DEPARTMENT OF INFORMATION STUDIES

Draft for comment

Enabled Backchannel: Conference Twitter Use by Digital Humanists

Ross, C., Terras, M., Warwick, C., and Welsh, A.

Department of Information Studies, University College London

claire.ross@ucl.ac.uk

Keywords: Microblogging, digital humanities, digital backchannels, conferences, user intention

Abstract:

Purpose

To date, few studies have been undertaken to make explicit how microblogging technologies are used by and can benefit scholars. This paper investigates the use of Twitter by an academic community, and poses the following questions: does the use of a Twitter enabled backchannel enhance the conference experience, collaboration and the co-construction of knowledge? How is microblogging used within an academic conference setting, and can we articulate the benefits it may bring to a discipline?

Design/methodology/approach

This paper considers the use of Twitter as a digital backchannel by the Digital Humanities community, taking as its focus postings to Twitter during three different international 2009 conferences. The resulting archive of 4574 "tweets" was analysed using various quantitative and qualitative methods including a qualitative categorization of twitter posts by open coded analysis, a quantitative examination of user conventions, and text analysis tools. Prominent Tweeters were identified and a small qualitative survey was undertaken to ascertain individuals' attitudes towards a Twitter enabled backchannel.

Findings

Henry Morley Building,
UCL,Gower Street, London WC1E 6BT

Tel: +00 44 (0)20 7679 7204
Fax: + 00 44 (0)20 7383 0557
Website : http://www.slais.ucl.ac.uk/

Draft for comment

Conference hashtagged Twitter activity does not constitute a single distributed conversation but, rather multiple monologues with a few intermittent, discontinuous, loosely joined dialogues between users. The digital backchannel constitutes a multidirectional complex space in which the users make notes, share resources, hold discussions and ask questions as well as establishing a clear individual online presence. The use of Twitter as a platform for conference backchannels enables the community to expand communication and participation of events amongst its members. The analysis revealed the close knit nature of the DH researcher community, which may be somewhat intimidating for those new to the field or conference.

Practical implications

This study has indicated that, given Twitter is becoming increasingly important for academic communities, new, dedicated methodologies for the analysis and understanding of Tweet based corpora are necessary. Routinely used textual analysis tools cannot be applied to corpora of tweets in a straightforward manner, due to the creative and fragmentary nature of language used within microblogging. In this paper, a method has been suggesting to categorize tweets using open coded analysis to facilitate understanding of tweet based corpora, which could be adopted by other studies.

Originality/value

This paper is the first exhaustive study that we are aware of concentrating on how microblogging technologies such as twitter are used by and can benefit scholars. This data set provides both a valuable insight into the prevalence of a variety of Twitter practices within the constraints of a conference setting, and highlights the need for methodologies to be developed to analyse social media streams such as twitter feeds. It also provides a comprehensive bibliography of other research into microblogging.

K**eywords**: Microblogging, Twitter, digital humanities, digital backchannels, conferences, user intention

C**lassification:** Research Paper

1. Introduction

With improved accessibility to an increasingly mobile web 2.0 environment, large numbers of users are creating content using a variety of tools. These web 2.0 innovations have brought about changes in the ways in which members of communities interact socialize and collaborate with each other. From sharing tedious and unremarkable babble of everyday life, to alerting people of breaking news, use in commercial and education based contexts, the uses of these web 2.0 applications for communication are as diverse as the people who use them. The user centered, decentralized concept (Kilbitsch 2007) allows anyone to become an active participant in the conversation.

Draft for comment

In recent years a new form of blogging, designated microblogging, has become increasingly popular, pervading daily life as well as academic communities of practice, although it has been accused of being a disruptive, distracting and inconsequential tool full of 'pointless babble'?[i]. Microblogging, with special emphasis on Twitter.com[ii], the most well known microblogging service, is increasingly used as a means of extending commentary and discussion during academic conferences. This digital "backchannel" communication (non-verbal, real-time, communication which does not interrupt a presenter or event, (Ynge 1970) is becoming more prevalent at academic conferences, in educational use, and in organizational settings. Frameworks are therefore required for understanding the role and use of digital backchannel communication, such as that provided by Twitter, in enabling a participatory conference culture.

Formal conference presentations still mainly occur in a traditional setting: a divided space with a 'front' area for the speaker and a larger 'back' area for the audience. This implies a single focus of attention. There is a growing body of literature describing problems with a traditional conference setting; lack of feedback, nervousness about asking questions and issues raised by the single speaker paradigm, where the focus on only one speaker can lead to a decrease in participation by others (Anderson et al 2003, Reinhardt et al 2009). The use of a digital backchannel such as Twitter, positioned alongside the formal or official conference programme, can address this, providing an irregular, or unofficial means of communication (McCarthy & Boyd, 2005), which can extend beyond the lecture room to engage with scholars across the community, throughout the entire conference. Backchannel benefits include being able to ask questions, or provide resources and references, changing the dynamics of the lecture room from a one to many transmission to a many to many interaction, without disrupting the main channel communication. However, negatives of this type of communication include a cause of distraction, the generation of disrespectful content and the creation of cliques amongst participants (Jacobs & Mcfarlane 2005, McCarthy and Boyd 2005). Nevertheless research consistently shows that digital backchannels are a valuable way for active conference participation (Kelly 2009) and that they are highly appropriate for use in learning based environments (Reinhardt et al. 2009). Recently microblogging has been adopted by conferences such as DH2009 to act as a backchannel as it allows for the 'spontaneous co-construction of digital artefacts' (Costa et al 2008). Such communication usually involves note taking, sharing resources and individuals' real time reactions to events –covering both conference presentations, and conference social activities.

This paper presents a study that analyses the use of Twitter as a backchannel for academic conferences, focusing on the Digital Humanities community in three different physical conference settings held from June to September 2009. Digital Humanities – the interdisciplinary field of research and teaching concerned with the intersection of computing and humanities disciplines - was chosen due to its early adoption and acceptance of emergent technologies. During three key conferences in the academic field (Digital Humanities 2009, University of Maryland, 22-25th June 2009, That Camp 2009, George Mason University, 27-28th June 2009 and Digital Resources in the Arts and Humanities 2009, Queens University, Belfast, 7-9th September 2009), unofficial Twitter backchannels were established using conference specific hashtags (#dh09, #thatcamp and #drha09, #drha2009[iii]) to enable visible commentary and discussion. The resulting corpus of individual "Tweets" provides

a rich dataset, allowing analysis of the use of Twitter in an academic setting, and specifically presenting how the Digital Humanities community has embraced this microblogging tool.

2. Research on Microblogging as Digital Backchannel Activity

Research exploring microblogging and digital backchannels has been undertaken in classroom settings (Yardi 2008, Costa et al 2008, Anderson et al 2003, Grosseck and Holoescu 2008), in the commercial sector (Jansen et al 2009, Zhao and Rosson 2009) and in more general terms (Java et al 2007, Krishnamurthy et al 2008). However until recently there has been very little research into the academic use of microblogging, specifically its use as a digital backchannel in a conference setting. Digital backchannel communication has become an increasingly important area of research, and several studies (see below) have focused on Twitter due to its growth as a persistent and convenient communication tool. There has previously been a lot of discussion about academic blogging practice (Walker 2006, Davies et al 2007); over the past few years there has been a sharp rise in the number of academics who use blogging for scholarly communication. Research has focused on the linguistic features, and conversational practices (Efimova and De Moor 2005, Stuart 2006, Luzon 2008), the motivations behind academic blogging (Nardi et al 2004) as well as the creation of communities of practice through blogging (Efimova and Hendrick 2005). These discussions provide useful insights into academic use of social media, however they do not actively apply to looking at academic microblogging as a digital backchannel.

Microblogging is a variant of a blogging, which allows users to quickly post short updates into their microblog. The simplicity of publishing such short updates in various situations in a fluid social network makes microblogging an innovative communication method that can be seen as a hybrid of blogging, instant messaging, social networking and status notifications. The word's origin suggests that it shares the majority of elements with blogging, therefore potentially microblogging, can be described using blogging's three key concepts (Karger & Quan 2005): the contents are short postings, these postings are kept together by a common content author who controls publication, and individual blog entries can be easily aggregated together. However, many microblogging sites, and specifically Twitter, combine key elements from social networking sites (Boyd and Ellison 2007) with key blogging characteristics. Like social networking sites, Twitter allows users to construct a profile within a bounded system, as well as articulate a list of other users with whom they share a connection, but these connections are directed rather than undirected (Boyd et al forthcoming); users can make connections ('follow') other users and see their microblog posts ('Tweets'), but the other users need not reciprocate.

Twitter is a simple and agile form of communication. In a flexible and ever increasing network of users, it offers new possibilities concerning lightweight information updates and exchange. Compared to regular blogging, microblogging fulfils a demand for a faster and more immediate mode of communication. In constraining posts to be short enough to be carried by a single SMS (Short Message Service) message, microblogging systems lower user investment in time and thought required to generate and consume content. This lowered barrier also supports new communication modes, including what Reichelt (2007) calls ambient intimacy:

> Ambient intimacy is about being able to keep in touch with people with a level of regularity and intimacy that you wouldn't usually have access to, because time and space conspire to make it impossible.

Therefore it is possible to suggest that beyond being just a tool for writing and communicating, microblogging platforms may serve as a foundation for building or enhancing a community of practice. A community of practice is formed by people within a shared domain who engage in a process of collective learning by interacting on an ongoing basis (Wenger 1998, 2002). Such interaction results in the improvement of the knowledge of each participant in the community and contributes to the development of the knowledge within the domain. For this reason, this communication method can be regarded as promising for academic environments in facilitating informal communication, learning and co-construction of knowledge.

