Organization or conversation in Twitter: A case study of chatterboxing

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Background to the present study

Informal observations:

- undergraduate student use of the hashtag gesture in f2f conversation

- use in Facebook

- use in advertising, news media, etc.

Nine West (shoes) magazine advertisement (2012)

What do we really know about the **use** of hashtags in Twitter? And how can we study it?

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Agenda

- Rationale
- Review of the literature
- Research Questions
- Methodology
- Results
- Discussion
- Limitations
- Conclusion

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Rationale

This study seeks to answer the fundamental question: Is it possible to say that Twitter #hashtags can be organizational in nature, or are they purely conversational?

- To explore this question, this case study uses chatterboxing during the Super Bowl to identify differences between #hashtags and @mentions.

  - *Chatterboxing*: discussion about a real-time televised event through the use of a second screen connected to a social media outlet such as Twitter or Facebook or to other electronic means of communication such as email (TV Licensing, 2012).

- Labeling posts correctly in Twitter is essential for chatterboxers if they want to participate in the conversation

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Review of the literature

Twitter as a Social Medium for Communication:

- Twitter is a noisy medium (Jackoway, Samet, & Sankaranarayanan, 2011; Honeycutt & Herring, 2009),

Primary Labeling Conventions within Tweets

- **#hashtags**: #Hashtags in Twitter are short labels with a hash mark or pound sign preceding the characters of the text string. #Hashtags either serve as a label like social tags in sites like Flickr, or they function as a prompt for comment (Huang, Thornton, & Efthimiadis, 2010, p. 3). Weng, Lim, He, and Leung (2010) see #hashtags as keywords or phrases that may or may not be interesting or adopted (p. 1121).

- **@mentions**: @Mentions on Twitter add the *at sign* immediately preceding a user's Twitter handle (user name). The use of @mentions provides coherence in an otherwise seemingly disorganized system where posts are displayed in chronological order (Honeycutt & Herring, 2009).

  - Honeycutt and Herring (2009) interpret any use of @mentions as promoting conversation and potentially collaboration. Within an hour of being tweeted, 31.2% of tweets with @mentions received a public response indicting that mentions promote conversation (Honeycutt & Herring, 2009).

- **RT: Retweets,** posts copied (and potentially modified or commented, often giving attribution to the original poster) as studied by boyd, Golder, and Lotan (2010) may include #hashtags and @mentions; they are generally considered conversational.

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Review of the literature, cont.

#Hashtags as *Aboutness*: Theoretical Considerations

- #hashtags have the potential to describe or interpret the content of a tweet expressing *aboutness* as indexers understand the term (Maron, 1977) and as folksonomies might be understood (Peters and Stock, 2007).
  - #hashtags function as pointers to these conversations.
- #hashtags seem to share the same benefits and problems as Peters and Stock (2007) note regarding folksonomies
  - Benefits: a type of low cost indexing, identification of communities, and so forth
  - Problems: uncontrolled vocabulary, language merging, and so forth

- Conversation and Organization on Twitter: For the purpose of this study, conversation implies information sharing between and among interlocutors while organization implies curation, analysis, and assumed retrieval.

  - Huang, Thornton, and Efthimiadis (2010) raised the question of conversation versus organization in relation to #hashtags, concluding that a priori #hashtags are not organizational in nature because users are not indexing for retrieval at a later date. They feel that the goal of #hashtag use is different from a posteriori tagging in social media sites (p. 1); instead, Twitter users use #hashtags to join and participate in a **discussion** (p. 5).

  - Efron (2010 & 2011) assumes #hashtags to be organizational, lending themselves to the study of retrieval of tweets.

If @mentions and #hashtags are both conversational as some researchers suggest, then we theorize they will be used in a way that is consistent within chatterboxing tweets.

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Review of the literature, cont.

Mobility and Geographic Location

- Tweets posted via:
    - apps installed on mobile devices or tablets
    - posted through the Twitter web interface on a web browser or client
- Mobility can help us understand the nature of #hashtags: We theorize that users coordinating events in real-time will direct their tweets to particular users through the @mention and that users describing and organizing their own personal tweets will tend to use #hashtags.
- Location-based aspects of Twitter can contribute to the richness of the data (Jackoway, Samet, & Sankaranarayanan, 2011). It is possible to know who in proximity is tweeting and to see the content of those tweets.

