discussions. Specifically, attention should be paid by public institutions to building brand equity through the use of concept marketing, audience engagement, use of big data, and thinking personally — strategies that have served private corporations well in monitoring issues of importance to their audiences.

Key Words

Drought, social media, Twitter, content analysis, communications, monitoring

Introduction

In the year marking the 25th birthday of the World Wide Web, it is evident the Internet has become embedded in daily life. More than 80% of U.S. adults report using the Internet, and the Pew Research Center has declared use of the Internet to browse the Web a significant activity for millions around the globe (Fox & Rainie, 2014). With the advent of social networking sites, users have become even more connected to, and through, the Web; as use increases, it has become evermore social and interactive. As of September 2014, more than 70% of online adults reported using social networking sites, and 52% used two or more networks frequently (Pew Research Center, 2015). Among the most popular social networks, Facebook dominates, followed by the career-focused LinkedIn, visually oriented Pinterest, and the microblogging platform Twitter (Pew Research Center, 2015).

Social Media Connects Us

Research indicates social networking sites often are used to maintain close social ties. Contrary to what was once thought about individuals using the Internet and social platforms at high rates, the average social network user is less likely to be socially isolated from peers and users tend to get more support from their social ties via such networks (Pew Research Center, 2014). However, users do not limit use of these sites merely to maintaining contact with friends and family. Weeks and Holbert (2013) indicated social media not only allow users to stay engaged socially, but also they allow easy dissemination of a variety of message content to members of one's network. "What makes social media a unique platform for news is the ability it affords citizens to now act as efficient content distributors" (Weeks & Holbert, 2013). Thus, social media have a "dual nature," serving as both a conversation enabler and an information source for users (Veltri, 2013).

This may not come as a surprise when considering use of social media in significant world events, such as uprisings in Tunisia and Egypt during the spring of 2011. Lotan and colleagues (2011) studied the exchange and dissemination of news and information via Twitter during the Arab Spring. In their study, the researchers determined news was "co-constructed by bloggers and activists alongside journalists" during political events, illustrating a merge between traditional media sources and information exchanged by networks of citizens experiencing rather than reporting the news. Shirkey (2009) aptly noted social media has the potential to provoke and sustain political events by allowing users to amplify certain pieces of news and information.

Veltri (2013) noted the rise of the participatory Web and increase in social media use results in large amounts of user-generated content, which allows the public to play a significant role in knowledge translation, information generation, and amplification. No longer is using the Web to disseminate information a one-way method of communicating. Instead, social media outlets operate as interactive news platforms, helping users engage with content and information, creating their own aggregated versions of the day's news. According to Weeks and Holbert (2013), social media "are quickly emerging as an important and prominent outlet for news engagement" (p. 213). Bosch (2012) argued in the global South social media are increasingly important in the conversation about climate change, and with the growth of mobile technologies in South Africa particularly, the rise in use of social media to discuss issues such as climate change cannot be ignored.

In addition to serving as information and news dissemination tools, social media increasingly are used in crisis communication and health information management. During crisis events, especially health- and welfare-related events such as the 2009 H1N1 flu pandemic (Freberg, Palenchar, & Veil, 2013), the 2008 wildfires in California, and the 2010 earthquake in Haiti (Veil, Buehner, & Palenchar, 2011), social media platforms are employed to help manage unexpected situations with potential impacts on human health. In studying the H1N1 pandemic, Chew and Eysenbach (2010) employed what they termed an "infoveillance approach" and used social media to monitor the spread of information related to the outbreak on Twitter and in real time as a tool to measure public attention to the issue. In the medical community, Eckler, Worsowicz, and Rayburn (2010) determined not only do organizations use social media as a way to provide services and information to members but also they use these platforms to provide community outreach and patient education as well as to handle public relations situations. "The [I]nternet in general and social media in particular are changing health care" (Eckler, Worsowicz, & Rayburn, 2010, p. 1047).

Recent studies have explored use of social networking sites in monitoring public opinion about key public issues. Veltri (2013) noted social media outlets create a vast amount of potential data for use in analyzing dynamics of public opinion about a given issue. Veil, Buehner, and Palenchar (2011)

suggested monitoring social media as a strategy for managing perceptions related to crisis situations. Pang and Lee (2008) noted Twitter can be a helpful real-time data source, allowing data mining, aggregating and analysis immediately, reflecting on the ground events. "As a research instrument, [W]eb-based social media is suitable to give a general impression about public discourse towards diverse issues and can be seen as a mirror of society" (Boehm, Kayser, & Spiller, 2010, p. 597).