The key feature of Twitter, which users see when they log in, is a stream of Tweets posted by those they follow. Twitter participants are constrained to posting updates which are 140 characters in length, and as users embraced the technology and its affordances, a series of conventions emerged that allow users to add structure to their Tweets (Boyd et al forthcoming). Users have developed ways to reference other users, devised language to disseminate messages and converged on labels to indicate topics. In particular the use of hashtags has proved very successful. Hashtags are a simple way of grouping messages with a '#' sign followed by a name or code which forms a unique tag for a specific purpose. The hashtag can be used in a conference setting when sharing and contributing to a specific topic or event. These conventions are discussed later in the paper.

Digital backchannel communication has become more prevalent recently with the proliferation of mobile hand held devices and wireless networking. The ubiquity of digital backchannel technologies has led to a parallel acceptance of microblogging tools in a variety of settings as a standard accompaniment to front channel discourse. However research on backchannels has shown both benefits and problems for group interactions, and for backchannel participants and non participants. Positive uses of microblogging back channels include being able to ask questions, or provide resources and references without disrupting the main channel interaction, as well as fostering collaborative learning and the co-construction of knowledge (Yardi 2006). Negative aspects of microblogging back channels include being characterized as informal, a cause of distraction, containing disrespectful content and creating cliques amongst participants (Jacobs and Mcfarlane 2005, McCarthy and Boyd 2005) as well as being considered as ephemeral and inconsequential (Codgil et al 2001, McNely 2009). Nevertheless research consistently shows that the digital backchannel is a valuable way for increasing active participation (Kelly 2009) and is highly appropriate for use in learning based environments (Reinhardt et al 2009, Kellog et al 2006).

The challenges of formal conference presentation and lectures have been a long standing discussion point (Geske 1992, Bligh 1971, Gleason 1986, Anderson et al 2003, Reinhardt et al 2009). Despite a lecture or a conference setting being a shared space, there remains a single focus of attention, a physical platform for didactic transmission with limited interaction from the back, restricting individuals to the role of either speaker or listener. In traditional conference front channel discourse, it has been suggested that collaboration and

interaction are lacking due to the limiting factors of the setting (Reinhardt et al 2009); apprehension to ask questions due to the size or climate of the conference, a lack of peer feedback in and by the audience, and a lack of participation when only one individual is speaking (Anderson et al 2003, Reinhardt et al 2009) all of which are not conducive to mass participation in a conference setting. The use of a digital backchannel, positioned alongside the formal or official conference programme can address these challenges, by changing the dynamics of the room from a one to many transmission, to a many to many interaction, without disrupting the main channel presentation.

With the growth of microblogging platforms, like Twitter, and the subsequent user driven adoption of such services as platforms for backchannel communication, it is important to consider the implications and whether or not a Twitter enabled backchannel does indeed enhance the conference experience, creating a more participatory conference culture or whether technology is being used for technology's sake, which fails to deliver meaningful conference content.

3. Method

With the recent popularity of microblogging systems like Twitter, it is important to better understand why and how people use these tools in conference settings. Understanding this will help to evolve the microblogging idea as a digital backchannel and develop both microblogging client and infrastructure software. We tackle this problem by studying the microblogging phenomena and analyzing different types of user intentions in a Twitter enabled conference backchannel. The data set is based on Twitter data, collected and archived by a Twitter archiving service, Twapper Keeper[iv]. Data from the three conferences was collected by archiving Tweets which used the four distinct conference hashtags. (These hashtags were used prior to and after the conferences, and have been reused by other conferences, therefore the corpus was limited to Tweets posted during the span of each conference). This provided a data set of 4574 Tweets from 326 distinct Twitter users, resulting in a corpus of 77308 tokens, which were analysed using various quantitative and qualitative methods which allowed us to understand and categorize the resulting corpus effectively. Although there are a number of automated Twitter analysis tools[v] which look at Twitter user IDs, there are no tools for hashtag analysis yet, therefore the analysis of the data set was completed manually. In addition, other basic analyses of the Digital Humanities community use of Twitter have been undertaken (Fluharty 2010, French 2010). This paper is the first exhaustive study concentrating on how such technologies are used by and can benefit scholars. This data set provides both a valuable insight into the prevalence of a variety of Twitter practices within the constraints of a conference setting, and highlights the need for methodologies to be developed to analyse social media streams such as twitter feeds.

Data analysis involved a qualitative categorization of Twitter posts and a quantitative examination of user conventions, in order to provide a deeper understanding of digital backchannel conference activity within the Digital Humanities community of practice. Quantitative analysis was used to provide a context for understanding Twitter conventions and their application in a conference backchannel setting. Measures were used such as

identifying prominent Tweeters, analysing the frequency of conversations between users, determining the frequency of reposting messages ("Retweeting") and the frequency of users sharing resources, and the differing use of Twitter at the three separate events.

Text analysis tools were also used to interrogate the corpus. It was assumed that frequent terms from Twitter traffic would reflect the topics and themes being discussed in the physical conference settings. The Digital Humanities conference Twitter data were run through a commonly used text analysis tool TAPOR[vi], to highlight the commonly used words in the Tweets, and to enable a comparison against the themes of the conferences. However to overcome text length limitations of microblogging, users have developed their own form of shorthand, code or jargon, this provided a problem gaining adequate analysis. This class of problems requires us to re-think our approach to text mining.

To characterize the type of user intention, individual Tweets were categorized qualitatively using open coded content analysis. Each post was read and placed into a category, determining the apparent intention of each Twitter post. Much research on user intentions in digital spaces has focused on search queries (Broder 2002) and blogging (Nardi et al 2004, Lento et al 2006), but relatively little has been done on microblogging. It was necessary to develop our own categories: although Java et al (2007) present a brief taxonomy of Twitter user intentions (daily chatter, conversations, sharing information and reporting news) they are based on general Twitter use and were too imprecise for our needs. Ebner (2009) discovered four major categories in his study of the use of Twitter during the keynote presentation at the Ed-Media 2008 conference, but this is a small study limited to fifty four posts made by ten distinct users, whereas the DH conferences involved a much larger user population. Through our analysis, Tweets were divided into seven categories: comments on presentations; sharing resources; discussions and conversations; jotting down notes; establishing an online presence; and asking organizational questions. These categories are specific to the Digital Humanities corpus: they were decided upon through close examination of the corpus content. Given the short format and message content, the ability to code Tweets without knowing the context is challenging and it was not always possible to attribute a coding category, therefore Tweets which were highly ambiguous were placed in an "Unknown" category (resulting in 1% of the corpus being classified as Unknown). It is important to note that the stated goal of the coding was to hypothesize on the intent of the user posting the message, rather than to provide a descriptive evaluation of the Tweet content.

In addition, a small qualitative study was undertaken to ascertain individuals' attitudes towards a Twitter enabled backchannel. Twitter users with the highest amount of Tweets from the Digital Humanities conference data set were identified and then sent an online survey (16 Twitter users were approached, and 11 responses were received). The survey was designed to be answered anonymously, concentrating on gathering data specifically on user perspectives on the use of a Twitter backchannel in a conference context. The survey was divided into ten questions, comprised multiple choice open ended questions, in order to gain insights into the individual's motivation for using Twitter, the purpose of Tweeting in a conference setting, whether conference Twitter use

differs from normal use, and whether they believe a Twitter enabled backchannel encourages a more participatory conference culture.

4. Findings

4.1 Corpus Analysis

Conference hashtagged Twitter activity does not constitute a single distributed conversation but, rather multiple monologues with a few intermittent, discontinuous, loosely joined dialogues between users. The majority of the activity was original Tweeting (90%, 4259 Tweets): only 10% (313 Tweets) were Re-Tweets (RT) of others' ideas or comments (Fig 1). The real time exchange and speed of review of shared ideas seems to create a context of users offering commentary and summaries and not spreading the ideas of others verbatim. However there is no universally agreed syntax for retweeting, though the prototypical formulation is 'RT @user…' (Boyd et al forthcoming), therefore some retweets using different syntax (for example 'retweet', 'retweeting', 'via' and 'HT') may have been missed.
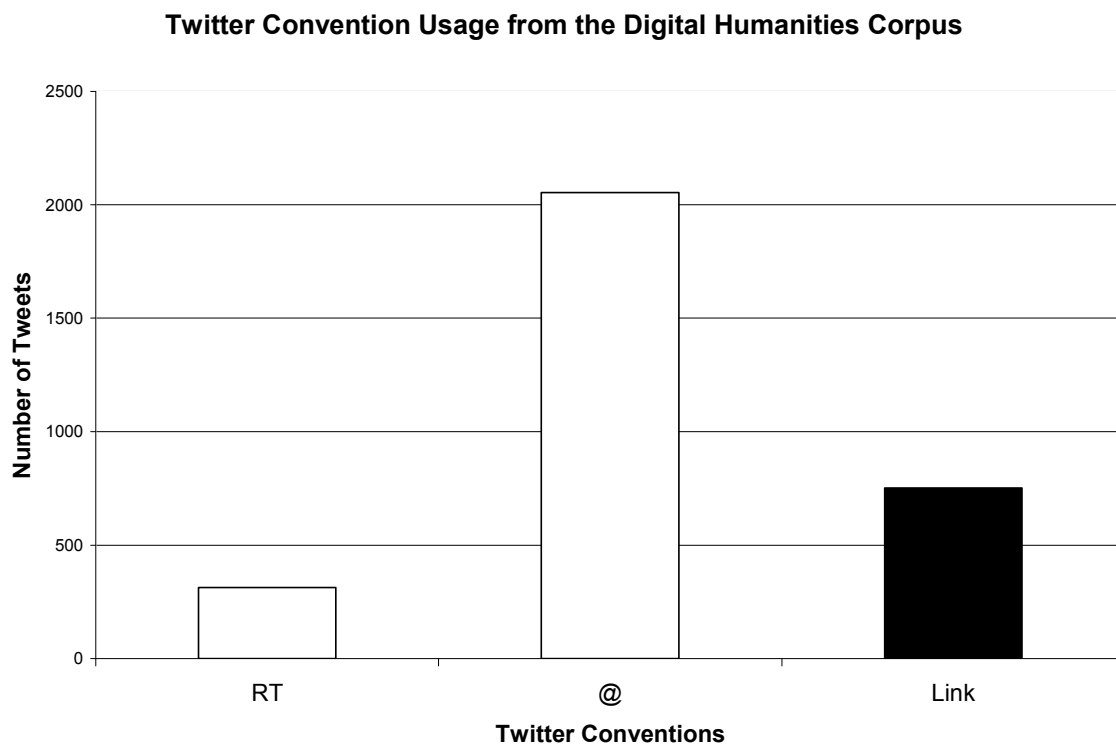

Fig 1: The use of Twitter in a conference setting, indicating the number of Tweets which included Twitter Conventions.