Location and mobility contribute to the overall quality of the chatterboxing interaction on Twitter.

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Review of the literature, cont.

Chatterboxing

- Chatterboxing is prevalent among those who watch television

- At the time of writing, 173,753 users had checked in to Super Bowl XLVI on GetGlue

- BlueFin reported the Super Bowl as being the largest social TV event recorded at the time, with a total of 12.2 million social media comments during the game. This number represented a growth of nearly 600% over social media comments in the previous year's game (BlueFin, 2012).

- TrendrrTV reported a higher number and one that focused on Twitter instead of on social media in general: Mark Ghuneim of TrendrrTV reported 15.8 million tweets during the Super Bowl in 2012, up from 3.01 million in 2011 (Kafka, 2012a).

- Twitter as a medium provides a venue where the "public interplay of voices [...] give[s] rise to an emotional sense of shared conversational context" (boyd, Golder, & Lotan, 2010, p. 1)

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Review of the literature, cont.

Qualitative Analyses of Tweets

- Inferring meaning based on tweets is an uncertain task. Topics of tweets are difficult to ascertain because tweets themselves are ungrammatical and internally noisy (Michelson & Macskassy, 2010). Content analysis and other qualitative analyses of tweets are nonetheless undertaken in studies of Twitter usage, often on subsets of tweets as a way of gathering a richer data pool.

  - Huang, Thornton, and Efthimiadis (2010) used qualitative methods to analyze the content of a subset of 224 tweets but did not report on the results in the paper we consulted.

  - Honeycutt and Herring (2009) analyzed the functions of @mentions in a subset of 200 tweets, to address questions of language of the tweet. Another subset of 50 tweets in English was analyzed to count specific instances of the @mention in tweets (Honeycutt & Herring, 2009).

  - In Michelson & Macskassy, user topics of interest were analyzed, with a pilot of four users' tweets being compared against Wikipedia to test the topicality of the content (Michelson & Macskassy, 2010).

  - As with other studies where an online user-created artifact is analyzed, Twitter studies that are qualitative in nature are unable to state with certainty the topic of a given tweet or the intention of the user.

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Research questions

RQ1: Are @mentions and #hashtags in posts (*tweets*) *different enough to represent two different labeling conventions?*

- To address the question of differences, tweets were taken from specific locations during a chatterboxing event where half of the locations implied more active involvement on the part of Twitter users.

RQ2: To what extent do #hashtags indicate *aboutness in tweets?*

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Methodology

2012 Super Bowl held February 5, 2012

TwitteR (Gentry, 2012) fo the R stastical language was used to search and retrieve tweets via the Twitter API for date range from February 5 to 6, 2012.

Aimed to pull a maximum of n=1500 *tweets* per location with #superbowl, 7 "locations" were identified using geograpic coordinates (or, were location-independent)

1. Locations with an invested interest

   – Boston (team)

   – New York City metro area (team)

   – Indianapolis (host city)

2. Locations (geographically dispersed) with football teams but a non-invested interest

   – Dallas

   – Miami

   – Seattle

3. Location-independent tweets for the location-independent qualitative study

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Data collection

In the first part of the analysis, the overall goal was to compare the invested-interest group against the non-invested-interest group to test for differences in the uses of the two labeling conventions.

Purpose

- understand the extent of the relationship between the two conventions

- determine whether there is justification for testing each separately in the succeeding group tests.

If there is no statistical or substantial relationship between the two, then we assume that @mentioning and #hashtagging are two separate actions and should be examined separately.

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Data collection

Next, we examine and compare the three locations within the invested-interest group (Boston ~ NY Metro area ~ Indianapolis).

- Goal: to understand whether there is reason to believe that these three locations are similar or come from similar populations.

- If, based on the relationship test between #hashtag use and @mentioning, we have reason to believe that the two have separate functions, we test each separately.

We repeat this process for the three locations within the non-invested-interest group (Dallas ~ Miami ~ Seattle) in order to determine whether these locations are similar.

