

# Florida State University Libraries

---

2014

## What do academic libraries tweet about, and what makes library tweet useful?

Besiki Stvilia and Leila Gibradze

This is a pre-print version of the article, and the publisher's version of record is available at <https://doi.org/10.1016/j.lisr.2014.07.001>.



# What do academic libraries tweet about, and what makes a library tweet useful?

Besiki Stvilia<sup>1</sup>, Leila Gibradze

*College of Communication and Information, Florida State University, 142 Collegiate Loop, Tallahassee, FL 32306-2100, USA*

## ABSTRACT

People spend an increasing amount of time using social media systems to network, share information, learn, or engage in leisure activities (e.g., gaming). Libraries too are establishing a social media presence to promote the library and provide services to user populations through the social media systems the users frequent. This study explores Twitter uses by six large academic libraries, and factors that make library tweets useful. 752 tweets were analyzed by topic to develop a subject typology of library tweets. In addition, tweets and Twitter user characteristics were analyzed to explore what makes library tweets useful, as measured by the number of retweets and favorites received. Content analysis of the samples of library tweets revealed nine content types, with the Event and Resource categories being the most frequent. In addition, the analysis showed that tweets related to study support services and building and maintaining connections with the library community were the most frequently retweeted and selected as favorites. The presence of a URL in the tweet was positively associated with the number of retweets, and the number of users followed was positively associated with the number of favorites received. Finally, a negative correlation was found between the account age and number of favorites.

## 1. Introduction

Social media systems have become increasingly popular, and users are spending a growing amount of time using these systems to network, share information, learn, and engage in leisure activities (e.g., gaming). A recent Pew survey of social media use found that more than 70% of online adults used some kind of social media. Almost 20% of online adults used Twitter, 46% of whom visited it on a daily basis and 29% of whom visited it more than once a day (Duggan & Smith, 2013). Another Pew report showed that Twitter ranked third among social media platforms (after Facebook and YouTube) by the percentage of U.S. adults who obtained their news from a social networking site (8%). Among 18 to 29 year olds,

---

<sup>1</sup> Corresponding author. *E-mail address:* bstvilia@fsu.edu (B. Stvilia).

Twitter ranked first, ahead of YouTube and Facebook, with 45% of U.S. adults from that age group consuming news on Twitter (Mitchell, Holcomb, & Page, 2013). Twitter is a large-scale microblogging system with social networking capabilities and with more than 230 million active users per month. Its users produce more than 500 million tweets (i.e., microblog posts) on a regular day.<sup>2</sup> Another survey from the Pew Center showed that 73% of Americans ages 16 and older would be willing to use an online Ask a Librarian-type service (Zickuhr, Rainie, & Purcell, 2013). Being aware of these trends, libraries too are establishing a social media presence to promote the library and provide services to user populations through the social media platforms and information and communication channels their users frequent.

## 2. Problem Statement

To provide effective information services through social media, librarians need relevant theories as well as practical, operational models. Efforts have been made to develop practical introductions to social media platforms for librarians and optimization guides to the social media presence (e.g., Solomon, 2011). Researchers and library and information science practitioners have developed theories and best practices to provide effective information services in traditional settings (Bopp & Smith, 2011; Case, 2012). It is not clear, however, whether these theories and best practices are directly applicable to virtual library services provided through social media platforms in general and through microblogging platforms such as Twitter in particular. More research is needed to determine effective models for the provision of library communication and services for each large social media platform. This includes gaining a better understanding of what library services a particular social media platform is most suitable for and how those service can be provided effectively using the platform. Furthermore, examining the current practices of Twitter use by libraries, the subject repertoire and the factors that make library tweets effective can inform the development of library programs and services, and training library staff in the use of social media platform. Finally, developing low-cost, automatable representations of microblog post usefulness and value is essential for enabling the effective and scalable search and ranking of microblogging content.

This study contributes to those research needs and objectives by exploring Twitter uses by academic libraries and factors that make library tweets useful and effective. In particular, the study aimed to address the following research questions:

1. How do academic libraries use Twitter? What are the types of tweets posted by academic libraries?
2. What makes library tweets effective? What are some of the relationships between characteristics of the library tweet and characteristics of the tweeter?

---

<sup>2</sup> <https://about.twitter.com/company>.

### 3. Literature Review

Blogs are web-based information-sharing systems in which content entries are posted in chronological order (Herring, Scheidt, Bonus, & Wright, 2004). Twitter is a microblogging system that restricts the length of content entries (i.e., posts or tweets) to 140 characters. In addition, Twitter provides social networking capabilities by enabling its users to follow each other, share their content, and hold conversations.<sup>3</sup> In this section, we review some of the Twitter-related studies that have examined the types of content shared by users and the Twitter network characteristics used to assess user or tweet importance.