66% (2054 Tweets) of the Tweets during the conference proceedings included direct references to others' Twitter IDs, using the '@' sign, as the source of a quote, object of a reply or debate. Twitter participants began using the @user syntax to refer to specific users as a form of 'addressivity' (Honeycutt and Herring 2009). The @ sign acts as an indication to a recipient of messages posted in an public forum that the message is intended

for them, therefore the @ sign is a tool to gain the target recipient's attention, which is essential for conversation to occur. Werry (1996) notes that addressivity is essential in a digital multi-participant public environment because the addressee's attention must be recaptured with every new message. This practice can be clearly seen in the Digital Humanities conference community by the high proportion of Tweets addressing other Twitter users. Additionally the @ sign is used to reference other users, this function is also attention seeking, specifically intended to alert the user that they are being mentioned in a Tweet. This is also an indication of conversational and collaborative practice: by taking the appearance of the @ sign as an indicator for an act of conversation or attention seeking behavior, the use implies a form of collaborative writing activity, driving a conference community of practice who are involved in shared meaning making and the co-construction of knowledge (McNely 2009). The data supports the assumption in previous Twitter studies (specifically Java et al 2007 and Honey and Herring 2009) that the presence of the @ sign signifies that the Tweet is part of a conversation. However, the content of the Tweets indicate that the discussion was between a few Twitter users rather than mass collaboration and was not necessarily focused on conference content. On the other hand it is not self-evident that all uses of the @ sign are intended to be conversational (Honeycutt and Herring (2009) indicate twelve different functions for the @ sign in a Twitter context), or that all the conversations in Twitter use the @ sign. Additional factors may need to be accounted for to determine the extent to which conference Twittering is conversational including the perceived user intention, which will be discussed later in this paper.

Providing links to outside content is a central convention developed by users constrained by the 140 character limit. Posting links enables user to point other users to extended information on any given topic. Sharing resources is a central practice in Twitter as a whole, therefore the percentage of links posted in the data set should be high. Sharing resources in a conference environment is an incredibly useful tool, as it provides context to discussion about specific projects or sites. 24% (752) of posts in the Digital Humanities data set included a link to outside content.

Jacob and Mcfarlane (2005) discuss polarization in digital backchannels, highlighting a conflict between an inclusive and participatory conference culture and a fragmentation of conference participants into cliques only intermittently engaged with the main presentations. There has also been a lot of discussion recently about the use of negative, disparaging and disrespectful comments within conference backchannels (Kellog et al 2006, Yardi 2007, McCarthy and Boyd 2005, Parry 2009). A prime example of this was at the recent Web 2.0 expo[vii], where the actions of the audience and the architecture of the Twitter backchannel during the keynote presentation produced a very negative experience (Boyd 2009, Michéle 2009), provoking a very public discussion about the implications of using a digital backchannel in a conference setting. This negative use was not the case at the Digital Humanities conferences, with the majority of the content being open and encouraging. The formation of cliques, in some instances does seem to be apparent during the Digital Humanities conferences. A small minority of users produce a disproportionately large amounts of Tweets (Fig 2), interacting with each other about other matters, indicating an unevenness of participation amongst users. This activity could lead to newer members of the discipline or newer Twitter users being excluded from the discussion. A high amount of users only produced 1 Tweet during the duration of the three conference (Fig 2). This lends support

to the notion of a '90:9:1' rule (Nielsen 2006) for new social media, where 90% of users are lurkers, 9% of users contribute from time to time and 1% participate a lot and account for the majority of contributions. Nor is this experience new, this participation inequality had been observed in other collaborative online environments for more then a decade (Nielson 2006, Anderson 2008, Nonnecke and Preece 2000, Kiesler et al 1984).

This participation inequality, particularly the disproportionate contribution of the few suggests the close knit nature of the fairly small Digital Humanities researcher community, but may also be somewhat intimidating for those new to the field or conference. This is a concern that should be focused on by any conference organizers. The potential for negative effects in a persistent and visible digital backchannel suggest that the community of practice should consider the implications of using a digital backchannel, there have been suggestions that a form of group censorship should be introduced (Codgill et al 2001). This would enable the community to become the authority of what is appropriate in any particular conference backchannel discourse.

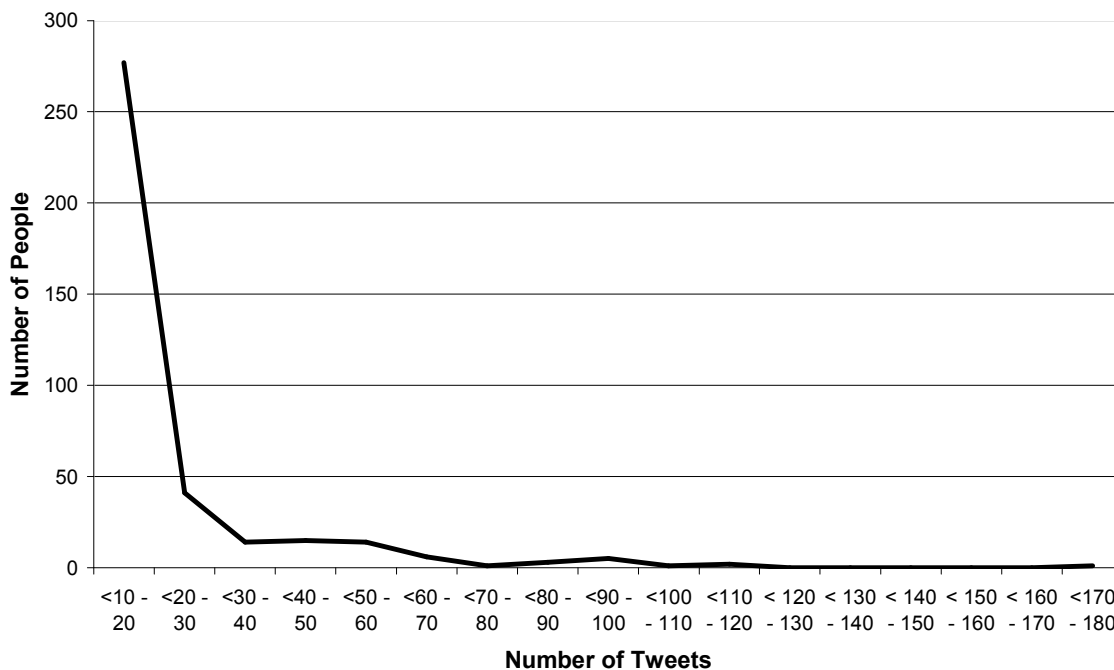**Tweet Density During the Digital Humanities Conferences**

Fig 2: Density of Tweets produced by Twitter users in the Digital Humanities Conferences corpus, indicating that many users only tweet a few times, whilst a small amount of users tweet very often. When the figures are analysed, it can be seen that the tweeters who post the most often actually provide the majority of tweets across the conference.

A question about official and unofficial backchannels can also be raised from these findings. When communication is digitally mediated, backchannels may not be visibly obvious. That is, even if participants know who else is participating in an interaction, it does not guarantee (as it does in the front channel) that the

backchannel is accessible. Visibility and awareness of backchannel activity is an important issue. For example: the DH09 conference had 318 attendees registered attendees (Fig 3); despite the profile of the attendees, all active in the digital humanities, only half used the Twitter enabled backchannel. At a digital conference you may expect this percentage to be higher, yet only 23 percent of the numbers registered for DRHA participated on twitter. However, 187% of the number of registrants for the Thatcamp unconference were tweeting: indicating how twitter posts can reach out to the wider community of practice and involve those not actually attending the event (and also highlighting that it can be difficult from tweet postings to ascertain who is actually attending an event without close study of the content). .

Conference	DH09	Thatcamp	DRHA09
Days	4	2	3
Number of attendees	318	100	124
Number of individual twitter users using the conference hashtag	169	187	23
Number of Tweets	1732	2568	274
Average number of Tweets per day	433	1284	913
Twitter Users as Percentage of Attendees	53%	187%	18%

Fig 3: Number of Conference Attendees against number of Twitter users

There are numerous factors which can affect the involvement of a conference community on twitter. Lack of participation could be due to a lack of awareness: if the backchannel is set up unofficially and is not actively encouraged and discussed by the conference organizers, then it may be more difficult to discover. This can be exemplified by the use of two different hashtags in the Twitter backchannel for the DRHA09 conference. Allowing communities to self organize is important, but this potentially leads to inconsistencies and a lack of participation and inclusivity by all members. Self organisation was also apparent at the DH09 conference where additional hashtags were developed to represent different sessions throughout the conference; however this practice was only adopted by a few users. Therefore by its nature an unofficial backchannel does not guarantee active participation.   In addition, a major factor to consider is the physical conference infrastructure: the availability of an internet connection and adequate power supplies is a prerequisite to allow online microblogging activity. From anecdotal evidence, the low use of the Twitter enabled backchannel at the DRHA09 conference appears to be caused by issues in the physical conference environment.   The proliferation of wireless networking, net books and mobile hand held devices has led to an acceptance of backchannel discourse; however it is essential that there are adequate resources available for individuals to utilize that technology. Conferences are only now routinely providing wireless access and power supplies for computers, (likewise, mobile phones that easily support technology such as twitter are a recent development).

