

# ***Exchanges: the Warwick Research Journal***

**Volume 1, Issue 1, October 2013**

<http://exchanges.warwick.ac.uk>

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## **Abstract**

*In recent years, researchers, social commentators and the mass media have turned their attention to shifts in the use of social media for political and social action. This article provides an overview of the recent discussions focusing on how Twitter specifically functions as a mediating tool for social acts. We present findings from a recent pilot project exploring the mechanics of disseminating information via Twitter across a dynamic human network in order to contribute to an understanding of how people use social media to share information and prompt others into action, and outline some approaches for performing this analysis. Taking the perspective of communities of users operating in hybrid spaces, we make recommendations for further research in this field.*

## **Keywords**

Twitter, hybrid spaces, social networks, social acts, information flow

## **Introduction**

We are witnessing a paradigm change in collective mobilisation ... from *solidarity* to *fluidarity* ...from *collective mobilisation* to the mobilisation of a collective of people and technologies ... a hybrid crowd. (Lasen & Martinez de Albeniz, 2011:155)

In recent years, researchers, social commentators and the mass media have turned their attention to shifts in the use of social media for political and social action. Since its launch in 2006, the microblogging platform ‘Twitter’ has become increasingly popular and powerful in assisting the ordinary person make public ‘acts’ of information sharing and social commentary. Gillan and Merchant (2013) argue that it has achieved “a new level of institutionalisation as it features in legal cases, debates about privacy, and political intrigue” (2013:47).

In its broadest sense, we conceptualise these social acts, along with phenomena supported by social media such as flash mobs and even more violent happenings such as riots, as a form of desired social ‘mobilisation’. The concepts of ‘hybrid spaces’ – merging people, technologies, and online spaces - and ‘homophily’ - the principle that we tend to be similar to our friends - can offer a useful lens through which to understand how people are persuaded to come together virtually and physically.

In this article, we discuss recent literature that reveals recent perspectives on the role of social media in social networks and movements. Building on this, we discuss the functions of Twitter and the potential role it can play in mediating social acts and find that closer studies of the ‘Individual User – Tool (Twitter) – Other User’ interface may contribute greatly to our understanding of the possibilities for this tool in social network formation and how individuals and communities collectively create meaning and make sense of the world around them. In order to provide a ‘real world’ example we present the methodology and findings of a recent empirical pilot study that created an open interactive Twitter event on a University campus giant video screen in order to investigate how Twitter functions as a mediating tool between direct human engagement and that individual working within a group or ‘network’. We intentionally created a cross-discipline research team to bring a range of expertise and to explore the possibilities for a mixed methods approach, and we reflect this in the format of the article, through the collaborative authorship and through the findings that are based on qualitative data and computational modelling. We conclude that effective ways of mapping a social network can reveal its information flow, connectedness, and communities, as well as give a sense of more complex triangular relationships and homophily. By combining a data-driven, network analysis approach with a sociologically driven qualitative analysis it is possible to derive a deeper insight into the operation of a hybrid network than is possible through using one approach in isolation.

## **Recent perspectives on the role of social media in social networks and movements**

### *The forming of social networks*

Social networks can be defined as “social structures that can be represented as...sets of *nodes* (for social system members) and sets of *ties* depicting their interconnections” (Wellman and Berkowitz 1988, cited in Zhao et al 2011:5). Actors in a network can be individuals, groups or

organisations that are connected in some way via certain relationships. However, these relationships do not exist in vacuum as we are located in different places from and to which we share information. This is what forms our ‘network society’ (Castells 2000). Our interaction with the external physical world is in part mediated by the technological tools we are both presented with and choose to carry about our person. Through our phones, tablets, and even simple cameras and music devices, we are able to reflect upon, capture, and connect with a place in a moment in time. Alternatively humans can make connections to other networks and be transported elsewhere or bring that other to where we are (de Souza e Silva & Delacruz 2006).

Social media plays a dual role in acts for social change: communication across the network of participating actors, but also sharing commentary across a wider network of onlookers. It comprises content, user communities and Web technologies, and networks, which mean that new ideas spread very quickly (Ahlqvist et. al. 2008). The principle that we tend to be similar to our friends – ‘homophily’ – is important in determining the information that we are exposed to and share within these particular relationships; including as friends on Facebook or followers on Twitter. Social selection – the circumstances that determine the people we are friends with - and social influence - the way we ‘fit in’ with these friends - play a part in network formation (Easley & Kleinberg 2010). Nevertheless, “a social network exists only if the users gain from cooperation and have the incentives to interact with one another. Therefore, to understand the necessary conditions for the formation of media-sharing social networks, we must investigate when and how users collaborate.” (Zhao et al 2011:167).

Due to the membership of many media-sharing social networks being voluntary and unregulated, the ‘connectivity’ or degree of connection between the multiplicity of communication networks can be varied (Kluitenberg 2006). The users’ cooperation cannot be guaranteed, giving rise to potential strategies employed by others to encourage such cooperation (Zhao et al 2011). Without any explicit attempt by the user, neighbour-copying can still occur where the individual mimics the behaviour of the closest individual. In everyday decision-making an information cascade occurs when people observe the actions of others and then make the same choice that the others have made, independently of their own private information signals.

