Historically Black Colleges and University Libraries' Utilization of Twitter for Patron Engagement: An Exploratory Study

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Abstract
African American millennials form the largest demographic of Twitter users. Historically Black College and University (HBCU) libraries have incorporated the micro-blogging service Twitter into their information services as a strategy to market and inform library users. However, there is little in the literature on assessment; do we know if users are interacting with libraries via social media? This study examined followers of HBCU libraries, and measures their engagement with library-generated content on Twitter. This study utilizes social analytics techniques, specifically propagation and sentiment analysis to measure the state of engagement among library Twitter followers, within a one-year period. Dispute an active presence on Twitter; libraries in this investigation had a relativity small footprint in the Twitter universe. Results indicate little engagement with followers and neutral emotional responses to library-generated tweets.
Keywords: Engagement; libraries; social analytics; social media; Twitter
doi: 10.9776/16477

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1 Introduction

Academic libraries have readily adopted social networking into their day-to-day information services. Some researchers like Dickson & Holley (2010) posit social media "can be an effective method of student outreach" while others suggest that many academic libraries "have no clear published objectives for using" social media tools such as Twitter (Kim, Abels, & Yang, 2012). There is very little empirical evidence, which supports academic libraries' expenditure of time and labor in support of social media platforms, nor is there a clear linkage between library social media activities and patron engagement. While information science researchers have begun to study various iterations of Twitter use at academic libraries, most of this literature consists of latent content analysis on library-generated social media data (Aharony, 2010; Cuddy, Graham, & Morton-Owens, 2010; Del Bosque, Leif, & Skarl, 2012).

Researchers such as Kim, Ables and Yang (Kim et al., 2012) have examined how patrons interact with library-generated content, specifically individuals who retweet academic library messages. Their findings reveled constituent units within the university and students comprised the largest demographics retweeting library content. Stvilia and Gibradze (2014) explored factors that made academic library tweets "useful" – measuring both the number of retweets and favorites. Most research of this nature conducts social media analysis of library-generated content, not analytics or data mining of the type and degree of engagement of patrons with library-generated content. Our work has developed a harvesting and analytics algorithm that represents a substantial interdisciplinary approach between the intersection of computational social analytics, computer science, and information science. This investigation is the first longitudinal empirical study on academic library-generated Twitter content at HBCU academic libraries that obtains empirical data on patron engagement. This investigation is focused around the following research questions: (1) Are HBCU academic library followers engaging in library-generated Tweets? (2) What sentiment is expressed around HBCU library-generated Tweets? Answers to these questions will provide important indicators for HBCU academic libraries investment in social media, and information science researchers examining how patron engagement is impacted by library-generated content on Twitter.

2 Research Methods

The authors captured Twitter activity from seventeen HBCU libraries over a twelve-month period (December 2013-December 2014), based on Suh et. al's model (Suh, Hong, Pirolli, & Chi, 2010). These were the only HBCUs at four-year institutions with active Twitter accounts. Additionally, we collected up to

3,200 tweets and retweets from each of the library's followers. The following units of analysis were used to measure the aforementioned research questions: velocities, followers, twitter activity, and sentiment.
The harvesting architecture of our system is not designed to introduce an original architecture, but rather to highlight the components used for this project for individual tweet analysis (Aggarwal, 2011; Sun & Han, 2012). The architecture is composed of three components: extracting data from data providers (i.e. the Twitter data servers) via the Twitter API; parsing, integrating, and storing the data in a NoSQL database that resides on a cluster at the University of Arkansas at Pine Bluff. A representative example of how we extract data is shown in Figure 1.

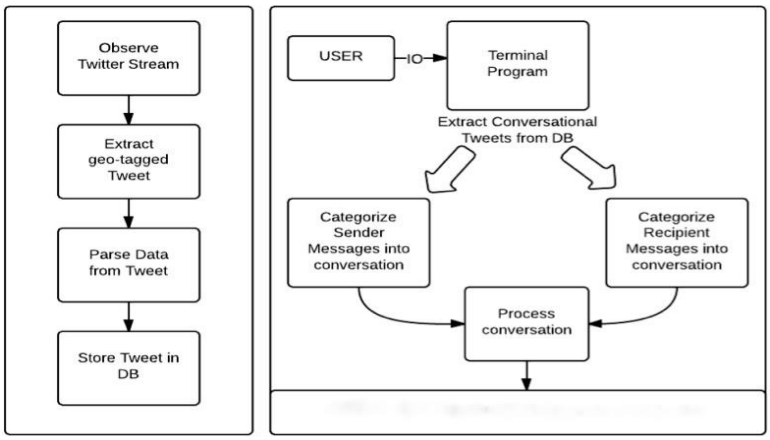

Figure 1. Illustration of Harvesting Process

The measures used in this research will help us better understand the degree to which follower's are engaging with library content; specifically we seek to understand are patrons responding to library posts quickly, if at all, and whether library followers are responding to the library's content via retweets. We answer RQ1 indirectly by measuring the velocity of tweets and retweets. It is assumed that the time interval between the receipt of a message and reply to said message would be shorter, if the replying user is truly engaged in the conversation (O'Brien & Toms, 2008; Ye & Wu, 2010)**.** RQ2 is answered using sentiment analysis. A technique frequently leveraged in measuring user engagement in social media platforms, sentiment analysis, or opinion mining, examines the polarity of text resulting in a scaled metric that denotes positive, negative, or neutral sentiment conveyed in the text of the tweet or retweet (Pak & Paroubek, 2010; Thelwall, Buckley, & Paltoglou, 2011, 2012). Sentiment analysis in this project is done on a per-tweet basis. Table 1 provides examples for sentiment scoring associated with the project.