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Data collection

Finally, based on the previous two tests there is a reason to believe that members in the invested-interest group are similar and members in the non-invested group are also similar, we examine and compare the two groups to each other (between the two conversation groups and between the two organization groups, separately).

- This final statistical test will also say something about the influence of location on Twitter users in their posts during a real time nationally televised event. An analysis of the platform used to post the tweets, when possible, will also be analyzed in a small random sample of tweets to assess the potential degree of mobility of users.

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Data collection

Qualitative methods: By studying a small random sample of tweets (n=100) we can develop a richer understanding of the character of content in Twitter while addressing one of our research questions.

93 complete and unique non-location-dependent #superbowl tweets retained

1. content themes for tweets identified

2. *aboutness* and placement of #hashtags in relation to the content of the tweets

   - As a reflection of the tweet's *aboutness*

   - Relative location in the tweet (*in situ* or as extra-grammatical tags).

3. the number of RTs in posts from all the locations was also assessed

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Results

Frequencies of @mentions by location							
	0	**1**	**2**	**3**	**4**	**5**	**>5**
INVESTED							
Boston	844	392	46	10	1	4	3
NY Metro	545	663	68	22	2	–	–
Indy	669	433	115	32	23	12	16
NON-INVESTED							
Dallas	880	308	75	13	12	3	9
Miami	842	360	73	17	5	2	1
Seattle	789	429	58	12	5	2	5

Results

Frequencies of #hashtags by location							
	0	**1**	**2**	**3**	**4**	**5**	**>5**
INVESTED							
Boston	684	391	116	90	14	3	2
NY Metro	742	299	223	20	11	2	3
Indy	661	349	175	72	32	5	6
NON-INVESTED							
Dallas	824	312	104	28	26	4	2
Miami	845	313	103	25	7	4	3
Seattle	878	279	94	39	5	1	4

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Results

Kendall's Rank Correlation tau Matrix, #hashtags to @mentions

	Boston @	NY Metro @	Indy @	Dallas @	Miami @	Seattle @
Boston #	**.1133*****	-.0030	-.0054	.0349	.0234	-.0337
NY Metro #	.0400	**.0917*****	**-.0444^**	-.0185	.0189	.0306
Indy #	.0180	.0266	**.0492***	**.0490***	-.0138	.0039
Dallas #	.0319	-.0094	-.0147	**.0478^**	-.0262	**-.0476^**
Miami #	.0237	-.0573	.0014	-.0085	**.0799****	-.0193
Seattle #	.0124	.0104	.0057	.0273	.0004	.0344

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ^ $p < 0.10$

First, we rule out multicollinearity and examine the relationships between hashtag and mentioning by location.

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Results

- Are the invested interest groups the same, as far as use of @mentions?

- H_0: Boston = NY Metro = Indianapolis

- Kruskal-Wallis rank sum test

  - @mentions: $H = 130.0359$, $df = 2$, $p < 0.001$

  - Reject the null hypothesis

- Post hoc pairwise Wilcoxon rank sum test

  - Boston ≠ NY Metro ($p < 0.001$) ## Reject the null

  - Boston ≠ Indianapolis ($p < 0.001$) ## Reject the null

  - NY Metro = Indianapolis ($p = 0.058$) ## Fail to reject

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Results

- Are the invested interest groups the same, as far as use of #hashtags?

- H_0: Boston = NY Metro = Indianapolis

- Kruskal-Wallis rank sum test

  - #hashtags: $H = 12.1263$, $df = 2$, $p < 0.0023$

  - Reject the null hypothesis

- Post hoc pairwise Wilcoxon rank sum test

  - Boston = NY Metro ($p = 0.2400$) ## Fail to reject

  - Boston = Indianapolis ($p = 0.2366$) ## Fail to reject

  - NY Metro $\neq$ Indianapolis ($p = 0.0015$) ## Reject

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Results

- Are the non-invested interest groups the same, as far as use of @mentions?