4.1.1 Textual Analysis

It has been suggested that microblogging creates new kinds of aggregated texts that must be understood as creative entities rather than in their individual pieces (Jones 2008). Therefore any one Tweet may not make

sense outside of the larger discourse, the larger collective environment or the community of practice, in which the Tweet is made. Thus it seemed appropriate to create corpora of all Tweets from all three hashtagged conferences in order to keep the collection environment intact. However, due to the 140 character constraints placed upon users and the development of Twitter conventions there has been a deviation from the standard form of languages used for writing, similar to the way in which SMS language deviates from the standard form (Ling and Baron 2007). This type of abbreviated, truncated, coded and unstructured writing style led to problems analyzing the corpus. It may be useful, in future, to look towards methodologies that have been developed to analyse other short messaging technologies, such as SMS messages (Ling and Baron 2007, Aw et al 2006), to develop relevant methodologies for our purposes.

Tapor, a frequently used tool for research, provided inconclusive results due to being unable to analyse the corpora fully, most likely because of the complex Twitter conventions. Therefore another textual analysis tool was used; AntConc 3.2.1w [viii]. It is likely that new textual analysis tools and methodologies will need to be developed, as traditional methods of analysis are not designed for the stylistic features and conventions of Twitter. AntConc highlighted frequently used words from the corpus including; http, RT, bit, ly, and specific user names, indicating that the Twitter conventions of sharing resources through link shortening services and Retweeting strongly influence the order of the word list (Fig 4). This needs to be considered if textual analysis of Tweets is to be utilized effectively, and a "twitter stop list" proposed to allow further analysis of tweets which would reduce noise.

Rank	Frequency Count out of Total (10724)	Word
1	2243 (20%)	thatcamp
2	1917 (17%)	dh
3	752 (7%)	http
4	603 (5%)	s
5	488 (4%)	digital
6	400 (3%)	m
7	311 (2%)	t
8	302 (2%)	rt
9	294 (2%)	drha
10	277 (2%)	humanities
11	268 (2%)	bit
12	267 (2%)	briancroxall
13	258 (2%)	ly
14	243 (2%)	elli
15	232 (2%)	amandafrench

16	204 (1%)	session
17	200 (1%)	up
18	199 (1%)	dancohen
19	195 (1%)	com
20	187 (1%)	nowviskie

Fig 4: Table showing 20 highest ranking words in the Digital Humanities Twitter Corpus

Word	Frequency (count) in Digital Humanities Abstracts (1038 total words)	Frequency in Tweets
Digital	40 (3.8%)	348 (3%)
Text	19 (1.8%)	53 (0.4%)
Humanities	15 (1.4%)	201 (1%)
S	13 (1.2%)	582 (5%)
Analysis	12 (1.1%)	35 (0.3%)
History	11 (1%)	132 (1%)
Data	9 (0.8%)	94 (0.8%)
New	9 (0.8%)	103 (0.9%)
Case	7 (0.6%)	13 (0.1%)
Project	7 (0.6%)	102 (0.9%)

Fig 5: Table showing 10 highest ranking words in the Digital Humanities Abstracts (an amalgamation of DH 09 abstract titles, That Camp 09 unconference session themes, and DRHA 09 abstracts titles, and their frequency in the Digital Humanities Tweet Corpus

When the Tweet corpus is compared to a corpus containing the paper titles and unconference session titles from the three events, more potentially useful information can be found. Digital, text, humanities, analysis, history, data, new and project all feature highly. It is also possible to extrapolate key themes from the content of the Tweets without automatic analysis. In this instance, textual analysis did not enhance our understanding of the Digital Humanities Twitter enabled backchannel. Twitter challenges the traditional authorial boundaries that are associated with writing and the word 'text'. If scholars want to understand emergent services like Twitter, particularly its use in academic conferences, there is a need to consider the cultural and linguistic importance of these texts and how they can be productively analysed.

Using open coded content analysis (as described above) it is possible to gain an insight into the user intentions of the Digital Humanities community of practice via the use of a Twitter enabled backchannel. Tweets were manually labelled into our eight categories: comments on presentations; sharing resources; discussions and

conversations; jotting down notes; establishing an online presence; asking organizational questions, and unknown. Most Tweets in the corpus fell into the category of jotting down notes (43%) (Fig 9, Fig 10), triggered predominately by the front channel presentation, suggesting that participants are sharing experiences and to a degree co-constructing knowledge. What is surprising is the lack of direct commentary on presentations (3%) (Fig 6, Fig 7). Although Reinhardt et al (2009) argue that Twitter enables thematic debates and offers a digital backchannel for further discussion and commentary, the Tweet data suggests that this does not appear to have happened to a significant extent at the Digital Humanities conferences.   This raises the question of whether a Twitter enabled backchannel promotes more of an opportunity for users to establish an online presence and enhance their digital identity rather than encouraging a participatory conference culture.

10% of posts were categorized as establishing an online presence (Fig 7) within the perceived user intentions of the Digital Humanities conference community (examples of establishing online presence Tweet content can be found in Fig 6). This is not to suggest that users are self indulgent, more that the users are alerting each other to their presence, and enabling them to situate themselves within a relatively small community of practice. Naaman et al (forthcoming) suggests that these type of posts may play an important role in helping users maintain relationships.

Category	Tweet Example
Comments on presentations	Dh09Twitteruser: really enjoyed @dhTwitteruser1 presentation on how she used MONK tool to read Stein #dh09
	Dh09Twitteruser: have yet to hear anything new at the 'deep reading' talk #dh09
Sharing resources	ThatcampTwitteruser: fir the Archiving Social Media group #thatcamp here is (among other things) what I use: http://dpante.de/FBUD/
	ThatcampTwitteruser: http://www.speculativecomputing.org/ivanhoe/ IVANHOE: A game of critical interpration #thatcamp
Discussions/ conversations	DrhaTwitteruser1 @drhaTwitteruser2 #drha2009 I'd be interested to see how they dealt with intertineatins and corrections
	ThatcampTwitteruser1 @thatcampTwitteruser2 I'll have to think about it. They're not totally orthogonal, but seem so in practice. #thatcamp
Jot down notes	Drha09Twitteruser: 'archiving is now principally about commitments and relationships' #drha2009
	Dh09Twitteruser: French: humanities are already digital, but not digitally literate. #Dh09
Establish online presence	ThatcampTwitteruser: Feeling like a really nerdy kid in a really nerdy candy shop trying to decide which sessions to go to #thatcamp
	Dh09Twitteruser: Just remembered I have binary M&M's. Oh joy of Joy's!

Post organisation al questions	dh09Twitteruser: can you use time stamps to navigate You Tube videos? I thought you could. Dh09#
	thatcampTwitteruser: what's the trajectory of learning 'digital' things in dh? Simple skills that build into deeper understanding? #thatcamp

Fig 6: Exemplar Tweets in Twitter User Intention Categories. User names have been anonymised.

4% of posts contained organizational questions (Fig 7), suggesting that within the Digital Humanities conference environment, it is more appropriate to ask questions in the physical setting. 24% of posts were categorized as discussions or conversations (Fig 7).   Traditional conference settings encourage conversation which derive order from turn taking and referrals to previous statements, but when utilizing a digital backchannel, the conversation, communications and commentaries are disrupted across a non-cohesive network in which the recipients are constantly changing. Therefore traditional conversation structures are missing from the Twitter corpus, resulting in a different type of participatory culture; rather than following interactions in an ordered exchange, users are placed in a multidirectional discursive space, where they loosely inhabit a multiplicity of conversational contexts at once. Users are potentially combating this disorientating context by simply providing step by step accounts of events, in an attempt to bring some coherence and order to the backchannel. This note taking activity provides an essential mediator in the co-construction of meaning within the conference and to the wider Digital Humanities community of practice. This, in turn, creates a stable environment for the mediation of knowledge and therefore suggests that the Digital Humanities conference Twitter enabled backchannel is encouraging a more participatory conference culture through the practice of writing notes.

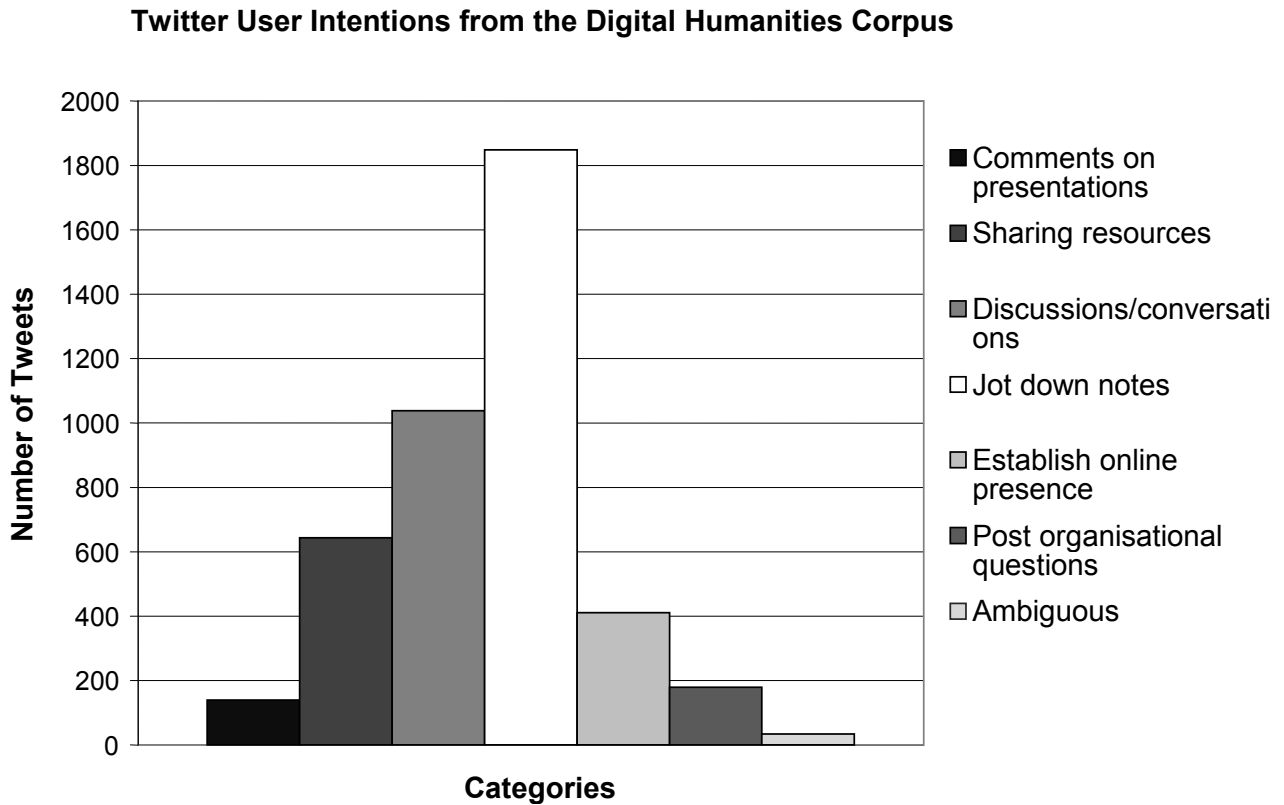**Twitter User Intentions from the Digital Humanities Corpus**