The study conducted by Del Bosque, Leif, and Skarl (2012) of Twitter use by 296 academic libraries is closely related to this research. In that study, the authors identified seven content types in the libraries' Twitter streams: campus events, community events, hours, library events, responses to reference questions, links to outside sites, and resources. In a different study describing the implementation of a Twitter-based information service in a health sciences library, Cuddy, Graham, and Morton-Owens (2010) identified five topics the library tweeted about: library facilities, resources, staff, services, and library and campus events. In addition, Thomas (2010) has argued that Twitter could be used for community building and employee interaction in organizations, including libraries. Kim, Abels, and Yang (2012) explored the types of users who retweeted academic library tweets. They identified 12 groups with the university organizations and students being most frequently retweeting groups. It is important mentioning that retweet numbers were more or less evenly distributed among the groups. There was only 14% difference between the most frequently retweeting group (university organizations) and the least frequently retweeting one (professional groups).

The relevant literature also includes studies that have examined the content of tweets from general samples of Twitter users. Honeycutt and Herring (2009) identified 11 content categories of tweets: about addressee, announce/advertise, exhort, information for others, information for self, meta-commentary, media use, express opinion, other's experience, self-experience, and solicit information. The tweet content typology by Naaman, Boase, and Lai (2010) included eight categories: information sharing, self-promotion, opinions/complaints, statements and random thoughts, me now, question to followers, presence maintenance, and anecdote. André, Bernstein, and Luther (2012) adapted the typology of Naaman et al. to evaluate the relationship between tweet category and its value to users in a general sample of Twitter users and tweets. Their adapted typology included the following categories: question to followers, information sharing, self-promotion, random thought, opinion, me now, conversation, and presence maintenance.

In bibliometrics and scientometrics, citation counts are often used to assess the impact of a publication, scholar, research center, or institution (e.g. Adkins & Budd, 2006; Cronin & Overfelt, 1994; Cunningham & Dillon, 1997; Lee, 2003). In addition, researchers have examined relationships between the characteristics of authors and author teams and their productivity and impact, as measured by the number of publications produced and the number citations received (Haslam et al., 2008; Hinnant et al., 2012;

---

<sup>3</sup> <https://about.twitter.com/>.

Stvilia et al., 2011). On the web, the number of “citations” (i.e., URL links) and the link structure are used by search engines to identify important or authoritative websites (Brin & Page, 1998). Similarly, the numbers of followers, user mentions, and retweets have been used to assess the influence or impact of Twitter users and tweets. On Twitter, social network connections among its users are established by following another and are followed by links. In addition, the ability of the follower to retweet the followed user’s tweet serves as the main mechanism for spreading information through those networks. Cha, Haddadi, Benevenuto, and Gummadi (2010) assessed the influence of users on Twitter by analyzing the number of retweets, mentions, and followers. Although, in general, they found a positive correlation between the number of followers and the number of retweets, for the top 10th and 1st percentiles of the most connected users based on link indegree (i.e., number of followers), the number of followers was not related to the number of retweets or number of mentions. André et al. (2012) used a crowdsourcing approach to identify the types of tweets Twitter users liked or disliked. They found that users preferred questions to followers, information sharing, and self-promotion. Users did not prefer the tweets categorized as presence maintenance, conversation, and updates on the user’s current status. Suh, Hong, Pirolli, and Chi (2010) found a positive relationship between the presence of a URL in a tweet and the probability of a retweet. In addition, they found positive relationships between the number of users followed and followed by and the probability of a retweet, although with very small effect sizes.

The studies reviewed in this section provide important insights in types of library tweets, as well as the relationships between tweet content characteristics and tweet impact in general context as measured by the number of retweets and/or favorites. However, there seems to be, a lack of research on the relationships among content types and other characteristics of tweets and their impact in the context of academic libraries. This study addresses that gap.

#### 4. Study Design

To address the research questions, the authors used an inductive approach. In particular, the most recent 1,200 tweets were collected from the Twitter accounts of the academic libraries of six U.S. public universities, all members of the Association of American Universities (AAU).<sup>4</sup> The data were collected and processed using the Twitter API (application programming interface) with the twitter4j Java libraries<sup>5</sup> and additional Java codes developed by one of the authors.

Because of the exploratory nature of the study, convenience sampling was used. To reduce the variance in the overall contexts of library Twitter accounts sampled (e.g., the financial resources available, the size of the user population served) and its potential effect on the relationships studied, the study population was restricted to the academic libraries of the public university members of AAU that, at the time of data collection on August 26, 2013, had a Twitter account at the main library level. Of the 34 public universities that were members of the AAU, the academic libraries of only six universities met this

---

<sup>4</sup> <http://www.aau.edu/default.aspx>.

