Is the Backchannel Enabled? Using Twitter at Academic Conferences [1]

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Abstract: Twitter, a social network and micro-blogging service that allows people to post small bursts of real-time information, is increasingly adopted by academic conferences to enable a backchannel for communication. This backchannel enriches communication at a conference that is usually solely supported by face-to-face interactions. To investigate what discourse Twitter could afford in the conference setting and how participants contribute to academic discourse through Twitter, in the present study I incorporated quantitative analysis, information visualization, and social network analysis techniques and analyzed a corpus of tweets from seven academic conferences. Results showed various types of Twitter usage at academic conferences as well as four categories of participants. This study also revealed some interesting phenomena of academic discourse on Twitter which might shed light on future practice.

Keywords: Twitter, social media, academic conference

Introduction

After the first Web 2.0 conference hosted by O'Reilly Media and MediaLive (O'Reilly, 2007), the term "Web 2.0," together with the notion of "user-generated content," quickly spread all over the globe and transformed people's understanding of the web. In the past few years, numerous Web 2.0 services were launched, covering a wide spectrum of services including social networking websites, video-sharing websites, wikis, blogs, social bookmarking, etc. In contrast to traditional websites which regard users as passive information retrievers, a Web 2.0 service allows users to make contributions to communal spaces and to communicate with each other easily. This trend encourages a new "participatory culture" in the information age (Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2006).

Twitter,[2] created in 2006, is a social networking and micro-blogging service that enables users to send and read each other's messages, which are called *tweets*. It is amongst the most influential Web 2.0 services and is still expanding rapidly. Twitter is a simple and agile communication tool, restricting each tweet to no longer than 140 characters. As a social network service, Twitter allows users to establish and maintain connections by *following* each other's tweets. When you become a follower of a user, that user's tweets will appear in a timeline on your Twitter feed. Furthermore, Twitter provides four

[2] Twitter, http://www.twitter.com and http://en.wikipedia.org/wiki/Twitter.

main ways for users to interact, including:

- RT: A user can share a tweet of another user by "retweeting" that tweet. The new post usually follows the syntax of "RT @original_user tweet_text_body"

- @reply or mention: An @reply is a tweet that begins with @username which addresses the receiver of this message, while a mention is a tweet that contains @username in its body. Either an @reply or a mention is public and accordingly can be accessed by other users

- Direct Message (DM): A direct message is a private corresponding between only a sender and a recipient

- Hashtag: Users can group together tweets with mutual interests or topics using hashtags—words or phrases prefixed with a pound sign (i.e. "#"). It provides a way of aggregating tweets and enables users to find people and communities with the same interests

Since Twitter puts comparatively more emphasis on individuals rather than group or community, hashtagging becomes an extremely important feature to bring people with a same interest together and to nurture community. For a specific event such as a conference, hashtagging is a simple way to aggregate scattered messages to a shared "playground" and to build a channel for information exchange and communication.

Research on Using Twitter on Conferences

Regardless of Twitter's popularity in various contexts, tweeting on an academic conference is a relatively new phenomenon. In this paper, an academic conference means a conference for researchers to present and discuss their work.[3] In a conventional academic conference setting, the space is divided into a "front" area for the speaker and a large "back" area for the audience (Ross, Terras, Warwick, & Welsh, 2010). In this context, attention is solely focused at the front and interaction is usually limited. This traditional conference model has a variety of problems, including feedback lag, stress for asking questions, and participation decrease caused by the "single speaker paradigm" (Anderson, 2008; Ebner, Beham, Costa, & Reinhardt, 2009). Moreover, there is little chance for the audience to interact with each other and to collectively construct understanding of given speeches.

Current endeavors to address those problems usually fall into two kinds of practice. The first kind of change is represented by a trend

[3] Academic Conference - Wikipedia, http://en.wikipedia.org/wiki/Academic_conference.

named as "unconference".[4] An unconference does not follow the routine of organizing a traditional conference; it invites participants to negotiate the content and structure of the conference according to their own interests (Crossett, Kraus, & Lawson, 2009). The other type of solutions tends to explore the possibilities of using digital tools to build "backchannels," which typically assume a secondary or background channel for communication besides question and comment sessions at conferences (Harry, Green, & Donath, 2009; McCarthy et al., 2005).