### *Types of social acts*

Gillan and Merchant (2013) define some of the key ways Twitter is used based on their dual auto-ethnography: citizen journalism, political activism, maintaining a fan-base, event back-channel, corporate advertising, service marketing, crowd-sourcing, informal social-networking, and ambient sociability (alone but communicating with friends). Murthy stresses that activism needs strong ties not weak ones and “Twitter is about loose networks of ‘followers’ rather than a structured organisation with leadership” (Murthy 2013:101), although here he is talking about large scale political movements rather than the social media-organised publicity ‘flash mobs’ we might be accustomed to in town centres. A closer study of the ‘Individual User – Tool (Twitter) – Other User’ interface may contribute greatly to our understanding of the possibilities for this tool in social network formation and how individuals and communities collectively create meaning and make sense of the world around them.

### **The role of twitter as a mediating tool for social acts**

#### *Hybrid network society and invisible technology*

Where technology and communication networks are interwoven with social and political functions, a ‘hybrid space’ is created (Kluitenberg 2006). However, the technology potentially becomes invisible as it disappears from people’s awareness, due to its frequent use and embedding in our everyday acts and the small and subtle appearance of the physical devices and the physical action required to control them. Manovich (2002) argues that spaces are continually enriched with technology, but only become activated or ‘augmented’ when a specific function is required, for example, one engages with other spaces through a wireless connection. Nevertheless, this human action, although utilising the Web, will also rely on the importance of (occupying) physical space (Jurgenson, 2011: 86).

Heidegger (1977) conceptualises technology as a “man-made means to an end established by man”. By conceptualising the human-tool interface as operating in a hybrid space, we are moving towards an understanding of communication and public ‘voice’ not so much objectively mediated by tools but as human social acts taking place in the same virtual reality space as the mundane and everyday acts that are shared and commented on by individuals and their ‘friends’.

This blurring of boundaries is an important element to consider in studies of the nature of interaction via social media.

*The functions of Twitter and the user interface*

Twitter is a micro-blogging service that allows users to post updates of a maximum length of 140 characters, published in reverse chronological order on their Twitter homepages. The posts - ‘Tweets’ - are intended as a response to the question “What’s happening?” This public response hints at a broader social commentary than its Facebook counterpart status update that asks “What are you doing?” or “How are you feeling?” Twitter can also be used to share photos and links to other sites, as a way of disseminating information in other forms than the simple 140-character Tweet. The user is asked three basic to-dos. Tell us what you’re doing, find some friends and follow what they’re doing, and turn on your mobile phone to update your friends on the go. In general, Tweets can be seen by all users on the medium rather than being restricted to one’s friends - anyone can instantly see a Tweet and respond to it (Murthy 2013). One does not need to ‘know’ the other user or have their permission to direct a Tweet at them, although optional anonymity and private accounts are built into the system.

Term	Meaning
<b>@ / at-mention</b>	Directs Tweets to certain users
<b>DM / direct message</b>	A private Tweet between two individuals (not published)
<b>Follower</b>	Another user who has elected to follow the user
<b>Hashtag</b>	Topic classifier; # placed before any text means a user can link their Tweet to a larger conversation on the same topic
<b>Profile</b>	Homepage equivalent with user information, followers, following and published Tweets
<b>Reply Tweet</b>	A Tweet which replies to another user(s) directly via @
<b>RT / Retweet</b>	Forwarded Tweets, written by others, viewable by followers.
<b>Timeline</b>	Real-time display of all Tweets of user and those followed
<b>Trending topics</b>	Most popular hashtags at any time.
<b>Tweet</b>	A message; restricted to 140 characters and publically available (even without having a Twitter account)

*Table 1 – Glossary of Twitter terms.*

Perceiving Tweets as mere superficial chat does not take into account the human creativity that takes place when discussions and information are combined and shared by users to create new meaning (Murthy 2013). Sturken & Thomas (2004) draw our attention to the user's own perceptions of the social media tool they are using as being relevant to the functioning of the tool:

People assign symbolic meanings to technologies. The messages we communicate about technology are *reflective*, revealing as much about the communicators as they do about the technology. (Sturken & Thomas 2004, cited in Baym 2010:23)

The dialogue between Twitter users occurs through the at-sign - @ - before another user's profile name to direct a Tweet at someone specific. Tweets can also be categorised by a 'hashtag'. Any word(s) preceded by a hash sign - # - through which the post of strangers are linked together, becoming included into a larger 'conversation' consisting of all Tweets with the same hashtag (Murthy 2013). The hashtag is a key function in the construction of networks, information cascade, and the possibility for collective social acts, as "conversations are created more organically...the discourse is not structured around directed communication between identified interactants. It is more of a stream, which is composed of a polyphony of voices all chiming in" (Murthy 2013: 3-4).

Also important is the function of the Retweet – the forwarding of Tweets written by others to one's followers. Murthy (2013) notes that this action attributes the Tweet to the retweeter, embedding the post in their profile and clearly labelled as such with the letters RT. This has a bearing on the meaning created: the information is not only shared as in 'passed along' but is given extra weight or voice by being posted by another, and is also attributed to that new individual with their own unique set of views, values, and followers.