In a study focused on Twitter conversations related to the long-term issue of global climate change, Pearce, Holmberg, Hellsten, and Nerlich (2014) examined tweets related to the Intergovernmental Panel on Climate Change (IPCC) in the wake of the organization's Fifth Assessment Report, "the first comprehensive assessment of the physical science evidence for climate change since 2007" (p. 1). Results indicated public concerns in four primary areas by prevalence of hashtags related to science, political campaigns, geographical discussions (climate change in specific regions of the world — Australia, the U.S., and Canada), and societal concerns and new technologies, essentially treating climate change as a social issue. The researchers concluded the use of hashtags in individual tweets were aimed at making connections among groups involved in the debate and helping "to make the socially intangible phenomenon of climate change more tangible" (Pearce et al., 2014, p. 9).

Drought as a Public Issue

In terms of far-reaching domestic issues today, drought may not appear on the radar of a majority of the public. However, recent severe drought conditions in heavily agricultural regions of the country have the potential to affect multiple sectors of the American economy. National news coverage has detailed the devastating, multi-year drought in California focusing on desperate times in California's Central Valley, which grows upward of 230 different crop varieties and more than a third of all produce in the United States (Bittman, 2012). This historic drought has affected multiple economic sectors in California, from the cattle industry where ranchers have had to sell off significant portions of their herds to skiing and winter sports industries where, instead of snow-packed mountainsides, residents and business owners are threatened with extreme fire conditions not usually seen until summer months (Onishi & Wollan, 2014).

In 2012, a remarkable drought struck the Midwestern U.S., destroying or damaging portions of major field crops in states producing a significant portion of the country's corn and soybeans. Approximately 80% of agricultural land in the country experienced drought during 2012, making it the most extensive and damaging dry period since the 1950s (USDA Economic Research Service, 2012). A striking aspect of the 2012 drought was how rapidly it increased in severity during the month of July, a critical time for crop development (USDA Economic Research Service, 2012).

In Nebraska, agriculture is the primary economic driver and puts the state fourth, behind only California, Texas, and Iowa, in terms of agricultural output (U.S. Department of Agriculture, National Agricultural Statistics Service, 2013). Cash receipts from farm products such as corn, soybeans, and red meat contributed more than $21 billion to Nebraska's economy in 2011 (Nebraska Department of Agriculture, n.d.). In 2012, Nebraska was hit particularly hard by drought. As of the end of August 2012, 90% of the state was declared under extreme or exceptional drought conditions, the two most severe designations (National Drought Mitigation Center, n.d.), leading to bans on irrigation, damaged crops, and record-low yields.

Theoretical Framework

The present study was grounded in a theoretical framework combining uses and gratifications theory, diffusion of innovations with a focus on opinion leaders, and framing theory. A popular choice

in explaining how people choose and use media, uses and gratifications theory was developed in part as a reaction to previous work assuming media users were passive and susceptible to direct effects of media messages. Katz, Blumler, and Gurevitch (1974) developed their approach to explain and understand why individuals choose certain media to satisfy their needs and wants. Katz and colleagues (1974) suggested using media helps strengthen understanding of self and society as well as ties with friends and family. Rubin (2009) asserted individuals initiate selection and use of different media based on a number of social and psychological factors, and media compete with other forms of communication, such as interpersonal interaction, for users' time and attention. Rubin noted the theory was designed to explore how users' needs are met by using certain types of media and to understand motives behind media behavior.

Ruggiero (2000) stated "uses and gratifications has always provided a cutting-edge theoretical approach in the initial stages of each new mass communications medium: newspapers, radio, and television, and now the Internet" (p. 3). Indeed, the theory now lends itself well to the study of social media. Gil de Zuniga, Jung, and Valenzuela (2012) employed uses and gratifications to online environments and determined those who seek information via social networks have more social capital and tend to participate to a greater degree in civic and political events than those who do not use social networks for information seeking.

As a second theoretical underpinning, Rogers' (2005) diffusion of innovations theory explains adoption of a particular innovation depends on three elements: personal characteristics of the adopter, characteristics of the innovation itself (such as perceived ease of use), and characteristics of the environment in which the adoption occurs. Those who adopt technological innovations in the earliest stages, called *innovators*, are seen as leading sources of opinion. *Early adopters*, immediately following innovators, may have a slightly slower rate of adoption but also function as opinion leaders; individuals in these groups are those to whom other groups look to for advice and information specifically related to the innovation.

Opinion leaders play an important role in diffusing information related to an innovation; in the case of the present study, the innovation is use of social media to participate in discussion related to and monitor a public issue. Ma, Lee, and Goh (2013) determined opinion leadership was the strongest factor predicting users' sharing of news and "individuals strive to share news to establish their influential positions as opinion leaders" (p. 404). Thus, sharing news via social media may be a way for users to accrue online social capital.