As a best representative of social media, Twitter is more and more commonly used in academic conferences, mainly thanks to its simplicity, increasing ubiquity of wireless access, and the booming of the mobile Internet. However, to date research about using Twitter in academic conferences has been scarce. Previous studies have mainly focused on three aspects. The first focuses on users and usages of Twitter. For example, a few previous studies have investigated who uses Twitter at conferences, and why and how they use it (DeVoe, 2010; Ebner et al., 2009; Ross et al., 2010). Based on a survey with a small sample, Ebner and colleagues (2009) identify attendees, online attendees, speakers and organizers of conferences as the main user groups of Twitter at a conference. By conducting a content analysis on users' tweets, Ross et al. (2010) have identified seven main purposes of using Twitter during conferences: comments on presentations, sharing resources, discussions and conversations, jotting down notes, establishing an online presence, and asking organizational questions. The second type of research focuses on interaction on Twitter during conferences, for instance, what types of interaction users are engaged in and whether Twitter encourages a participatory culture (McNeill, 2009; Ross et al., 2010). The last cluster of research centers on the effect of using Twitter for academic conferences. For example, two studies explore whether the use of Twitter enhances conference experience, collaboration, and collective building of knowledge (McNeill, 2009; Ross et al., 2010). Additionally, Letierce and colleagues (2010) incorporate timeline analysis and social network analysis together to study whether the use of Twitter could help reach a broader audience. To summarize, previous research on using Twitter at academic conferences mainly relies on descriptive statistical analysis on survey responses or on users' tweet counts. Although there are studies that incorporate content analysis and social network analysis, they fail to go any deeper by further analyzing their visualizations to uncover underlying principles.

This paper presents a study that analyzes Twitter use in seven different academic conferences which happened from 2009 to 2011. By analyzing a rich set of tweets aggregated by particular hashtags,

this paper investigates the characteristics of Twitter users, online discourse, and social networks on Twitter during these conferences. More specifically, this study wants to answer the following research questions:

- What are the common user patterns of Twitter at academic conferences?

- What are the dynamics of different types of discourse on Twitter, i.e. retweet (RT) and @reply?

- What is the relationship between tweeting, being retweeted and being responded? What are the different types of users?

Methods

Participants and dataset

Seven academic conferences that took place from 2009 to 2011 were studied. They were selected mainly by convenience sampling, but also with a consideration that they represent different research fields and conference scales as much as possible. These conferences include: Medical Library Association's 2009 Annual Meeting and Exhibition (#MLA09); Coalition for Networked Information Spring 2010 Membership Meeting (#cni10s); ED-MEDIA 2010 - World Conference on Educational Multimedia, Hypermedia & Telecommunications (#edmedia); Console-ing Passion 2010 - International Conference on Television, Audio, Video, New Media, and Feminism (#CUPO); Chartered Institute of Library and Information Professionals' New Professionals Conference 2010 (#npc2010); Institute for Enabling Geospatial Scholarship meeting (#geoinst); and International Conference on Learning Analytics and Knowledge 2011 (#lak11). Themes of these conferences ran across extensive fields, including education, digital humanities, library science, computer science, geology, and information and media studies; their forms and scales also varied from meeting among a small group of scholars in two days, to large scale conferences with thousands of participants. During these conferences, Twitter hashtags, e.g. #MLA09, were officially or unofficially claimed and used by a number of people; this made it possible for people to track a particular conference from a distance and to retrieve tweet archives later as well.

Public tweets with specific hashtags for these conferences were collected through Google Docs spreadsheets and Twapper Keeper.[5] The retrieved dataset is composed of 8073 tweets posted by 1221 distinct users.

[5] Twapper Keeper is a tweet archiving service that could capture every single tweet containing a hashtag once the archive is created, http://twapperkeeper.com/.