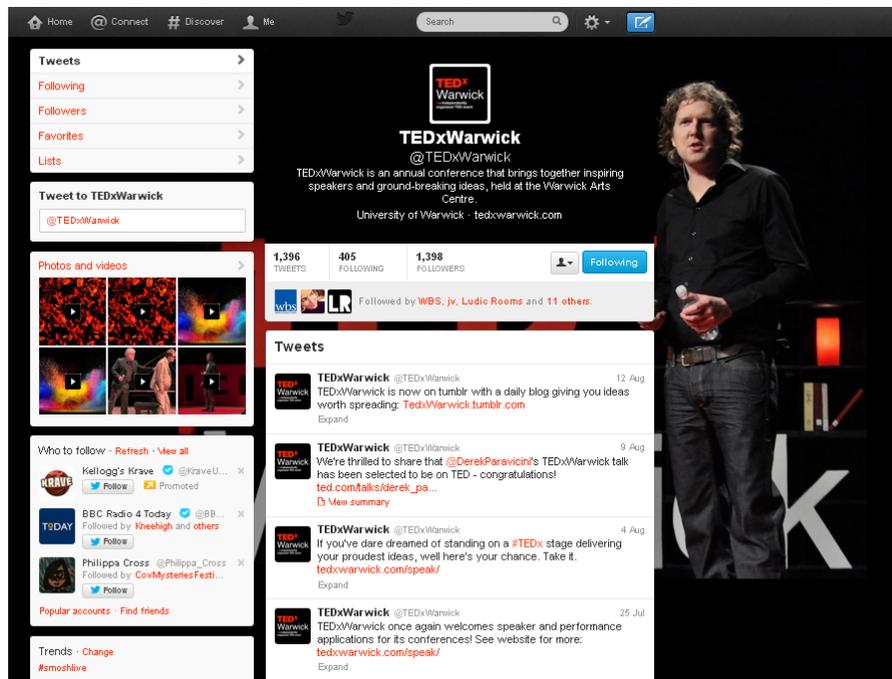


Figure 1 - The Twitter profile page of TEDxWarwick, showing the use of @, #, and RT. Accessed 21/8/13

### *Awareness of audience*

There is a stage at which individual users progress from not only controlling a new interface such as Twitter, to comprehending the social dimension inscribed in and enabled by its interface (Herwig 2009). Given the public reach of Twitter, it is not just the actual number of followers but the user's own perception of the anonymous others that may read and even retweet their original content that has a bearing on their sense of wider audience and agency in having a public voice. This is compared to Facebook where the user's number of friends "provides material evidence for the success and status of that user's constructed identity" (Charles 2012:123). Twitter networks often formed around an event of particular interest, such as a TV talent show or a sports match, where the stars are 'spoken to' by the ordinary user or the broadcaster highlights pertinent content. Here it is possible to cross a boundary and make visible and physical what is usually only virtual as a form of 'telepresence' – a term attributed to Minsky (1980) the founder of MIT's artificial intelligence laboratory, which refers to the user's perception that they are interacting with other humans as if in the same space.

## **Methodological approaches for research in tracking and analysing social acts via twitter**

### *Generating data from Twitter*

Tweets can be analysed in two distinct ways: firstly, Tweets can be analysed as individual objects with word and function content, such as Kouloumpis et al (2011), who found that the Twitter features – hashtags, emoticons, and intensifiers (such as exclamation marks) – were more useful than the word content in tracking sentiment. Secondly they can be analysed as objects that are taken up by another user – either by retweeting or the adoption of hashtags.

A number of large scale studies have taken place over the last few years, and whilst their results are perhaps not dramatically different to what one might expect, they provide important evidence and tested methodological approaches for future research in this area. Suh et al (2010) used a dataset of 74 million Tweets to identify factors associated with retweet rate, also building a predictive retweet model. They found that URLs and hashtags have strong relationships with ‘retweetability’. Perhaps unsurprisingly the number of followers, as well as the age of the account, seems to affect retweetability, although the number of past Tweets does not predict retweetability of a user's Tweet.

Romero et al (2011) collected over 3 billion messages over 6 months from more than 6 million users, analysing sources of variation in how the most widely-used hashtags on Twitter spread within its user population. They found that sources of variation in hashtag use “involve not just differences in the probability with which something spreads from one person to another...but also differences in a quantity that can be viewed as a kind of ‘persistence’, the relative extent to which repeated exposures to a piece of information continue to have significant marginal effects on its adoption.” (2011:1). Hashtags that were more politically controversial were particularly persistent, in contrast to those created within the Twitter conversational style of words joined together, such as #itsalwaysme. Romero et al concludes by saying that “some of the most significant differences in hashtag adoption provide intriguing confirmation of sociological theories developed in the off-line world” (2011:8) such as ‘complex contagion’, relating to repeated exposure to ideas, particularly those that are contentious. This is consistent with other research and literature that acknowledge the subjectivity and the motivation of the user, influencing their interaction with spaces, communities, and the tool itself. They make strong recommendations for further study including: ‘homophilly’ and influencing behaviours across

topics and categories; and a more fine-grained analysis of a population at the individual level to contribute more detailed user-level data to the emerging body of broader studies.