The final pillar of this study is framing theory, which posits the way in which a message is framed and the symbols, images, and words chosen to communicate an idea indicate to audiences how the message should be interpreted. "Frames are *organizing principles* that are socially *shared* and *persistent* over time, that work *symbolically* to meaningfully *structure* the social world" (Reese, 2003, p. 11). Goffman (1974) asserted humans actively classify, organize, and interpret life experiences in order to make sense of them and these schemata of interpretation, which are essentially frames, help us "locate, perceive, identify, and label" information for better understanding (p. 21). Entman (1993) suggested frames are found in four locations in the communication process: in the mind of the message creator, in the text of a message, in the mind of the receiver, and in culture, where culture is defined as society's public discourse. Framing researchers have acknowledged frames enable message creators to categorize information quickly and efficiently and package it in a way that can be best understood by audience members, providing a kind of mental map for interpretation (Dunwoody, 1992; Gitlin, 1980). Prior to the popularity of the World Wide Web, the Internet, and social media, this function was primarily limited to journalists.

Framing has been studied in numerous contexts, most notably within mediated mass communication. While a wealth of framing research exists, to date only a small number of studies have been conducted combining framing theory and social media. However, the body of research linking framing theory and social media is growing, with three studies of note.

Liu and Kim (2011) explored organizations' framing of messages related to the 2009 H1N1 pandemic flu, investigating responses disseminated via both traditional and social media. The researchers noted, "the digital age allows researchers to now identify how organizations frame their messages for the public" by using social media to communicate directly, rather than relying on traditional media (Liu & Kim, 2011, p. 235). Traditional and social media messages released by 13 organizations during a month-long period were collected from organizations' official websites, Facebook pages, and Twitter feeds. Analysis indicated framing differences existed between messages on social and traditional media; organizations used disaster, health crisis, and general health issue frames more in traditional media outlets than in social media outlets but tended to use social media outlets as often as traditional media outlets when employing a general crisis frame.

Wasike (2011) explored framing in news stories posted on social news sites Reddit and Digg and determined most popular among the frames employed in posted stories were those with a human-interest theme. This illustrates a departure from previous research indicating readers' dominant interests lie in stories of disaster and financial news. Veltri (2013) used framing theory to inform a study analyzing more than 24,000 tweets related to nanotechnology and discovered that while nanotechnology itself was not a popular topic of conversation on Twitter, information related to nanotechnology was shared by a small number of "power users," or highly networked individuals. Additionally, in analyzing the tweets, Veltri discovered more than 90% were new messages, while 7 percent were re-tweets, and 1 percent were mentions. A total of 94% of tweets included website links, illustrating a preference among users for "forwarding" information instead of merely making original comments. In noting the study's limitations, Veltri commented often social media users, Twitter users specifically, tend to use communications technology readily and have large networks of people with whom they discuss important matters. According to Veltri:

> These new arenas constitute a vast pool of potential data for analyzing public opinion dynamics regarding the public understanding of science and risk perception. Social media are now a key source of data as new opinion-tracking methods such as mining, aggregating and analyzing online data in real time have become available. (p. 846)

Purpose and Objective

Given the above framework linking uses and gratifications, diffusion of innovations, and framing theories, the purpose of this qualitative case study analysis was to examine Twitter conversation focusing on drought in Nebraska during the period of time designated as extreme or exceptional drought by The National Drought Mitigation Center. A single research objective was used to guide the study:

> Describe the public Twitter conversation related to drought in Nebraska between July 11, 2012, and July 11, 2013.

Methods

The enormous amount of data generated by social media acts as the single largest source of unsolic-

ited public opinion available (Pew Internet & American Life Project, 2012). Industry professionals describe social media data as a massive, real-time focus group (Crimson Hexagon, n.d.) without the key downside of traditional focus groups: peer pressure and controlled environments normally leading to expected responses rather than honest views. Research using social media data must employ qualitative methodologies to explore why and how users discuss important topics online. For this study, a constructivist worldview guided the selection of a case study approach to investigate the online (Twitter) conversation regarding drought during a period of extreme drought in Nebraska. Case study research is a qualitative research method "in which the investigator explores a bounded system … and reports a case description and case-based themes" (Creswell, 2007, p. 73).

A review of records from the U.S. Drought Monitor showed the period of July 11, 2012, through July 11, 2013, as a time where Nebraska experienced the longest sustained period of extreme drought conditions in the past century. As a result, drought impacts were widespread and continuously reported in the news. This time frame thus served as an opportune data collection period to review conversations on Twitter surrounding drought. Tweets were collected using the Sysomos MAP system from Marketwired to ensure rapid and complete collection of data. A Boolean search query was constructed to gather data:

> drought AND NOT (football OR [sports team] OR espn) AND (Nebraska OR crops OR agriculture) with Nebraska

The above search served as a filter to eliminate Tweets not referring to drought related to lack of rain. For example, many Tweets during the fall referred to Nebraska sports where athletes went on a *scoring drought*. The Boolean search query combined keywords using operators such as AND, OR, and NOT, to provide relevant search results. Multiple search queries were run to identify and optimize the final Boolean search keywords and operators.