Data analysis

A descriptive statistics analysis was first conducted to provide basic information about Twitter use in each conference. This analysis includes a number of variables, including number of Twitter participants, total number of tweets, number of tweets per user, retweet percentages, message percentages, etc. To better understand the different patterns of Twitter usage in these cases, a cluster analysis on the seven conference cases was conducted.

To study the dynamics of Twitter discourse on these conferences, a visualization tool that visualizes each user's tweets in a chronological order was developed. This visualization tool also highlights retweet and reply links between twitter users. In this way, we can visually recognize discourse between Twitter participants, investigate the dynamics of Twitter discourse, and discuss possible ways for encouraging participation.

Finally, a Social Network Analysis (SNA) on every conference Twitter community was conducted. Visual representations of social networks were created with Gephi, a sophisticated software package for SNA and various visualization tasks. This analysis, together with a cluster analysis on all users in each community, could identify different types of Twitter participants and reveal characteristics of each type.

Findings and Discussion

Overview of Twitter Usage in all Cases

Table 1 shows a summary of Twitter use in all seven conferences. As illustrated by these important statistics, the situation of Twitter use differs greatly among different cases. For example, in "geoinst" and "CUPO" conferences, tweet counts per user are remarkably high, while this score in some other cases is low. Similarly, difference on percentage of retweets (RT) and messages (@reply) is also significant and it may be an indicator of whether Twitter enables a backchannel.

To discriminate similarity and difference of Twitter usage in these conferences, a cluster analysis has been done on the conference cases. This analysis does not include variables related to conference scales, such as total participants and total tweets, but only takes variables relevant to actual Twitter usage, such as average tweet, retweet, and public message counts, into account. The cluster analysis clearly differentiates three groups:

- Group 1: CUPO and geoinst. According to Table 1, average tweet per user in the two cases is very high, but with great variance

Table 1: Summary of Twitter usage in all conferences

	Users	Tweets			Retweets		@Reply		RT%	Msg%
		Sum	M	SD	M	SD	M	SD		
All cases	1221	8073	6.61	20.26	1.16	5.13	0.7	2.83	17.55%	10.62%
MLA09	383	2031	5.3	14.1	1.13	4.82	0.6	2.25	21.27%	11.23%
cni10s	94	477	5.07	12.76	0.64	2.5	0.2	0.63	12.58%	3.98%
edmedia	226	687	3.04	6.69	0.85	5.66	0.43	2.95	28.38%	14.12%
CUPO	80	963	12.04	26.72	0.86	1.79	1.34	4.45	7.17%	11.11%
npc2010	117	795	6.79	17.04	0.73	3.2	0.5	1.01	10.69%	7.30%
geoinst	106	1758	16.58	48.8	1.26	4	1.35	3.56	7.62%	8.13%
lak11	215	1362	6.33	14.13	2.06	7.53	0.95	3.54	32.45%	15.05%

among users (SD = 46.8 and SD = 26.7 respectively). Actually, the most active Twitter users of the two conferences, posting 364 and 172 tweets respectively, take 20.7

- Group 2: MLA09, cni10s, npc2010, and edmedia. In these cases, scores on average tweet, retweet, and message per user are close to each other. However, the percentages of retweet and message in all tweets vary greatly among cases, reflecting more subtle differences in Twitter user patters on different conferences.

- Group 3: lak11. This case distinguishes itself from other cases by high percentages of retweets and messages. Although the edmedia conference also has considerably high percentages of retweets and messages, average post number of its users is too small. So, it can be said that Twitter use on the lak11conference is active and highly interactive in comparison with other cases.

Although three different schemes of Twitter use are identified, the Pareto principle (also known as the "80-20 rule," see Koch (2011)) or the Long Tail effect (Anderson, 2008) is approximately applicable to all cases, i.e., 20% twitterers post 80% of total tweets (see Figure 1). For Twitter use in academic conferences, the concept of legitimate peripheral participation (Lave & Wenger, 1991) is the major form of participation for most attendees. This fact is important in framing our expectation and designing strategies in building the Twitter backchannel for conferences.