- H_0: Dallas = Miami = Seattle

- Kruskal-Wallis rank sum test

  - #hashtags: $H = 8.7802$, $df = 2$, $p < 0.0124$
  - Reject the null hypothesis

- Post hoc pairwise Wilcoxon rank sum test

  - Dallas = Miami ($p = 0.6952$) ## Fail to reject
  - Dallas ≠ Seattle ($p = 0.0098$) ## Reject
  - Miami = Seattle ($p = 0.2440$) ## Fail to reject

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Results

- Are the non-invested interest groups the same, as far as use of @hashtags?

- H_0: Dallas = Miami = Seattle

- Kruskal-Wallis rank sum test

  - #hashtags: $H = 5.1268$, $df = 2$, $p < 0.07704$

  - Fail to reject the null hypothesis.

- Post hoc pairwise Wilcoxon rank sum test

  - Dallas = Miami ($p = 0.776$) ## Fail to reject
  - Dallas = Seattle $(p = 0.072)$ ## Fail to reject
  - Miami = Seattle ($p = 0.754$) ## Fail to reject

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Results

- Is the invested interest group the same as the non-invested interest group, with regards to use of @mentions?

- H_0: Invested Interest Group = Non-invested Interest Group

- Wilcoxon rank sum test

  - $Z = 9.9411$, $p < 0.001$, 95% CIs [0.0005, 0.00011]

  - Reject the null hypothesis

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Results

- Is the invested interest group the same as the non-invested interest group, with regards to use of #hashtags?

- H_0: Invested Interest Group = Non-invested Interest Group

- Wilcoxon rank sum test

  - $Z = 11.5831$, $p < 0.001$, 95% CIs [0.00004, 0.00009]

  - Reject the null hypothesis

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Results

Content of tweets	No.	%
Announce/advertise; Info for others	22	24%
Express opinion (general likes, dislikes)	26	28%
Commercials (explicit mention of content)	13	14%
Game events (explicit mention of content)	32	35%
	93	100

Content of random sample of #superbowl tweets independent of location.

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Results

Aboutness of non-#superbowl #hashtags (n=46)	No.	%
Directly concerning the contents of the tweet	23	50%
Teams (e.g. #Patriots)	8	17%
Affective or conversational (e.g. #lmfao, #JustSaying)	6	13%
Venue other than #superbowl (e.g. #SB46)	3	7%
Network (e.g. #NBC)	2	4%
Other (e.g. #IndianapolisChildrensChior)	2	4%
Complete sentences (e.g. #DaddysDrinkinCabernet)	2	4%

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Results

Placement of #hashtags	No.	%
Beginning of tweet	4	3
End of tweet	94	68
Between sentences or complete thoughts	4	3
Within tweets as words or sentences	36	26
Total	138	100

Discussion

- We view #hashtags on Twitter as first-order organizational acts rather than first-order communicative acts.

    - Library and information science has much to offer to the study of #hashtag use.

    - We concede that there is a facilitation of conversation through the use of #hashtags

- In a real-time environment like a nationally televised event, #hashtags use promotes organization.

    - #Hashtags function in a way similar to social tags in traditional social tagging sites like CiteULike, Flickr, and Delicious due to their spontaneous use and creation and their grouping function for *aboutness* and affective topics.

- When deciding on a theoretical framework for analyzing and studying #hashtagged tweets in Twitter, it is necessary to distinguish between the field of organization and communication for choosing a theory.

    - Results in this study imply that the greater the number of Twitter conventions used, the more the tweet should be considered conversation.

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Limitations

- The Super Bowl is a popular event and therefore the locational, organizational, and conversational aspects of chatterboxing during this event may be more pronounced than in other Twitter studies where certain groups have a non-invested interest in a much less dramatic event and its outcome.

- There is a difference between users' symbolic conventions to organize and communicate on Twitter, and the relationship between these conventions becomes statistically dependent for invested-interest locations in our chatterboxing context

- We, however, make no generalizable, qualitative claims about the use of these two conventions. More understanding about the qualitative differences and uses is needed.

Conclusion

- Based on the quantitative results of the study, we rejected the notion that #hashtags are identical to @mentions

- Based on the qualitative results, we reject the notion that #hashtags do not provide for the description of tweet *aboutness* in a way that may be similar to social tagging.

- Accordingly, we feel that it is appropriate for researchers to use organization of information theory when analyzing #hashtags in tweets

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