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COLLEGE FOOTBALL TWITTER COMMUNITIES: THE HUSKER
TWITTER COMMUNITY DURING THE 2012 CAPITAL ONE BOWL

By

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COLLEGE FOOTBALL TWITTER COMMUNITIES: THE HUSKER
TWITTER COMMUNITY DURING NEBRASKA FOOTBALL GAMES

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University of Nebraska, 2012

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Our increasingly interconnected society has allowed total strangers to share insights in real time with increasing frequency and ease through the use of social networking sites like Twitter, Facebook, LinkedIn and Google Plus. Twitter, a social network based on the cell phone short messaging system, has previously shown an ability to aid in the sharing of information during major events such as presidential debates and breaking news.

Sporting events are also places where large groups of people share a similar experience. Traditionally, information has flowed to average viewers, through professional journalists. Due to social networking sites like Twitter, fans now have the ability to speak directly to professional journalists, other fans as well as representatives within a sports organization during an event, regardless of distance, and in real time. The adoption of Twitter into these sporting communities may be shifting traditional communication patterns among sports organizations, journalists and average fans.

Understanding how reflective the flow of information is to the actual events on the field, how the parties involved in this social media community communicate, and the influence of institutional social media accounts with different users is paramount in further understanding how information is shared using social media.

By examining a collection of Tweets obtained during the 2012 Capital One Bowl game with Nebraska versus South Carolina this research has been able to take a closer look at the Nebraska Football Twitter community in order to begin understanding these questions. Users can be divided into two groups, seekers of information and sources of information. Ultimately, understanding how users seek out information and communicate during a sporting event will assist first hand sources of information such as journalists and sports organizations in better tailoring their messages to the correct audience to gain the best, most accurate information available in an instantaneous manner.

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CHAPTER 1: INTRODUCTION

Our increasingly interconnected society has allowed total strangers to share insights in real time with increasing frequency and ease. Social networks have facilitated this communication in ways that are fundamentally changing how some members of society seek out and share information. Twitter is a popular social network that allows regular users, journalists and other influential parties to connect and share information in real time, using minute-by-minute short messages.

During live events such as political debates and sporting events this ability to communicate may be shifting communication patterns among viewers, journalists and participants. Traditionally, information has flowed to average viewers through professional journalists. Fans now have the ability to speak directly to professional journalists, other fans and representatives of a sports organization during an event - regardless of distance and in real time - through Twitter. Sporting events have traditionally been a place for large numbers of individuals to coalesce and communicate about or during a shared event. Many sports organizations on both the college and professional level have taken notice of this shift in communication and invested in social network presences in hopes of engaging with fans.

Little research has been completed on how college and professional sports organizations fit into the Twitter media community with journalists, fans and athletes themselves. Gaining a clearer picture on how reflective the flow of information is to the actual events on the field, the way the parties involved in this social media community communicate, and the influence of institutional social media accounts is paramount in

better tailoring what type of information to provide and what times are most effective for consumption by the broadest possible audience.

Nebraska football has a highly interested fan base, a large cadre of traditional media reporters in print, television and radio as well as a growing number of new media bloggers. There has been little or no published research into the social media landscape of Nebraska football and limited research on social media interaction during college football games on a broader scale. The goals of this research are to gain an overview of the #Huskers Twitter community; the influential accounts within the community, the reflectivity of Twitter traffic to game-day events, and the interaction between different account types within the community. This research also serves as an early attempt to quantify the way Twitter serves the collegiate football fan community in sharing information and opinions.

This research focuses on traffic from the #Huskers Twitter community during the Nebraska versus South Carolina 2012 Capital One Bowl in order to make some observations about these specific topics. As expected, the overall volume of traffic on Twitter was indicative of major events on the field, particularly scores, the halftime break and some major infractions on the field. The patterns of these interactions on Twitter might illustrate tendencies among individuals in the community in processing and sharing information. Institutional accounts also hold a strong degree of influence within these specific team communities; however conversational influence was limited to positive events such as scores and wanes when negative events occur or once a team loses a game.

CHAPTER 2: TWITTER IN MODERN SOCIETY

The social network Twitter was founded in 2006 with the intent of combining the mobile telephone's 160 character short messaging system with an Internet-based social network for communication purposes (Arrington, 2006). As of June 2011, 13 percent of all online American adults participated in-group messaging via Twitter, more than half of which access the service via their mobile phone. A greater percentage of users are nonwhite males ages 18 to 49 (Smith, 2011b), showing that users are reflective of the target demographic for most sports organizations. July of 2011 Twitter celebrated its fifth anniversary and the company took that moment to portray the stellar growth the service has seen since its inception. As of the summer of 2011, Twitter users sent 350 million tweets per day and nearly 460,000 new users signed up for the service per month (Olivarez-Giles, 2011).

A recent Pew Study found that two-thirds of adult Americans use social media services such as Facebook, Twitter, or LinkedIn (Smith, 2011c). Nearly half of all adults use social networks to connect with others who have shared interests. Thanks to advances in mobile technology this connection has become an all-the-time affair.

Mobile devices have become ubiquitous in modern life with eight in ten adult Americans owning mobile phones. This mobility is shifting the way that Americans access the Internet. As of May 2010, 59 percent of all Americans accessed the Internet wirelessly either through a laptop computer or cell phone (Smith, 2010).

One in three adults in America own a smartphone (Smith, 2011a), allowing users to increasingly use their phones for non-voice related activities as well. While 23 percent have accessed a social networking site from their phone, more than half of connected cell

phone users access the Internet daily from their cell phone with 43 percent doing so multiple times a day (Smith, 2010). Among those under 45, smartphone ownership is around 50 percent (Smith, 2011a).

One area where users have congregated online are weblogs, places where users can gather to “share opinion and analysis about current events,” (Kaye, 2005). Twitter is identified as belonging to a new form of blogging known as micro-blogging; short messages fewer than 200 characters that are published on the web independently or disseminated via a social network. Uses of Twitter have been defined into the following categories similar to blogging - daily chatter, conversations, sharing information and reporting news (Java, 2007).

Twitter has some differentiating characteristics from other social networks; one being that a user does not need to reciprocate the connection with another user. One study found that nearly 80 percent of all connections are not reciprocal. This statistic is almost the opposite of other social networking sites (Kwak, 2010). Many people follow others not just for social reasons but also to find information.

A study that compared information found on Twitter with that in the New York Times found that while the areas of coverage were similar, the distribution was different for Twitter than traditional media. Twitter was more focused on entertainment and personal news. While there was an apparent lack of focus on world news events originating from average users on Twitter, users actively helped spread this news by republishing, or retweeting in the Twitter vernacular, traditional news sources (Zhao, 2011).

CHAPTER 3: TWITTER COMMUNITY USER ROLES AND MAKEUP

Users of Twitter can be broken into three broad categories - sources of information, friends and information seekers. A user also may be considered in different categories for different Twitter communities (Java, 2007). In this way, Twitter communities form around shared interests with certain members serving roles as information sources while others are information seekers. Since these communities are malleable and users can take part in multiple communities at the same time, a user can serve as an information source in one community while simultaneously being an information seeker in another and can even be both a source and seeker in the same community.

Another way to divide users into groups on Twitter has been to differentiate between organizations, journalists/media bloggers, ordinary individuals and others (Choudhury, 2012). Organizations are defined as having some sort of business or marketing interest on Twitter. Journalists or media bloggers are defined as individuals associated with some mass media organization and maintain a blog or reporting interest on a particular topic. Ordinary individuals are people who are on Twitter for a variety of personal reasons including staying in touch with friends and finding information relevant to their interests. The other category, while meant as a catch all, likely includes many celebrities that do not satisfy organizational or journalist/media blogger standards.

These celebrities often have large numbers of followers. One study that looked at a female athlete's Twitter profile found that followers overwhelmingly self-reported as white, affluent and educated. Reasons for following that particular athlete were listed as

respecting that person's character, standing in the community, role model status, etc.

Areas associated with personal elements scored more highly than purely informational ones (Clavo, 2010). Celebrity sports personalities are enticing for ordinary individuals to follow in order to gain behind-the-scenes access to that athlete.

Ordinary users, or what are often called fans in sports terminology, have also been a highly studied segment of the Twitter community. One such study found that Twitter users who follow a specific sport team are highly identified with that team. A high percentage follow athletes and sports writers while a lesser number follow coaches and were also likely to attend a game (Blaszka, 2011).

While more than three quarters of avid college football fans who use social media use Facebook to keep up with their favorite teams, during games more turn to Twitter (Broughton, 2011). Twitter's instantaneous information appeal coupled with widespread mobile adoption has given the service an advantage during live events.

Studies on the information sources side have looked at sports journalists' self-perceived use of Twitter versus their actual usage. A self-reporting study found sports writers were using Twitter primarily to report breaking news (Schultz, 2010a). However, when another study looked at the content of tweets from journalists independent of self-reporting the opposite was found. More than half of sports journalists' tweets had opinion or commentary in them (Schultz, 2010b). It's possible that while journalists recognize the ability to use Twitter for breaking news, the reality may be that they use the service primarily to give their opinion.

CHAPTER 4: MEASURING INFLUENCE

Influence has been studied extensively in sociology, communication studies, marketing and political science. Everett Rogers identified this type of influence in his 1962 book Diffusion of Innovations which theorized that new information gets communicated through social networks over time before reaching mass adoption (Rogers, 1962). Finding out which users on Twitter are highly influential, defined as having the ability to “cause desirable and measurable outcomes and actions” (Leavitt, 2009; Solis, 2012), is useful in determining the social makeup, communication patterns and idea leaders of communities in online social networks.

Traditionally, small cadres of communicators, called *influentials*, excel in influencing other members of the network (Rogers, 1962). Contemporary researchers of influence have theorized that the role of these *influentials* is in fact over emphasized and marketers should instead focus on other factors such as interpersonal relationships and the readiness of society to adapt to a new idea as indicators of probable influence (Watts and Dodd, 2007).

Much of the studying of influence on Twitter has grappled with how to determine and define *influencers* on the network (Leavitt, 2009; Kwak, 2010; Bakshy). Twitter allows users to see two simple metrics to determine the level of an account’s influence - the number of people who follow a specific user and the number of other users that account follows. However, as previously explored, people are on Twitter for reasons that are varied as well as being user and topic specific. This indicates that simply seeing how many people follow another user may not be truly indicative of that user’s influence (Leavitt, 2009; Kwak, 2010; Bakshy).

The mechanics of Twitter allows for users to identify other users who are influential by methods on top of following them. At the outset of search engine optimization a similar problem was encountered. Word counts on pages were ineffective in providing relevant page ranking systems. Researchers instead worked to define and discover “hubs” and “authorities” by using the hypertext link system on the Internet (Kleinberg 1999). A similar attempt paired these results with a “PageRank” system with like results (Brin 1998). Using hyperlinks is somewhat intuitive. Any time a hyperlink is added to a webpage it acts as a “latent human judgment” that can then be used to “formulate some notion of authority” (Kleinberg 1999).

On Twitter, these “latent human judgments” come in the form of actions the messaging service uses to communicate with different members in the community. These four actions are intrinsic in the system itself and have been widely adopted by users. They can be defined as replies, retweets, mentions and attributions (Leavitt, 2009). All of these actions rely on using the @ sign before a username in order to differentiate the content of a Tweet with the user that is being signaled. A reply is a response from one user to another user’s piece of content that begins with “@username” and is used as a response to content from that user. Retweets are citations or attributions of one user’s content by another user and can either begin with “RT:@username” or may be marked only using quotation marks. A mention is similar to a reply, with the exception that the “@username” does not occur as the first word string in the tweet. Attributions, then, are also similar to retweets except that they use a different system to show the origination of the content such as “via @username” (Leavitt, 2009).

Alex Leavitt's study titled *The Influentials: New Approaches for Analyzing Influence on Twitter* found that Mashable, a popular social media and technology blog, is more influential than CNN. Furthermore, celebrities typically have higher follower counts that foster more conversational actions such as replies and mentions while news organizations often have other users re-publish their content using actions like retweets or attributions (Leavitt, 2009).

Another study that attempted to quantify influence of Twitter used multiple indicators and broke levels of influence into three primary categories: indegree influence, retweet influence and mention influence (Cha, 2010). The indegree influence was an indicator of how many users followed a specific Twitter user, or put into news and broadcast terms the audience of that user. Retweet influence is how often a tweet from one account was retweeted by others. This indicates the ability of a user to generate content with pass-along value. Mention influence is the number of mentions of a user's name. Cha furthered the notion that celebrities, or accounts with exceptionally high follower counts, are successful in spawning numerous mentions while traditional news organizations are more adept at influencing retweeting of content. Secondly, Cha posited that "influence is not gained spontaneously or accidentally, but through concerted effort" and that maintaining a level of personal involvement was core to building influence.

Studies looking at news organizations and the spread of information over social media has found that there are a myriad of factors at play into which social media posts are more likely to be picked up and spread through the social media community. The genre of news story as well as other factors including the named entities in the article, the subjectivity of the writing in the article and the source that generates the post all affect

how likely a post will spread (Bondari, 2012). This work found that the source of the news article is helpful in determining the popularity of a tweet, but that traditional sources of journalism did not guarantee that a tweet gain more popularity. In fact, the accounts that had the most organizational clout were new media blog sites like Mashable and tech company blogs like the Google Blog. Whether this shows an inherent source bias within the interests of users on Twitter or it is determined by other factors has not been explored, however it seems probable that early adoption users of Twitter are more likely to be drawn to technology news sources than average citizens.

All of these attempts have been to decipher which users on Twitter are able to sway public opinion about specific topics and their relative ability to do so. Research in viral marketing has attempted to examine the role of content as well as the user in determining the level of influence a tweet may have.

One study examined hashtags, or a type of keywords on Twitter, to determine how quickly adoption of those keywords gained widespread use within communities. What they found were keywords in areas of politics and sports gained adoption by the broader community “significantly higher than expected by chance” (Romero, 2011). This may point to the highly emotional nature of these topics, which give them a greater chance of virality.

Studying the virality of messages is not solely in the realm of social media. Advertisers and marketers have previously studied virality and have found that emotional experiences at the ends of the spectrum, anger or joy, are more likely to be shared through word of mouth than average experiences (Anderson, 1998). Research on brands using Twitter in order to engage in “electronic Word of Mouth”, or eWOM, has found

that the majority of Twitter interactions ended with positive sentiments being expressed (Jansen and Zhang, 2009). Emotion (particularly arousal as stated by the authors) assists in determining which ideas get spread throughout social media (Berger, 2009).

Another study found an interesting caveat to be true from the tourism industry. Negative tweets tended to get spread faster than positive sentiments, even if in absolute terms positive tweets outnumbered the negative (Barbagolla). Again, this study does not take into account specific elements of live sporting events.

Another study used the method of retweeting as a primary influence model to build a cascading tree of influence in order to find the most cost effective place to target individuals for online marketing (Bakshy, 2011). What researches discovered was that users who exert moderate to average levels of influence may be more cost effective in terms of marketing than attempting to target users that could be classified as *influentials*.

While research has begun to establish ways to establish levels of authority on Twitter, what makes some users more authoritative than others continues to be somewhat elusive. The research at times seems to counter itself, indicating that information seekers may look to official and traditional accounts as trustworthy purveyors of information but also seek a more personal experience with a brand or personality. The emotion of individual users is highly tied into how quickly messages are spread and are not necessarily linked to traditionally authoritative news sources. The emotion tied into sporting events presents an opportunity to better understand how influential official accounts are in Twitter communities during live events.

CHAPTER 5: TWITTER AND LIVE EVENTS

Given Twitter's real time nature it is somewhat intuitive that it could be used as a tool for communicating topic specific information. In the 2008 United States presidential debate season there was considerable focus on Twitter and live events. By using hashtags, or searchable tags attached by users to their own tweets, researchers determined the volume of tweets over the span of a debate was a strong indicator of events of importance during the debate itself (Shamma, 2009).

Researchers also noticed a slight correlation with character length and instances of high volume. Using these observations they created two new metrics for evaluation of Twitter with live events - chatness and importance. Chatness looks at character length as a way to determine how interested a person is with the event over the act of tweeting. By measuring character length of tweets they were able to calculate an overall chatness number to assist in showing where a viewer's attention is primarily directed.

Importance uses the "@" messaging function of twitter to determine how much social interaction is going on within a Twitter community. Similar to chatness, importance takes the number of "@" messages and determines a value that can be tracked to show how much conversation is taking place (Shamma, 2010).

The overall public mood from a debate was also shown as being possible to evaluate using Twitter. While not constituting a scientific poll of the general public, researchers were able to use messages from Twitter, coded by third party individuals and then placed in aggregate to get an overall feel from the Twitter population in regards to the debate (Diakopoulos, 2010). Another study brought about the idea of using the Term Frequency-Inverse Document Frequency (TF-IDF) method to quantify sentiment in

predefined temporal segments of the debate. By collapsing tweets into “pseudo-documents” researchers were able to easily determine word frequency and define points of interest from the users (Shamma, 2010). An interesting application used similar methodology paired with video to both determine and tag highlights from a European soccer match with fairly high levels of success for goals, but intermittent success for bookings, or fouls (Lanagan, 2011).