Fig 7: Perceived Twitter user intentions in a conference setting, indicating that a large proportion of Tweet content involved jotting down notes

In 2001, Cogdill et al, developed a taxonomy of backchannel discourse, which identified five categories of backchannel; process oriented, context orientated, participation-enabling, tangential and independent backchannel. From the data set of the Digital Humanities conferences it is possible to suggest that these categories are still current in a Twitter enabled backchannel, specifically the content orientated and participant enabling backchannel. Content orientated discourse is a private response to the content of the front channel interaction. Cogdill et al (2001) indicates that a content orientated backchannel offers commentary on the content of the public discourse. In the Digital Humanities data set, the open coded content categories comments on presentations and post organizational questions would fit directly into the content orientated discourse. The participation-enabling backchannel bears more resemblance with the Digital Humanities conference digital backchannel communications, a backchannel to help users function better in the conference environment, providing information to help members of the community to participate more fully in discussions, gain the community's approval and feel more comfortable in the group. The high percentage (43%) of jotting down notes frames the conference community and allows others to participate (Fig 8).
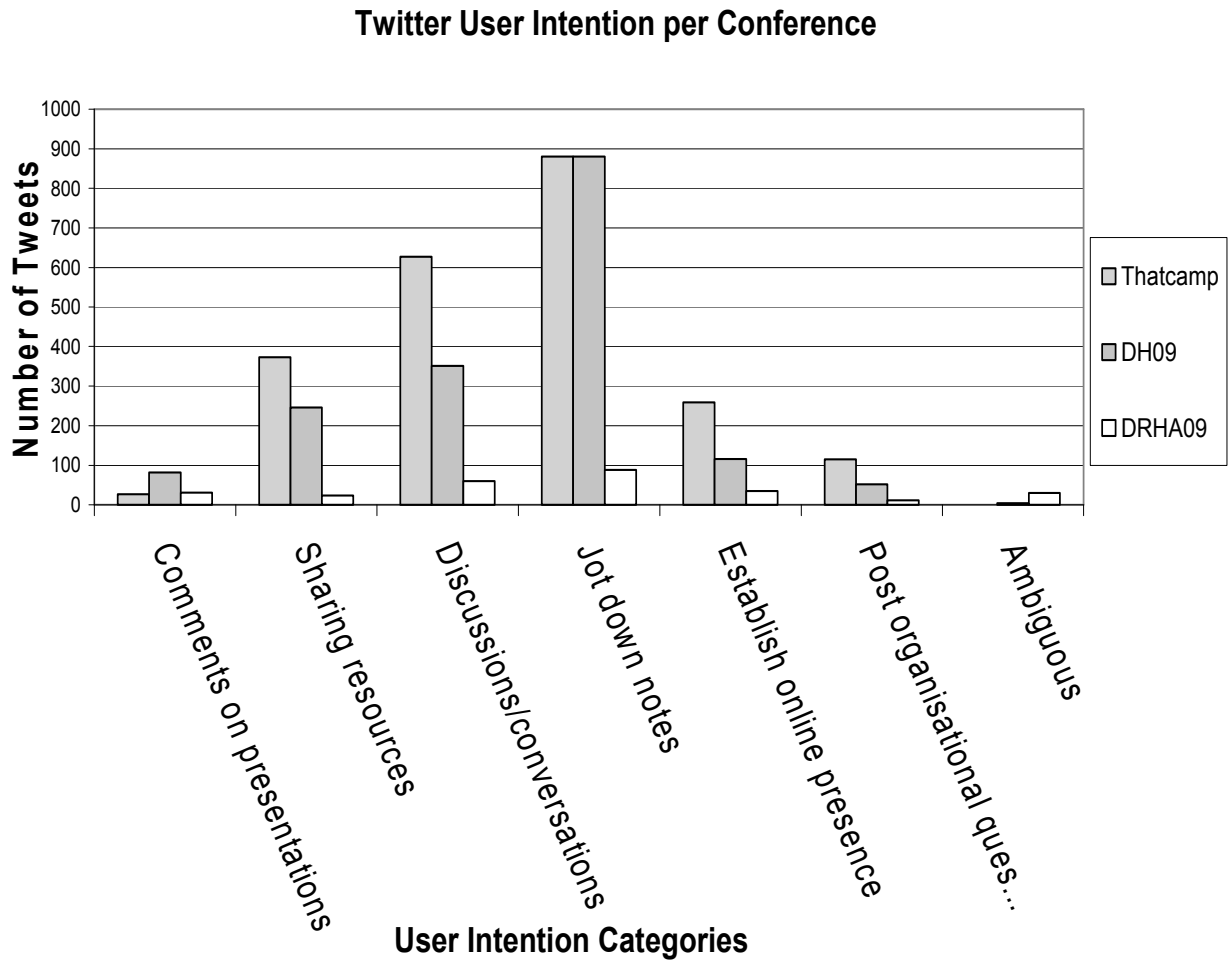
Twitter User Intention per Conference

Fig 8: Twitter User Intention per Conference, highlighting the high percentage of jotting down notes at both That Camp, and Dh09

Open coded analysis also enables us to look more directly at whether a Twitter enabled backchannel enhances the conference experiences, participation and the co-construction of knowledge, or whether it is just full of 'pointless babble'. It is possible to split the categories into two larger groups; 'information providers' and 'whispering in class' (Fig 9).

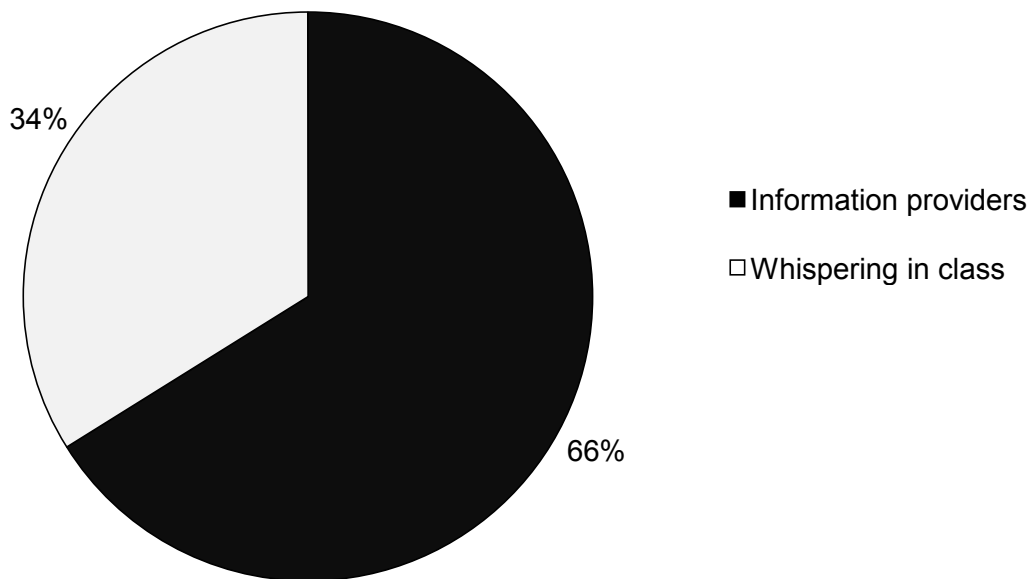**Twitter Information Providers or Whispering in Class**

Fig 9: Twitter Information Providers or Whispering in Class, The majority of Tweets fall into the Information Provider Category

Whispering in class contains the categories establishing an online presence, and discussions and conversations. This is because a lot of the content of these Tweets did not provide useful information about the conference or its themes. Whereas the information providers category contains comments on presentations, sharing resources, jotting down notes and posting organizational questions. These can be seen as actively co-constructing knowledge and in essence amplifying the conference. Being able to follow the actions of social reporters or following links to outside content allows a larger group of users to participate in the conference and make meaning. The whispering in class category does not mean that it is pointless babble however: networking with other members of the community and establishing your identity in that community (whether in the backchannel or in the main channel) play a strong part in the conference experience.

4.2 Survey Responses

The eleven responses to the email survey on twitter usage is a small sample of the Digital Humanities community, and therefore results from the survey cannot be taken to be statistically indicative of the Digital Humanities as a whole. However, the survey responses do give an qualitative guide to the approach and opinion of those who routinely use twitter as part of their professional Digital Humanities activities. The small qualitative study of the top Twitter users from the Digital Humanities conferences indicates that a relatively small

percentage are early adopters of the technology with 2 respondents (18.2%) holding Twitter accounts for over 24 months. It may be expected that this percentage would be higher due to the nature of the Digital Humanities community, who tend to be early adopters of new technologies. 4 respondents (36.4%) of those questioned have had active twitter accounts for 12-18 months and 2 respondents (18.2%) have been active for 0-12 months.