The search yielded a total of 2,834 individual tweets, 30 of which were removed due to sports references not filtered out by the Boolean constructed search. Twitter data were imported in MAXQDA and coded in vivo to identify emergent themes, which were used to develop a rich narrative describing the Twitter conversation related to the drought.

Stake (1995) suggested data source triangulation as a validation strategy. Triangulation was used in this study to validate findings between researchers' individual codes and themes, and Sysomos MAP software provided additional data analysis and visualizations. These methods were all used to explore the Twitter communities' experience of the drought in Nebraska. Additionally, the U.S. Drought Monitor website provided drought condition data and definitions to build a timeline of events (see Figure 1). The timeline created visualizes data from both Twitter and the U.S. Drought Monitor to illustrate volume and themes of online conversations during the period of analysis.

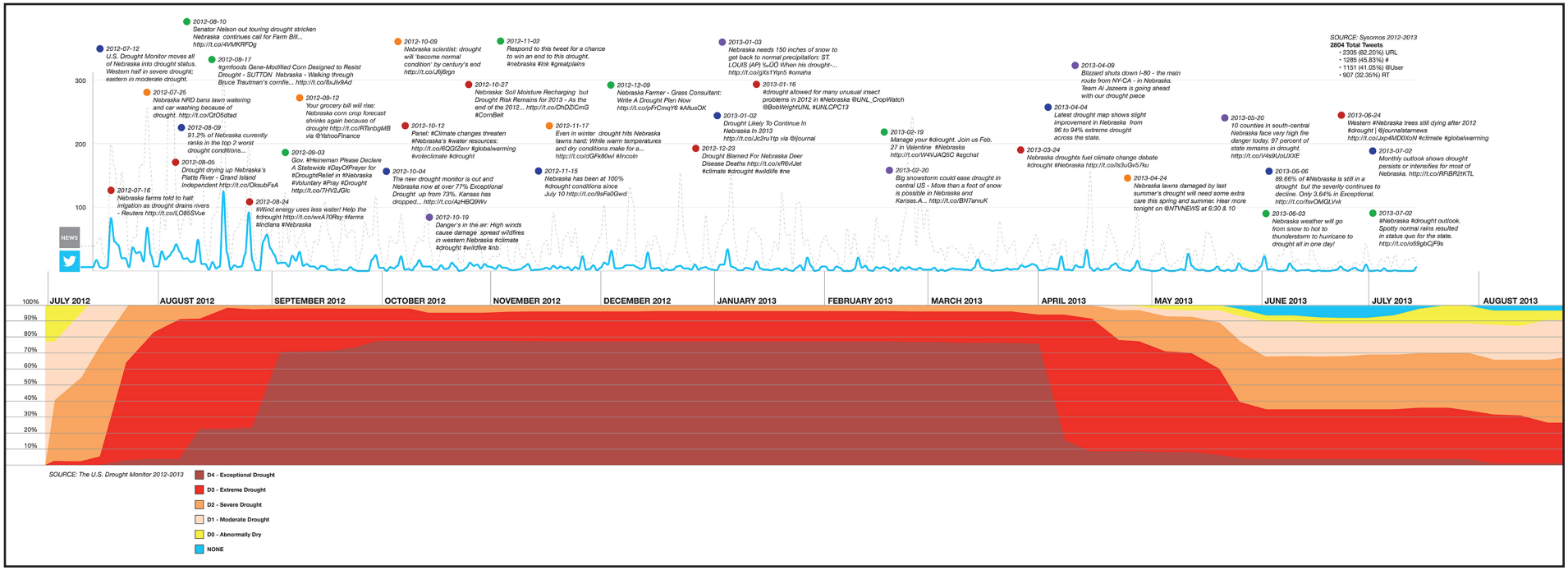

Figure 1. Timeline of Events on Twitter and U.S. Drought Monitor (July 11, 2012, to July 11, 2013

Findings

The Twitter and U.S. Drought Monitor timeline (see Figure 1) demonstrated an increase in tweets published as the drought worsened. As winter months set in, however, and drought conditions were perceived as less severe, conversation on Twitter decreased despite traditional news outlets' continued reporting on difficult drought conditions. The following section describes emergent themes highlighting the breadth of Twitter discussions about drought.