A study that looked to identify different user groups and quantify the types of posting done by each during events found that organizations tended to point to more outside source information through URLs than regular citizens or journalists/bloggers. This same study also found some interesting information regarding the interaction between these different groups. For events such as the Bonnaroo music festival organizations tend to be more interactive with an increased number of @ replies. Ordinary individuals tended to have more @ replies that were conversational in nature in these types of events. Journalists/bloggers and individuals tended to ask more questions than individuals as well. However the greatest take away in looking at multiple types of events was that “there are inherent differences among events and that user types respond differently in the context of different events,” (Choudhury, 2012).

CHAPTER 6: RESEARCH AND METHODOLOGY

The University of Nebraska-Lincoln Athletic Department has run an official Twitter account since February of 2010 and has amassed more than 48,000 followers in that time. This account is located at the website www.twitter.com/Huskers and has served as a news outlet for all 23 varsity sports with an emphasis on the football team.

During football games this Twitter account, referred to as @Huskers in common Twitter vernacular, is used to update fans that may not have access to a broadcast of the game with scores, major plays and official statistics from the Nebraska Media Relations department. The University has adopted the #Huskers hashtag as an official hashtag for all sports and has promoted the adoption of this hashtag by other users who wish to join the social media conversations.

Along with the official Twitter account from the University, there are a number of other organizations, journalists and bloggers and ordinary fans that regularly tweet about Nebraska football news on a regular basis as well as during games. The University has promoted the use of the #Huskers hashtag for all fans, journalists and other organizations tweeting about Nebraska football to assist in organizing the conversation.

For this study tweets were collected during the Capital One Bowl on January 2nd, 2012 using a third party program named The Archivist by Mix Online. The game was played on a neutral field and broadcast nationally on television by ESPN on television as well as locally on radio affiliates allowing viewing access to a large number of fans.

Tweets were collected three hours prior to kickoff, during the game and for three hours after the game ended. Researchers used a variety of searches to collect tweets and analyzed being done on all tweets that contained the word “Huskers” in them. Those tweets were then aggregated into a single document. A recording of the broadcast was later used to log times of important events during the game in order to cross reference the broadcast with findings from the data collected from Twitter.

CHAPTER 7: CAPITAL ONE BOWL GAME OVERVIEW

Before delving into specifics regarding the data captured from Twitter during the 2012 Capital One Bowl it would be beneficial to give an overview of the series of events that occurred during the game. These events were compiled from a log made from the ESPN broadcast of the Capital One Bowl as well as the official game summary posted by the University of Nebraska Athletic Department.

Nebraska won the coin toss and deferred to the second half. South Carolina elected to receive the ball in the first half. After Nebraska kicked off the game at 12:03 pm South Carolina's first drive consisted of five plays and ended in a punt. On the first play of the drive Nebraska's Lavonte David forced the ball loose, which was recovered by South Carolina. Nebraska held South Carolina on third-and-twelve on the fifth play of the drive with a quarterback sack, forcing a change of possession.

Nebraska's first possession would prove to be short-lived but very effective. A short run from running back Rex Burkhead was followed by a 14-yard pass completion for a first down. Quarterback Taylor Martinez then hit Kenny Bell for a 30-yard touchdown pass scoring the first six points of the game. The extra point was blocked by South Carolina and returned to the opposite end zone resulting in a six-to-two score after the first ten minutes of play.

A 45-yard kick return set South Carolina up with good field position on the next possession. After a 13-play, 55-yard drive, South Carolina scored a touchdown and took the lead nine-to-six. South Carolina kicked off out of bounds resulting in a penalty and Nebraska starting its drive on its own 40-yard line. The Huskers would get a first down before their offense stalled. However, a facemask penalty on South Carolina during the

punt resulted in Nebraska retaining possession of the football. On the third play following the penalty, running back Rex Burkhead lined up behind center in a trick play formation called the Wildcat. Burkhead handed the ball to running back Ameer Abdullah who scored a touchdown giving Nebraska a 13 to 9 lead over South Carolina. The Gamecocks went three-and-out on the next possession giving Nebraska the ball before the end of the first quarter.

In the second quarter the Huskers' drive stalled and Nebraska traded possessions with South Carolina a couple more times. With 11:45 left in the second quarter Nebraska regained possession and began a drive from its 34-yard line. Nine plays later, Nebraska found itself in scoring position from South Carolina's eight-yard line. Abdullah rushed the next play and fumbled the ball, which was recovered by South Carolina at the seven-yard line.

The Gamecocks capitalized on the swing of momentum with a 78-yard pass to the other end of the field. The Nebraska defense held South Carolina to the three-yard line over the next four plays forcing the Gamecocks to attempt a field goal. South Carolina missed the 20-yard field goal giving Nebraska the ball back on the Huskers' three-yard line.

Nebraska's next drive took the Huskers deep into South Carolina territory before Taylor Martinez threw an interception at the 26 yard-line. South Carolina regained possession of the ball with 38 seconds left in the first half. The Gamecocks then drove the ball down the field ending in a 51-yard, Hail Mary touchdown pass to end the second quarter. The first half ended with South Carolina taking the lead 16 to 13 over Nebraska. As the teams were leaving the field Nebraska head coach Bo Pelini was interviewed by

ESPN's sideline reporter. Pelini answered to a question about how they planned to respond by saying "We're fine, we'll be fine," in a somewhat terse, short statement.

Nebraska received the football for the second half and successfully drove the ball down the field to South Carolina's 18 yard-line. The drive stalled and Nebraska subsequently missed a 35-yard field goal. Nebraska's defense held the Gamecocks on the next possession, quickly regaining possession of the football.

On the Huskers' next drive, a series of penalties stopped them before they built any momentum. South Carolina retook possession at the 29 yard-line with 4:19 left in the third quarter. On the fifth play of the drive Nebraska's Alfonzo Dennard and South Carolina's Alshon Jeffery were ejected from the game for fighting. Nebraska regained possession of the ball and was unable to convert the drive into a touchdown before the end of the quarter. After three quarters South Carolina continued to lead the game 16 to 13.

Nebraska had the football at the start of the fourth quarter, but was forced to punt on the second play. South Carolina started its next drive and advanced 41 yards in five plays to extend its lead to 23 to 13. Nebraska's next possession lasted six plays and ended after a 14-yard sack of Martinez that forced a Husker punt.

South Carolina took possession with 9:25 left in the game and drove 71 yards in 13 plays for another touchdown, extending the Gamecock's lead to 30 to 13. Nebraska's final possession resulted in a series of quarterback sacks before punting the ball back to South Carolina to end the game. The final score was 30 to 13 with South Carolina winning the Capital One Bowl over Nebraska.

CHAPTER 8: GAME REFLECTIVITY OVERVIEW METRICS

Previous research on Twitter and live events has shown a correlation with volume of Twitter traffic with important moments during the event (Shamma, 2009 and Lanagan, 2011). The study conducted using European soccer matches showed high correlation with scoring and more difficulty in finding correlations with bookings and fouls.

Unfortunately, Nebraska only scored two touchdowns, both in the first quarter of the game. Yet the game had some other moments of strong emotional swings in momentum like the Hail Mary pass at the end of the first half and Dennard and Jeffery ejected from the game. It seemed reasonable to assume that similar results would appear from the Capital One Bowl.

Every tweet was time stamped with the minute the tweet was posted, information from which user posted the message as well as the content of the tweet. Researchers looked at tweets from 9:00 am to 6:00 pm Central Time in order to ensure that all messages during the event as well as sufficient messages before and after the event were captured. As well as capturing the time during the game this also established a three-hour window before and after the game to determine a baseline level of tweets.

The number of users who were actively tweeting using the word “Huskers” showed an increase during the time period of the game. There were 3,557 users engaged on Twitter during the game compared to 1,151 users during the pregame and 1,192 users in the postgame period. Previous research used time bands around important events to ensure gathering all tweets surrounding specific points in time (Lanagan, 2011). Using similar methodology researchers grouped tweets into five-minute intervals.

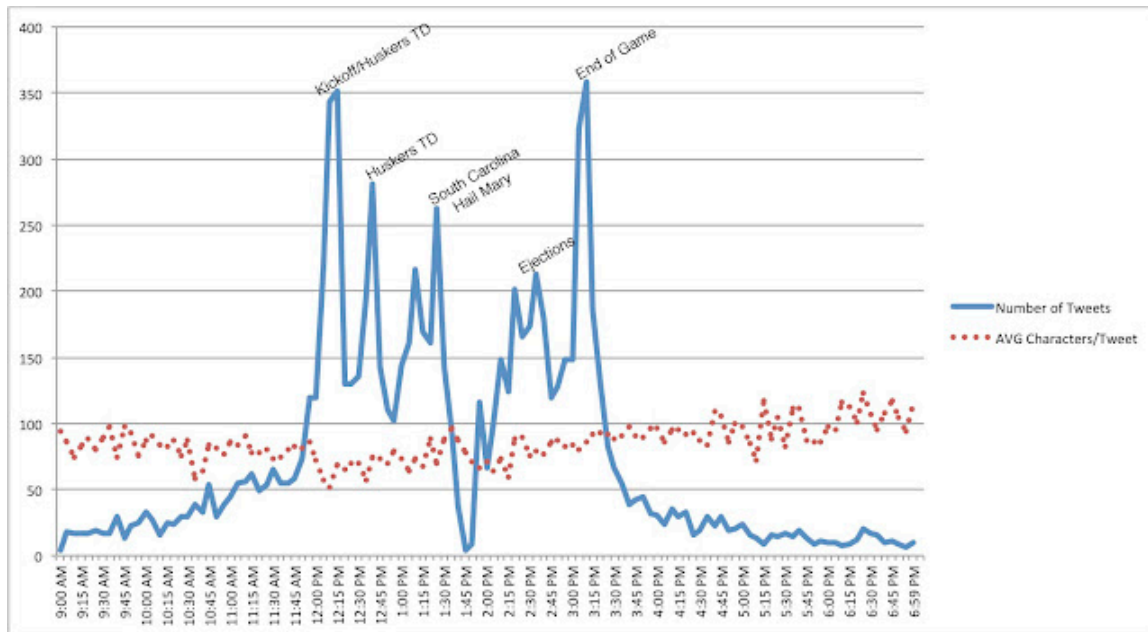


Figure 8.1: Tweet Volume and Average Characters per Tweet for the Capital One Bowl

The resulting data showed a substantial increase in traffic from 12:00 pm to 3:10 pm during the game [Figure 8.1]. Using five-minute intervals the average number of tweets was 167.68 compared with the pregame average tweet volume count of 37.17 and a postgame count of 29.07. During the game, nine significant spikes in Twitter volume occurred; four of these spikes occurred around a moment when either Nebraska or South Carolina scored. The top volume was in the 3:00 pm to 3:10 pm time period, which corresponded with the end of the game. The second-highest spike occurred from 12:00 pm to 12:10 pm during which the game officially began. The other four spikes corresponded with missed scoring opportunities, two players being ejected, a Hail Mary pass at the end of the first half and a series of penalties.

As well as Twitter volume the research also showed average character length in the same time frame. Previous research demonstrated that character length gives insight

to how Twitter users weigh the value of the actions occurring during the live event versus the act of tweeting itself. Lower character counts indicate that people are more interested in the live event itself (Shamma, 2009).

During the Capital One Bowl average characters per tweet were 76.72 versus a pregame average of 82.44 and a postgame average of 99.45 [Figure 8.1]. A slight increase in character length occurred around half-time. During the game users were more focused on the events on the field with Twitter being a secondary focus, however in periods without action people spent more time tweeting. Beyond the difference in average character length between pre-game and post-game, a change in the average character length from the first half of the game to the second also occurred. From 12:00 pm to 1:49 pm, a time frame that encapsulates the beginning of television coverage to halftime, the average character count per tweet was 69.68. From 1:50 pm to 3:20 pm the average character length per tweet was longer at 80.98 characters. Likely because of the differing nature of the halves, users spent more time interacting with Twitter in the second half than the first.

The character length troughs do not have the same volatility as volume of tweets, yet for the most part do have a relationship with volume. For instance, from 11:56 am to 12:00 pm the average characters per tweet was 72. During the next two five minute intervals, which correlate with the start of the game and scores from both teams, average character per tweet dropped to 58 and 52 respectively, before it rebounded to 69 at 12:15 pm. Also, from 1:21 pm to 1:25 pm characters dropped from 88 per tweet to 70 characters per tweet. This time frame lines up with a Hail Mary pass from South Carolina to end the first half.

There was also a spike in character length at 2:20 pm, which results in consistently longer tweets from that point forward. This would line up with the ejection of Nebraska's Alfonzo Dennard and South Carolina's Alshon Jeffery for fighting during the game. The average character length per tweet during the game prior to that point was 69.32 while after 2:20 pm the average increased to 84.16. It is possible that this was the point fans discussing the game on Twitter began to decide that Nebraska had lost the game and began to focus more on the act of tweeting their opinion versus reacting to events on the field.

Research on the 2008 presidential debates used @ messages between users to examine conversation between users during the debates (Shamma, 2010). During the Capital One Bowl there was an increase in @ messages used per minute during the game with an average of 12.48 per minute compared to a pregame average of 5.06 and a post game average of 4.59 [Figure 8.2]. While there was indeed an increase in conversation in the Huskers Twitter community during the game, when looked at as the percentage of tweets that contained at least one @ sign there was actually a drop during the game.

During pregame the average number of tweets with an @ character was 47.76 percent, postgame it was 47.63 percent and during the game it fell to 32.08 percent [Figure 8.3]. Either the volume of tweets during the game increased faster than the level of conversation, or there was actually less conversation occurring during the game than either before or after. It is interesting to note that following points of peak Twitter volume the percentage of tweets that contain at least one @ sign will also rise, meet or exceed the 45 percent threshold that was representative of the pregame and postgame average.

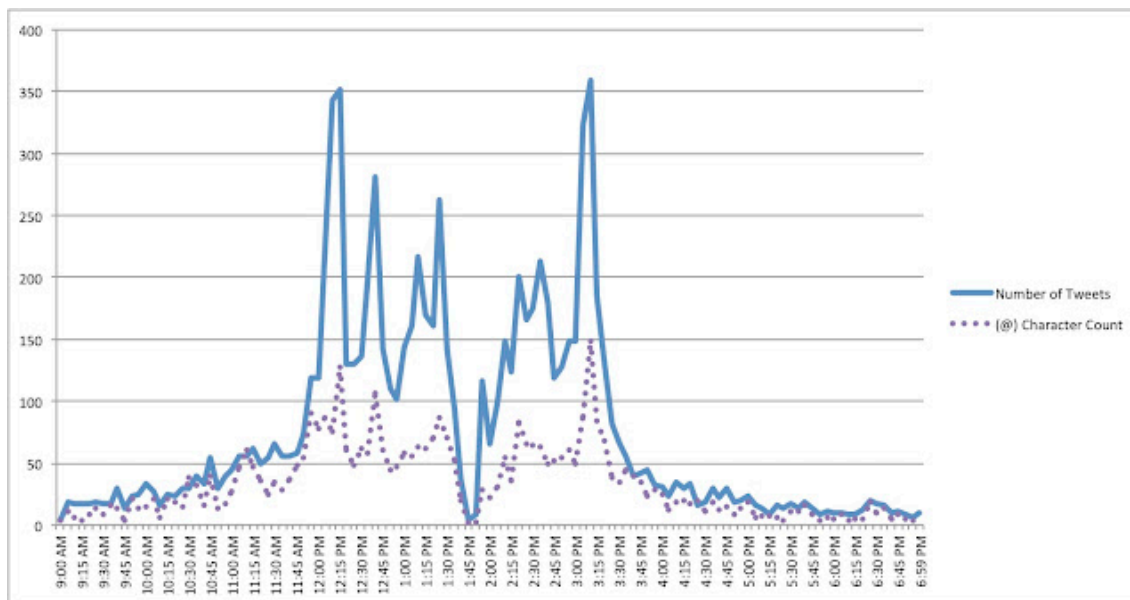


Figure 8.2: Twitter Volume and @ Character Volume During the Capital One Bowl

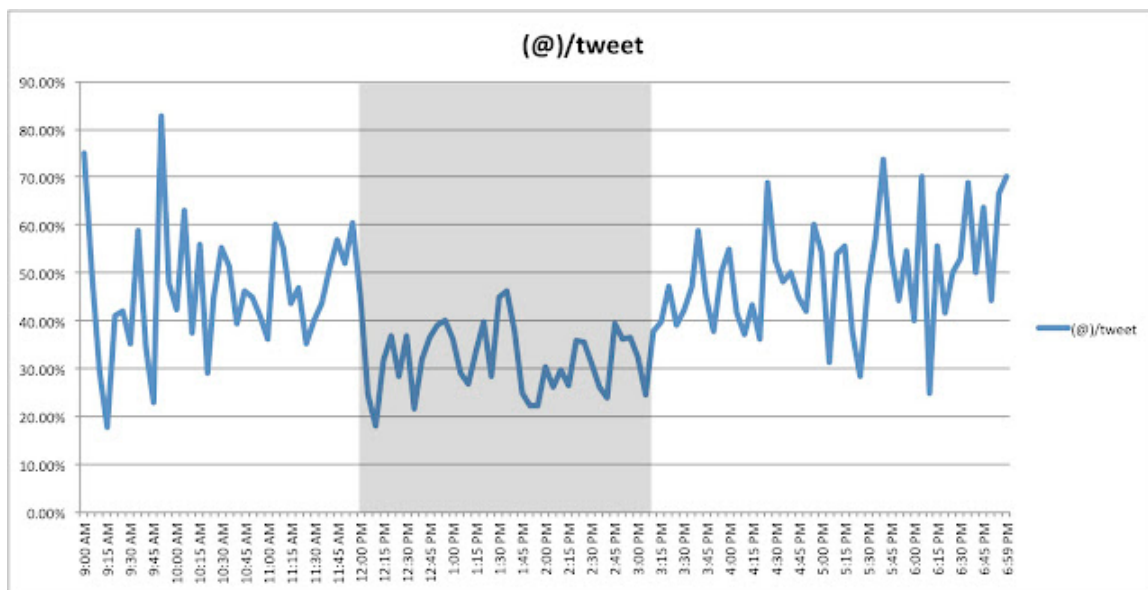


Figure 8.3: @ Characters per Tweet During Capital One Bowl Shaded

The issue of accurately gauging the direct user-to-user conversation level during live events proves to be complex. An increase in the overall amount of conversation occurs during the event, but more tweeting goes on as well. This means that while there was more conversation it made up a lower percentage of the overall Twitter activity during the Capital One Bowl.