<sup>5</sup> <https://github.com/yusuke/twitter4j>.

criterion. The Carnegie Classification of Institutions of Higher Education<sup>6</sup> classified the sampled universities as research universities with very high research activity. All of them were residential campuses, and the average size or number of students enrolled was 39K (SD= 13K).

The collected data were preprocessed to prepare it for analysis. Because the objectives of the study were to explore what libraries tweet about and what makes library tweets useful, the study considered only original tweets. Retweets were removed from the sample. In addition, tweets bearing little content, such as brief acknowledgments of users thanking the library for information or services provided (e.g., “welcome”), brief comments on someone else’s tweet (e.g., “lol”), short encouragements (e.g., “keep going”), and personal conversations were removed from the sample. This reduced the size of the sample from 1,200 to 752 tweets.

Each case of the data consisted of two profiles: a Twitter account profile and a tweet profile. The account profile included the number of tweets, the number of accounts followed, the number of accounts followed by, and the account age in days. The tweet profile consisted of the tweet length, the date of the tweet, the number of times it was retweeted, the number of times it was marked as a favorite, the number of URLs included, the number of user mentions, and the number of media entities attached to the tweet with the Twitter Photo Upload feature. The number of retweets and the number of favorites received were used as indirect indicators of the usefulness of the tweet. In addition, a base-10 logarithmic transformation was applied to the account profile features to bring their scale closer to the scale of the tweet profile features.

To identify the categories of library tweets, the collected tweets were content analyzed (Bailey, 1994a, 1994b). In particular, guided by the literature, the two authors independently content analyzed the data for themes and topics by using the open-coding approach. In the next step, the authors jointly analyzed the resultant coding schemes and iteratively merged into a single typology of nine general types (see Fig. 1), which the authors then used to recode the sample independently. After the recoding was completed, the authors compared their codings and resolved any differences.

## 5. Findings

The content analysis identified nine categories or types of tweets (see Table 1). The most frequently occurring type was Event. The libraries tweeted about regular events, such as annual Red Cross blood drives, food drives, book sales, edible book and zine contests, and professional days (e.g., Librarian’s Day). The libraries also tweeted about book signings by faculty, the opening of a new library building, and different art, archival, research, and engineering exhibit announcements. In addition, the authors placed in this category tweets about different workshops, classes, tours, and orientations carried out by the libraries as well as different presentations and talks held across the campus (see Table 2).

---

<sup>6</sup> <http://classifications.carnegiefoundation.org/>

**Table 1**  
Categories of tweets.

Category	Frequency	%
Event	213	28.3
Resource	171	22.7
Community Building	97	12.9
Operations Update	86	11.4
Study Support	65	8.6
Q&A	50	6.6
Survey	29	3.9
Staff	22	2.9
Club	19	2.5
Total	752	100.0

The second most frequently occurring category type was Resource. This category included tweets about traditional library research sources, such as catalogs, subscription article databases, bibliographies, and maps. The Resource category also included tweets about different publications (e.g., newsletters) and blogs maintained by the library, as well as references to information resources on the web that the tweeter found interesting or useful. In addition, this category encompassed tweets about software and computer resources provided by the library, including rentals of laptops and tablet computers (see Table 2).

The category Community Building included general tweets promoting the library as a place to receive research support, study, or hang out and have fun. This category also included tweets providing emotional support and congratulating students on various achievements (e.g., completing exams), as well as congratulating the library or a specific department for being recognized or achieving a high ranking in a national poll. In general, these types of tweets used a higher rate of affective terms (see Table 2).

The Operations Update category combined tweets providing status updates on the library, such as the hours of operation, power or network outages, air-conditioning or heating problems, or the building closing or opening after some emergency (e.g., a terrorism threat). The category also included tweets providing updates about library study areas to route students to less utilized study spaces.

The Study Support category included tweets focused on promoting the library as a study location and providing information on various support services for students effectively utilizing that place. These included stress management services, such as bringing therapy dogs during finals week, distributing stress-relief balls, providing free yoga sessions, and organizing games and contests for students to de-stress between studies. Tweets in this category also referenced providing students with noise-filtering earplugs and distributing free snacks and water.

The Q&A category included responses to reference questions and questions related to interlibrary loans, course reserves, conditions inside the library building (e.g., temperature), the availability of computer

equipment, the hours of operation, and information technology support. It is important to note that when the authors analyzed this category of tweets, they had access only to the responses and not to the questions.

The next three content categories were less frequent. The Survey category included tweets intended to help recruit participants for various polls and surveys about library use, perceptions of current library services, and the need for new services. This category also included tweets about recruiting volunteers to test the usability of a library website and the interfaces of other library systems. The Staff category included tweets introducing and promoting librarians by announcing different honors and recognitions they had received. It also included tweets about vacancies in the library and introductions of new hires. Finally, the Club category included tweets related to different activity groups and clubs hosted by the libraries, such book, cooking, and knitting clubs (see Table 2).