Anticipated themes included likely *agricultural issues,* such as crop damage, livestock disease, water issues, and economic impacts. As expected, *Twitter served as a news outlet* for information on drought status and conditions while it also contained reports of data from local, national, and international sources. Unexpectedly, extensions of these themes crept into tweets about *environmental impact* that discussed climate change issues, promotion of wind energy, and danger to wildlife. A surprising subset of this theme was discussion of *extreme weather* such as lightning strikes that sparked wildfires in Nebraska, while rain or snow in winter months yielded speculation of the drought's possible end. Unexpected themes also involved *effects on the public,* such as increases in food bills, witnessing extremely dry landscapes, and gardening during drought. *Proposals of solutions* to address drought also emerged, such as a day of prayer, grants for recovery efforts, preparations for drought as a new norm, the use of humor to lighten the mood of the situation, and effective management strategies to handle effects of drought.

Twitter as a News Outlet

As expected, *Twitter served as a news outlet* for information on drought conditions and contained reports of data from local, national, and international sources. Numerous organizations and individuals reported on the *latest conditions*. For example, "Drought claims almost every inch of Nebraska" was a simple description of the conditions. On the other hand, many reported from sources, such as "US Drought Monitor: 83% of Nebraska is in extreme/exceptional drought an increase from 64% in just 1 week." As the drought worsened, tweets increasingly revolved around severe conditions.

In winter months, or any other perceived period of relief from the drought, tweets often provided *rainfall and snowfall information:* "Rain and snow this coming week will put a big dent in the Nebraska drought. #agwx #sdwx #newx #weather." However, even in winter, Twitter users pointed out the amount of precipitation needed was extremely high. One user stated, "Charts show the staggering rainfall deficit in #drought stricken Nebraska #climate." Users understood precipitation was needed, but *misconceptions* triggered false alarms about the drought's end and fueled speculation during periods of rain or snowfall. Questions were raised: "Has Recent Rain And Snow Ended the Drought in Nebraska?" Every little bit of precipitation was scrutinized and speculated over as enough to end the drought: "Good news: Thanks to recent rain and snow #Nebraska's drought condition is improving."

Historical references and information provided a *drought history* to help frame the current situation. One tweet compared past droughts in the state: "1934 drought vs. 2012 #drought in the Nebraska prairie" As drought extended over the winter months and continued into spring, reports of *lasting effects* and eventually *news about relief* efforts to ease the impact left on Nebraska emerged. Many tweets and stories revolved around impact on agriculture in the state: "Report anticipates smallest Nebraska wheat crop since 1944 via @OWHnews #txwater #drought."

1. Twitter as a News Outlet	
Latest Conditions	Drought claims almost every inch of Nebraska. US Drought Monitor: 83% of Nebraska is in extreme/exceptional drought an increase from 64% in just 1 week. 91% of Nebraska is now in extreme or exceptional drought up slightly from last week. #drought12 All Nebraska counties now in national drought disaster area according to #USDA. #NRCS programs help
Precipitation Information	Rain and snow this coming week will put a big dent in the Nebraska drought. #agwx #sdwx #newx #weather Extraordinary snowfall needed to relieve drought: ST. LOUIS (AP) -- When his drought-stricken Nebraska farm… Charts show the staggering rainfall deficit in #drought stricken Nebraska #climate
Misconceptions	Has Recent Rain And Snow Ended the Drought in Nebraska? Good news: Thanks to recent rain and snow #Nebraska's drought condition is improving.
Drought History	Report anticipates smallest Nebraska wheat crop since 1944 via @OWHnews #txwater #drought Drought 2012: Is History Repeating Itself? http://t.co/orLbkMmQ via @luannschindler #Nebraska Scorched earth - the BBC travels to #Nebraska in the midst of an historic #drought where ranchers and farmers despair 1934 drought vs. 2012 #drought in the Nebraska prairie

Figure 1: Twitter as a New Outlet Example Tweets

Agricultural Issues

Agricultural impact such as crop damage, livestock disease, water issues, and economic problems were common among observations on the drought's impact on the region's agricultural industry. For example, "Crops in Nebraska Deteriorate: Drought conditions continue to stress corn beans and pastureland." Such tweets led to comments about how crop damage affects feed costs: "Drought Means Higher Feed Costs For Ranchers Next Year."These impacts continued to grow and worsened over time, resulting in a swath of tweets offering solutions and relief beyond waiting for precipitation due to the realization that drought would continue longer than expected: "Nebraska farmers advised to plan for more drought."

As Nebraska's economy is heavily dependent on agriculture, discussions about *economic impact* were expected and were indeed a central topic of discussion throughout the year. State and regional economic effects were of primary concern: "Drought costs Nebraska corn crop nearly a quarter billion dollars – Rapid City Journal" (Rapid City is located in South Dakota). However, the impact was felt well beyond the state border: "Chinese need assurance that Midwest crops will survive drought: Nebraska."