One metric uses conversation level as an indicator to the event itself is Importance. As mentioned previously, Importance attempts to use the level of @ messages to determine how interested users are with the event itself using the following formula.

$$Importance = 1 - (count_{minute}(@)/count_{max}(@))$$

The most important moment during the event is indicated with a value of 1 while the least important moment is indicated with a 0 (Shamma, 2010).

At first glance using the Importance metric on tweets during the Capital One Bowl that contain the word “Huskers” showed an inverse of the tweet volume graph [Figure 8.4]. Six highly significant inverted spikes occur in the Importance graph that point to moments during the game when the most @ signs per minute took place. The same events are represented in both metrics with only a couple of exceptions.

Using Importance is helpful in gauging specific points in time that users are engaged in conversation, but it does suffer some weaknesses Importance is heavily influenced by volume of tweets since it appears to correlate strongly with tweet

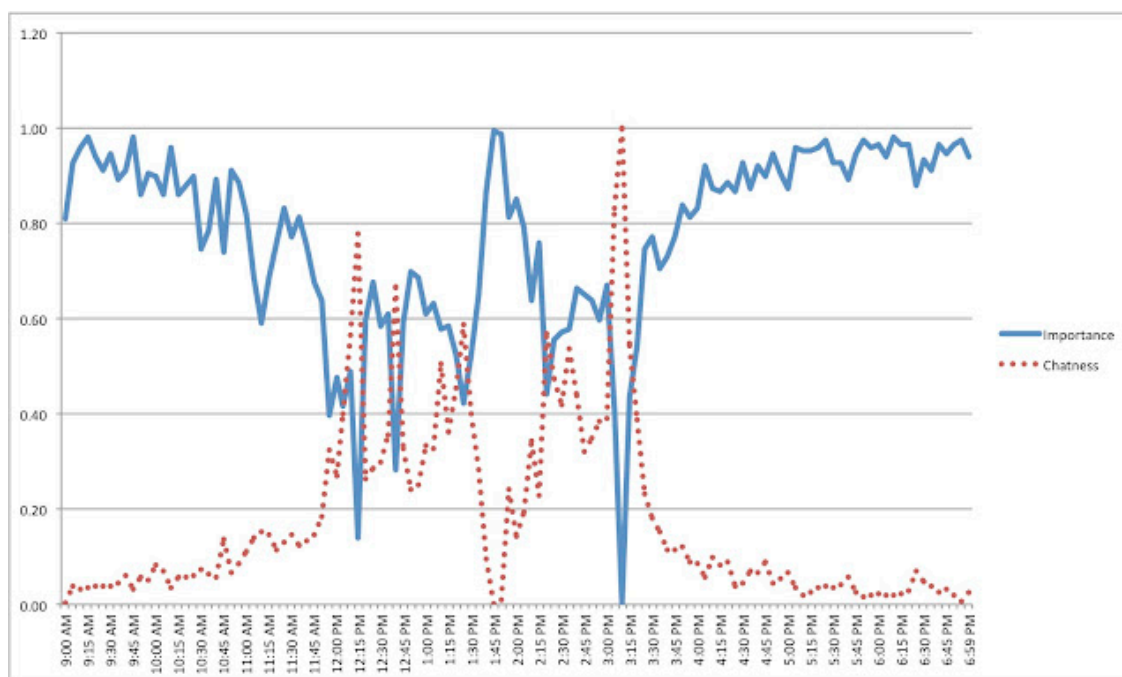


Figure 8.4: Importance and Chatness Graphs for the Capital One Bowl

volume. Since the spikes in volume are so severe they could have a disproportionate effect on showing when people are more likely to be engaged in conversation. If the goal is to find the time when the users on Twitter are the most engaged in conversation, using @ signs as a ratio of tweet is more effective. However, if you are looking to find when the highest number of Twitter users are engaged in conversation, then Importance assists in finding those moments. Secondly, since the formula uses the entire event as a baseline to determine maximum @ character levels it falls apart when trying to get a micro look at a specific point in the game.

Chatness, as previously mentioned, is another metric that examines the number of characters being typed per tweet per minute to illustrate the time people spend writing their tweets (Shamma, 2010), and is represented in the following formula.

$$Chatness = \frac{(COUNT_{minute}(chars) - COUNT_{min}(chars))}{(COUNT_{max}(chars) - COUNT_{min}(chars))}$$

Chatness is then rated on a scale from 0 to 1 where 1 is the time when tweets per minute have the longest character count.

In applying the Chatness formula to the tweets from the Capital One Bowl that contain the word “Huskers” we see similar spikes to those we saw in tweet volume [Figure 7.4]. The spikes are not identical. Chatness spikes, while being in the same location, have a different degree of change in them. This was most evident in comparing the first and last spikes, or the first touchdown and the end of the game. When looking at volume, the first spike contained 352 tweets while the final spike contained 359, a difference of only 2 percent. However, in the Chatness metric, the final spike represented the point of the most characters per minute with a number of 1 while the first spike as a Chatness number of .78, a difference of 22 percent. Again, since Chatness relies on looking at maximum and minimum values across the entire time span of the game, it loses its usefulness when attempting to examine a micro level of interaction around specific events.

Comparing the two metrics shows that while the volume of tweets were close to each other at the beginning and the end of the game, the end of the game was a time when users spent more time writing their tweets and had more to say resulting in more characters per tweet. This would make sense considering after the first touchdown users would be turning back to the game, while the end of the game provides users more opportunity to tweet without concern for missing any action from the game.

These metrics all show that traffic on Twitter is useful in determining where points were scored or major moments of controversy occurred in the game. The volume of tweets that contained the word “Huskers” in them was significantly higher overall during the game than either before or after. The average number of characters per tweet fell during the game as well, indicating that users were tweeting shorter messages, possibly fitting tweets in between plays or during commercial breaks. Importance and Chatness are helpful secondary metrics as well, particularly for identifying the top few moments during the game that sparked conversation or active retweets. However, these metrics only give a broad overview of the game and group events into five-minute, arbitrary boundaries. Examining the seven highest volume moments in greater detail better visualizes the reflectivity of Twitter traffic during the game as well as verify that conversations during these volume spikes were indeed about on field events of the Capital One Bowl. Examining the time period around these volume spikes in minute-by-minute detail gives a clearer picture in order to better understand communication patterns during these events.

CHAPTER 9: GAME REFLECTIVITY OF OPENING KICKOFF

It is not surprising that the minutes leading up to kickoff accounted for one of the highest peaks in Twitter traffic. As fans get ready to watch the game, many may want to share this excitement with their friends on social media. With that acknowledgment, it is important to note that the events of the 2012 Capital One Bowl are not indicative of an average football game. Coupled with the excitement from it being the last game of the season, the first few minutes of this game included a fumble forced by Nebraska and

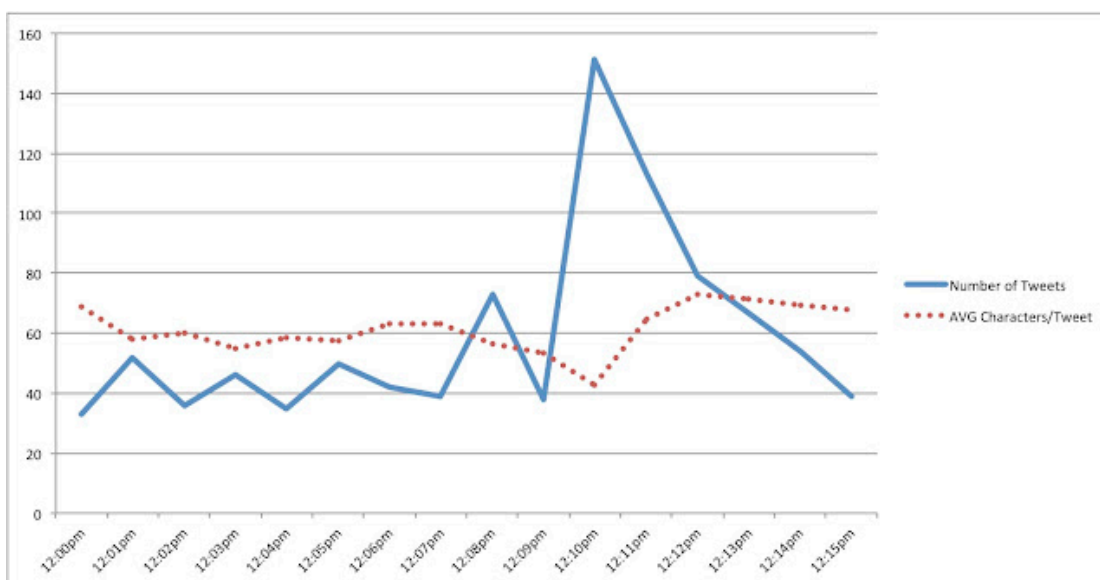


Figure 9.1: Tweet Volume and Average Characters per Tweet at Kickoff

recovered by South Carolina, a three-play, 46-yard scoring drive by the Huskers and a blocked extra point returned for two points by South Carolina. These events all occurred within the first ten minutes of the game.

The first ten minutes of the game were combined with the five minutes before kickoff, when television coverage started, in order to get a better understanding of these events and how the Twitter community responded to them. Examining this time, from 12:00 pm to 12:15 pm with minute-by-minute accuracy gives us greater detail into the reaction of Twitter users during the game.

Overall Twitter volume had a peak/valley pattern through the majority of the time with two major spikes in traffic [Figure 9.1]. The lesser of the two spikes occurred at 12:08 pm with the greater two minutes later at 12:10 pm. The first spike correlates with a Nebraska defensive stop on third down when Will Compton and Eric Martin sacked the South Carolina quarterback. It is not surprising then that the greater peak, at 12:10 pm,

was the moment when Nebraska scored on a 30-yard pass completion from Taylor Martinez to Kenny Bell. This peak was sustained until 12:13 pm, which as the point that traffic fell below the 12:08 pm peak. During the spike in Twitter volume at 12:10 pm a drop occurs in the average character length, which rebounds the next minute and reaches its highest point for the period the following minute. The blocked extra point occurred within this sustained traffic period at 12:11 pm as well as a commercial break from ESPN. The next play does not occur until 12:15 pm, giving fans a four-minute window to engage with Twitter without the risk of missing any game action.

Performing a TF-IDF analysis of the tweets validates the assumption of the primary topics of conversation during this period. The most frequent words, excluding Huskers, were *game*, *gbr*, *capitalonebowl*, *start*, *let's*, *big*, *nebraska* and *touchdown* [Table 9.1]. Two words, *gbr* and *capitalonebowl*, are not words so much as hashtags. The hashtag *#capitalonebowl* was the game's official hashtag while the hashtag *#gbr* is a common abbreviation Husker fans use for the common cheer "Go Big Red." Expanding word frequency to look at two and three-word phrases we see even more clarity of common tweet topics. These even identify primary players such as *kenny bell* and *martinez to kenny*, as well as the blocked kick as the 25th and 26th most common two-word phrases with *blocked* and *extra point*.

When looking at the overall number of @ signs during this time period, no discernible uptick occurs around 12:08 pm when Nebraska forces a punt by South Carolina [Figure 9.2]. However, a significant spike in @ signs occurs two minutes after the touchdown and blocked extra point at 12:12 pm, which peaks at 12:13 pm with 44.78 percent of all tweets containing an @ sign [Figure 9.3].

Table 9.1: TF-IDF for Kickoff Period

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
game	go huskers	let's go huskers
gbr	the huskers	to kenny bell
capitalonebowl	let's go	matinez to kenny
start	big red	go big red
let	kenny bell	kenny bell for
big	touchdown huskers	huskers martinez to
nebraska	for the	touchdown huskers martinez
touchdown	south carolina	huskers touchdown huskers

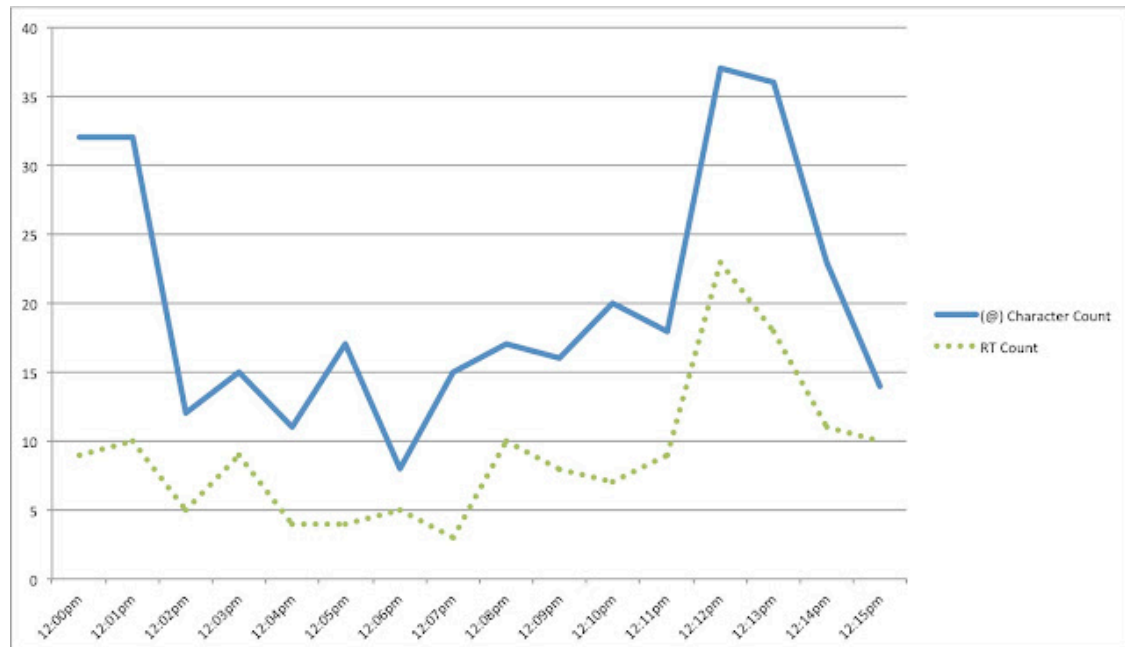


Figure 9.2: @ Characters and Total Retweets During Kickoff

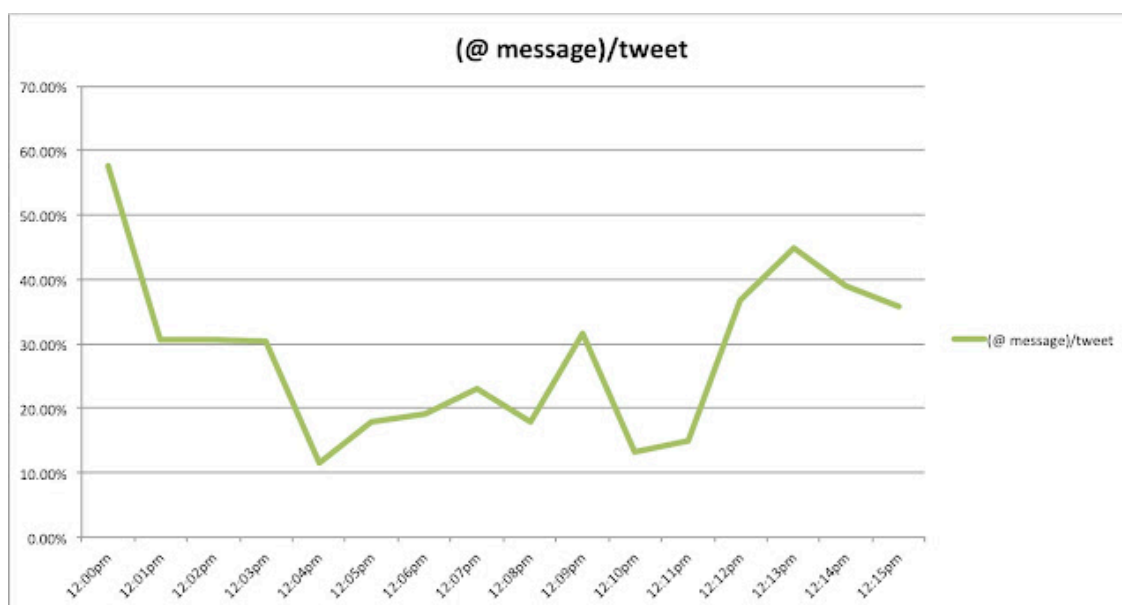


Figure 9.3: Percentage of Tweets Containing at Least One @ Sign

CHAPTER 10: GAME REFLECTIVITY OF SECOND TOUCHDOWN

The second highest volume peak of the first half occurred around 12:40 pm.