The respondents of the survey reported that the main motivation for using Twitter is to keep up to date with what is going on in the Digital Humanities sector (10 respondents 90.9%) as well as for professional development (7 respondents 63.6%) and developing existing networks (5 respondents 45.5%) (Fig 10). The open ended responses strongly support this, with the majority of respondents stating that the main benefit of using Twitter is to gain to up to the minute Digital Humanities news, strengthening collegial relationships, maintaining connections with those in the field as well as being able to see who is working on similar research.

> Respondent 1: I've been able to connect with other scholars who are working on topics that are related to my research. Since most schools only need one person in a particular specialty, Twitter allows me to stay connected with colleagues whose work is more closely aligned with my own. It's also allowed me to discover new people whose work is related but falls outside of my specific discipline. I now know many more history and American studies scholars than I did before.

> Respondent 7: Keeping up with what's going on in the DH community, making connections with others in that community, and maintaining those connections.

> Respondent 8: Twitter is a very effective means of keeping abreast with news and information in my areas of professional and personal interest.

The majority of respondents (9 respondents 81.8%) use Twitter more in a conference setting than normal everyday use (Fig 11), suggesting that the conference environment is conducive to academic Tweeting. The respondents stated several key reasons for the purpose of Tweeting during conference proceedings including to take notes and share information, to aggregate points to attendees and non attendees, to report on proceedings, to hold discussions, to record thoughts and to create a personal record which can be reflected on at a later date.

> Respondent 1: First, to let people who are not at the conference know what is happening. Second, to communicate with others who are at the conference; it allows us to have a backchannel discussion to what is going on in the current presentation. Third, to form my own thoughts and create a record of notes of what I've seen and/or learned. Fourth, to share additional materials, such as links, etc., that are related to the presentation at hand.

> Respondent 4: 1.reporting out to people who aren't there, 2. note taking, but in public, 3. backchannel

These responses follow very closely the categories used to reflect user intentions, suggesting that the categories are representative of Twitter user intentions in a conference environment.

Main Motivations for Using Twitter by DIgital Huanities Respondents
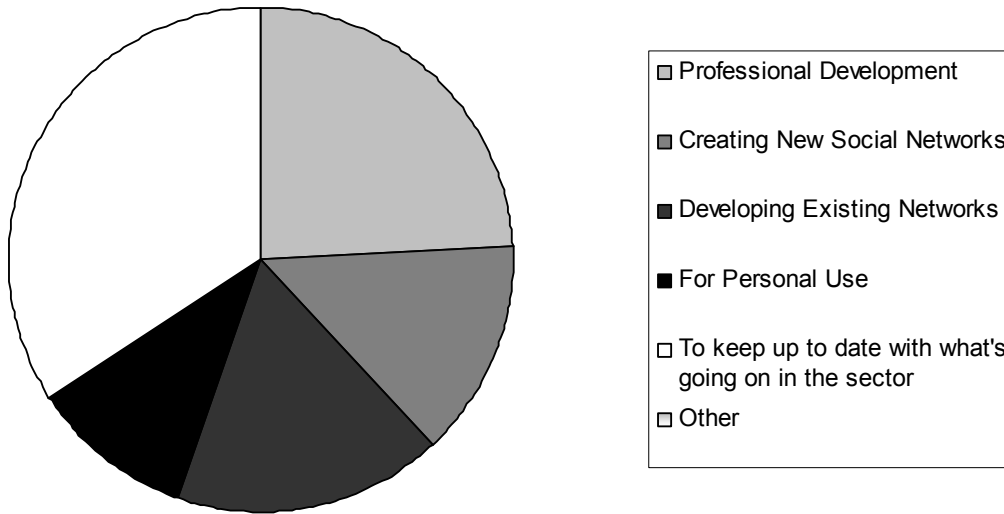

Fig 10: Graph showing the main motivations for using Twitter by the respondents to the small qualitative study, highlighting professional development and keeping up to date with the sector as the key motivations.

How Digital Humanities Respondents use Twitter Differently at Conferences from Normal Twitter Use
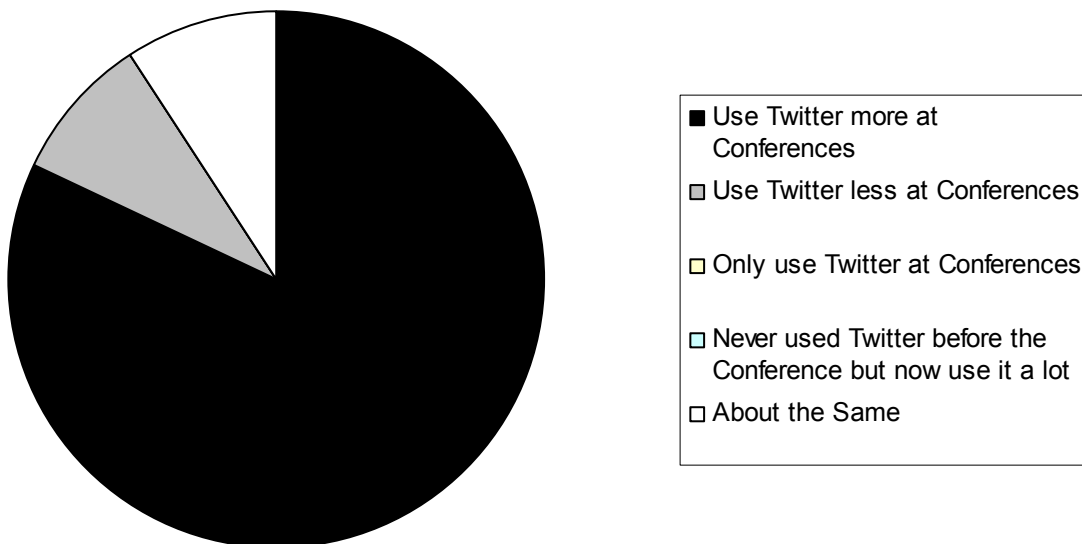
Fig 11: Graph showing the how respondents Twitter usage differs from normal use, strongly indicating that that the conference environment is conducive to academic Tweeting due to respondents using Twitter more in conference settings.

7 respondents (63.6%) always used the specific conference hashtag (Fig 12), suggesting that the convention of hashtagging content, topic and events is common practice which implies that the use of the conference hashtags does establish visible commentary and discussion within the community and provides a relatively reliable and searchable archive of events (should tweets be saved for future use).

Digital Huanities Respondents Usage of the Conference Hashtags to Identify Tweets (#dh09, #thatcamp, #drha09, #drha2009)
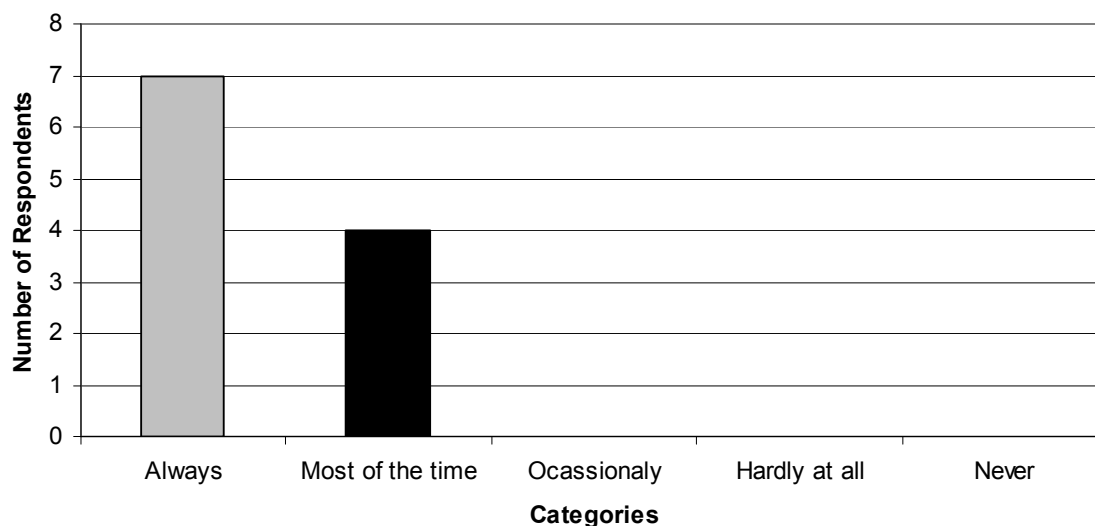

Fig 12: Graph showing the how respondents utilized the Conference Hashtags in the content of the Tweets, the majority always attached the specific conference hashtag to Tweet content.

Respondents were asked their opinion on whether or not a Twitter enabled backchannel encourages a more participatory conference culture. The majority of responses stated that the Twitter enabled backchannel does encourage participation. One respondent, however, was unimpressed by conference backchannels, finding them distracting and concluding that Tweeting should be 'silent and discreet',which contrasts another respondents view that backchannels should be visible.

> Respondent 8: I have been unimpressed by backchannels presented on conderende podiums behind speakers. I find they distract from the presentation. I think tweeting should be silent and discreet.

Respondent 4: Only if it's visible to all, while the talk is happening. Doesn't have to be prominent, but should be obvious.

Several respondents also raised the concern that backchannel use could have negative effects, suggesting that users should be civil.

Respondent 10: I think so, yes, although as with any online social medium, we should be mindful to be civil and not, say, gang up on a speaker.

Many respondents also believe that a participatory Twitter enabled backchannel is an interesting dynamic that needs to be explored in further detail.

Participation in a Twitter enabled backchannel may depend on users' roles in the conference setting. Therefore to learn about the respondents roles at the Digital Humanities conferences the survey asked for clear information about their participation at the events (Fig 13).