**Table 2**Term profiles of tweet categories.<sup>a</sup>

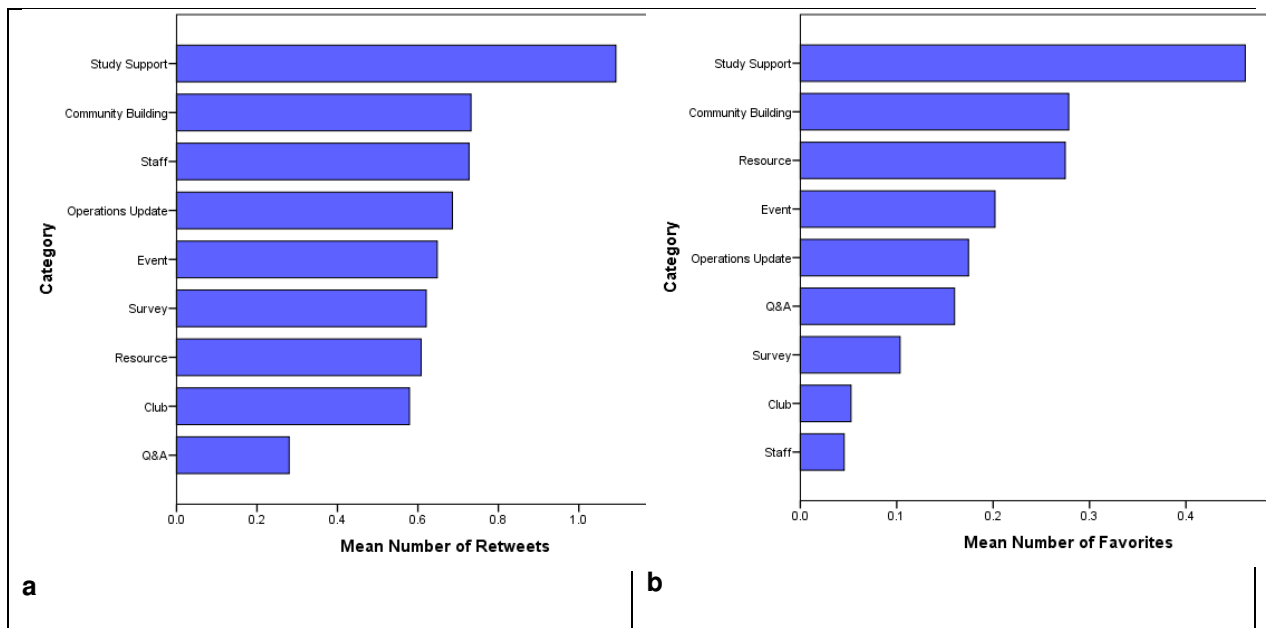
Category	Term profile
Event	library, book, exhibit, workshop, annual, edible, contest, tomorrow, sale, party, reading, art, faculty, holocaust, collection, display, celebrate, research, virtual, drive, game, blood, tour, visit, food, talk, lecture, artist, meet, opening, broadcast, calendar, winter, panel, address, group, symposium, discovery, zine, series, fashion, reception, course, present, remembrance, speech, anniversary, play, sport, poet
Resource	library, book, map, research, video, website, resource, collection, blog, software, report, database, paper, guide, service, article, work, literacy, folio, photo, subscription, laptop, story, ebook, technology, stack, application, reader, journal, information, channel, desktop, drawing, tool, browser, productivity, scanner, theses, exhibit, newsletter, reference, citation, literature, ereserve, computer, openaccess, ipad, scholarship, catalog, bibliography
Community Building	library, learning, hope, great, student, luck, back, come, studystrong, best, follow, visit, congratulation, awesome, final, week, check, librarian, happy, reference, book, enjoy, love, read, celebrate, place, serve, honor, graduate, feel, friendly, spirit, share, convocation, honored, safe, education, social, space, thankful, greet, fantastic, resource, proud, fun, inspire, outstanding, top, service, success
Operations Update	library, hour, open, final, close, extend, week, break, spring, today, study, floor, sit, late, campus, website, notice, reopen, update, weekend, reminder, tomorrow, power, catalog, maintenance, wireless, outage, warm, staff, building, threat, current, shutdown, site, safe, thanksgiving, service, nopower, situation, water, steam, status, food, fountain, bomb, stack, full, noisy, schedule, football
Study Support	library, study, studystrong, come, break, final, dog, coffee, free, puppy, snack, therapy, room, librarian, student, fun, destress, seat, place, cookie, desk, earplug, lemonade, stressbuzzter, relax, information, reserve, delivery, bar, space, water, class, socialize, supplies, homesick, blowing, bubble, exam, buddy, patrol, homestretch, relief, studybreak, guard, tutoring, yoga, fruit, game, extra, table
Q&A	library, check, open, access, loan, floor, student, email, main, info, time, search, professor, map, public, early, connect, today, feel, depend, page, tweet, reserve, space, contact, mind, post, study, request, work, interlibrary, find, pass, president, bookstore, forward, donor, place, answer, quiet, faculty, computer, collection, digital, response, trouble, shelve, license, comp, join
Survey	library, survey, website, better, test, time, awesome, contact, best, web, love, giftcard, cash, day, make, volunteer, win, book, chance, place, brain, strategic, planning, common, pick, come, kill, polling, quick, minute, downtime, giveaway, visit, open, free, vote, suggest, comment, idea, moment, ball, chocolate, hear, poll, future, learn, shape, share, complete, vision
Staff	library, librarian, university, start, jobs, director, position, personal, research, manager, archivist, visit, meet, collection, apply, team, management, employment, verify, accept, excite, open, recruit, assistant, focus, periodical, topic, citation, integrate, system, semester, multitalented, development, link, announce, soontobe, digital, division, interesting, scholarship, residency, come, friendly, seek, advice, spotlight, individual, lead, candidate, jobpost
Club	library, readaloud, read, room, book, join, tin, feature, trifle, present, floor, cafe, lyric, club, reading, alley, hear, romance, author, artist, community, pan, summer, president, recipe, discussion, historic, comic, museum, favorite, knitting, discuss, poster, ebony, series, ground, happy, fiction, theme, come, selection, exhibit, cartoon, charity, bookmadness, fireplace, learn, program, crochet, group