Focusing on this time period from 12:30 pm to 12:45 pm we see a flaw in only looking at five-minute intervals of tweets. The peak moment during this zoomed in time period occurred right at 12:36 pm, the first minute of the 12:40 pm time frame [Figure 10.1]. In fact there are two fairly close peaks, 12:35 pm and 12:36 pm, indicating a shared event for those two minutes. This corresponds with a Nebraska touchdown from Rex Burkhead to Ameer Abdullah late in the 12:35 pm minute. Again, we see a drop in the average character length that has an inverse correlation with the rise in volume at 12:35 pm, but immediately rebounds.

Looking at the TF-IDF confirms this spike correlates with Nebraska's second touchdown as *touchdown* and *burkhead* are the first and third most prominent words in this time period [Table 10.1]. *Abdullah* shows up as the seventh most common word,

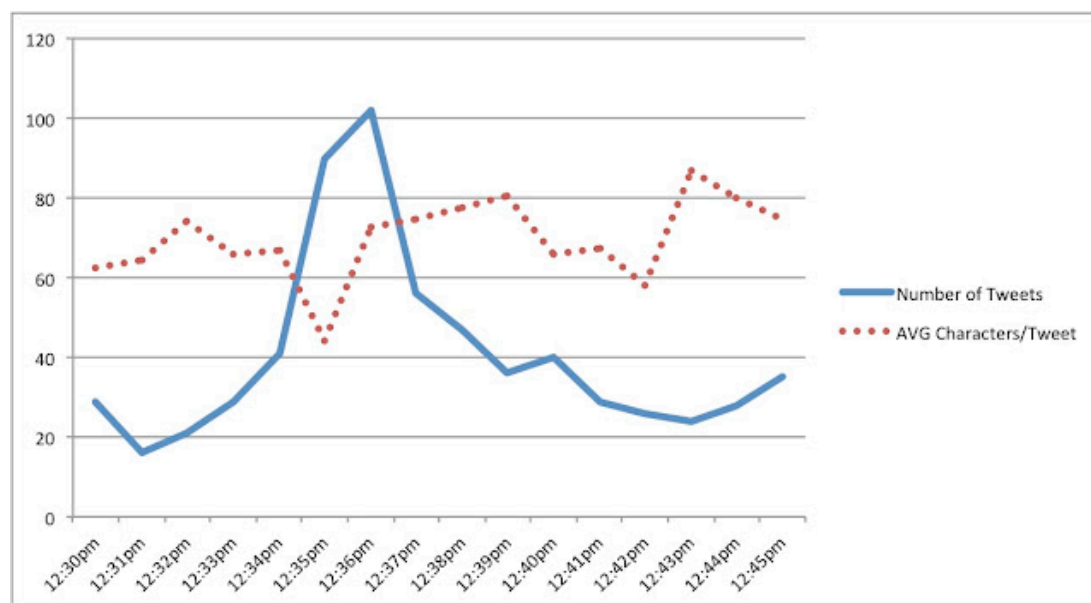


Figure 10.1: Tweet Volume and Average Characters per Tweet at Second Touchdown

Table 10.1: TF-IDF During Second Touchdown

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
touchdown	go huskers	huskers touchdown huskers
good	the huskers	extra point is
Burkhead	touchdown huskers	is good nebraska
nebraska	Rex Burkhead	point is good
Rex	is good	score extra point
yard	Abdullah for	yard score extra
Abdullah	S Carolina	Abdullah for the
let's	huskers touchdown	itches Abdullah for

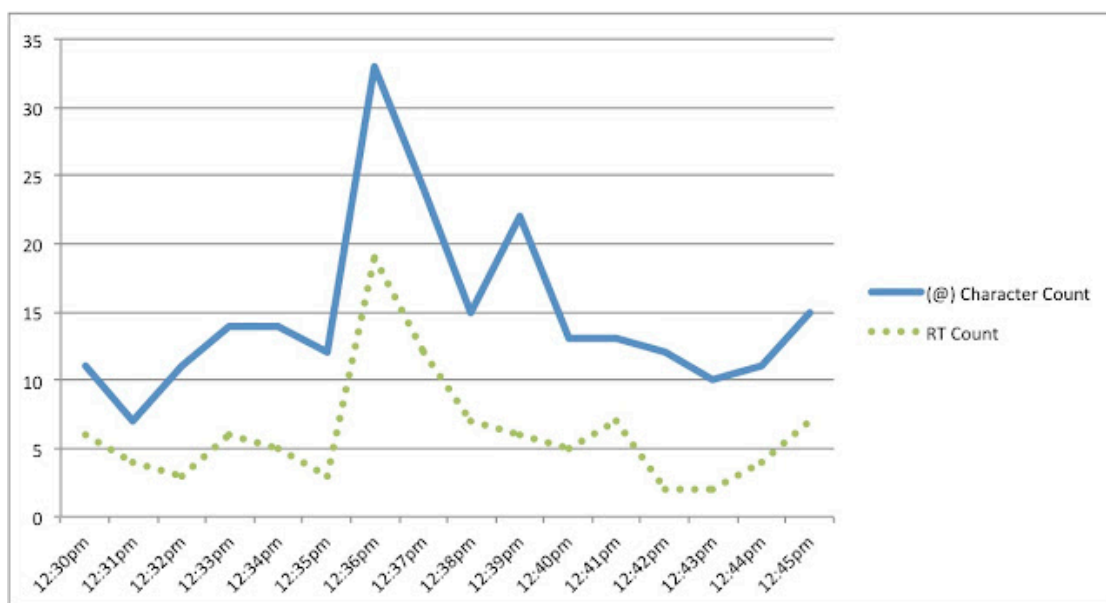


Figure 10.2: @ Character Volume and Total Retweets During Second Touchdown

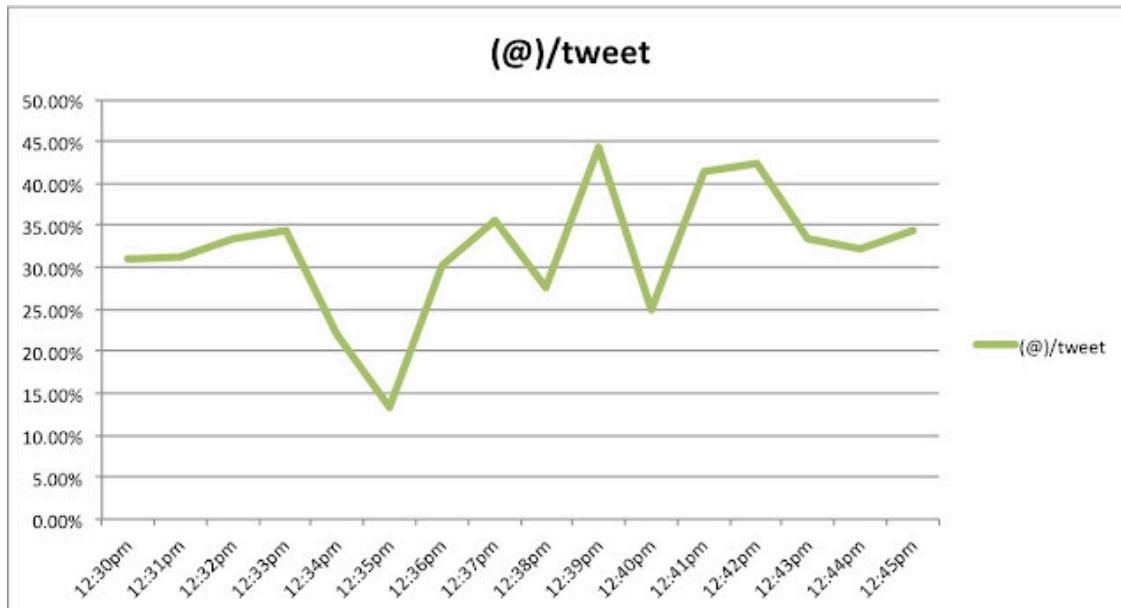


Figure 10.3: Percentage of Tweets Containing at Least One @ Sign During Second Touchdown

which may at first seem strange since he was the one who scored the touchdown.

However, Burkhead's primary position is running back, and for this play he lined up under center and handed the ball off to Abdullah. The third most common three-word phrase for these tweets is *extra point is* following variations of tweets about huskers and touchdown, significant since the previous extra point was blocked.

The @ sign temporal lag peak for this period was less pronounced with the peak in @ signs occurring at 12:36 pm [Figure 10.2]. While this was technically during the peak in Twitter volume, it was a minute behind the beginning in the uptick in Twitter traffic. The number of @ messages per tweet peaks three minutes later at 12:39 pm with 44 percent of all tweets containing an @ message [Figure 10.3].

CHAPTER 11: GAME REFLECTIVITY OF SECOND QUARTER SPIKE

The third highest spike of Twitter volume in the first half and the fourth highest overall occurred at 1:10 pm. Examining the time frame from 1:05 pm to 1:15 pm allows a closer examination of this spike.

The minute-by-minute examination revealed the spike in Twitter volume occurred at 1:08 pm, while characters per tweet increased at 1:08 pm and remained elevated until 1:13 pm [Figure 11.1]. The number of @ signs per minute was highly volatile, although there was a slight increase after 1:08 pm [Figure 11.2 and 11.3]. However, when looked at as the percentage of @ signs per Tweet the numbers stabilize with a drop at 1:07 pm and a spike at 1:12 pm. This spike at 1:12 pm was four minutes after the initial spike in Twitter volume.

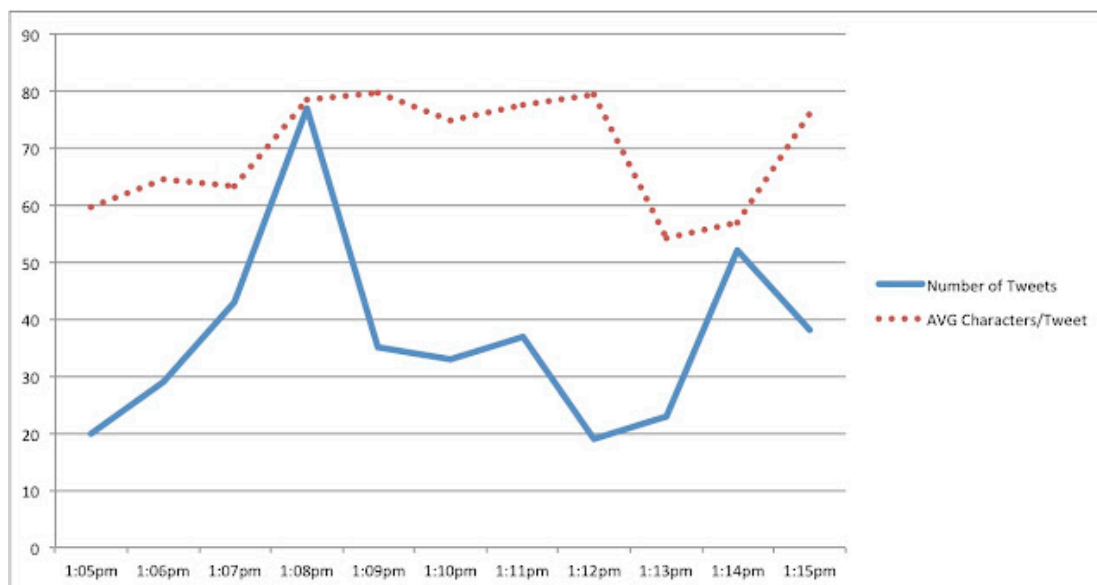


Figure 11.1: Tweet Volume and Average Characters per Tweet During Second Quarter Spike

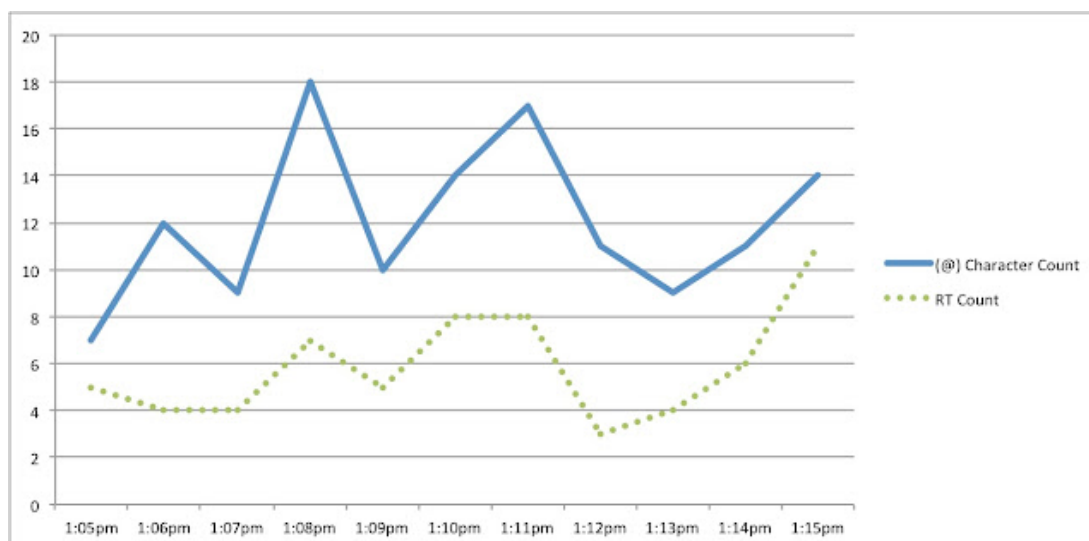


Figure 11.2: @ Character Volume and Total Retweets During Second Quarter Spike

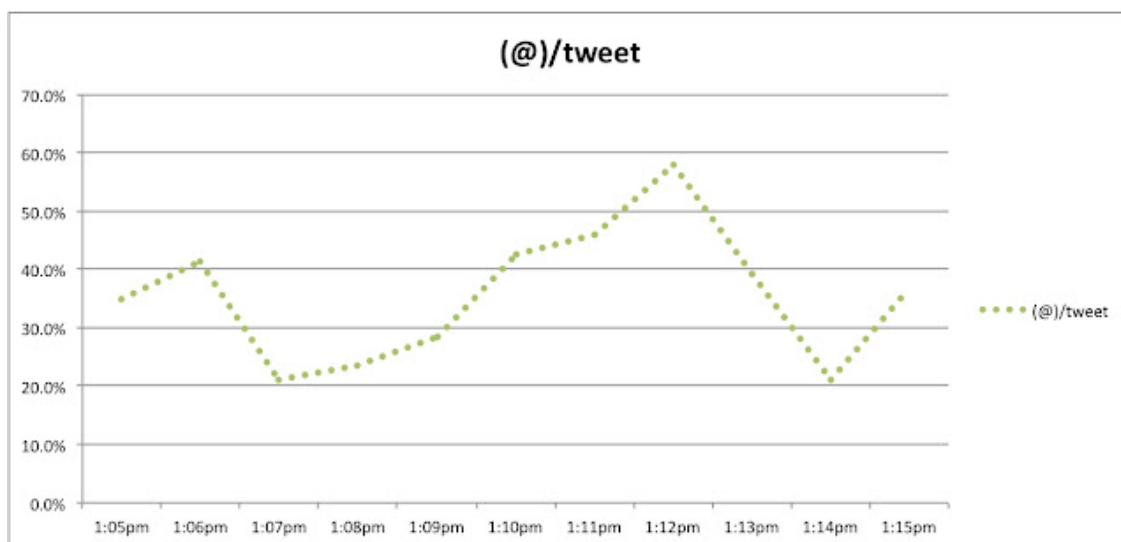


Figure 11.3: Percentage of Tweets Containing at Least One @ Sign During Second Quarter Spike

Table 11.1: TF-IDF During Second Quarter Spike

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
capitalonebowl	the huskers	let's go huskers
big	go huskers	go big red
gamecocks	let's go	for the huskers
game	for the	big red let's
you	big red	it on 4th
let's	go big	for it on
red	field goal	on the huskers
down	on the	by the huskers

According to a log of the ESPN broadcast, South Carolina missed a field goal at 1:07 pm which might account for the surge in Twitter activity at 1:08 pm. The log also indicates that Rex Burkhead converted a fourth down play into a first down at 1:13 pm, which was followed by another spike in volume at 1:14 pm.