### *Our pilot study*

The pilot study we report on here took these key points from the review of literature and previous research studies as its starting point. We specifically aimed to explore how network links are created and reinforced at a more detailed user level, namely:

- How Tweets function as public social acts in hybrid (on and offline) spaces
- How information propagates between smaller communities of users across a wider network
- How computational analysis can be used to model hybrid (human-technology) social networks

The research required an interdisciplinary approach in its methodology. Operating from a new user account, we created the hashtag ‘#wj25’ that when used on a designated day, would allow a Tweet to be projected onto a giant public screen in a main campus thoroughfare. The giant screen was situated just behind an outdoor performance venue during the Student Arts Festival. The hashtag and screen combined to offer an incentive for participants to post as well as explore notions of wider public audience. The hashtag also gave a single indicator for gathering Tweets relevant to the ‘event’ (the live screen).

### *Mapping Social Networks*

Online Social Networks are particularly suited to computational modelling as the users and communication between them can be readily captured and analysed. Such an analysis can be split into two parts, structure and information flow, but the two are intrinsically linked. The principal idea behind analysing the structure of an Online Social Network is to identify the shape of the network; that is, to identify the users and the connections between them. In the case of Twitter this could look at followers and direct messages.

Once the shape and layout of the network has been identified, subsequent analysis can go in a number of directions. One analysis would be to identify sub-groupings or ‘communities’ of users. We define ‘communities’ as “groups of related nodes that correspond to functional subunits such as...social spheres,” (Ahn et al 2010). Furthermore, we are interested in such groups that have a large number of intra-connections but few connections to other sub-groups. A second form of analysis is to identify the important nodes in the network (see Tang et al 2010). In the case of Twitter this could help identify highly influential users: users whose Tweets reach a large number of people or who serves to transfer information from one sub-group to another.

The common abstraction in the literature for analysing the flow of information and ideas is the concept of influence and idea adoption (Cosley et al 2010). A user in the network is exposed to a number of ideas and can either adopt an idea or not. Additionally each user is influenced by its neighbours and influences them in turn. In the case of Twitter, this form of analysis could be used to look at how Retweets propagate around a network or how the use of hashtags propagates over time but could additionally be extended to look at the actual content of the Tweet for particular words or meaning.

In our pilot study, the architecture of the monitoring software was based on a client-server model with database storage. The server used the Twitter streaming API to continuously search for Tweets containing ‘#wj25’. Each Tweet was added to a moderation queue, allowing a member of the team to either publish the Tweet or keep it hidden if it contained offensive content. Each Tweet was given a score depending on the number of hashtags (#), mentions (@) and Retweets (RT).

Every 14 seconds the two highest scoring Tweets were chosen for display based on a formula<sup>1</sup>.

---

1

$$\text{Overall Score} = \frac{\text{LastAppearance} \times (5R + 2H + M)}{\text{Age}}$$

Where *Age* is the time in seconds since the creation of the Tweet, and *Last Appearance* is the time in seconds since it last appeared on the screen (or equal to *Age* if the Tweet has not yet been displayed). *R* is the number of times the Tweet has been retweeted. *H* and *M* are the number of hashtags and mentions contained in the Tweet respectively. The formula was designed to ensure that new Tweets had a high probability of being selected. The weights applied to *R*, *H*, and *M* were designed to encourage engagement with other users.

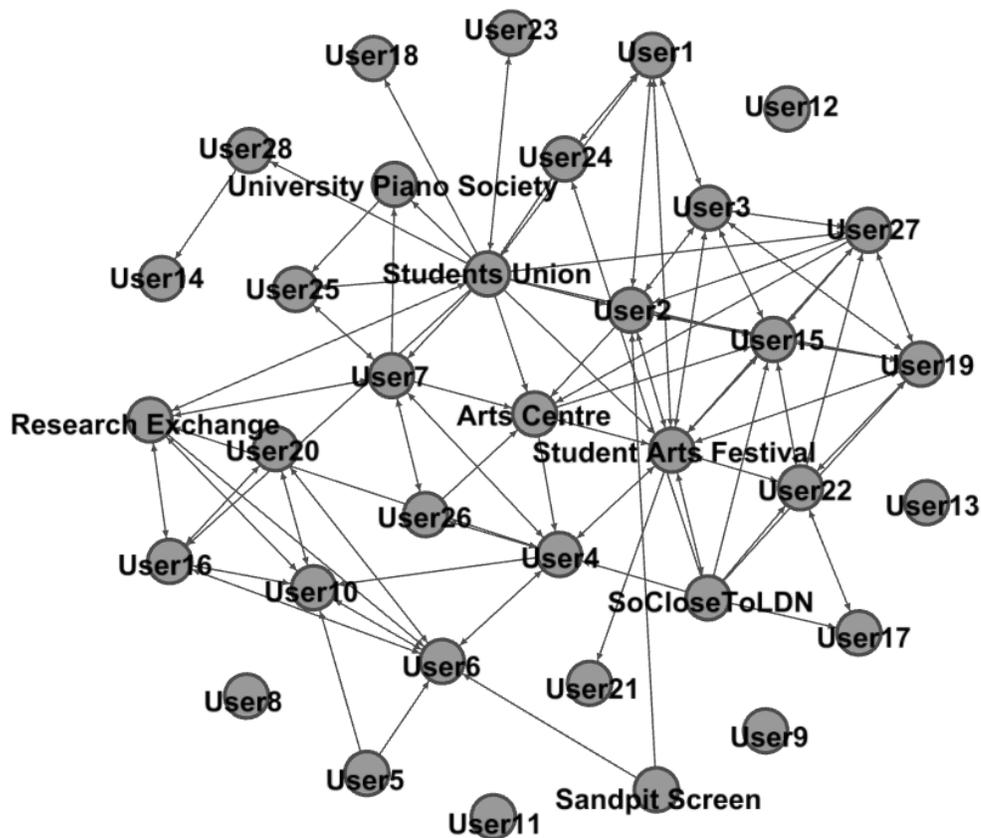
Whilst the screen and Twitter feed was 'live', two members of the research team observed the actions of people in a thoroughfare space near the screen, in particular the Arts Festival performance area, and approached individuals to complete a survey questionnaire.