<sup>a</sup>Includes the 50 most frequently used terms for each category.

Of the 752 tweets analyzed, 271 had at least one retweet and 131 received at least one favorite. On average, tweets received 0.67 (SD = 1.4) retweets and 0.23 (SD = 0.6) favorites. In addition, on average, tweets included 0.47 (SD = 0.51) URLs, 0.61 (SD = 0.91) user mentions, and 0.04 (SD = 0.2) media entities. The average length of a tweet was 107 (SD = 29.81) characters.

On average, the six library Twitter accounts analyzed sent 1,817 (SD = 1,126) tweets, followed 1,062 (SD = 641) users, were followed by 2,006 (SD = 788) users, and were 1,503 (SD = 450) days old. The Shapiro-Wilk test showed that none of the tweet characteristics was normally distributed. Hence, nonparametric methods were used to examine the relationships between tweet and account characteristics. The Kruskal-Wallis test revealed statistically significant differences among the content categories of tweets for the number of favorites ( $\chi^2 = 16.48$ ,  $df = 8$ ,  $p < 0.036$ ). However, the test did not find statistically significant differences among the categories at the 0.05 level for the number of retweets, although it was close to significance ( $\chi^2 = 15.11$ ,  $df = 8$ ,  $p < 0.057$ ).

The Study Support category received the highest average number of both retweets and favorites, followed by the Community Building category. For the next position, however, the rankings differed. The next most highly retweeted category was Staff, and the next category with the highest number of favorites was Resource (see Fig. 1). The fact that the Resource category received the third highest number of favorites might suggest that followers of library Twitter accounts used the favorite tool as a way to bookmark useful resources for later.



**Fig. 1.** Distributions of the average number of retweets and favorites by tweet category.

A nonparametric Spearman correlation test showed a low positive correlation between the number of retweets and the number of URLs and tweet length. In addition, the test showed a low negative

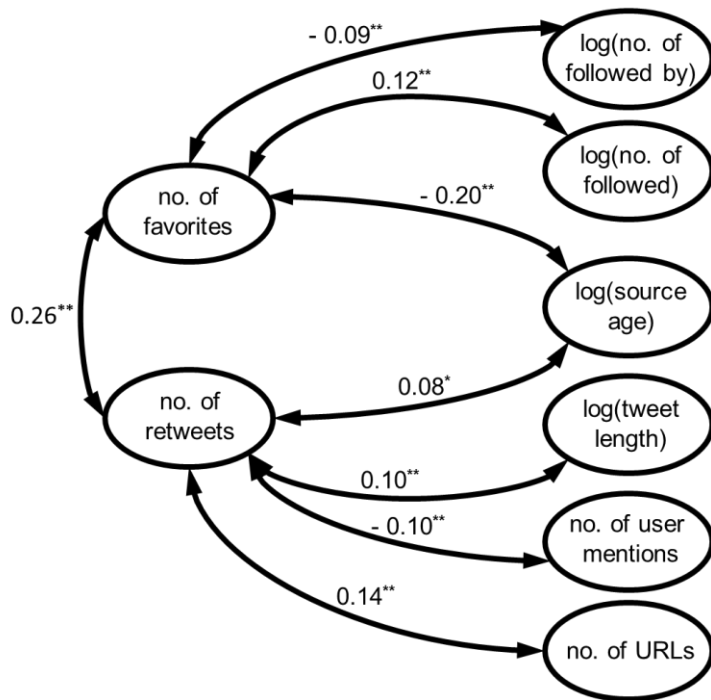
correlation between the number of retweets and the number of user mentions. Similarly, the Spearman test showed a low positive correlation between the number of favorites and the number of users followed, and a low negative correlation between the number of favorites and the number of users followed by (see Table 3, Fig. 2). Account age correlated negatively with the number of favorites and correlated positively with the number of retweets, but with a very low coefficient.