The TF-IDF from the time period reveals little about the content of the tweets. The second most frequent word outside of *Huskers* for this time period was *big*, possibly indicating a moment of significance to users watching the game [Table 11.1]. The second, third and fifth most frequent two-word phrases were statements of positive cheering - *go Huskers*, *let's go* and variations of *go big red*. It seems logical considering the frequency of affirmative statements that tweets at this time were exclamations of excitement following the missed scoring opportunity from South Carolina.

The three-word phrases *for it on* and *it on 4th* indicate that there was also frequent conversation about Rex Burkhead's fourth down conversion at 1:13 pm.

CHAPTER 12: GAME REFLECTIVITY OF END OF FIRST HALF

As volatile as the opening minutes of the game were, it is not surprising that the closing minutes of the first half were equally as volatile. The overall game Twitter volume chart shows the time from 1:16 pm to 1:30 pm as being a timespan of increased interest to examine in greater detail. According to the log of broadcast events, this time period includes a South Carolina interception as well as a last second Hail Mary touchdown from South Carolina.

Twitter volume for this time period followed a different pattern than in the first two events from the half, unsurprisingly considering the differing nature of this

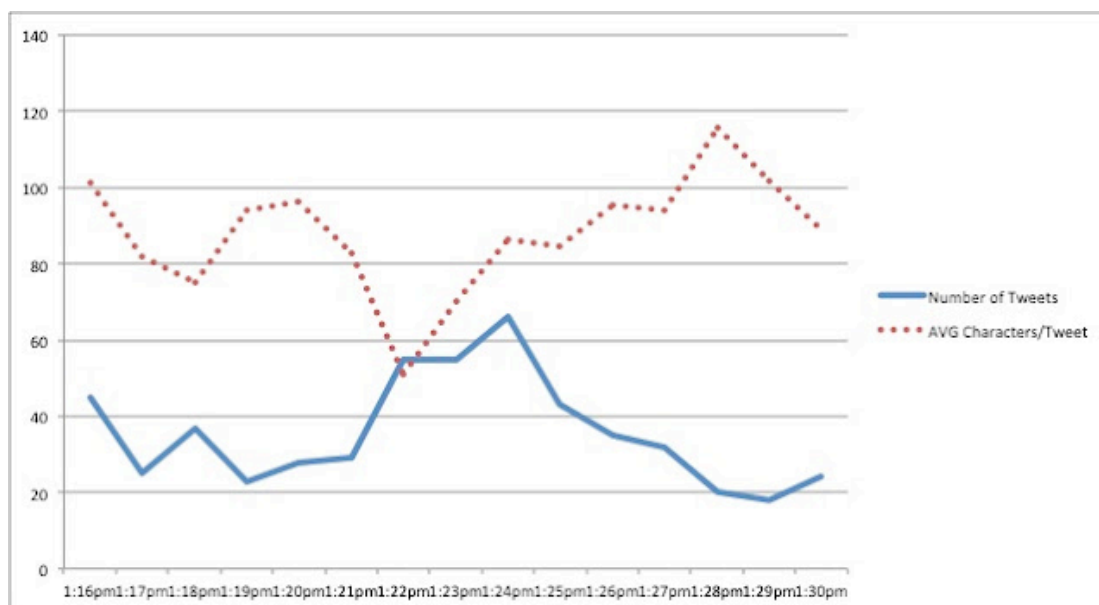


Figure 12.1: Tweet Volume and Average Characters per Tweet at End of Half

event [Figure 12.1]. At 1:22 pm we see an uptick in Twitter volume that plateaus until 1:24 pm when it rises again, before falling below the average for the time period at 1:26 pm. Several factors could lead to this alternative behavior. Considering this event runs into the end of half, users had more time to issue tweets without worrying about missing any ensuing game action. Secondly, Bo Pelini was interviewed on ESPN as the Huskers were leaving the field and heading to the locker room. His somewhat short, terse response of “We’re fine,” to the reporter could have given Twitter users something else to talk about as well.

The TF-IDF for this period shows that a lot of the conversation was centered on the half [Table 12.1]. Bo Pelini’s appearance on TV may have had a substantive influence on Twitter traffic - the fifth most recurring two-word phrase was *Bo Pelini* while the sixth and tenth most recurring two-word phrases were variations of his answer. Looking at the rest of the TF-IDF we see that the single word frequency list gives clues

Table 12.1: TF-IDF During End of First Half

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
half	the huskers	on 4th down
just	in the	it on 4th
you	first half	for it on
down	go huskers	the first half
first	Bo Pelini	first half huskers
game	we'll be	that attitude #playingtowin
nebraska	come on	love that attitude
we	have to	to love that

that the first half was over with the most common word being *half*. *Hail Mary* and *South Carolina* are tied for tenth most common two-word phrases.

Looking at average character length from figure 12.1 we see again an inverse relationship with the volume spike at 1:22 pm. However, the average characters per tweet in this time period overall was 84.57, nearly eight points higher than the overall game average, indicating that overall users were tweeting longer messages than on average during the game. Following the drop in average character count, a steady increase in character counts occurred until 1:28 pm when they hit their peak.

The number of @ signs also showed a temporal lag consistent with other points in the game [Figure 16a]. The fewest @ signs per minute occurs at 1:22 pm during the volume spike and then consistently rose and finally peaked at 1:26 pm with 54.29 percent of all tweets containing an @ sign [Figure 16b].

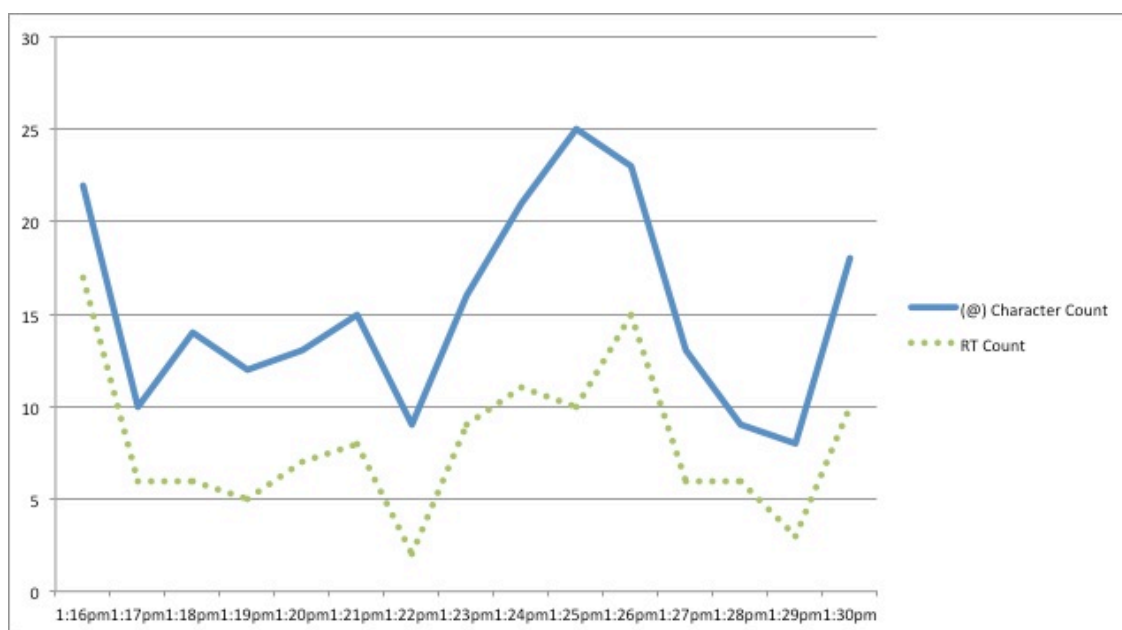


Figure 12.2: @ Character Volume and Total Retweets During the End of First Half

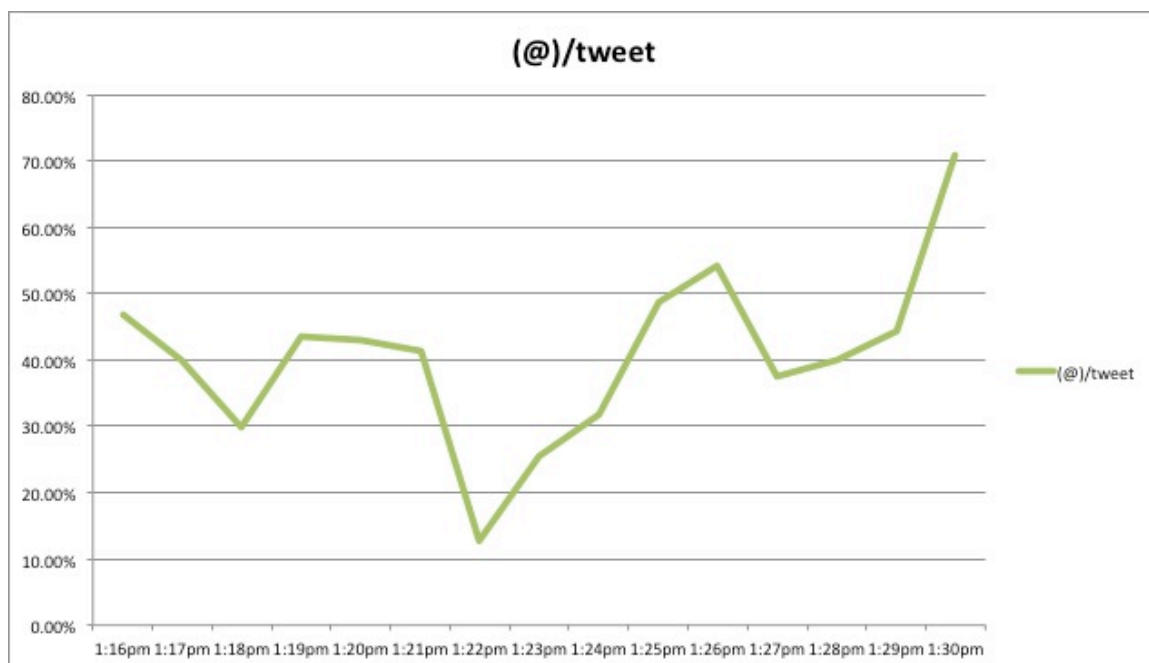


Figure 12.3: Percentage of Tweets Containing at Least One @ Sign During the End of First Half

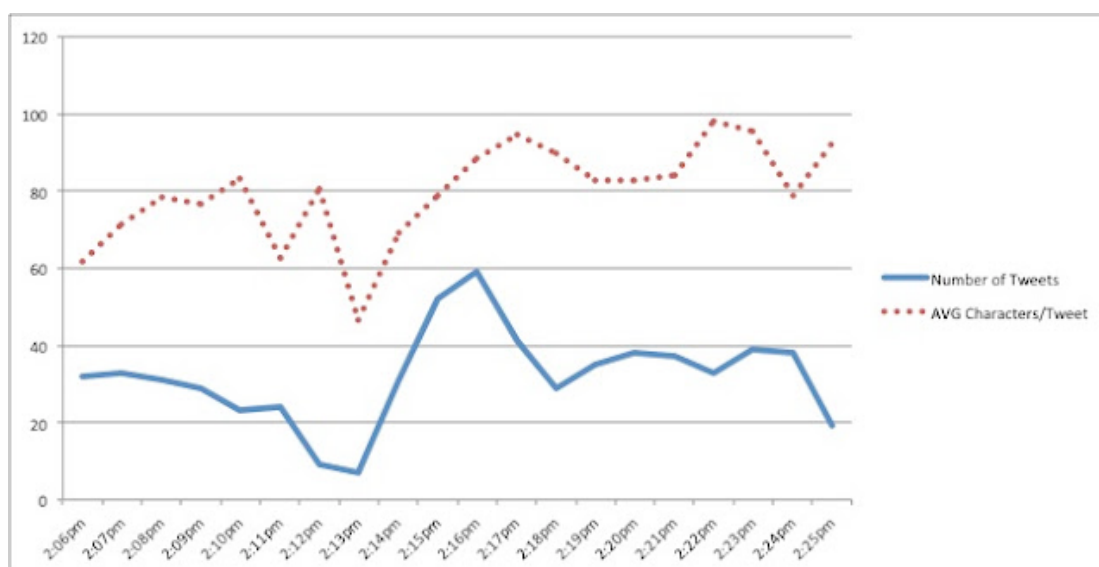


Figure 13.1: Tweet Volume and Average Characters per Tweet for First Peak in Second Half

CHAPTER 13: GAME REFLECTIVITY OF SECOND HALF PEAKS

Nebraska did not score a touchdown in the second half, or the second quarter for that matter. For this reason the second and third largest spikes of the second half cannot be attributed to scores from the Huskers. The first of these spikes occurred at 2:20 pm, which was more closely examined with a 2:05 pm to 2:25 pm time frame analysis.

The tweet volume shows a drop in the 2:12 pm and 2:13 pm minutes before reaching a peak at 2:16 pm [Figure 13.1]. The average characters per tweet and number of @ signs show similar patterns with drops at 2:13 pm. The number of @ signs peaked at 2:16 pm as well [Figure 13.2], with a significant drop in the percentage of tweets that contain an @ sign [Figure 19b]. The log from the ESPN broadcast shows that two players were ejected for fighting at this point in the game, Alfonzo Dennard from Nebraska and Alshon Jeffery from South Carolina.

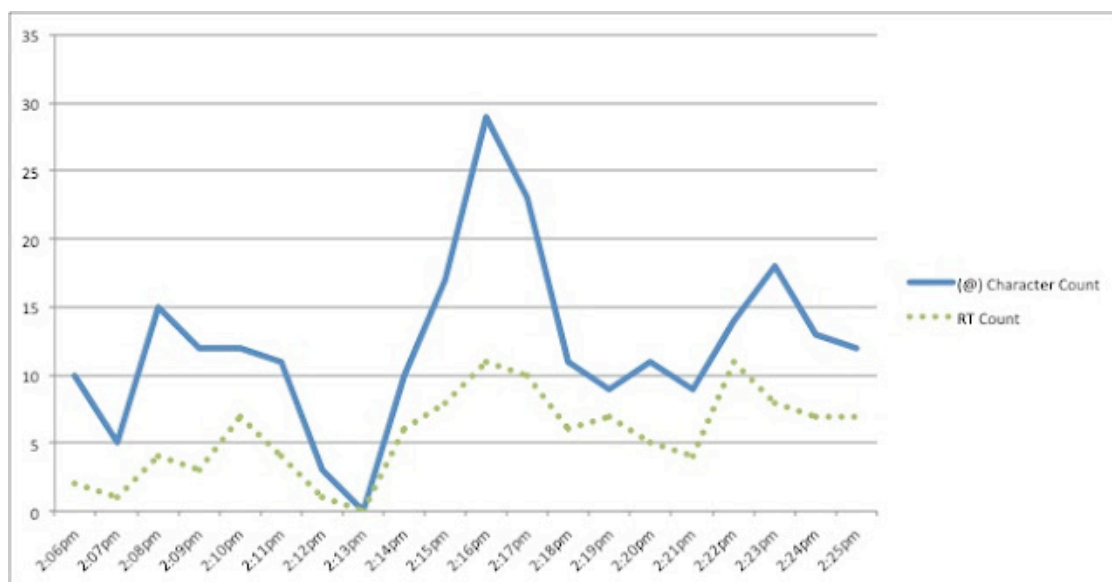


Figure: 13.2: @ Character Volume and Total Retweets for First Peak in Second Half

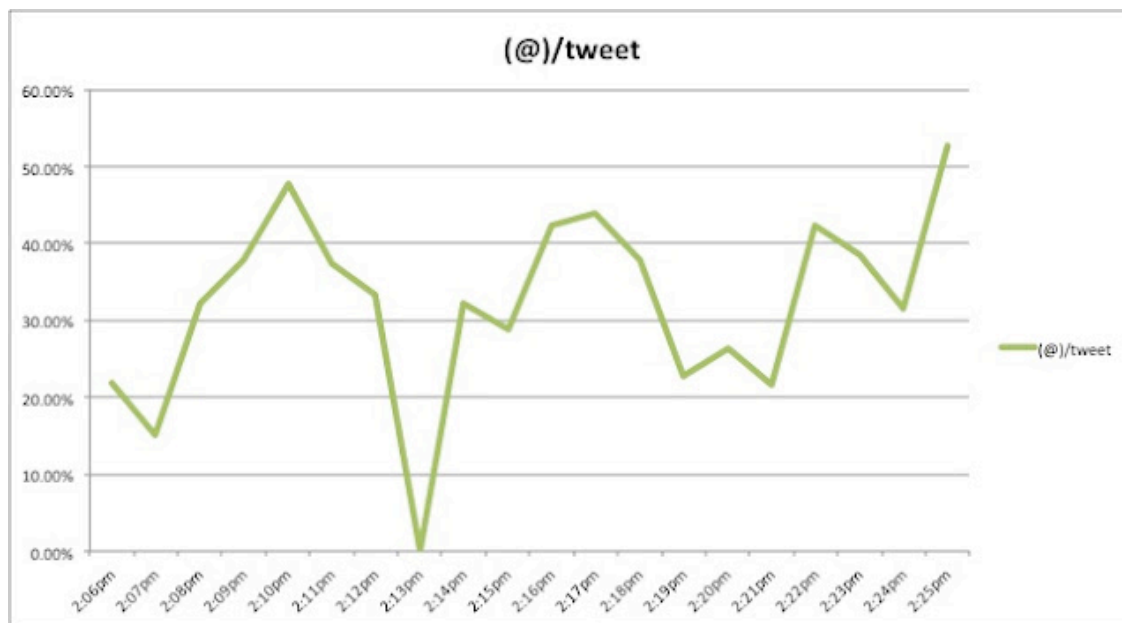


Figure: 13.3: Percentage of Tweets Containing at Least One @ for First Peak in Second Half

Table 13.1: TF-IDF for First Peak in Second Half

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
Dennard	the huskers	come on huskers
game	in the	slightly surprised huskers
get	on huskers	only slightly surprised
ejected	of the	be only slightly
you	this game	I'd be only
come	huskers are	fourth quarter I'd
capitalonebowl	huskers capitalonebowl	in the fourth
just	the field	point in the

The TF-IDF confirms that discussion at this time centered on the actions of these two players [Table 13.1]. The most frequently used words for tweets in this time period were *Dennard*, *get*, *game* and *ejected*. The names *Alfonzo Dennard* and *Alshon Jeffery* appeared in the two-word frequency list at numbers 13 and 12, respectively. The most frequent three-word phrases were variations of a popular retweet at the time from @RedCladLoon - "This has reached Bizarroville. If a unicorn ran onto the field at some point in the fourth quarter, I'd be only slightly surprised."