Discourse Dynamics Enabled by Twitter

In order to go beyond descriptive analysis and more clearly illustrate the dynamics of activities on Twitter, a visualization tool that visualizes tweets in a chronological order was developed. Figure 2 is an example of visualization results. In the visualization, the horizontal
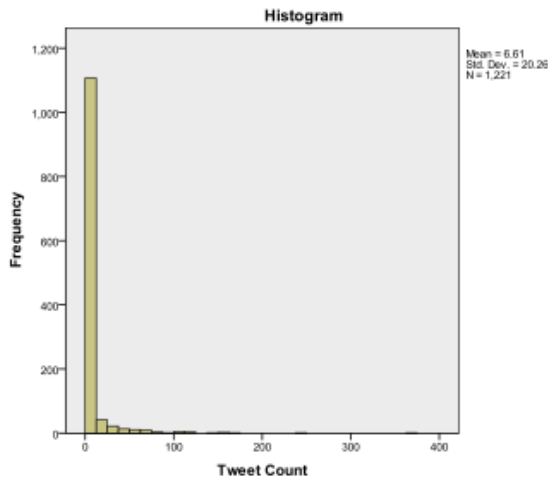
Figure 1: Distribution of tweets per user in the whole dataset

axis represents the timeline, increasing from left to right; the vertical axis represents users sorted in a descending order of their tweet counts. Each horizontal gridline stands for one single user, so we can clearly see the participating process of each user. For these dots and lines, one red dot stands for a tweet, a grey line means a retweet connection, and a green line represents a message (@reply) between two users. So from the visualization, we can easily tell who is tweeting, when people tweet, who is retweeting from whom, and who is talking to whom. Furthermore, we can also clearly see how tweets scatter in a time span and among users, how well Twitter facilitates and maintains discourse, and when the climaxes of Twitter use at a conference happen.

One important characteristic of Twitter use at a conference is that the virtual discourse highly parallels the physical progress. In a zoom-in image of one conference (see Figure 3), with retweet and message information filtered, simultaneous eruption of tweets from time to time turns out to be concurrent with several favored keynote speeches when the Twitter timeline is compared with the conference program. This characteristic is shared by other cases, and was also mentioned in a former case study (Letierce, Passant, Breslin, & Decker, 2010). Therefore, it is clear that Twitter was constantly actively used by participants during the conferences. The correspondence of physical events and tweets pikes is a solid piece of evidence of Twitter's function as backchannel in these academic conferences. However, it also raises the question of how could we take advantage of this correspondence to encourage more participation and information spread and exchange.