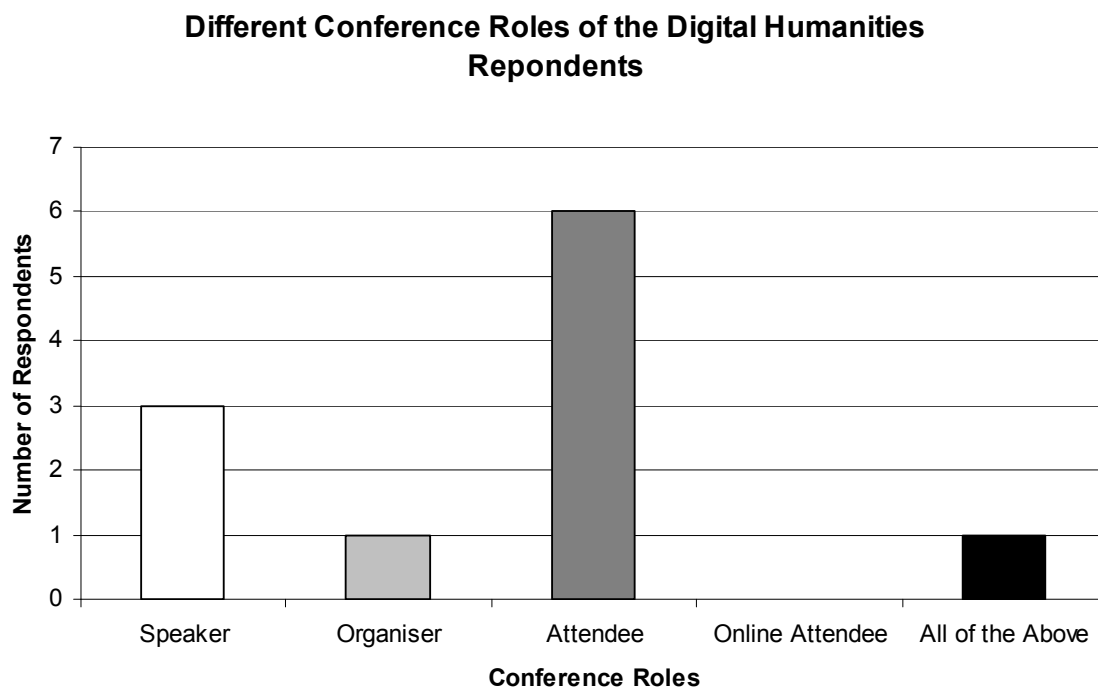**Different Conference Roles of the Digital Humanities Repondents**

Fig 13: Graph showing the different roles of the respondents at the Digital Humanities Conferences

This data provides inconclusive evidence as to whether Twitter users' conference roles have a bearing on backchannel use, as all roles were utilized by the highest Tweeters in the DH data set. The survey enquired into the respondent's experiences of their ability to follow conferences on Twitter, if they were not physically

attending. The majority of respondents felt that it was fairly easy to follow an event online, particularly when Tweeters are reporting on the presentations. The ease of following conference proceedings online via a Twitter enabled backchannel raises the question of Tweets from online attendees. Do the user intentions differ from those of the physical conference attendees? Is one more for reporting and the other more conversational? This is a key issue that should be investigated further particularly the difference in Twitter use between speakers and attendees and the issue of individuals Tweeting and using conference hashtags whilst not actually physically attending the event is something that needs to be addressed in future research. These issues and the inability of the data set to provide substantial evidence highlights one of the main difficulties in looking at a data set of conference Tweets after the event has taken place; there is no way of qualifying the data in order to gain a deeper insight into the users themselves, so it is necessary to strongly focus on the content of the Tweets.

This small qualitative survey seems to indicate that the conference environment is conducive to Tweeting, allowing users to aggregate proceedings for other attendees (both physical and online) in essence acting like social reporters. A Twitter enabled backchannel does seem to encourage a participatory conference culture and Twitter as a tool is becoming incredibly useful to the Digital Humanities community.

5. Conclusion

This study of Digital Humanities conference Tweets provides an insight into the Digital Humanities community of practice, and how academics use twitter in a conference based setting. Digital Humanists have, historically, been quick to adopt emergent media to aid their own tasks. The use of Twitter as a platform for conference backchannels enables the community to expand communication and participation of events amongst its members. This enhanced participation allows the Digital Humanities community to co-create knowledge ensuring that the 'collaborative knowledge of the community is greater than any individual knowledge' (Johnson 2001, 31). The digital backchannel constitutes a multidirectional complex space in which the users make notes, share resources, hold discussions and ask questions as well as establishing a clear individual online presence. This enables members of the Digital Humanities community to 'feel connected' (Wenger at al 2002, 17).

While determining individual user intentions in Twitter in a conference setting is challenging, it is possible to describe broad behavioral trends of Tweeting during Digital Humanities conferences. The predominance of note taking suggests that the DH community could be classed as social reporters, commenting on the conference presentations for outsiders, rather than collaborating during the conference. There was also a tendency for a small group of users to produce the majority of Tweets, interacting with each other about other matters. This suggests the close knit nature of the DH researcher community, but may also be somewhat intimidating for those new to the field or conference. The potential for negative effects of conference Tweeting suggest that the community of practice should consider the implications of using a digital backchannel as conference enhancer. Conference organizers could introduce a form of group censorship (Codgill et al 2001) or develop a form of digital backchannel etiquette, allowing users to monitor themselves as well as other contributors. This would

enable the community to become the authority of what is appropriate in any particular conference backchannel discourse.

A key difficulty in looking at a data set of conference Tweets after the event has been presented: there is no way of qualifying the data in order to gain a deeper insight into the users themselves, therefore it is necessary to strongly focus on the content of the Tweets. Additionally, routinely used textual analysis tools cannot be applied to corpora of tweets in a straightforward manner, due to the creative and fragmentary nature of language used within microblogging. Given that twitter is becoming increasingly important for academic communities, new, dedicated methodologies for the analysis and understanding of Tweet based corpora are necessary.

The use of digital backchannels is facilitating a change for conference events from largely one-to-many ephemeral broadcasts to exchanges with increasing interaction between speaker and audience, and between participants both local and remote either in space or time. With the increasing prevalence of Twitter enabled backchannels in academic conference environments it is possible to present digital backchannel communication as a viable tool for the co-construction of knowledge within a community of practice. However, this argument is by no means complete or definitive. Those who participate in digital backchannel communication, whether organizers, speakers or attendees, must understand and confront the visibility, user awareness and potential negative factors, in order to influence the construction the Twitter enabled backchannel as a effective conference tool; one which fully encourages a participatory conference culture both in the front and backchannel setting. The Twitter enabled backchannel thus raises questions about the nature of conference participation and whether or not it is helped or hindered by a digital backchannel. Rather than mere whispering in class, the Twitter record produced at each of the conferences featured here provides important, although transient, evidence regarding how Digital Humanities, as a community of practice, functions and interacts. An analysis and understanding of tweet based corpora can therefore inform our understanding of academic events, and the academic appropriation and application of social media.

References

1.   Anderson, C. (2008). The Long Tail. 2nd ed. New York: Hyperion

2.   Anderson, R. J., Anderson, R., VanDeGrift, T., Wolfman, S. A., and Yasuhara, K., (2003). Promoting Interaction in Large Classes with Computer Mediated Feedback. CSCL 2003. Computer Supported Collaborative Learning, pp. 119-123, Bergen, Norway, 2003. Available from: www.cs.virginia.edu/~rea9x/papers/cscl-2003-cfs-sp.pdf (accessed on 18 October 2009).

3.   Aw, A., Zhang, M., Xiao, J., Su, J. (2006). A Phrase-based Statatistical Model for SMS Text Normalization Proceedings of the COLING/ACL 2006 Main Conference Poster Sessions, ppages 33–40, Sydney, July 2006. Available from: http://portal.acm.org/citation.cfm?id=1273078 (accessed on 14th December 2009)

4.   Boyd, D. (2009). Spectacle at Web2.0 Expo... from my perspective. (online). Available from: http://www.zephoria.org/thoughts/archives/2009/11/24/spectacle_at_we.html (accessed on 25th November 2009)

5.   Boyd, D. and Ellision, N. (2007). Social Network Sites: Definition, History and Scholarship. *Journal of Computer-Mediated Communication*, *13*(1), article 11. Available from: http://jcmc.indiana.edu/vol13/issue1/boyd.ellison.html (accessed on 5 November 2009).

6.   Boyd, D., Golder, S., Lotan, G. (forthcoming). Tweet, Tweet, ReTweet: Conversational Aspects of ReTweeting on Twitter. *Proceedings of HICSS-43*. Kauai, HI: IEEE Computer Society. January 5-8, 2010. Available from: http://www.danah.org/TwitterResearch.html (accessed on 5 November 2009).

7.   Cogdill, S., Kilborn, J., Fanderclai, T.L., Williams. M.G. (2001). Backchannel: Whispering in Digital Conversation. In Proc. of the 34th Hawaii International Conference on System Sciences (HICSS 2001); IEEE Press. Available from: http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=926500 (accessed on 18th October 2009).

8.   Costa, C., Beham, G., Reinhardt, W., Sillaots, M. (2008). Microblogging In Technology Enhanced Learning: A Use-Case Inspection of PPE Summer School 2008. In, Microblogging in technology enhanced learning conferences: A use case Inspection Workshop at the European Conference on Technology Enhansed Learning 2008. Maastricht, the Netherlands Available from: http://www.know-center.tu-graz.ac.at/content/download/1650/8519/file/2008_ccosta_microblogging.pdf (accessed on 15th October 2009).