The second highest peak in volume for the second half occurred at the 2:35 pm mark on the full game volume analysis. A detailed analysis of this event starting at 2:28 pm and ending at 2:38 pm separates this volume peak from the previous one. The analysis shows a volume peak at 2:31 pm with no discernible drop in the average characters per tweet [Figure 13.4]. The frequency of @ signs in tweets peaks

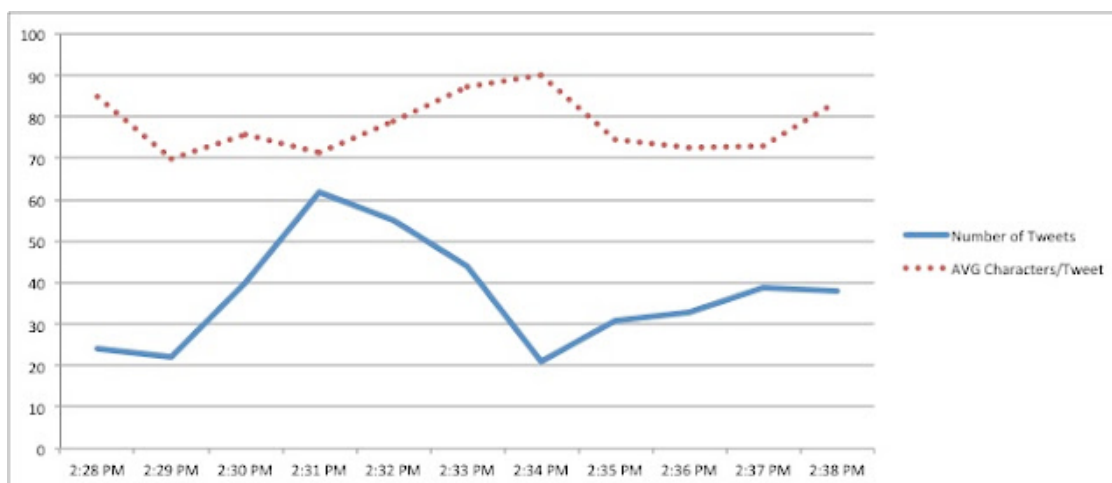


Figure 13.4: Tweet Volume and Average Characters per Tweet for Second Peak in Second Half

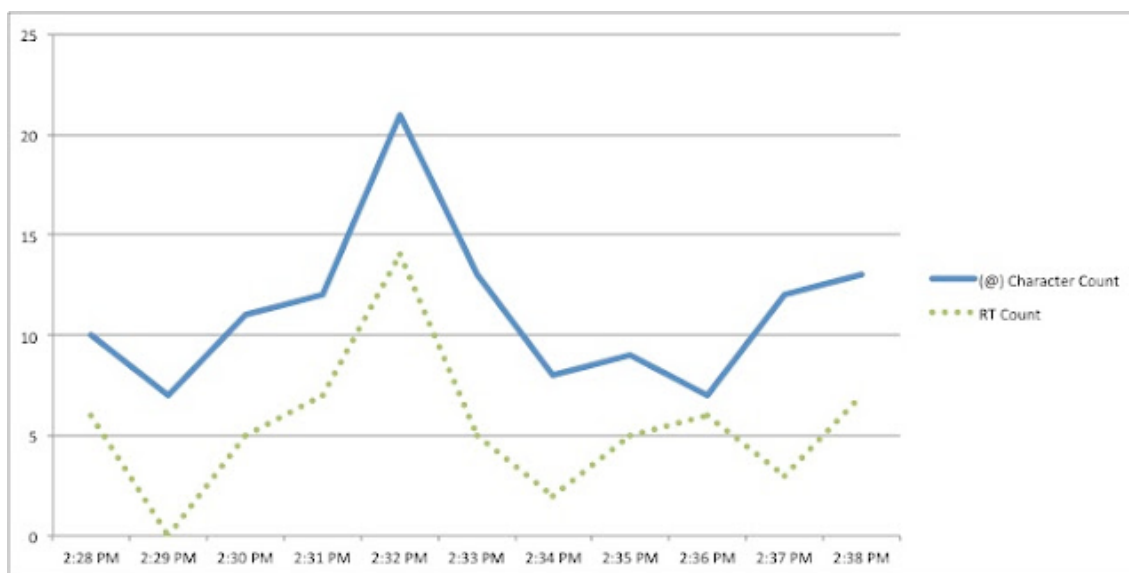


Figure 13.5: @ Character Volume and Total Retweets for Second Peak in Second Half

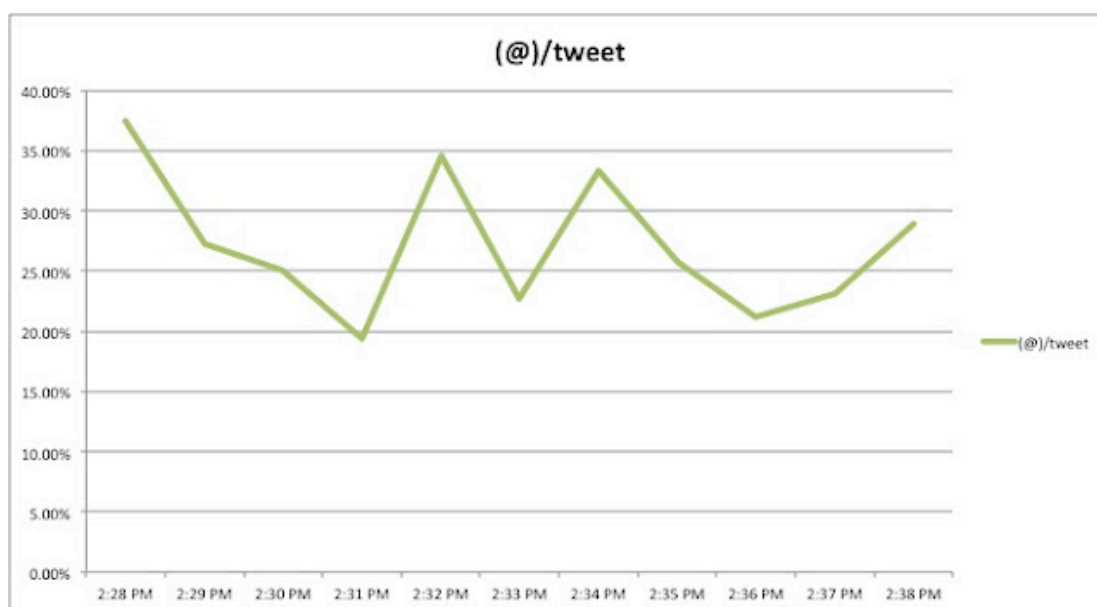


Figure 13.6: Percentage of Tweets Containing at Least One @ for Second Peak in Second Half

Table 13.2: TF-IDF for Second Peak in Second Half

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
game	the huskers	come on huskers
capitalonebowl	come on	the huskers are
come	huskers are	for the huskers
get	Bo Pelini	Bo Pelini is
down	on huskers	fine we're fine
Pelini	in the	this tv timeout
now	for the	ref during this
like	Pelini is	the ref during

at 2:32 pm [Figure 13.5], but no peak occurs in the number of @ signs per tweet that reaches above 40 percent [Figure 13.6].

The event log of the ESPN broadcast shows a South Carolina touchdown at 2:31 pm. However, the TF-IDF reveals that most of the conversation centered on Nebraska Head Coach Bo Pelini [Table 13.2]. The most frequently occurring words were *game*, *capitalonebowl*, *come*, *get*, *down* and *Pelini*. The two-word frequency list revealed that *Bo Pelini* was the fourth most frequently used two word pair during that time period. A second look at the ESPN broadcast reveals that at this time Bo Pelini was shown on camera in a verbal exchange with a referee. In fact, ESPN went to a commercial break at 2:31 pm with a replay in slow motion of coach Pelini arguing with the referee.

CHAPTER 14: GAME REFLECTIVITY OF END OF GAME

The largest spike in tweet volume occurred in the 3:05 pm to 3:10 pm range, which correlates approximately to the end of the game. Unlike the end of the first half, no shocking final play occurred at the end of the game. Rather it was a series of events that led to an inevitable outcome.

Expanding the minute-by-minute analysis to 2:55 pm to 3:20 pm to include the time leading up to the end of the game as well as an adequate time band around the conclusion of the game allowed for a more accurate look at this event. The closer look reveals a build up in volume that begins at the 2:59 pm mark and continues with some volatility until 3:11 pm when it reaches the other side of volatility [Figure 14.1]. This area shows three distinct peaks in volume at 3:02 pm, 3:06 pm and 3:08 pm. While this

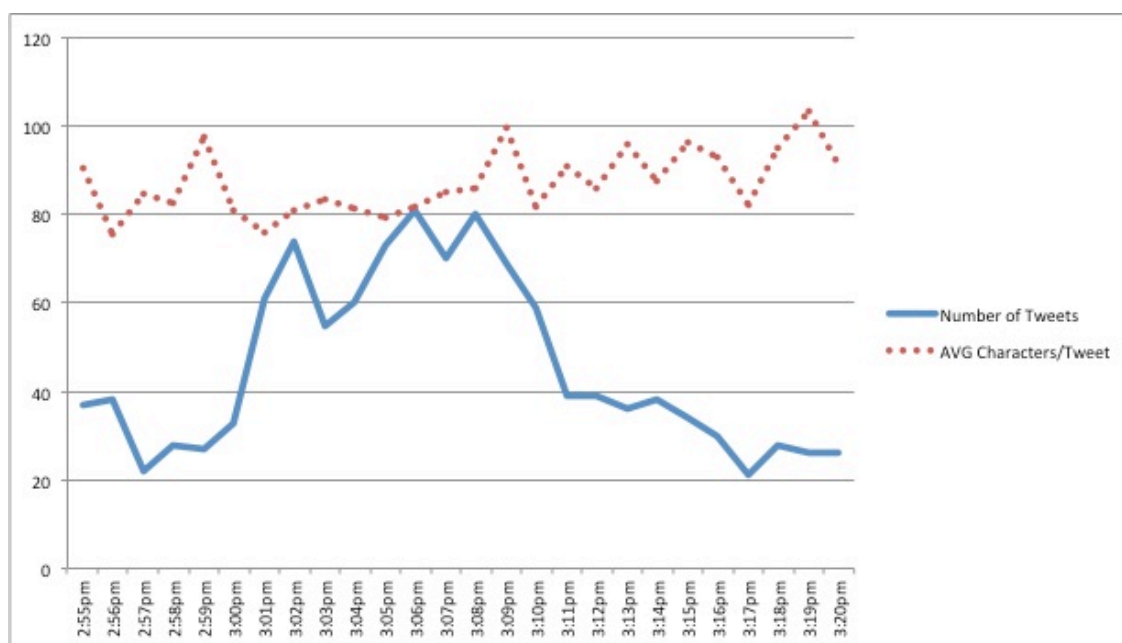


Figure 14.1: Tweet Volume and Average Characters per Tweet for the End of Game

period had the longest sustained increase in Twitter volume, it was not the largest single minute spike in Twitter volume. At 3:06 pm, 81 tweets were recorded. At 12:10 pm there were 151 tweets were registered. A significant drop in average characters per tweet does not take place during this time period, although a sustained trough exists during the peak volume period.

A TF-IDF for the 2:55 to 3:20 pm time period shows that frequent discussions revolved around the words *game*, *capitalonebowl*, *nebraska* and *win* [Table 14.1]. The three-word frequency list adds extra context with phrases such as *over the nebraska* and *gamecocks win the*. A closer examined TF-IDF looking at the individual peaks did not reveal anything significantly different about these moments from others in the time period. According to the ESPN log of the game, the official end of the game corresponds with the final peak at 3:08 pm.

Table 14.1: TF-IDF for the End of the Game

Single Word Frequency	Two-Word Phrase Freq.	Three-Word Phrase Freq.
game	the huskers	capital one bowl
capitalonebowl	south carolina	the south carolina
nebraska	in the	the nebraska corn
you	for the	over the nebraska
bowl	corn huskers	gamecocks win the
win	my huskers	carolina gamecocks win
gamecocks	one bowl	south carolina gamecocks
season	capital one	nebraska corn huskers

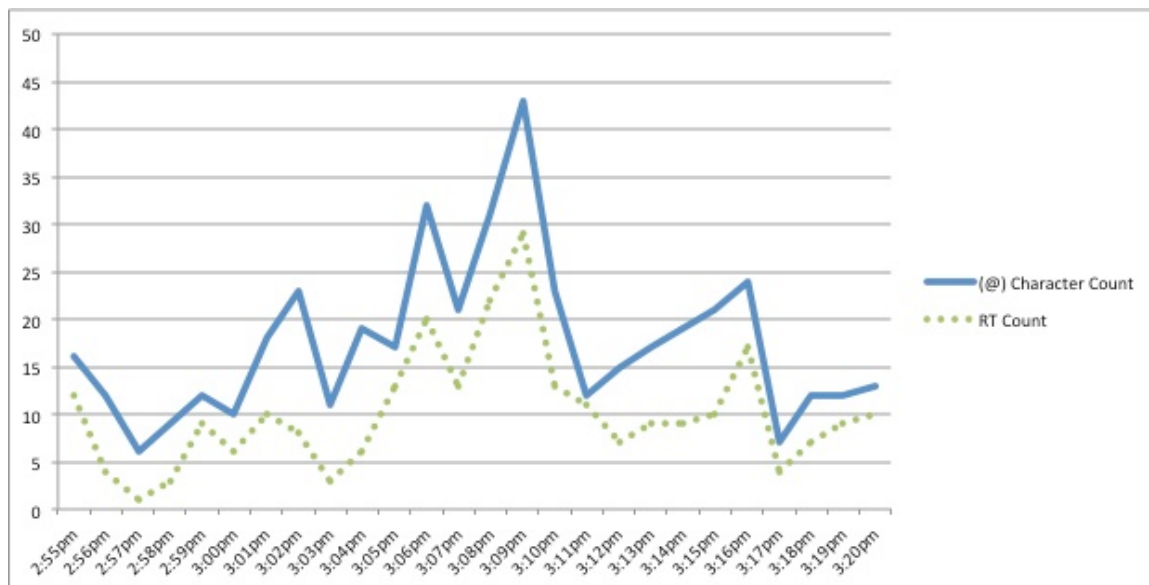


Figure 14.2: @ Character Volume and Total Retweets for the End of the Game

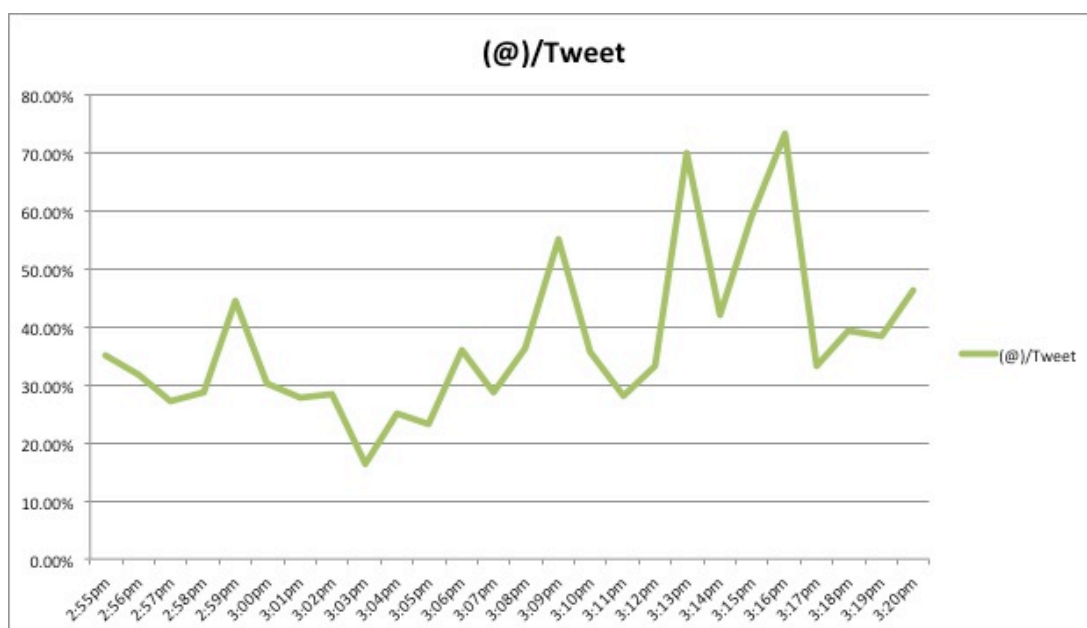


Figure 14.3: Percentage of Tweets Containing at Least One @ Sign at the End of the Game

The number of @ signs during this time period show a strong resemblance to the overall volume, with peaks at the same points in time and grow in number until it reaches peak level at 3:09 pm [Figure 14.2]. The amount of conversation lagged past the peak Twitter volume with the percentage of @ signs per tweet peaking at 3:16 pm at 73 percent [Figure 14.3]. Taken as a whole, during this time period users were not concerned with game action but were instead focused on using Twitter to communicate about the game. The high percentage of tweets that contained an @ sign indicate a high amount of conversation between users at this time.