### **Pilot study: initial findings**

Using a cross-discipline methodology, there a number of initial findings that respond to key areas identified in the literature: hybrid (people, technology, and event/place) spaces and telepresence; homophilly and network connections; and different types of activity.

#### *Mapping the #wj25 Network*

By collecting Tweets and noting the followship of the participants in the '#wj25' event, a database was constructed and used to recreate the network of users that emerged over the course of the event. The network data were analysed using the network analysis tool Gephi (Bastian 2009). Figure 2 shows a projection of this network data where nodes represent users and edges represent followships. Edges in the network diagrams in this paper are directed and the direction of an edge from User A to User B implies that User B follows User A. The edge directions can be seen as representing the way information (in the form of Tweets) flows from a user to their followers.



*Figure 2. The #wj25 network map showing the users that tweeted during the event and the followships that connect them into a network. Although in the public domain, personal user names have been anonymised in sensitivity rather than guaranteed anonymity.*

Figure 3 shows the network map with the nodes re-sized in proportion to the number of Tweets that the user made over the course of the event and re-coloured in proportion to the number of followers the user has. Larger nodes made more Tweets and nodes with higher colour saturation have more followers.

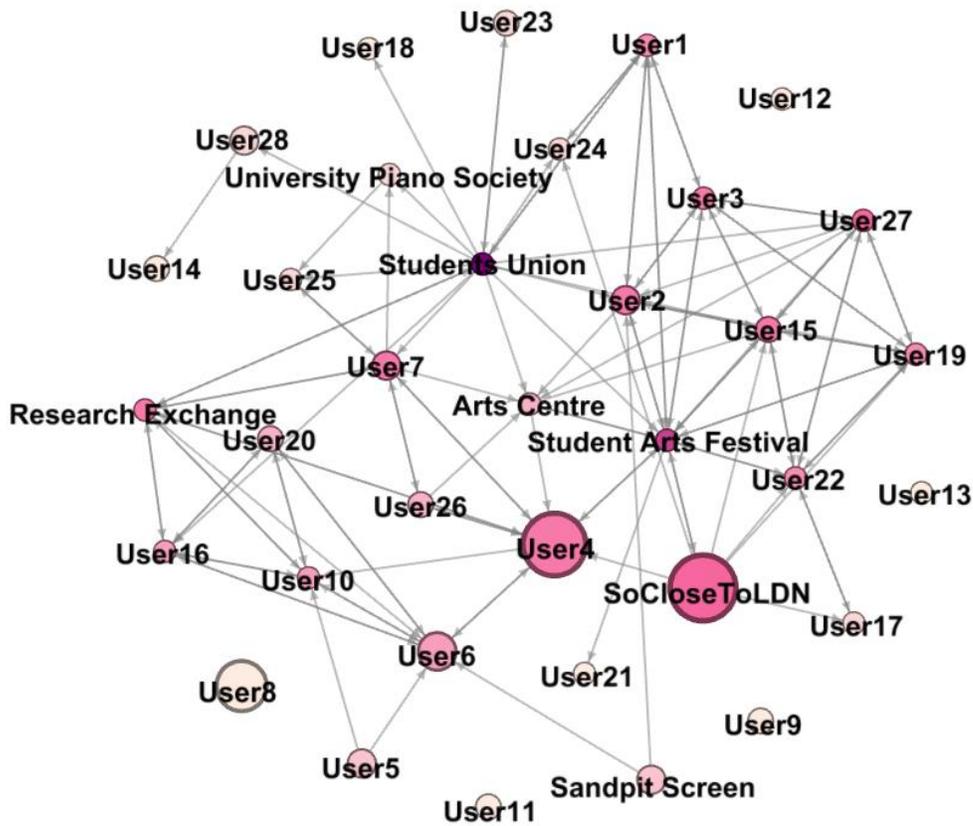


Figure 3. The #wj25 network map with node size representing tweet volume (larger nodes indicates more Tweets) and node saturation representing followers (more saturation indicates more followers)

Although small, this is a very connected network, with an unsurprising followship commonality to the Twitter account for the Arts Festival that research event was part of. However there are 5 users who participated that have no connection to other people in the network.