High	Medium	Low
1 minute ~ 60 minutes	61minutes~360 minutes	361 minutes – Never

Table 1. Velocity Ranking Scale

Velocity of tweets in this study referrers to the time difference between tweets and subsequent retweets. This allows analysis of how fast tweets travel within a user's network. Therefore, we categorize tweet velocity into three groups as listed in Table 2 below. In addition, the text below represents categories of twitter activity by HBCU libraries measured by the total number of followers and the velocity of library-generated content that is retweeted:

Low: A library has low tweets but low retweets by followers and low velocity (speed). [0-100]
Medium: Low retweets but medium velocity [101-200
High: Medium- to- High tweets. Medium to High Retweets by followers. [201+]

Type	Location	Sentiment Score	Followers	Velocity	Twitter Activity
Public	Georgia	2.1	2233	Medium	Medium
Private	Louisiana	2.09	419	Medium	Medium
Public	North	1.3	729	Low	Low

	Carolina				
Public	Florida	-0.142	335	Low	Medium
Private	Alabama	1.2	40	Low	Low
Private	Washington DC	-1.83	53	Low	Low
Private	Texas	1.96	621	Low	Medium
Public	Mississippi	-0.892	2	Low	Low
Public	North Carolina	1.3	548	Low	Low
Public	North Carolina	1.13	111	Low	Low
Private	Georgia	2.002	1208	Low	Medium
Private	Georgia	1.651	328	Medium	Low
Private	Louisiana	2.076	93	Low	Low
Private	North Carolina	1.02	15	Low	Low
Public	Mississippi	-0.321	7	Low	Low
Private	South Carolina	1.2	55	Low	Low
Public	North Carolina	2.1	108	Low	Low

Table 2. Twitter Metrics Summary

3 Findings

Our results indicate that followers are disconnected from content disseminated by HBCU libraries on Twitter. Social engagement is exceedingly low among this community of libraries and the sentiment expressed around their tweets is indifferent. Although Table 3 shows a scattering of libraries with medium levels of Twitter Activity these entities nevertheless score low with respect to velocity. This grouping of libraries were fairly active in tweeting content and had followers ranging from 329-1208, but we found their tweets were never retweeted or at best were disseminated by followers more than six hours after their original posting. Tweets propagating within this temporality demonstrate a lack of interest or engagement among followers. These responses were not wholly surprising. Del Bosque and colleagues (2012) study of Twitter trends in academic libraries found “very few were using the resource to carry on a two-way conversation.”

The sentiment scores provide a numeric measure of the emotional impact of library-generated content among followers and non-followers who retweeted content. Overall we observed data emanating from libraries lacked any form of emotional response. In this case sentimentality need not necessarily score as positive or negative, but library content must elicit some form of sentiment in order to engage. A consequence of this indifference, to the library’s content, by followers, is a one-way flow of information wherein the library is essentially engaged in a conversation with itself. This is illustrated in Figure 2, which shows the non-bidirectional Tweeter communication among a library’s Twitter followers.

Although this library generates content, it rarely sparks engagement among its followers, as evidenced by the overwhelming one directional follow of content. We did however; observe a few instances of engagement within this library’s Twitter activity. For example, there were instances of community formation around library content, in the two nodes at the bottom of Figure 2. Here the library’s tweet is exchanged among individual followers, but never moves beyond this small community. In contrast, the right cluster illustrates engagement among a subset of followers. In this instance library-generated content is retweeted among a pool of followers forming a much broader community in both complexity and variety of engagement.

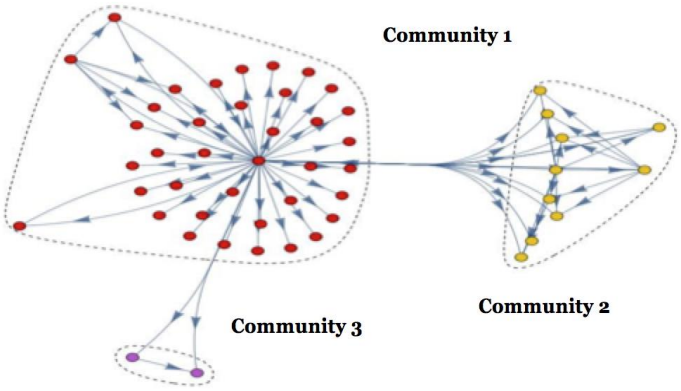

Figure 2. Communication among Library Communication

4 Conclusion

A limitation of this research was the overall low number of Twitter accounts at HBCU libraries and the low number of library-generated tweets on those accounts. Therefore this limits the amount of follower retweet of library-generated content. As a result the scope and scale of this project measuring engagement and sentimentality is impacted adversely, such that our conclusions are predicated on a narrow grouping of HBCU libraries. Future research will expand this investigation by taking a closer examination of follower retweets of library-generated content. A deeper examination of followers' retweet content in association with velocity measures and sentiment analysis will assist libraries in measuring their impact on patron engagement.

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