Furthermore, farmers in the state rely primarily on *irrigation* to produce crops. This in turn

yielded tweets related to new water usage policies and strategies implemented during the drought. At one point farmers were ordered to stop irrigating: "This is getting scary. Farmers forced to stop irrigating because of low river levels. #drought #Nebraska #climate." As irrigation halted, livestock health became an issue. Nebraska is also known for *beef production,* and concerns were raised about livestock conditions and mitigation strategies offered. Measures were taken to survive the drought: "Drought forces Nebraska cattlemen to thin herds." However, drought created additional animal health problems: "Drought brings untreatable disease to Nebraska cattle."

2. Agricultural Issues	
Agricultural Impact	Crops in Nebraska Deteriorate: Drought conditions continue to stress corn beans and pastureland. Lost our 8,000 acre fall corn job in central Nebraska! #drought. The farmer is going to make corn hay! Worse than experts say! #agchat Drought Means Higher Feed Costs For Ranchers Next Year Nebraska farmers advised to plan for more drought
Economic Impact	Chinese need assurance that Midwest crops will survive drought: Nebraska USDA cuts corn-crop estimate as drought hurts yields Drought costs Nebraska corn crop nearly a quarter billion dollars - Rapid City Journal
Irrigation	Drought prompts state to send water shut-off notices to 300 southeast Nebraska Farmers who irrigate have been ordered to stop because of drought conditions This is getting scary. Farmers forced to stop irrigating because of low river levels. #drought #Nebraska #climate
Beef Production	Drought forces Nebraska cattlemen to thin herds Brian Fuchs of the Drought Mitigation Center tells @NBCNewsBusiness the meat industry will be hard-hit by #drought Drought brings untreatable disease to Nebraska cattle

Figure 2: Agricultural Issues Example Tweets

Environmental Impact

The *environment* emerged as a popular topic during the analysis period, as well. Often, tweets reported observations of dry riverbeds and land: "Wow, just saw a very large river bed and no river in Nebraska. First sign of the drought. :(." Along with personal accounts, humor was used to cope with the severity of the conditions: "Nebraska is 500 miles of dead corn and dry rivers." Calls were made to Washington, D.C., to push for an approved farm bill: "The drought has definitely taken a toll on habitat in Nebraska. #FarmBillNow."

Wildfires, extreme weather and *other effects on the environment* also were reported, including effects on wildlife and insects and tree stress. Drought created ideal conditions for wildfires: "Lightning sparks Nebraska wildfire amid drought - Chicago Tribune." Wildlife were reported as suffering from drought: "Drought Blamed For Nebraska Deer Disease Deaths: Nebraska's continuing drought is being blamed for a bi …"

Somewhat surprisingly, the *Keystone XL pipeline* emerged as a hot topic in relation to drought conversation. Users saw the drought as an opportunity to connect water issues to the proposed pipeline and potential dangers posed to the Ogallala Aquifer, which is located underneath the majority of the state: "Nebraska report says #Keystone XL still crosses #aquifer and 100% of Nebraska is in extreme #drought. #NoKXL #water @reuters." Such tweets took advantage of the conversation to highlight possible environmental impacts while injecting humor about better ways to use the pipeline: "Idea: Repurpose #KeystoneXL to carry Arctic meltwater! #noKXL RT @heidicullen 70% of Nebraska under at least extreme drought conditions."

Effects on the Public

3. Environmental Impact	
Environment	Nebraska River levels dangerously low: Rivers and streams across Nebraska are drying up due to drought exposing... Wow, just saw a very large river bed and no river in Nebraska. First sign of the drought. :(Nebraska is 500 miles of dead corn and dry rivers The drought has definitely taken a toll on habitat in Nebraska. #FarmBillNow
Wildfires and Extreme Weather	Lightning sparks Nebraska wildfire amid drought - Chicago Tribune Even with #declines due to drought Nebraska is still a top destination for pheasant hunters! Drought Blamed For Nebraska Deer Disease Deaths: Nebraska's continuing drought is being blamed for a bi... Drought keeping grasshopper numbers low in parts of Nebraska A Nebraska Forest Service official says the drought has put extreme stress on trees and shrubs
Keystone Pipeline	Nebraska report says #Keystone XL still crosses #aquifer and 100% of Nebraska is in extreme #drought. #NoKXL #water @reuters Idea: Repurpose #KeystoneXL to carry Arctic meltwater! #noKXL RT @heidicullen 70% of Nebraska under at least extreme drought conditions

Figure 3: Environmental Impact Example Tweets

As Twitter is a sounding board for all manner of voices (individuals and organizations), tweets often expressed views from non-agricultural entities reflecting about how drought affected their lives, often focusing on an *increase on prices*. Many of the problems caused by drought initially impacted the agricultural sector but quickly began affecting the general population. Food prices were expected to increase as a result of the drought: "Drought Impacting Grocery Store Prices: The current drought we're in isn't just affecting us here in Nebraska." Price hikes at the gas pump were attributed to widespread drought conditions: "Drought may also be behind rising gasoline prices in Nebraska."