The survey questionnaire generated supplementary information about this network's general use of Twitter. Certainly not all those in the screen area were Twitter users and those who were used it to read news and information relating to others, which they did 2 or 3 times as much as posting themselves. Therefore the online network is a small subset of those who would have seen the screen and projected posts since there were significant numbers of people in the thoroughfare who were not necessarily avid users of Twitter.

As well as looking at followers and tweets, we examined the number of triangles in the graph. Eckmann and Moses (2002) define a triangle as a set of three users where each user in the triangle follows both of the others. The number of triangles is responsible for many phenomena, including the rapid (high number of triangles) or slow (low number of triangles) information propagation in a network (Eckmann and Moses 2002, Easley and Kleinberg 2010). In the case of Twitter in particular, the formation of a triangle guarantees higher information exposure since a reply from one user to another is displayed to the third user of the triangle as well. Therefore, the formation of triangles is a crucial parameter in the information exposure of the network and the analysis of our graph.

For the network of active users in the #wj25 network we are able to generate the data in Table 2. These measurements show that a significant subset of the active users are not only linked to one another, but also participate in and form more complex structures, such as triangles. Figure 4 shows the network map with users in triangles coloured red with the size of the node representing the number of Tweets.

<b>Total active users</b>	35
<b>Mutual Followships</b>	84
<b>Users in a triangle</b>	16
<b>Total triangles</b>	41

*Table 2. Statistics of user triangle formation for the #wj25 network.*

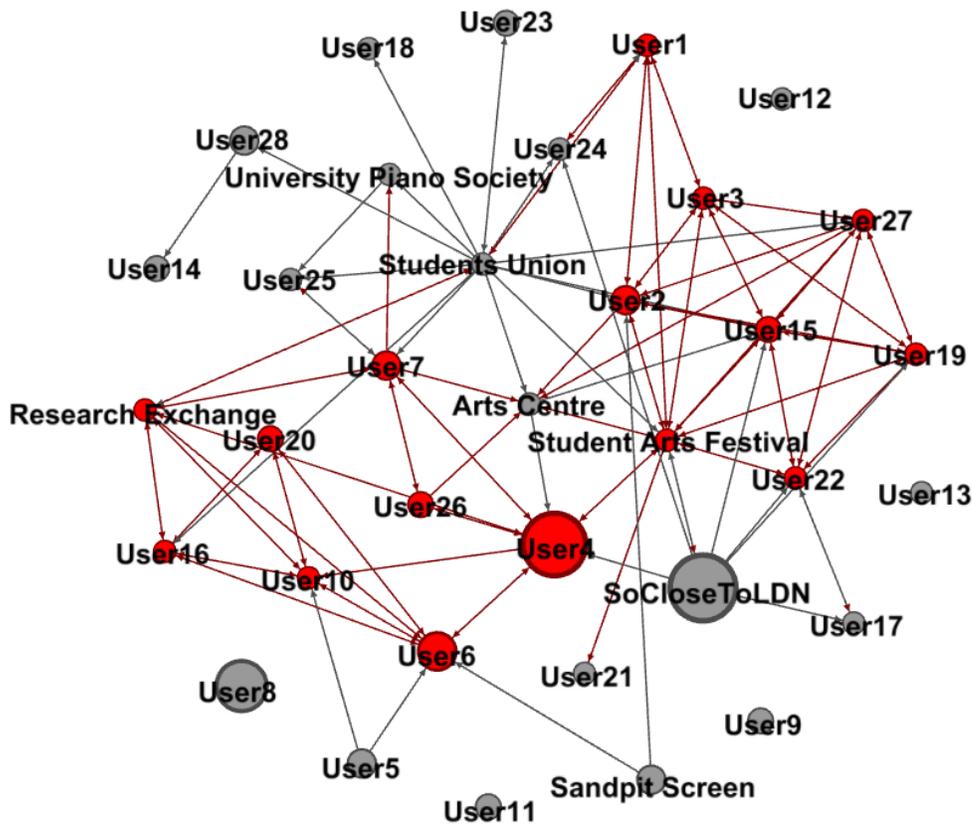
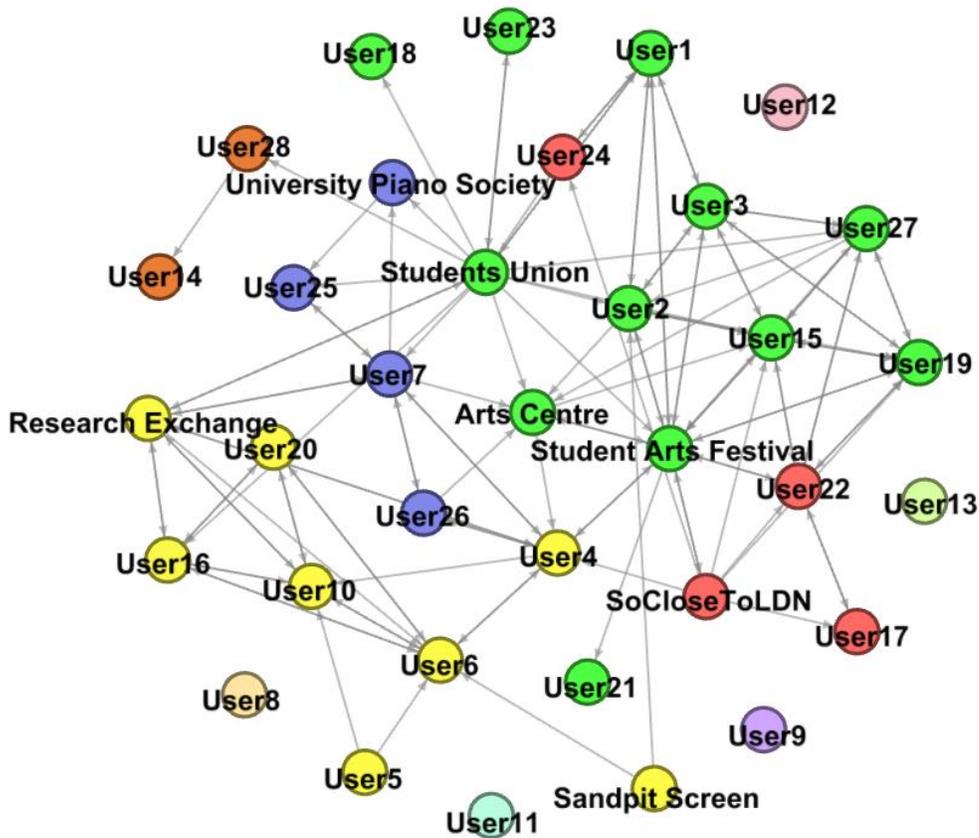