9.   Efimova, L., & de Moor, A. (2005). Beyond personal webpublishing: An exploratory study of conversational blogging practices. In Proceedings of the 38th Hawaii International Conference on System Sciences (HICSS-38) pp. 107- 118. Available from: https://doc.novay.nl/dsweb/Get/File-44480 (accessed on 26th November 2009)

10.   Efimova, L., Hendrick, S. (2005). In search for a virtual settlement: An exploration of weblog community boundaries. Paper presented at the Second International Conference on Communities and Technologies 05, Milan, Italy. Available from: https://doc.telin.nl/dsweb/Get/Document-46041/ (accessed on 26th November 2009)

11.   Fluharty, S. (2010). Gender Breakdown for Followers of Digital Humanties on Twitter. (Online). Avaliable from: http://groups.google.com/group/digital-humanities-barriers-to-participation/browse_thread/thread/c171876be52a8511 (accessed on 22nd January 2010)

12.   French, A. (2010). Make "10" Louder, or, The Amplification of Scholarly Communication. (Online). Available from: http://amandafrench.net/2009/12/30/make-10-louder/ (accessed on 7th January 2010)

13.   Grossseck, G., Holotescu, C. (2008). Can We Use Twitter for Educational Activities? E-Learning and Software for Education. Available from: http://www.scribd.com/doc/2286799/Can-we-use-Twitter-for-educational-activities (accessed on 18th October 2009)

14.   Jacobs, N. and Mcfarlane, A. (2005). Conferences as Learning Communities: Some early lessons in using 'back-channel' Technologies at an Academic Conference- Distributed Intelligence or

Divided Attention. Journal of Computer Assisted Learning, Volume 21, Number 5, October 2005 , pp. 317-329(13). Available from:

http://www.ingentaconnect.com/content/bsc/jcal/2005/00000021/00000005/art00001 (accessed on 15 October 2009).

15.   Jansen, B.J., Zhang, M., Sobel, K., Chowdury, A. (2009). Twitter power: Tweets as electronic word of mouth. In Journal of the American Society for Information Science and Technology, 60, 11. pp. 2169-2188. Available from: http://www3.interscience.wiley.com/journal/122467185/abstract (accessed on 18th October 2009)

16.   Java, A., Song, X., Finin, T., Tseng, B. (2007). Why We Twitter : Understanding Usage and Communities. In WebKDD/SNA-KDD '07: Proceedings of the 9th WebKDD and 1st SNA-KDD 2007 workshop on Web mining and social network analysis pp. 56-65. Available from: workshops.socialnetworkanalysis.info/websnakdd2007/.../submission_21.pdf (accessed on 6th October 2009)

17.   Johnson, C. M. (2001). A survey of current research on online communities of practice. The Internet and Higher Education, 4(1), 45-60.

18.   Karger, D. R., Quan, D (2005). What would it mean to blog on the semantic Web? Web Semantics: Science, Services and Agents on the World Wide Web

Volume 3, Issues 2-3, October 2005, pp. 147-157. Available from:

http://www.sciencedirect.com/science/journal/15708268 (accessed on 18th October 2009).

19.   Kellog, W.A., Erickson, T., Wolf, T.V., Levy, S., Christensen, J., Sussman, J., Bennett, W.E. (2006). Leveraging Digital Backchannels to Enhance User Experience in Electronically Mediated Communication. Available from: http://portal.acm.org/ft_gateway.cfm?id=1180943&type=pdf (accessed on 18th November 2009).

20.   Kelly, B. (2009). (TwitterFall) Your're My Wonder Wall. UK Web Focus: Reflections on the Web and Web 2.0. (Online). Available from: http://ukwebfocus.worpress.com/2009/04/20/twiterfall-youre-my-wonder-wall/ (accessed on 18 October 2009).

21.   Kiesler, S., Siegal, J., McGuire, T.W. (1984). Social Psychological Aspects of Computer-Mediated Communication. American Psychologist. Vol. 39, No. 10, pp1123-1134. Available from: http://psycnet.apa.org/journals/amp/39/10/1123.pdf (accessed on 11th January 2010)

22.   Kolbitsch, J. (2007). Kōrero: An Integrated, Community-Based Platform for Collaboration. International Conference on Knowledge Management (ICMK'07), Vienna, Austria, August 27th-28th, 2007, pp. 1-13. Available from: http://www.kolbitsch.org/research/papers/2007-Korero.pdf (accessed on 15 October 2009).

23.   Krishnamurthy, B., Gill, P., Arlitt, M. (2008). A few Chirps about Twitter. In Proceedings of the first workshop on Online Social Networks, pp. 19-24. Available from:

http://portal.acm.org/citation.cfm?id=1397741 (accessed on 15th October 2009)

24.   Ling, R. and Baron, N.S. (2007). Text Messaging and IM. Journal of Language and Social Psychology, Vol. 26, No. 3, pp 291-298. Available from: http://jls.sagepub.com/cgi/content/abstract/26/3/291 (accessed on 14th December 2009)

25.	Luzon, M. (2008). Scholarly hyperwriting: The function of links in academic weblogs. In Journal of the American Society for Information Science and Technology, 60, 1. pp. 75-89. Available from: http://www3.interscience.wiley.com/journal/121394128/abstract?CRETRY=1&SRETRY=0 (accessed on 26th November 2009)

26.	McCarthy, J.F. and Boyd, D. (2005). Digital backchannels in shared physical spaces: Experiences at an academic Conference. In Proceedings of the Conference on Human Factors in Computing Systems. Available from: http://portal.acm.org/ft_gateway.cfm?id=1056986&type=pdf (accessed on 15 October 2009) .

27.	McNely, B.J. (2009). Backchannel Persistence and Collaborative Meaning Making. Proceedings of the 27th ACM international conference on Design of communication. Bloomington, Indiana. Pp, 297-304. Available from: http://portal.acm.org/citation.cfm?id=1621995.1622053 (accessed on 15th October 2009).

28.	Michéle, J. (2009). When Social Technologies Become Antisocial. (Online). Available from: http://www.opposableplanets.com/leadership/2009/11/when-social-technologies-become-antisocial/ (accessed on 25th November 2009)

29.	Nardi, B.A., Schiano, D.J., Gumbrecht, M., & Swartz, L. (2004). Why we blog. In Communications of the ACM , 47(12), pp. 41-46. Available from: http://portal.acm.org/citation.cfm?id=1035134.1035163 (accessed on 15th October 2009)

30.	Nielson, J. (2006). Alertbox Participation Inequality: Encouraging More Users to Contribute. (Online). Available from: http://www.useit.com/alertbox/participation_inequality.html (accessed on 11th January 2010).

Nonnecke, B. and Preece, J. (2000). Lurker Demographics: Counting the Silent. In Conference on Human Factors in Computing Systems. Proceedings of the SIGCHI . pp73-80. Available from: http://portal.acm.org/citation.cfm?id=332040.332409&type=series (accessed on 11th January 2010)

31.	Reichelt, L. (2007). Ambient Intimacy. (Online). Available from: http://www.disambiguity.com/ambient-intimacy (accessed on 5 November 2009).

32.	Reinhardt, W., Ebner M., Beham G., Costa, C. (2009). How People are using Twitter during Conferences. In, Hornung-Prähauser, V., Luckmann, M. (Ed.) 2009. Creativity and Innovation Competencies on the Web, Proceeding of 5. EduMedia Conference. Pp. 145-156. Available from: http://lamp.tu-graz.ac.at/~i203/ebner/publication/09_edumedia.pdf (accessed on 6th October 2009).

33.	Stuart, K. (2006). Towards an analysis of academic weblogs. Revista Alicantina de Estudios Ingleses , 19, pp. 387-404 Available from : rua.ua.es/dspace/bitstream/10045/5206/1/RAEI_19_21.pdf (accessed on 26th November 2009)

34.	Wenger, E. (1998). Communities of practice: learning, meaning, and identity. New York, Cambridge University Press

35.	Wenger, E., McDermott, R., & Snyder, W. M. (2002). Cultivating communities of practice: A guide to managing knowledge. Boston, MA: Harvard Business School Press.

36.	Yardi, S. (2008). Whispers in the Classroom. In McPherson, T. (Ed.). Digital Youth, Innovation and the Unexpected, The John D. and Catherine T. MacArthur Foundation Series on Digital

Media and Learning, pp. 143-164. Cambridge, MA: MIT Press. Available from:

http://mitpress.mit.edu/catalog/browse/browse.asp?btype=6&serid=170 (accessed on 5 November 2009)

37.   Ynge, V. (1970). On getting a word in edgewise. In Campbell, M.A. (Ed). 1970. Papers from the Sixth Regional Meeting of Chicago Linguistic Society, Chicago Linguistic Society, Chicago, pp. 567–577.

38.   Zhao, D., and Rosson, M.B. (2009). How and why people Twitter: the role that micro-blogging plays in informal communication at work. *Proceedings of the ACM 2009 international conference on Supporting group work.* ACM: Sanibel Island, Florida pp. 243-252. Available from:

http://portal.acm.org/citation.cfm?id=1531710 (accessed on 15th October 2009)

---

[i] Data analytics provider, Pear Analytics concluded from their study of Tweet Content that 40.55% of tweets are pointless babble. http://www.pearanalytics.com/wp-content/uploads/2009/08/Twitter-Study-August-2009.pdf

[ii] Twitter was created by a San Francisco based privately funded startup and launched publicly in August 2006. http//:Twitter.com/about

[iii] The community aspect of Twitter means that participants self organize, instigating tags themselves, hence the participants of Digital Resources in the Arts and Humanities used two different hashtags to discuss the conference depending on the Twitter user.

[iv] www.twapperkeeper.com, The early Tweets from one conference (DH09) were not archived, and had to be recovered manually from users Twitter streams. This was done by Peter Organisciak and Alejandro Giacometti. The Twapper Keeper archives for the three Digital Humanities conferences can be found at: http://twapperkeeper.com/dh09/, http://twapperkeeper.com/thatcamp/, http://twapperkeeper.com/drha09/ and http://twapperkeeper.com/drha2009/

[v] Twitter analysis tools include http://twitteranalyzer.com/, http://www.twitalyzer.com/, http://trendistic.com/, http://twitturly.com/, http://tweetstats.com/, although these tend to focus on analysis of networks surrounding individual users names, instead of individual hashtags. As such, they were not appropriate for our purpose.

[vi] http://portal.tapor.ca/portal/portal a text analysis portal for research

[vii] http://www.web2expo.com/

[viii] http://www.antlab.sci.waseda.ac.jp/software.html