CHAPTER 15: BROADCAST COMMERCIAL BREAK INFLUENCE

During the game users are required to split their attention between game action and Twitter in order to participate in both events. It is logical that the average length of tweets would fall during the game in order to accommodate this split attention. Football

also has built in slow periods, more so than many sports. Twenty-five to thirty seconds of down time between plays is typical. Games that are televised, which for major college football nearly all of them are, have built in commercial breaks that often occur after touchdowns or change of possession. Between quarters and halves there are built in breaks as well. During times of confusion or other non-common events on the field extra time is also added between plays. This extra amount of downtime could allow users more ability to split attention between Twitter and game action.

The points within a football game that tend to contribute to longer time between plays are also typically events of more importance. Touchdowns and change of possessions are typically followed by commercial breaks. Considering touchdowns and swings in momentum have shown to correlate with high levels of Twitter volume a rise in average characters per tweet following these moments would seem logical. The emotional excitement of the event coupled with the extra time between game action should lead to a heightened amount of tweeting in volume as well as character length.

Running an analysis of the change in average character length of tweets during the immediate moments around the peak events revealed a rise in the average character of tweets after an event. The analysis did not count the end of the game since the tweets at that point did not represent a single event so much as a lead up to the end of the game. It is important to note that this rise in average characters was just not over the event itself, but in the minutes leading up to the event as well.

On average the three minutes prior to the event had an average character count per tweet of 74, while the average for the three minutes following the event was 79

Table 15.1: Average Character per Tweet Leading Up To and Following Peak Events

T VALUE	12:10pm	12:40pm	1:22pm	2:20pm	2:31pm	AVG
-3	63	74	94	83	84	79.6
-2	57	66	96	63	69	70.2
-1	53	77	82	80	75	73.4
0	43	44	50	46	71	50.8
1	65	72	86	69	78	74
2	73	74	84	78	87	79.2
3	71	77	95	88	90	84.2

[Table 15.1]. The minute of the event itself represented a low point in average character count with 51. While it may be impossible to know if the lowered average character count was due to the event or to the extended time available to spend on Twitter, the research shows tweets following an event are longer than those during or prior to an event.

Secondly, possibly due to the nature of the game, the first half saw a lower overall average character count than the second half [Figure 15.2]. In the first half the average character count for the three minutes prior to an event was 74 while in the second half it was 76. The difference in the three minutes following the event was even more pronounced, with the first half having an average of 77 while the second half had an average of 82.

The average number of characters during the event itself was even more drastic, with the first half showing an average of 46 while the second half had an average of 59 [Figure 15.2]. A couple of reasons may account for this difference. First, the type of

Table 15.2: Average Characters per Tweet Leading Up To and Following Peak Events Total and Averages For Each Half

T - AVG	74	T - AVG 1st	74	T - AVG 2nd	76
T AVG	51	T AVG 1st	46	T AVG 2nd	59
T + AVG	79	T + 1st	77	T + AVG 2nd	82

events recorded in the first half were different than those in the second half. The events in the first half were touchdowns, two from Nebraska and one from South Carolina. The second half events correlated with a player ejection and a series of penalties with an argument between Nebraska head coach Bo Pelini and the referees. Second, the change in average characters shows that users were more interested in the act of tweeting their thoughts than the events of the game itself.

CHAPTER 16: INFLUENCE IN RETWEETS AND @ MESSAGES

Discovering which users were the most active on Twitter using the word *Huskers* during the Capital One Bowl was an important first step to determining the level of active users during the game. The five most active users in the pregame period were @Huskers, @zombiedevaney, @pookigirle, @huskersportnews and @johnnyiiiic. The @Huskers account, the official account for the Athletic Department, had the most tweets with 11 in a three-hour period. In game the most frequent users were @flippy042, @Huskers, @derekjohnson05, @bigstad24 and @capitalonebowl. The number of tweets during the game from the most frequent users also significantly increased with the @Huskers account tweeting 68 times in the just over 3 hour time period. The most frequent Twitter users after the game were @huskerjunction, @cbssportsneb, @c_lee, @nebraskabuzztap, @brettobin, @scoutnebraska and @tweetsbyvamosi. The number of tweets for the postgame period from the most frequent users were similar to pregame with @huskerjunction tweeting 13 times in the three-hour postgame time period.

In comparing the overall level of @ messages across the length of the entire study, a high correlation exists between the volume of @ messages with overall tweet

volume. The four highest points of Twitter traffic, which also happened to be the four highest volume of @ messages during the Capital One Bowl on Twitter, in closer detail show which accounts were exerting greater influence at these times. These points in the game corresponded to the opening kickoff and first touchdown, the second Nebraska touchdown, the South Carolina Hail Mary pass to end the first half and the end of the game. The accounts that received the most @ mentions, regardless of the @ message action type, were a mix of official organizational accounts, journalists/bloggers, high profile individuals and novelty comedic accounts.

Official accounts included Nebraska Athletics (@Huskers), ESPN (@CollegeGameDay) and the Capital One Bowl (@CapitalOneBowl). These three accounts are not surprising considering the nature of the event. They represent the team researchers are examining in the analysis, the event they are competing in and the television provider for that event. What was surprising was the disproportionate level of @ mentions in regards to official accounts. In all four events, with the exception of the end of the game, the @Huskers were mentioned multiple times more than the second most mentioned account, particularly in events that correspond with a Nebraska touchdown.

During the first touchdown, an overall Twitter volume spike occurred at 12:10 pm with a spike in @ messages at 12:12 pm and 12:13 pm. The Huskers account made up 41 percent of all the @ messages during that time period with 66 percent of all @Huskers actions comprising of retweets [Figure 16.1]. Mentions and replies made up 16 percent and 12 percent of those actions. At the point of the second touchdown, an overall Twitter volume spike

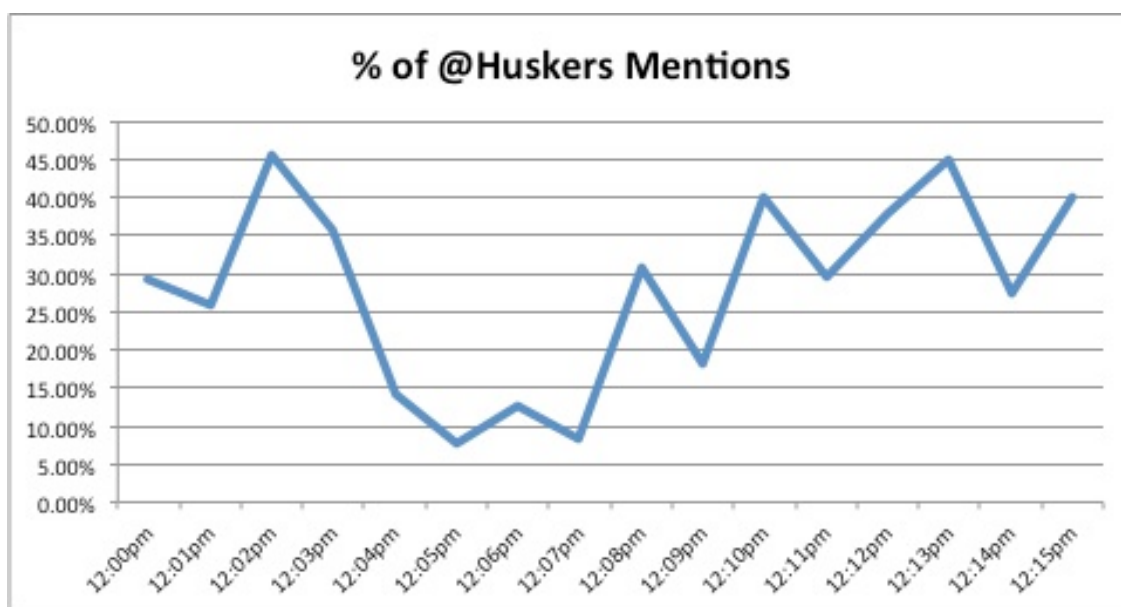


Figure 16.1: Percent of @Huskers Mentions During Kickoff

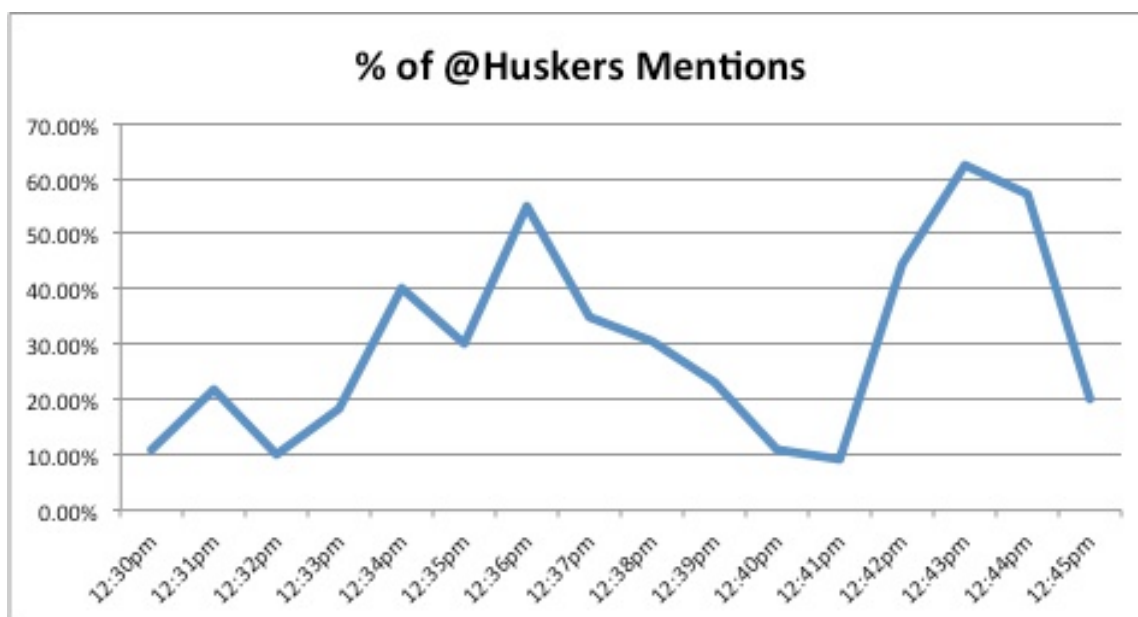


Figure 16.2: Percent of @Huskers Mentions During Second Touchdown

began at 12:35 pm with a spike in @ signs at 12:36 pm. The type of @Huskies actions during that minute were 65 percent retweets and 36 percent mentions and combined made up almost 55 percent of all @ message actions during that minute [Figure 16.2].

There was a difference between the @Huskies actions at non-scoring events during the Capital One Bowl with scoring events. At the start of game coverage, from 12:00 pm to 12:01 pm, another spike occurred in the level of @Huskies actions as well. During this peak 60 percent of all @Huskies interactions were mentions, 33 percent were retweets, 7 percent were replies and @Huskies message interactions made up 22 percent of all @ message actions [Figure 16.1].

At the end of the first half, from 1:16 pm to 1:30 pm, @Huskies message actions were 4 percent attribution, 24 percent retweets, 13 percent replies and 39 percent mentions. The peak time for @Husker mentions was at 1:21pm, while the peak for overall @ messages was at 1:26 pm. Overall, @Huskies accounted for 20 percent of all mentions but the overall conversation was more distributed among other users rather than being driven by one official account. In fact, @ message counts for the top six most frequently mentioned accounts during this time only show a modest increase in number of @ messages at 1:26 pm, where overall @ messages peak. [Figure 16.3]

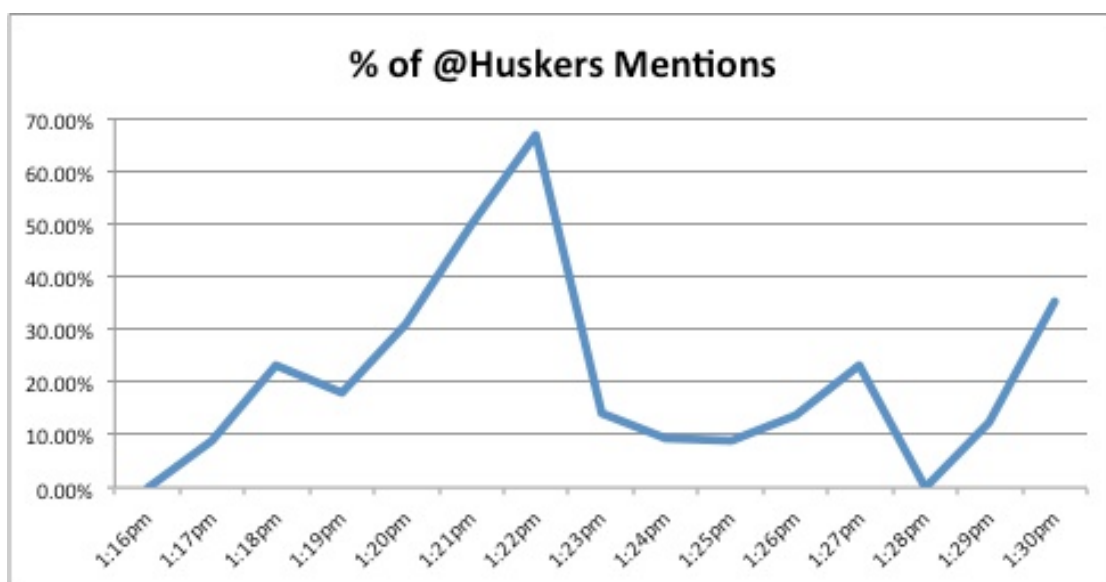


Figure 16.3: Percent of @Huskers Mentions During End of First Half

The official @Huskers account shows attributes of both a news organization - a high percentage of retweets - while exhibiting attributes of celebrity accounts - a high percentage of mentions and replies - depending on the type of event. Particularly, it the determining factor was the emotional quality of the particular moment. During events of high positive emotion, like touchdowns, a high degree of retweets take place. During moments of high negative emotion, such as the Hail Mary pass at the end of the firsthalf and the end of the game, a higher number of attributions and replies occur.

During moments of negative outcome, such as the Hail Mary pass at the end of the first half, the @Huskers user makes up a lesser percentage of all @ message actions. In fact, the six users that received the most @ message actions during the 1:16 pm to 1:30 pm time period do not share a spike in @ actions with the overall spike in @ messages [Figure 16.4]. For this particular event the most @ messages occurred at 1:25 pm but did not result in a spike in @ messages with any particular user account.

The end of the game showed an interesting mixture between official accounts driving @ actions with an overall flatness of @ messages across all Twitter users. The official Capital One Bowl account, @CapitalOneBowl, accounted for the most @ message actions from 2:55 pm to 3:20 pm and showed a significant spike in @ action volume at 3:08 pm and 3:09 pm [Figure 16.5]. During this peak in @ activity 83 percent of all actions towards @capitalonebowl were retweets of the final outcome of the game. It should be noted that this tweet, as well as numerous tweets from @CollegeGameDay, may span multiple Twitter communities. By using the #Huskers hashtag as well as official South Carolina hashtags these tweets spread through both communities.