W*ater usage in the home* also became a statewide issue: "Drought or no drought many Nebraska communities face challenges finding adequate water." Water restrictions in much of the state's cities and towns were reported: "Water restrictions bloom across Nebraska in drought." With restrictions emerged discussions about *lawn and garden issues*: "Even in winter drought hits Nebraska lawns hard:

While warm temperatures and dry conditions make for a …" In turn, advice was offered to homeowners about how to manage properties: "Ways to save lawn garden and trees during drought: Even though parts of Nebraska could see some rain today …"

4. Effects on the Public	
Increase on Prices	Drought Impacting Grocery Store Prices: The current drought we're in isn't just affecting us here in Nebraska Drought may also be behind rising gasoline prices in Nebraska
Home Water Usage	Water usage rises with temps dry conditions Drought or no drought many Nebraska communities face challenges finding adequate water. Water restrictions bloom across Nebraska in drought
Lawn and Garden	How to deal with lawn / plant drought stress in #Nebraska Ways to save lawn garden and trees during drought: Even though parts of Nebraska could see some rain today… Even in winter drought hits Nebraska lawns hard: While warm temperatures and dry conditions make for a...

Figure 4: Effects on the Public Example Tweets

Proposals of solutions

Proposals of solutions to address drought also emerged, such as a day of prayer, grants for recovery efforts, preparations for drought as a norm, the use of humor to lighten the mood of the situation, and effective strategies to handle effects of drought. Requests for donations were posted: "Donations for Nebraska drought & fire relief can be made at [URL] #drought." Also, the drought became a case-in-point, highlighting the need for Congress to enact a Farm Bill: "Pause in cybersecurity bill discussion to talk about drought in Nebraska and inaction on another bill the Farm Bill." Other initiatives and scientific innovations were offered as ways to combat drought conditions. A statewide day of prayer was also suggested: "PLS RT @kfabnews @Gov_Heineman Please Declare A Statewide Day of Prayer for Drought Relief in Nebraska."

The drought left some *wishing for water* in strange, peculiar, and humorous ways. One user stated: "Hoping for rain always. #Nebraska #drought #justlikelastyear #andtheyearbefore #aaaandtheyearbeforethat." Others highlighted struggles using humor: "The drought is so bad in Nebraska residents of the state have started calling watermelons 'dustmelons.'" Furthermore, tweets became requests for precipitation — "Hey Kansas! Send some of that snow up here! Nebraska needs 10 feet to fix our drought!" — even going so far as to make a game out of tweeting to end the drought: "Respond to this tweet for a chance to win an end to this drought."

5. Proposals of Solutions	
Suggestions	Donations for Nebraska drought & fire relief can be made at [URL] #drought Pause in cybersecurity bill discussion to talk about drought in Nebraska and inaction on another bill the Farm Bill. Nebraska NRCS Offers Initiative to Aid Drought Recovery #gmfoods Gene-Modified Corn Designed to Resist Drought - Nebraska -- Walking through Bruce Trautman's cornfield. PLS RT @kfabnews @Gov_Heineman Please Declare A Statewide Day of Prayer for Drought Relief in Nebraska Are you worried about #Drought? Attend the Risk Management Seminar Feb. 21
Wishing for Water	Hoping for rain always. #Nebraska #drought #justlikelastyear #andtheyearbefore #aaaandtheyearbeforethat The drought is so bad in Nebraska residents of the state have started calling watermelons 'dustmelons.' Hey Kansas! Send some of that snow up here! Nebraska needs 10 feet to fix our drought! Respond to this tweet for a chance to win an end to this drought.

Figure 5: Proposals for Solutions Example Tweets

Discussion and Recommendations

The breadth and variety of discussion about drought during the time period of study was surprising. While data indicated a broad spectrum of topics in Twitter conversations about this period of agricultural and environmental stress, media coverage and academic reports were at the center of Twitter discussions. A majority of tweets in the period of analysis included links to government and academic websites serving as sources of information about drought conditions.

Academic institutions, specifically land-grant institutions, have an obligation to serve citizens through education, service, and research. Interestingly in this study, beyond the occasional announcement or public event related to drought, universities such as the state land-grant institution were surprisingly absent from the discussion on Twitter. Consequently, an opportunity exists for educational institutions and organizations to serve as opinion leaders using social media and social networks to disseminate timely and relevant information, while also monitoring and participating in discussions surrounding important public issues to aid in building community.