Figure 4. The #wj25 network map showing users in triangles (red colour) and their tweet volume (size)

The proportion of active users in triangles in this dataset may be linked to the formation of social, physical, ‘communities’ – such as student arts performers - and participation level of the (active) users during the event (Eckmann and Moses, 2002). Indeed, it can be seen from Figure 4 that some of the more active tweeters are part of a network of triangles, but this is not universally the case.

The Screen additionally mimicked the use of a hashtag for juxtaposing comments relating to a particular event or tangible object, in this case the thoroughfare that the screen and some performance events were situated in and the Arts Festival as a whole. In the first instance, this connects users from disparate or related communities, revealed if we establish membership identities within the network. An analysis of the network map using the algorithm developed by

Lambiotte et al (2009) splits the network into local communities based on the connections between neighbouring nodes. Applying this algorithm to the #wj25 network reveals a number of different communities within the network as shown in Figure 5:



*Figure 5. Communities discovered in the #wj25 network map. Four principal communities are identified (Yellow, Green, Red and Blue) along with one pairing (Brown) and independent users (pale)*

### *Types of Activity*

Projecting the Tweets on the giant screen mimicked the function of Twitter in sharing information and opinions with wider audience and followers. From cross-referencing the survey data and an analysis of the individual Tweet content different types of activity can be identified.

Tweets are mostly consistent with the user's principal community, supporting the hypothesis regarding homophily – that the connections and social acts made through this online medium is related to the real world similarities of interest and engagement. This is a small sample and further research with a larger data set may benefit from investigating this further. Nevertheless, we have identified clear communities within our network. As depicted in Figure 8, users in yellow are closely associated with the research project and tended to promote the event. Those in blue are closely related to the University as staff or societies, their Tweets tending to be marketing or commentary of events. Green is the largest community, based around the Student Union and the Student Arts Festival, posting for and about events, with a wider community in red formed around the fringes, representing the SoCloseToLDN online event.

Some users took the opportunity to promote the Student Arts Festival – either with straightforward 'official' information or from a more personal perspective, appreciating the event & general surroundings. Cross-referencing with the network map shows that individuals can be prompted to contribute to this marketing. This is the case with at least two users, who are not closely connected to the Student Arts Festival like others are, but still promote it in both objective/informative and subjective ways:

**@User16 Great atmospher at tocil fields in #warwickuni #wj25 (sic) [13:14.06]**

**@User23 @sandpitscreen #wj25 put on your dancing shoes and come dance with us at Warwick Folk's ceilidh at 5pm in the Atrium :D [15:06.01]**

SoCloseToLDN – a separate online event where members of the public could send players around London to get photographs of locations – were also aware of the potential added value of the screen, adding #wj25 to their own posts to generate interest and increase their remote audience. This is also a good example of telepresence, in that the event allowed members of the public to be 'virtually' in London and that this presence was projected into the thoroughfare through the screen. Other individuals used #wj25, and therefore the screen, to increase the size of their own personal and social gesture, such as saying 'hello' to a friend or thanking a friend for a drink.

### *Hybrid Spaces and Interaction Modalities*

The literature suggests that hashtag brings Tweets together as a ‘conversation’. The positioning of the screen in the physical space and the fact that it provided a window into a virtual space prompted some interesting interaction modalities from the users. As one user stated, it was a “fun way to interact without face to face chat” (Questionnaire #9). Not all posts were positive with users seizing the opportunity variously to share their disappointment that TV coverage of a tennis tournament was not being screened; deplore the waste of money that the Screen symbolised; and, for outlier @User11, to criticise the music of an outdoor concert in front of the Screen.