At this same point the @Huskers account saw an even 50 percent split between reply actions and retweets. Actions toward @Huskers accounted for 25 percent of all actions at 3:08 pm. Actions toward @CapitalOneBowl accounted for 33 percent of all @ actions during their peak period from 3:08 pm to 3:09 pm [Figure 16.6]. Both of these are well below the makeup of @ actions directed towards official accounts during events that featured a touchdown.

All of this demonstrates that the conversation for events with a positive emotional association was different than those with negative emotional associations. Points with a negative association, the South Carolina Hail Mary and the end of the game, are far flatter, or more widely distributed, among numerous different accounts and not focused on the content from one particular user.



Figure 16.4: Aggregate Number of @ Message Actions for Top Six Most Messaged Accounts During the End of the First Half

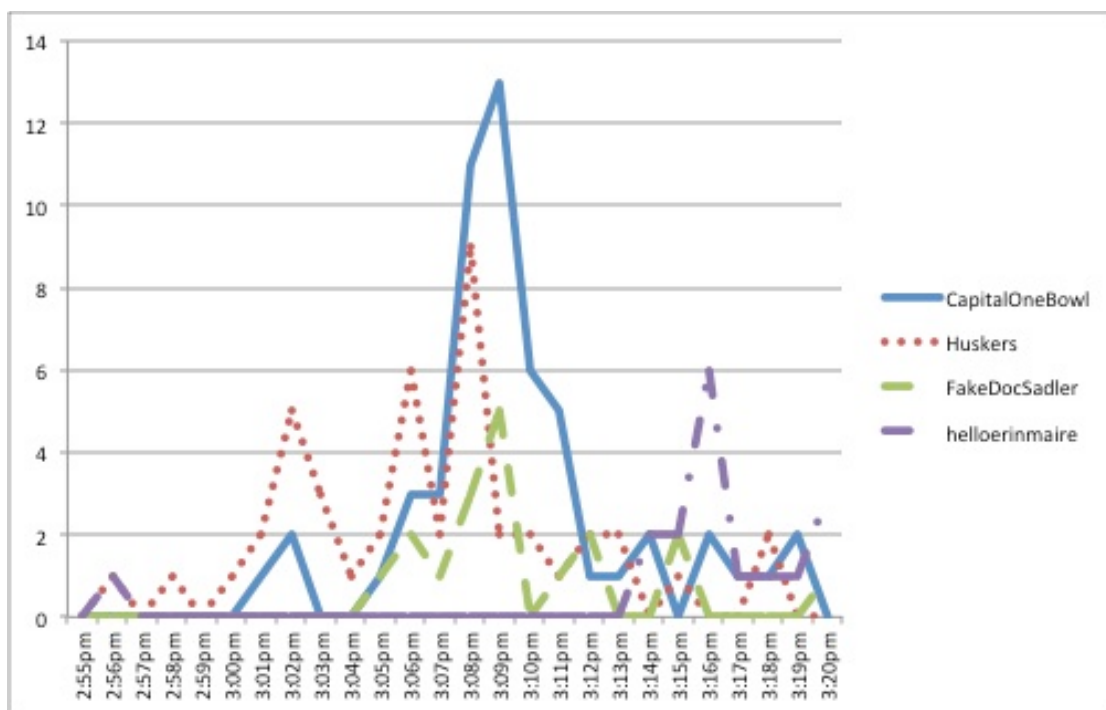


Figure 16.5: Number of @ Message Actions for Top Four Most Messaged Accounts During the End of the Game

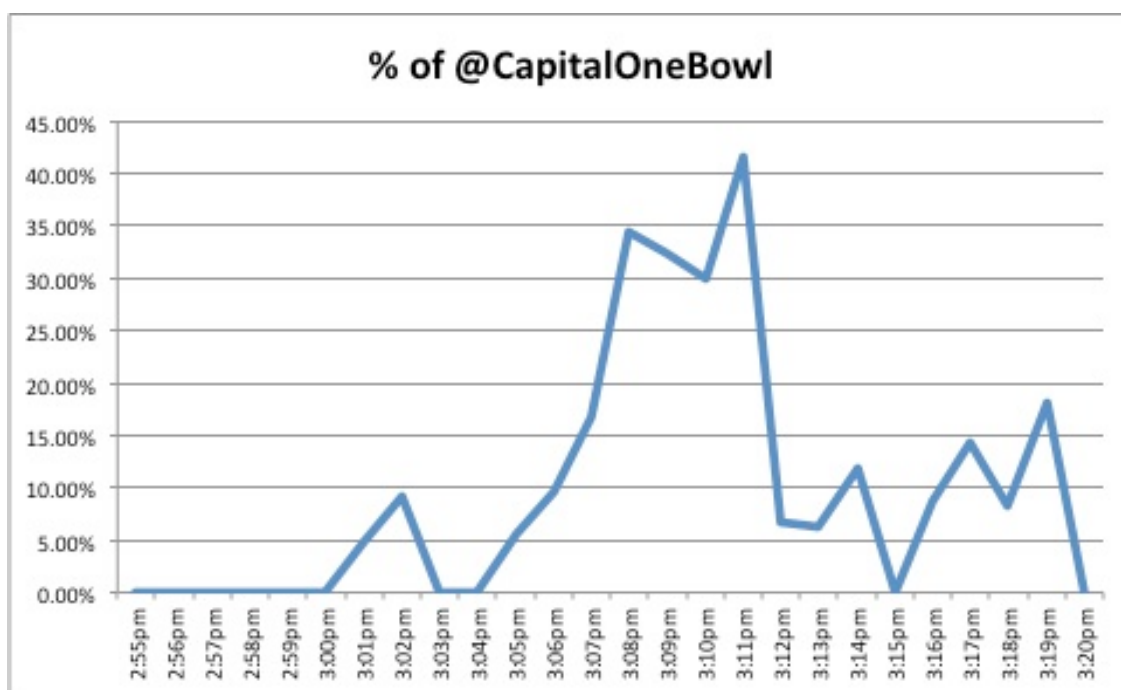


Figure 16.6: Percent of @CapitalOneBowl Mentions During the End of the Game

Other accounts that appeared in the top five accounts to most frequently receive an @ message action during these four events were journalists/bloggers, celebrities, novelty comedic accounts, or players. The journalist/bloggers that appeared were users @max_olson, @HuskerExtraBC, @HuskerExtraSip, @KevinKugler, @Sean_Callahan and @helloerinmarie. The only celebrity account that appeared on the list was user @ndamukong_suh. Comedic novelty accounts include @FauxPelini and @FakeDocSadler. All of these users have significantly lower follower numbers than official accounts such as @CollegeGameDay and @Huskers and likewise received significantly fewer @ message actions in this study.

CHAPTER 17: EVENT SPECIFIC INTERACTIVITY MODEL

The previous points of interest have assisted in constructing a model that represents Twitter interaction from the Capital One Bowl for events of seemingly high importance, particularly touchdowns. The importance in this model is in assisting information sources in directing their messages to possible audience members at points in time that they will be more easily consumed by average users. The first half and second half were drastically different in the type of plays and dramatic swings in action. For this reason the events that follow this model most closely all occurred in the first half - Nebraska's first and second touchdown and South Carolina's Hail Mary touchdown at the end of the half.

At the time of the event, a spike occurs in the volume of tweets that was accompanied by a drop in the average character length of tweets at this time. These events were recognized as universally important by the community due to the large spike in traffic. When events of importance happen users spend more time watching the event unfold and spend less time tweeting resulting in shorter messages. This inverse relationship validates the theory behind the Chatness metric as posited by Shamma et al in analyzing the broadcast of the 2008 presidential debates.

At the end of the game this pattern of average characters having an inverse relationship with traffic volume was not observed, possibly due to the nature of tweeting at the end of the game as well as the specific events themselves. During game action, time constraints that limit the time that can be spent tweeting, specifically the time between plays when a user was able to tweet without risking missing any further game action. This time constraint was not present at the end of the game and was a probable

reason for no discernible drop in the average characters per tweet along with the spike in volume. Secondly, the end of the game slowly becomes an inevitable outcome whereas major events earlier in the game came by surprise. This inevitability allowed users to spend more attention tweeting opposed to actively watching the game.

Other instances that did not see a drop in average characters were followed immediately with a commercial break such as the missed South Carolina field goal and the time around Bo Pelini on camera arguing with a referee. The other exception was the ejection of Dennard and Jeffery during the third quarter that consumed considerable time without game action occurring. In the case of the player ejection, the initial incident was not seen on camera but later replayed. The entire series of events took several seconds to sort out on the field and both volume and average character length both fell before rising in conjunction. This event captured many users' attention causing a drop in character length before they were able to express a statement. Even after the ejections were announced it took several more seconds for play to resume as coaches and referees were sorting out details. The ejection of a player is a rare occurrence as well, meaning that the emotion attached to this action would likely be higher than a more common game occurrence.

The increase in Twitter volume as well as the drop in average characters was all indicative that users spend these events of positive emotion to send out short burst messages that are very similar to the act of cheering. Any messages sent out by information sources at these times need to be very succinct in order to ensure that users are more likely to ingest the information. Also, attaching points of information, such as

statistics regarding a player, should be added to the primary tweet announcing the event as these tweets are the ones that are most likely to be shared through the community.

As well as a drop in the average characters per tweet a drop occurred in the percentage of @ signs per tweet at the moment of the event. This drop was followed by a sharp increase in the percentage of @ signs per tweet, which typically peaks three to four minutes later after nearing or surpassing 45 percent of all tweets. This pattern was even more universal than the previous observation. While the drop in average characters per tweet and spike in traffic volume appeared only for Nebraska's touchdowns as well as South Carolina's Hail Mary pass the @ sign pattern appeared in nearly every traffic spike observed. Pregame and postgame levels of @ signs per tweet rest around 47 percent of all tweets.

This may indicate that after moments of importance, conversation levels resume to a "normal" level for the community when users are more interested with conversing on Twitter than actively watching the game. Other possibilities are that a core number of users exist who use a significant portion of the @ signs and that after a major event they continue discussing the event after the more casual users end their tweeting. A third theory may be that users are less inclined to browse their Twitter feeds during the game for fear of missing game action and that once a major event forces them to interact with Twitter, they are more likely to retweet older messages they had yet to see on their Twitter feed.

Information sources should direct all conversational tweets during this time period when users are more interested in engaging with the community. After major events

average users are more engaged with Twitter while seeking out conversation on the platform and will be more likely to engage with accounts that offer conversational opportunities at this time.

Accounts that showed the most influence over Twitter @ message actions were primarily official accounts, particularly the @Huskers account. Especially when the event that correlates with a spike in @ messages was a positive event, the resulting @ message actions will have a high frequency of relating the @Huskers account. When events are more negative in nature a wider distribution of @ message actions occurs that do not necessarily correlate with an official account. This shows that during events with a positive emotional outcome, users are more likely to “cheer” in affirmation with official accounts. However, during times of negative emotional outcome, they are more likely to engage in conversation with each other than to repeat the negative news from official accounts on Twitter. This indeed supports the hypothesis that positive news was more likely to be repeated on Twitter (Anderson, 1998; Jansen and Zhang, 2009; Berger, 2009).

This emotional response poses a challenge for official social media accounts associated with Athletic Departments. To a degree, a lot of influence on Twitter during events is tied with a positive emotional outcome to the game, something that is out of the control of the social media team. However, being prepared to maximize during these positive events will assist in gaining the most influence at these times.

Finally, it should be noted that the level of Twitter activity during an event increases dramatically from pregame and postgame levels. The challenge for information sources during these peak times is to ensure that adequate staffing exists in order to meet

and respond to the sheer volume of social media interaction. Studying the level and rate of volume increases on other social media platforms such as Facebook may help to further define the level of staff needed to adequately handle social media response and interaction during games.

CHAPTER 18: FURTHER RESEARCH

Twitter traffic during the 2012 Capital One Bowl confirmed that the Huskers Twitter community was reflective of Nebraska scores and other influential moments during a football game. Twitter volume highlights moments of shared interest among the community with the degree of spike indicating the importance of the event. A drop in average characters per tweet during moments of tweet volume spike further validates the idea that average character length indicated the level of engagement by users with action on the field over the act of tweeting. Secondly, the average characters per tweet are lower throughout the course of the entire game than during pregame and postgame.

Future study on content analysis of tweets during college sporting events could help further flesh out this reflectivity and provide insight into how much information can be received during a game from Twitter alone. Considering the unique factors of football with built in breaks and downtime between plays, examining reflectivity for other sports that do not have these built in down times could assist in further demonstrating how users split attention during events with Twitter.

Influence proved to be a trickier subject to flesh out. Official accounts generated more @ message actions than journalists/bloggers, celebrities, or average users during times of peak Twitter volume. The primary @Huskers account had a large percentage of

retweets during levels of peak Twitter activity on events of positive emotional quality.

During negative emotional events the number of @ messages flattened out among more users than solely official accounts, meaning there was broader conversation among users for negative events than during moments of positive emotional activity.

Future research should work to continue to broaden the understanding of community interactions. While this search captured the officially promoted hashtag for Nebraska Athletics as well as any variation of the full school's nickname of Cornhuskers, it is impossible to know from this study how widely adopted the #Huskers hashtag is. Other research has shown that adoption of hashtags in sports is faster and more widely adopted than other areas (Romero, 2011), but for this community no research exists on the subject. It may be impossible to collect all tweets that pertain to a given game since users may tweet about the game without including any predeterminable search word. However, further defining how widely adopted the #Huskers hashtag is would assist in broadening the pool of tweets to be analyzed to include variances of Nebraska as well as individual players. Taking a random sample of those who use the Huskers keyword once during an event and examining all of their tweets to see how frequently they use the #Huskers hashtag would help determine the level of adoption. Using secondary keywords such as key players, other school names such as Nebraska and opponent mascots could also assist in determining adoption rates of official hashtags.

Further challenging this study was the nature of the game itself. The Capital One Bowl was not an average game by typical sports writers' analysis. The game possessed dramatic swings in momentum between the two teams, excitement that possibly led to emotional reactions from Twitter users that may not have been typical. Being a bowl

game it was also neither a home nor an away game. Secondly, the game was on a Monday at 12:00 pm Central Time, when a number of fans may have been at work. All of these factors are not representative of an average college football game.

Events such as Coach Bo Pelini arguing with the referees on camera, which was also replayed prior to a commercial break on the ESPN broadcast, may not have been as evident to fans sitting in the stadium. A home game may place more typically active Twitter users in the stadium and change their experience of events. It is also possible that secondary factors, such as poor cellphone reception at the stadium, may prohibit fans from actively tweeting during the game. Further study of home games may provide insight into the makeup of active users during home games and their impact on the overall Twitter volume during the game. Further understanding the makeup of the Huskers Twitter community would assist journalists and official accounts in knowing what type of content may be more relevant. Away games may also prove to offer a different set of Twitter users. While the Capital One Bowl is indeed a trip for most Husker fans, it is possible that more fans attended the Capital One Bowl than would attend a regular season away game due to its timing over the winter holidays. Further study of away games may help further expand our knowledge of Twitter users during bowl games as well as during away games.

The time of the game was also not typical due to the day of the week. The Capital One Bowl was played on a Monday while most college football games are played on Saturdays. Twitter users may have followed the game differently due to this factor since some may have been at work, visiting family from the holidays, or other places that they typically don't follow the game from. It is possible that more users would have followed

the game from their phones while at work if they did not have access to television or radio. It is also possible that users would be with larger groups of people when games are played on Saturdays opposed to during the week.

While it is unclear how many users watched the game on the ESPN television broadcast, it is safe to say that users are able to follow the game from a variety of sources. While a large portion of them probably did watch the game on ESPN, a number also would have listened to the radio broadcast and perhaps a smaller portion of them would have followed the game online. College football games can be broadcast on a variety of television stations with Nebraska games in the 2011 season airing on ESPN, ABC and the Big Ten Network. Each of these networks has different distributions, different announcers and different production styles that may influence the viewing experience of Twitter users during the game. When users are not able to watch the television broadcast at all, they may listen to the game broadcast on the local radio affiliate, which is also streamed live over the Internet. The broadcasters on the radio broadcast may provide different context to the game, which may also affect the experience for users from television viewers. Examining how Twitter users are following the game would help decipher the added context they are experiencing with the game.

Having a better understanding of user interactions with each other during live coverage is beneficial for information sources to better tailor their messages during events. Journalists and institutions can determine ways to reach the widest audience possible at optimal times, which information is most pertinent and the times users are most likely to receive those messages. Knowing whether users are primarily in the stadium or at home would assist informational sources in providing adequate context.

Knowing which other sources of information are helping form the opinions of users during the game would also assist in understanding the overall context of the game.

Ultimately, assisting information sources in better tailoring their messages to the correct audience helps information seekers gain the best, most accurate information available in an instantaneous manner.

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