According to the summary of descriptive statistics in the last section and previous studies (Ross et al, 2010; DeVoe, 2010), retweets
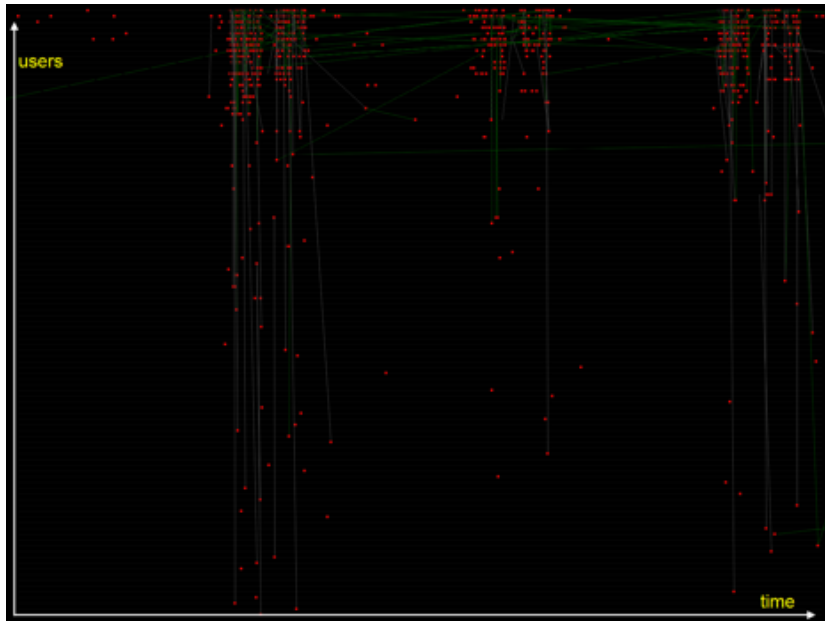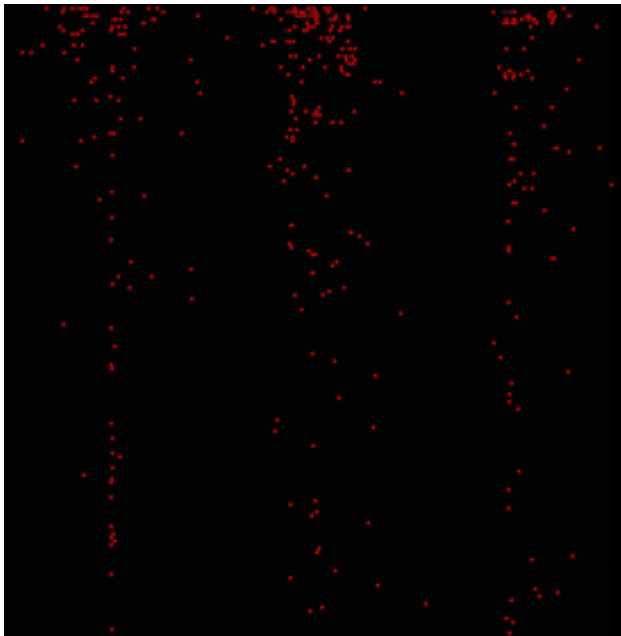
Figure 2: Timeline visualization of #geoinst

Figure 3: A zoom-in visualization image of #edmedia

and messages take a considerable portion of total tweets. They serve as the dominant communication mechanisms on Twitter. Colleagues have argued about the importance of using "@" sign for "addressivity" (Honey & Herring, 2009). Regarding the use of retweets and messages, Figure 2 reveals two interesting phenomena. Firstly, most retweets stem from active users who post a lot (reflected by the image that most grey lines start from the top). This might be explained by the fact that while some people are actively tweeting about the conference, most other attendees "in the long tale" are more inclined to read and retweet tweets posted by "established" Twitter participants. This links established between "elite twitterers" and "peripheral twitterers" show a shared attention among participants to tweet posts in parallel with the physical conference track, and this shared attention is vital for the success of the Twitter-enabled backchannel. Secondly, retweeting usually happens more instantly than sending a message (shown by the tendency that grey lines are overall steeper than green lines). For this phenomenon, since messages or mentions show more intimate connection than retweets, they more rely on existing social networks, which make sending messages or mentioning more sustaining than retweeting. Moreover, shorter reaction time of retweets might result from the fact that Twitter, as a real-time information network, lacks a way to maintain important information at "the top" of the discourse; as a result, late-comers would lose the chance to read former quality posts because of the instantaneity of communication on Twitter. For conference organizers, it would be of great value to have important tweets accumulated for people who can only participate in part of the Twitter backchannel.

However, even though communication established by public messages could last longer, sustaining conversation is still scarce, as revealed by the scarcity of "wave-like" green lines between two twitterers. A previous study also reported a notable decrease of connection in social network analysis when researchers raised the threshold of directed replies from one to two (Letierce et al, 2010).

Social Networks and User Types

Although Social Network Analysis (SNA) seems to be a natural tool to investigate Twitter, which is a social networking service, few previous studies has adopted this technique. This paper attempts to investigate social networks formed on each conference through Twitter. Besides mathematics measurements, such as betweenness, centrality, closeness, and cohesion, this paper focuses on identifying different types of "actors" and their locations in social networks (Wasserman, 1994). In this manner, different types of Twitter users could be iden-

tified. To triangulate findings from SNA, a cluster analysis on users is also performed for each case. The cluster analysis considers three variables, including user's tweet number, times of being retweeted, and received replies. By comparing results from SNA and cluster analysis, we can better understand characteristics of each user category.