A practical and information-focused social media policy, where trust is built through interesting, entertaining, and informative content over time will enable university organizations to become influencers and opinion leaders on such public issues. Data in this study from state organizations served little more purpose than as bulletin board announcements. Efforts to stand out among the din on social networks with quality, credible information from educational institutions and land-grant universities will set the stage for increased public engagement on important topics.

Roger's (2003) diffusion of innovations theory provides a model for organizations to leverage ways in which early technological adopters approach analysis of social media data, classified by some as "big data." The concept of content marketing provides a framework for institutions to get started. A number of strategies can be integrated so institutions are established as thought leaders on so-

cial networks, providing timely information about complex and important issues facing the public. Strategies based on such analysis include building brand equity through content marketing, audience engagement, the use of big data, and thinking personally.

Building brand equity through content marketing. Organizations must plan social media presence and strategy by implementing a purposefully developed editorial calendar and practicing active listening to social media environs. An excellent (now classic) example of the active listening approach's success was Oreo's "dunk in the dark" tweet during the 2013 Super Bowl electricity outage. During the outage, Oreo's social media team created a clever graphic that became shared widely on Twitter and other social networks. Such widespread advertising was possible because the Oreo brand had a team monitoring a major event (the Super Bowl) on social media and social networks, keeping a pulse on the event and conversations online and enabling an almost real-time response with relevant content interesting to the audience.

Audience engagement through active monitoring and tracking of trends via social media allows organizations to understand online, real-time conversations in order to act authentically when the times comes to interject ideas into the conversation. Properly done, building on content-marketing efforts allows organizations to build brand equity and lead audiences to consider the institution for accurate, authentic, and interesting content — in other words, possibly being considered opinion leaders. Leading brands, such as Dell and Gatorade, have specially designed social media centers, which actively monitor and respond to customers as comments and concerns are posted. Companies such as Jet Blue and Best Buy even use Twitter as a customer service platform to actively respond to customer issues related to products or services. Audience engagement in this manner can and should be adapted for use by academic institutions.

Use of big data and analysis of past events will allow organizations a chance to put strategize about effective approaches to issues and topics of concern to audiences. In the case of severe drought such as the one used for the basis of this study, a university need not wait for the next severe incident to plan its approach. Historical social media data can help institutions prepare materials and initiatives to help mitigate issues. Commercial strategic communicators have used this strategy for years with traditional information and marketing campaigns, analyzing results and crafting subsequent strategies. With the advent of digital and interactive media, one byproduct is the enormous amount of data that must be analyzed quickly and efficiently. More importantly are insights and tactics must be extracted from the data and put into place for future efforts.

Finally, organizations such as academic institutions need to *think personally* and attempt to frame conversations in more personal ways. Social media are inherently personal platforms and can level the playing field for voicing a variety of thoughts and opinions. By using social media, universities and organizations large and small all have a platform to voice ideas, regardless of budgets and prestige. Academic institutions possess a wealth of faculty experts — genuine opinion leaders who may provide more authentic perspectives and aid in personalizing online conversations. In the case of the present study, instead of organizations tweeting purely factual information, consider how experts in water usage and conservation might have become trusted voices for key information during the drought. Institutions should work with and provide support for such experts to make complex issues more personal.

Many of the approaches outline above are used commonly in the communications industry, but room exists for their use in non-profit, education, and outreach organizations, that seem to be, at least in the case of the drought year studied here, missing opportunities to become trusted leading sources of information for new audiences through effective use of social media.

Recommendations for additional research include actively monitoring social media, especially Twitter, to track and establish trend benchmarks for public issues in addition to drought. Monitoring trends allows organizations to identify influencers, contribute information, and correct misinformation regarding the framing of a particular issue. Tracking trends and participating in online discussion allows organizations to actively engage in framing the event in the public's mind.

Limitations of this study include the de facto nature of case study research where results and findings cannot be generalized. However, this case study does provide a first look at types of public issues organizations may address through social media data and analysis. Additionally, the study is limited by the use of Twitter as the sole social network for data. In a dynamic, online environment, future research should look at the interaction and mix of media, traditional and social, to gain a more holistic view of how public issues are discussed online. Future research also should explore other types of public issues, such as climate change, economic downturns, food safety, health epidemics, and other common issues that affect the public.

Analysis of social media data, in combination with other data, can help public organizations set, execute, and assess strategies and objectives, which will help more effectively reach public audiences. This study provided an analysis of a single, year-long issue and how the online conversation unfolded on Twitter. Drought affected all aspects of life in Nebraska, revealing a breadth of conversations around a single public issue and multiple opportunities for organizations, specifically government agencies and the state's land-grant university, to actively engage public audiences by providing relevant facts, resources, strategies, and other content.

This project is a first step in examining public issues online. More case studies may help establish patterns, which can inform development of public issues modeling via online and social media conversations.

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