**Table 3**

Spearman rank correlation test results for tweet and tweeting entity characteristics.

Item	No. of retweets	No. of favorites	No. of URLs	No. of user mentions	No. of media entities	log(tweet length)	log(source age)	log(no. of tweets)	log(no. of followed)	log(no. of followed by)
No. of retweets	1	<b>0.26**</b>	<b>0.14**</b>	<b>-0.10**</b>	0.02	<b>0.10**</b>	<b>0.08*</b>	0.01	-0.01	-0.04
No. of favorites	<b>0.26**</b>	1	0.05	0.00	0.05	-0.02	<b>-0.20**</b>	0.04	<b>0.12**</b>	<b>-0.09**</b>

\*p < 0.01; \*\*p < 0.005 (two-tailed).



**Fig. 2.** Spearman rank correlation test results for tweet and tweeting entity characteristics (\*p < 0.01, \*\*p < 0.005; two-tailed).

## 6. Discussion

The first research question examined the types of Twitter uses by academic libraries. The analysis identified nine tweet content types, with Event, Resource, and Community Building being the most frequently occurring categories (see Table 1). A comparison of the results of this study with two studies examining the content types of library tweets revealed substantial overlap (see Table 4). Indeed, the content category sets of both Del Bosque et al. (2012) and Cuddy et al. (2010) could be fully mapped onto the set of categories identified by this study. However, there were some differences. Del Bosque et al. and Cuddy et al. included more categories with finer granularity for the Event category, whereas the typology in this study had more specific types of library services: Operations Update, Study Support, Q&A, and Club. The Club category can be considered both a service and an event subtype. Hence, the Club category in the typology for this study could be mapped onto the service and event categories of both Cuddy et al. and Del Bosque et al. because it contained tweets announcing club meetings and promoting them as services provided or hosted by the library. The other two typologies did not include categories that could be mapped onto the Community Building and Survey categories. This result suggests that the use of Twitter by libraries is evolving and that libraries are adding new themes, uses, and strategies to their tweeting repertoires. In addition, it is important to note that not only was the Community Building category among the most frequently occurring content types, but also that it was both the second most frequently retweeted category and the second most frequently selected as a favorite.

The Study Support category dominated the other categories in both the number of retweets and the favorites received, signifying the popularity and usefulness of services grouped under that category. It is noteworthy that the Resource category ranked third for the number of favorites received but ranked seventh for the number of retweets. This result suggests library users are using these two Twitter mechanisms differently. Some users could be using favorites as a bookmarking mechanism to bookmark useful resources for later. Additional qualitative research exploring the uses of these two mechanisms could shed more light on users' intentions and objectives when using retweets or favorites with their library tweets. A deeper understanding of how users use these mechanisms could inform both the library's Twitter-based information service practices and the overall design of the Twitter interface.

This study found fewer topic category overlaps with the general Twitter studies reviewed in the literature. This result was expected because the objectives and goals of the organizational use of social media platforms such as Twitter might differ from the objectives held by individual users, and in this study, tweets related to personal communication were purposely removed from the sample. Nevertheless, categories from those studies, such as self-promotion, exhort, announce/advertise, and solicit information, could be mapped onto the Community Building, Q&A, and Staff categories. Additional research exploring the differences and similarities between the organizational, community, and personal uses of Twitter could inform the development of more effective policies and best practice guidelines for libraries.

**Table 4**

Tweet content category mapping.