By using prefuse and Gephi, I created social network visualizations for all studied conferences. Taking the visualization of #edmedia conference for example (see Figure 4), every single node in the graph stands for a distinct user. For each node, its size presents the number of tweets the user posted; the darkness of node color indicates how many messages this user has received. This visualization and its thumbnail (at the left bottom) present a major cluster of participants in this community, as well as isolated small groups and individual participants. From the visualization, we can identify connectors, leaders, bridges, and isolates in the Twitter community and summarize major user types.

In light of the visualization and cluster analysis results, users could be roughly classified into four groups:

- "Engine participants": This group is represented by user number 114, 108, 164 and 137 in this graph. They post a lot, attract attention from other people, get retweeted by others, and talk to different people; they serve as "connectors" or "hubs" in this network. These users are also clustered into the same groups in the cluster analysis. Mapping to the physical world, these users are mostly regarded as experts in the research domain of this conference and get involved in a lot of offline conversations during the conference.

- "Pop stars": This type of user is rare, with user number 70 (red node on the left side) as the only representative in this case. This type of user post a few tweets, but could stir up massive feedbacks in the community. In this conference case, user 5 served as a keynote speaker whose speech won extensive acclaims. Cluster analysis also successfully clusters this user into a separate group. Each of other cases also contains one or two such users.

- "Lonely twitterers": Some attendees could only get little attention or feedback, even though they post a considerable number of tweets. Number 85 to 49 belong to this category. One possible reason they are relatively "lonely" is that they are not established scholars and have little chance to be heard in physical world. In addition, tweet quality of some users in this category is limited.

- "Peripheral players": As discussed above, most participants' participation is peripheral. They post or retweet a few tweets; they

may read a lot of tweets from other participants, but rarely engage in conversations.
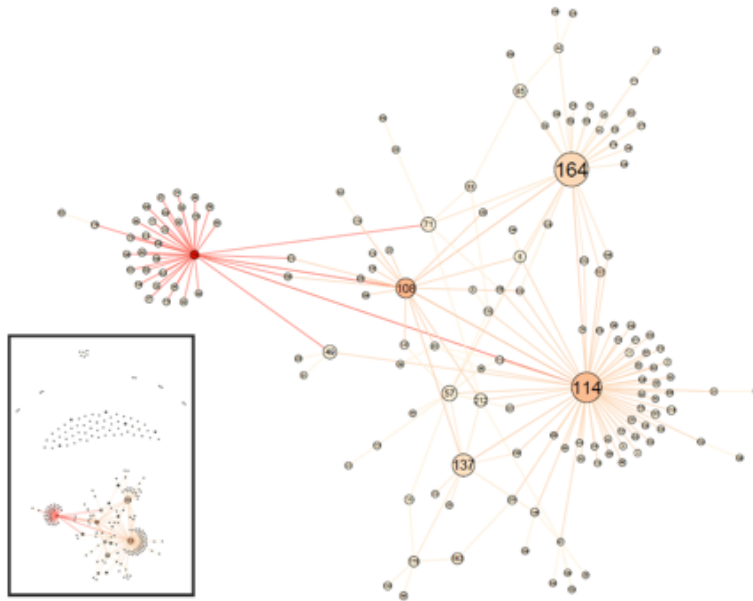

Figure 4: Social network analysis of #edmedia

In this case of edmedia, conference organizers did not play an active role on promoting the Twitter backchannel; they mainly used Twitter as a way to broadcast notifications to participants rather than stimulating discussions. However, in some other cases, such as lak11, conference organizers were serving as engine participants by conveying personal thoughts, posting important links, retweeting interesting tweets from participants, and publicly addressing participants in their tweets. Some conference organizers took advantage of their large number of followers, and helped to get voices from some participants heard by a broader audience by retweeting their posts. While playing as active participants themselves is one way to promote the backchannel for organizers, understanding roles of each type of participant and looking for ways to meet their distinctive needs could also encourage broader and more in-depth discourse on Twitter. This direction calls for further research and experiments.