@User27 is an interesting example. Figure 5 shows him as part of the Student Arts Festival community, and is a user with many followers who tweets frequently in his daily life (see Figure 4). On his Twitter homepage he defines himself as an arts critic as well as a social critic, suggested by his background image of a recent on-campus protest. Instead of joining the others in marketing and personal positive promotion of the work of his community he instead chooses to criticise the University by his negative comments about the Screen. He purposefully uses the Screen itself to further publicise his own comment, enabling him to physically inhabit the very space he is challenging.

There were also some examples of users communicating in a truly hybrid way, interacting both with the Twitter space and the physical space through the medium of the screen. In these interactions information and messages are present on the Twitter network and also on the screen allowing people who are not connected to each other to see what others are posting and reply. The game of ‘I Spy’ started by @User8 and the photograph taking interactions centred around @User28 (covered below as case studies) are both examples of information flow in a truly hybrid space.

@User28 is an interesting example of interplay and the potential for a ripple effect in social behaviour. He was sat in a bar near the screen but only became engaged when he saw another person taking a photograph. He paid more attention to the projected text and made his first post:

**@User28 Just want to see if this will show up #wj25 [18:46.39]**

It did, which prompted him to then take a photo of his own post on the screen. One of the research team, @User6, noticed his desire to interact with the screen and built on @User28's own creative response, posting – from his own Twitter account – a photo of the photo; a playful interchange which was reciprocated, along with a personal recognition of the other users through the @ and a connection with a particular real-world community, the University Photography Society:



*Figure 6. The interplay on the screen and the photo of a photo.  
This image is from the user's Twitter website homepage.*

Here we have a physical act prompting a virtual act into a dialogue between users who do not follow one another. Eventually, another of @User28's followers also joins in, trying to start a

quiz. Unfortunately this was just before the screen was switched off and so we were unable to track subsequent acts:

**@User14 @SandpitScreen #wj25 let's play a game! Q – What turns in to ice faster, hot or cold water? Tweet answer to @SandpitScreen with #wj25 [19:45.39]**

@User8 is another interesting case. From the network graphs it is evident that he is unconnected in terms of inner communities but tweeted a lot. From his questionnaire we know that he particularly enjoys this kind of interactive event and posted a short farewell to the University with a sad face emoticon in the evening (it was the end of his last year as a student). Early on he initiates a game of 'I Spy' and manages to bring several other users in the physical space into the interchange. It is a particular type of dialogue as its sustainability depends not just on people using the hashtag but also entering content that plays within known rules. Rather than for an online audience it is designed for people who are occupying the same physical space and may guess appropriately (although that is not to say that others elsewhere could not). Even so, within the designs of the onscreen 'game', unless followers of participating users picked up on it and retweeted, the game would not extend very far outside of the immediate physical – and online – group of people. @User8 as the originator also gave himself particular power as he supposedly knew and could see the answer – in actual fact he did not start off with an answer in mind and was waiting for the most interesting response, exploiting his physical anonymity. From this small case we can see how an individual can become engaged and initiate social acts in others even from outlying community position. There is perhaps some attempt at inflation of personal or social status through the use of this social media platform that may be worth considering in other Twitter-based research.

In contrast to the previous two users, @SoCloseToLDN, operating the London based Virtual Tourist experience (Red in Figure 8), is well connected, although also peripheral, to the largest community (Green in Figure 8). The user repeatedly used #wj25 in order to increase audience awareness of their event but very few of their associated users did when they retweeted posts. Working on the same premise as 'I Spy' - that sustainability and growth requires an investment of posts by followers - we assume that SoCloseToLDN's followers were unaware of the potential

power of the screen and of the hashtag. This is a reminder that simple opportunities to reach a wider audience via Twitter are not fully understood or exploited for whatever reason; therefore the social act does not reach the full potential of its impact.

## **Conclusion**

Recent literature and research highlights a need for studies that consider the spread of information and creation of networks across social media within a given temporal and spatial frame, capable of analysing at both individual and community levels. Along with an exploration of suitable methods of computational modelling and integrated qualitative data, such studies will contribute to developing our understandings of our network society. Throughout the findings of the pilot study presented in this paper we have provided a rich analysis of the way in which people used Twitter and the hybrid space through the course of the #wj25 event.

By combining a data-driven, network analysis approach with a sociologically driven qualitative analysis it is possible to derive a deeper insight into the operation of a hybrid network than is possible through using one approach in isolation. We believe that closer studies of the Individual User – Tool (Twitter) - Other User interface can contribute greatly to our understanding of the possibilities for Twitter in social network formation and collective meaning making as users continue to interact with the world around them on a daily basis.

In our analysed network, Tweets operated as objective and subjective social acts that promoted ideas and events, as well as made personal social gestures. Users subconsciously and consciously operated in a hybrid space, using the physical presence of the giant screen to initiate playful dialogues and power shifts, and to entice others as active users into the social network.

By finding an effective way of mapping the social network we were able to begin to reveal its level of connectedness, and information flow through a number of smaller communities, as well as give a sense of more complex triangular relationships and homophily. This approach, as recommended by Romero et al (2011), has provided an analysis of the users at an individual level whilst also considering their place in the overall network structure. It sits well beside the many quantitative, impersonal approaches taken in much of the literature and could be expanded towards other larger studies.

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