Source	Event	Resource	Community Building	Operations Update	Study Support	Q&A	Survey	Staff	Club
This Study	×	×	×	×	×	×	×	×	×
Del Bosque et al. (2012)	×	×		×		×			×
Cuddy et al. (2010)	×	×		×	×	×		×	×

The Spearman correlation test found low positive correlations between the number of retweets and the number of URLs and tweet length. This finding is in agreement with those of Suh et al. (2010). When they analyzed a general sample of tweets, they too found a positive relationship between the presence of URLs and the probability of a retweet. Because the presence of a URL and the longer length of a retweet could be considered indicators of the tweet's greater informativeness, this finding suggests that readers might consider content-rich, informative tweets more useful. In addition, it could be that inclusion of URLs adds value by enabling readers to obtain additional information on entities, events or sources of the news referenced in the tweet. A followup study collecting qualitative data on readers' preferences for tweet characteristics, including use of URLs, could provide more in-depth explanations and insights on the trends and patterns identified by this study.

The Spearman test showed a low negative correlation between the number of retweets and the number of user mentions. This finding suggests that tweets with personal connection might have less general reuse value and that users might be reluctant to retweet them to their followers. It was interesting that no significant associations were found between the numbers of retweets and network-based measures, such as the numbers of users followed and followed by.

The Spearman test found a low positive correlation between the number of favorites and the number of users followed, and it found a low negative correlation between the number of favorites and the age of the library account (see Table 3, Fig. 2). A low negative correlation was also found between the number of retweets and the number of accounts followed by. This finding is quite interesting because one would expect that a higher number of followers would be associated with a higher number of favorites. This finding might point to the nonlinear behavior of this relationship. The Twitter library accounts analyzed in this study were established accounts with more than 2,000 followers and following more than 1,000 users, on average. The possibility of nonlinear behavior for the relationship between the number of followers and the number of favorites is also supported by previous general studies on Twitter use. Cha et al. (2010) found that having a high number of followers did not necessarily mean the tweeter was influential in terms of the number of mentions and retweets generated.

The study has a limitation. Data were collected from the Twitter streams of large academic libraries at large universities. Hence, the findings of this study may have limited generalizability to other kinds of libraries or smaller academic libraries that might have different priorities for library services and related Twitter uses based on their user community needs, availability of resources, or both.

## 7. Conclusion

Social media platforms, including microblogging systems such as Twitter, are rapidly gaining ground as channels of communication and information service provision in organizations, including in libraries. In this article, we reported on an exploratory study of Twitter use by six large academic libraries. Content analysis of samples of library tweets identified nine content types, with the Event and Resource categories being the most frequently occurring types of tweets. In addition, the analysis revealed that tweets related to study support services and to building and maintaining connections with the library community were the most frequently retweeted and selected as favorites. The presence of a URL in the tweet was positively associated with the number of retweets, and a positive correlation was found between the number of users followed and the number of favorites received. In addition, a negative correlation was found between the account age and the number of favorites. Finally, a review of the literature and comparison with the study findings showed that libraries have a dynamic tweeting repertoire. New tweeting themes emerge as libraries introduce new services and new uses of Twitter (e.g., promotion and community building). The findings of this study can be used to inform social media policy and develop best practice guidelines in libraries.

Developing low-cost (i.e., automated) representations of tweet usefulness and value is essential for enabling the effective and scalable search and ranking of microblogging content. This article reports on the quantitative results of a content analysis of library tweets, which used the number of retweets and favorites received as indirect measures of tweet usefulness. However, it is possible that the Twitter retweet and favorite tools were used for purposes other than to indicate the tweet's usefulness or importance. A future related study involving interviews with representatives of the user communities following the libraries' Twitter accounts would provide additional insights into users' motivations for and goals of using the favorite and retweet tools with library tweets.

In addition, the result showing a low positive correlation between the number of URLs in a tweet and the number of retweets is quite interesting. Future work analyzing the content referenced by these URLs could provide additional understanding of the usefulness and value of library tweets to users.

This study did not examine Twitter use by librarians for private or intraorganizational communication. Twitter use for informal communication at work merits its own separate study (e.g., Zhao & Rosson, 2009). It would be helpful in future research to examine how Twitter is used for intraorganizational communication (both formal and informal) in libraries and how librarians separate or do not separate organizational from personal Twitter communication.

## References

Adkins, D., & Budd, J. (2006). Scholarly productivity of U.S. LIS faculty. *Library and Information Science Research*, 28, 374–389.

André, P., Bernstein, M., & Luther, K. (2012). Who gives a tweet? Evaluating microblog content value. In Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work (CSCW '12, pp. 471–474). New York, NY: Association for Computing Machinery.

Bailey, K. (1994a). *Methods of social research* (4th ed.). New York, NY: The Free Press.

Bailey, K. (1994b). *Typologies and taxonomies: An introduction to classification techniques*. Thousand Oaks, CA: Sage.

Bopp, R. E., & Smith, L. C. (2011). *Reference and information services: An introduction* (4th ed.). Santa Barbara, CA: Libraries Unlimited.

Brin, S., & Page, L. (1998). The anatomy of a large-scale hypertextual Web search engine. *Computer Networks and ISDN Systems*, 30, 107–117.