Conclusion

This paper analyzes a rich tweet dataset containing hashtags from seven academic conferences. Based on a descriptive statistical analysis, I discussed common and different features of these Twitter use

cases, and identified three distinctive types of practices of using Twitter to establish a backchannel for academic conferences. To better understand the dynamics of online discourse on Twitter, I implemented a visualization tool which visualizes tweets in a chronological and networked manner. A closer look at the visualization reveals several interesting phenomena about user interactions, including the instantaneity character of retweets in comparison with public messages; this feature of retweeting could result in bury of important information worth sharing to a broader. Therefore, finding an effective way to keep important ideas alive in the Twitter discourse will be of great value for conferences. Furthermore, a preliminary Social Network Analysis and a cluster analysis on user's data were conducted to study the structure of formed social network and different roles of participants. This analysis identifies four major types of users, which include engine participants, pop stars, lonely twitterers, and peripheral players. A deep understanding on the roles and needs of each category of users is crucial for conference organizers to nurture an effective Twitter backchannel.

Future work will focus on ways to incorporate more advanced visualization techniques to produce an interactive and usable visualization tools and try to make them openly accessible for conference use. Besides the links established by retweeting and mentioning connections between users, semantic relationship would be another promising dimension that could be used to link users or users and resources. Also, a comparison between Twitter participants and registered conference participants, together with discourse analysis, would help to evaluate the coverage of Twitter use and the way information spread within the Twitter community. These further directions would provide more meaningful guidance for enabling the Twitter backchannel for academic conferences.

References

Anderson, C. (2008). *The long tail: Why the future of business is selling less of more*. Hyperion.

Crossett, L., Kraus, J. R., & Lawson, S. (2009). Collaborative Tools Used to Organize a Library Camp Unconference. *Collaborative Librarianship*, *1*(2).

DeVoe, K. M. (2010). "You'll Never Guess Who I Talked To!": Tweeting at Conferences. *The Reference Librarian*, *51*(2), 167–170. doi:10.1080/02763870903579877

Ebner, M., Beham, G., Costa, C., & Reinhardt, W. (2009). How people are using Twitter during conferences. *Creativity and innovation Competencies on the Web*, 145.

Harry, D., Green, J., & Donath, J. (2009). Backchan. nl: integrating backchannels in physical space. In *Proceedings of the sigchi conference on human factors in computing systems* (pp. 1361–1370). ACM.

Honey, C. & Herring, S. C. (2009). Beyond microblogging: Conversation and collaboration via Twitter. In *System sciences, 2009. hicss'09. 42nd hawaii international conference on* (pp. 1–10). IEEE.

Jenkins, H., Clinton, K., Purushotma, R., Robinson, A. J., & Weigel, M. (2006). Confronting the challenges of participatory culture: Media education for the 21st century. Retrieved from http://www.newmedialiteracies.org/files/working/NMLWhitePaper.pdf

Koch, R. (2011). *The 80/20 principle: the secret to achieving more with less*. Random House LLC.

Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Letierce, J., Passant, A., Breslin, J. G., & Decker, S. (2010). Using Twitter During an Academic Conference: The# iswc2009 Use-Case. In *Icwsm*.

McCarthy, J. F. et al. (2005). Digital backchannels in shared physical spaces: experiences at an academic conference. In *Chi'05 extended abstracts on human factors in computing systems* (pp. 1641–1644). ACM.

O'Reilly, T. (2007). What is Web 2.0: Design patterns and business models for the next generation of software. *Communications & strategies*, (65).

Ross, C., Terras, M., Warwick, C., & Welsh, A. (2010). Pointless babble or enabled backchannel: conference use of twitter by digital humanists. *Digital Humanities*.

Wasserman, S. (1994). *Social network analysis: Methods and applications*. Cambridge university press.