Case, D. (2012). *Looking for information: A survey of research on information seeking, needs and behavior* (3rd ed.). Bingley, United Kingdom: Emerald.

Cha, M., Haddadi, H., Benevenuto, F., & Gummadi, P. K. (2010). Measuring user influence in Twitter: The million follower fallacy. In Proceedings of the Fourth International Conference on Weblogs and Social Media (ICWSM 2010, pp. 10–17). Palo Alto, CA: Association for the Advancement of Artificial Intelligence.

Cronin, B., & Overfelt, K. (1994). Citation-based auditing of academic performance. *Journal of the American Society for Information Science*, 45, 61–72.

Cuddy, C., Graham, J., & Morton-Owens, E. (2010). Implementing Twitter in a health sciences library. *Medical Reference Services Quarterly*, 29, 320–330.

Cunningham, S., & Dillon, S. (1997). Authorship patterns in information systems. *Scientometrics*, 39, 19–27.

Del Bosque, D., Leif, S. A., & Skarl, S. (2012). Libraries atwitter: Trends in academic library tweeting. *Reference Services Review*, 40, 199–213.

Duggan, M., & Smith, A. (2013, December). *Social media update 2013*. Washington, DC: Pew Research Center. Retrieved from [http://pewinternet.org/~media/Files/Reports/2013/Social%20Networking%202013\\_PDF.pdf](http://pewinternet.org/~media/Files/Reports/2013/Social%20Networking%202013_PDF.pdf)

Haslam, N., Ban, L., Kaufmann, L., Loughnan, S., Peters, K., Whelan, J., & Wilson, S. (2008). What makes an article influential? Predicting impact in social and personality psychology. *Scientometrics*, 76, 169–185.

- Herring, S. C., Scheidt, L. A., Bonus, S., & Wright, E. (2004). Bridging the gap: A genre analysis of weblogs. In Proceedings of the 37th Annual Hawaii International Conference on System Sciences, 2004 (*HICSS '04*, pp. 1–11). Washington, DC: IEEE Computer Society.
- Hinnant, C., Stvilia, B., Wu, S., Worrall, A., Burnett, G., Burnett, K., Kazmer, M., & Marty, P. (2012). Author team diversity and the impact of scientific publications: Evidence from physics research at a national science lab. *Library & Information Science Research*, 34, 249–257.
- Honeycutt, C., & Herring, S. C. (2009). Beyond microblogging: Conversation and collaboration via Twitter. In 42nd Hawaii International Conference on System Sciences, 2009 (*HICSS '09*, pp. 1–10). Washington, DC: IEEE Computer Society.
- Kim, H., Abels, E. & Yang, C. (2012), Who disseminates academic library information on Twitter?. *Proc. Am. Soc. Info. Sci. Tech.*, 49, 1-4.
- Lee, C. (2003). A scientometric study of the research performance of the Institute of Molecular and Cell Biology in Singapore. *Scientometrics*, 56, 95–110.
- Mitchell, A., Holcomb, J., & Page, D. (2013, November). News use across social media platforms. Washington, DC: Pew Research Center. Retrieved from <http://www.journalism.org/files/2013/11/News-Use-Across-Social-Media-Platforms1.pdf>
- Naaman, M., Boase, J., & Lai, C. H. (2010). Is it really about me? Message content in social awareness streams. In Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work (CSCW 2010, pp. 189–192). New York, NY: Association for Computing Machinery.
- Solomon, L. (2011). *Doing social media so it matters: A librarian's guide*. Chicago, IL: American Library Association.
- Stvilia, B., Hinnant, C., Schindler, K., Worrall, A., Burnett, G., Burnett, K., Kazmer, M., & Marty, P. (2011). Composition of scientific teams and publication productivity at a national science lab. *Journal of the American Society for Information Science and Technology*, 62, 270–283.
- Suh, B., Hong, L., Pirolli, P., & Chi, E. H. (2010, August). Want to be retweeted? Large scale analytics on factors impacting retweet in Twitter network. In 2010 IEEE Second International Conference on Social Computing (SocialCom, pp. 177–184). Washington, DC: IEEE Computer Society.
- Thomas, L. C. (2010). Twitter at the office. *Journal of Web Librarianship*, 4, 79–82.
- Zhao, D., & Rosson, M. (2009). How and why people Twitter: The role that micro-blogging plays in informal communication at work. In Proceedings of the ACM 2009 International Conference on Supporting Group Work (GROUP '09, pp. 243–252). New York, NY: Association for Computing Machinery.



Zickuhr, K., Rainie, L., & Purcell, K. (2013, January). Library services in the digital age. Washington, DC: Pew Research Center. Retrieved from <http://libraries.pewinternet.org/2013/01/22/library-services/>