



#qldfloods and @QPSMedia: Crisis Communication on Twitter in the 2011 South East Queensland Floods

Research Report

Media Ecologies Project
ARC Centre of Excellence for Creative Industries & Innovation (CCI)
<http://cci.edu.au/>

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We express our gratitude to the many emergency services personnel and volunteers who worked on rescue and recovery during the 2011 South East Queensland floods, in the hope that more effective crisis communication strategies using social media can play a small role in limiting the impact of future natural disasters on lives and property.

About the CCI

The ARC Centre of Excellence for Creative Industries and Innovation (CCI) was established in 2005 to focus research and development on the contribution the creative industries and their contributing disciplines make to a more dynamic and inclusive innovation system and society.

With core support from the Australian Research Council from 2005-13, it is acknowledged as a global leader in this emerging field. It is a broadly-based, cross-disciplinary, internationally-focused centre embracing both fundamental theoretical, and highly applied, research in media, cultural and communication studies, law, education, economics and business and information technology, addressing key problems and opportunities arising for Australia, the Asian region, and more broadly in the world, from innovation in and through the creative economy.

The CCI is headquartered at Queensland University of Technology in Brisbane, Australia, and involves researchers from universities throughout Australia. The University of New South Wales node is based at the Journalism and Media Research Centre.

The Media Ecologies and Methodological Innovation Project

The Media Ecologies Project develops innovative interdisciplinary methods (and new ways of combining existing methods) for media and communication studies, in order to better map, track and analyse the changing media environment. It focuses on the increasingly complex relationships among professional media outlets, online social networks, and mobile media. A specific aim of the project is to track how acute media events (like natural disasters and other crises) unfold across this complex media ecology.

EXECUTIVE SUMMARY

Social media, including *Facebook* and *Twitter*, played an important role in crisis communication at the height of the 2011 South East Queensland floods crisis (10-16 January). This report examines the role of the short-messaging system *Twitter* in disseminating and sharing crisis information and updates from state and local authorities as well as everyday citizens. We assess the overall use of *Twitter*, as well as that of the most important emergency service account, the Queensland Police's @QPSMedia account.

Key overall findings:

- The *Twitter* hashtag #qldfloods quickly became the central coordinating mechanism for floods-related user activity on *Twitter*. Hashtags are a user-generated tool for marking specific messages as relating to a particular topic or theme.
- More than 35,000 tweets containing the #qldfloods hashtag were sent during the period of 10-16 January; more than 11,600 of them on 12 January alone (the height of the flooding in Brisbane). More than 15,500 *Twitter* users participated in #qldfloods.
- Due to the sociodemographic factors, attention was mainly focussed on the situation in Brisbane and Ipswich, the major population centres affected.
- *Twitter* is used in important ways to find and disseminate information. 50-60% of #qldfloods messages were retweets (passing along existing messages, and thereby making them more visible); 30-40% of messages contained links to further information elsewhere on the Web.
- During the crisis, a number of *Twitter* users dedicated themselves almost exclusively to retweeting #qldfloods messages, acting as amplifiers of emergency information and thereby increasing its reach.
- #qldfloods tweets largely managed to stay on topic and focussed predominantly on sharing directly relevant situational information, advice, news media and multimedia reports.
- Emergency services and media organisations were amongst the most visible participants in #qldfloods, especially also because of the widespread retweeting of their messages.
- Leading accounts included the Queensland Police Service Media Unit (@QPSMedia), ABC News (@abcnews), and the *Courier-Mail* (@couriermail). @QPSMedia, in particular, received some 25 retweets for each of its messages, significantly amplifying its audience reach.
- *Twitter* both drew on and became a source for mainstream media. Social media users around the world shared a wide range of flood-related media resources via *Twitter*. Meanwhile, users closer to the site of the disaster shared their own experiences and observations, often by including photographs and videos in their tweets.
- More than one in every five shared links in the #qldfloods dataset was to an image hosted on one of several image-sharing services; and users overwhelmingly depended on *Twitpic* and other *Twitter*-centric image-sharing services to upload and distribute the photographs taken on their smartphones and digital cameras.

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Key findings about the role of @QPSMedia during the floods:

- As the most visible account on #qldfloods, the Queensland Police Service Media Unit account (@QPSMedia) played a leading role in disseminating timely and relevant information to the public, and in coordinating and guiding the wider discussion.
- The Queensland Police Service was able to 'cut through' effectively: to reach its immediate audience as well as be passed along and thus amplified many times over, with the help of other *Twitter* users acting as further information disseminators, especially at the height of the crisis.
- Tweets from and to the @QPSMedia account were overwhelmingly focussed on providing situational information and advice. Engagement between @QPSMedia and its followers remained topical and to the point, significantly involving directly affected local residents.
- By contrast, the overall #qldfloods discussion contained substantially more tweets discussing the wider implications of the disaster and offering personal reactions, often sent from elsewhere in Australia and the world.
- @QPSMedia's '#Mythbuster' tweets – directly tackling the rumours and misinformation about the floods which circulated on *Twitter* and elsewhere – were especially successful, and very widely retweeted.
- The central role of @QPSMedia as an information source was widely acknowledged and applauded by *Twitter* users even while the disaster event itself still unfolded. This also places @QPSMedia well as an important participant in the *Twitter*-based coverage and management of future crises.
- Additionally, @QPSMedia also played a crucial role in enabling affected locals and more distant onlookers to begin the difficult process of making sense and coming to terms with these events, even while they were still unfolding.
- The tenor of tweets during the latter days of the immediate crisis shifted more strongly towards organising volunteering and fundraising efforts, but more strongly so in the overall #qldfloods discussion than in the @QPSMedia conversation. @QPSMedia provided information on volunteering opportunities, but did not significantly promote fundraising schemes.
- Retweeting of messages focussed especially on tweets with immediate relevance to the crisis at hand: tweets containing situational information and advice, and news media and multimedia links were retweeted disproportionately often. In general #qldfloods discussion, though not in the @QPSMedia conversation, this is true also for help and fundraising tweets. Less topical tweets were far less likely to be retweeted.
- @QPSMedia's now established position as a leading account for crisis communication in Queensland places it well to explore more systematic approaches for crowdsourcing situationally valuable information directly from the *Twitter* community, in addition to continuing its role as a key information disseminator.
- Similarly, @QPSMedia is also in a position to build further dedicated links to the *Twitter* accounts of key media organisations and civic authorities, to develop a more comprehensive social media crisis communication infrastructure in Queensland.

Recommendations and Outlook

Our findings point to an important role for social media, including *Twitter*, in crisis communication. This has implications for the practical work of emergency services and media organisations, as well as for further scholarly research.

For emergency services:

- Social media can play an important role in crisis communication and emergency management, and the wider user community is generally willing to support and assist the work of emergency services if that work is undertaken in a way that is compatible with the established community conventions of the social media platform itself.
- The use of social media for crisis communication is still emerging, and remains largely *ad hoc*. Emergency services should review their current social media presences, and develop more comprehensive, flexible strategies for using social media in times of crisis. Crucially, this also involves further staff training in using social media effectively.
- The utility of different social media platforms in specific crisis situations should be further evaluated. *Facebook*, *Twitter*, and other platforms have different strengths and weaknesses, and should be used as appropriate for the task at hand.
- An established presence on *Twitter* is important, and ongoing monitoring of *Twitter* activities by everyday users is valuable. In particular, it is important to recognise established and emerging user practices (such as the use of specific hashtags – like #qldfloods – for recurring crisis situations), and work within these conventions.
- Coordination between different emergency and government services, and with media organisations, is important to avoid conflicting messages and ensure that key information is widely disseminated. Dissemination of corrections and end-of-alert announcements should be improved.
- Social media are media for two-way communication. Wherever possible and appropriate, the accounts of emergency organisations should engage with and respond to messages received from the general public.
- Approaches to crowdsourcing crisis-relevant information from the general stream of social media updates by everyday users should be trialled, in collaboration with technology and research partners.

For media organisations:

- Media organisations (especially the ABC, as the national emergency broadcaster) play an important role in crisis communication, and need to connect closely with emergency services during natural disasters. Retweeting emergency messages may be appropriate.
- Local media are likely to play an especially important role – during the South East Queensland floods, @couriermail and @612Brisbane (the local ABC radio station) emerged as especially prominent accounts.
- Like emergency services, media organisations should listen to other *Twitter* users during a crisis, including monitoring social media conventions and using appropriate *Twitter* hashtags such as #qldfloods. They should respond to users where possible, particularly given the significance of interaction for those in disaster-affected areas.

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- Media organisations have clearly established strengths in curating information from diverse sources. During crisis events, they are well placed to collate crisis information from emergency services, media reports, and the general public. Crowdsourcing information through social media may play an important role in this process, and appropriate technological supports for these activities (e.g. *Google* or *Ushahidi Maps*) should be trialled – if possible, in collaboration with relevant emergency services.

For researchers:

- Significant additional, internationally comparative work on social media and crisis communication is necessary. From early 2012, we will conduct a three-year ARC Linkage project in partnership with the Queensland Department of Community Safety and Eidos Institute to study the use of social media in future natural disasters in Queensland; further work in other Australian states and overseas could complement this.
- The study of social media at scale and in close to real time remains in its infancy. More advanced methods, tools and shared protocols for ‘big data’ research, as well as appropriate research training, are urgently needed, and require further funding and institutional support. In particular, more robust infrastructure for capturing, storing, processing, and visualising very large social media datasets is necessary.
- Crowdsourcing crisis-relevant information from social media streams (well beyond established hashtags) is emerging as a key area of further development. If current crisis events can be reliably identified from trends in *Twitter* data, for example, this would constitute a valuable new information input for emergency services, adding to their existing range of sources.
- Access to social media data at scale is limited, and *Twitter* is in the process of further locking down and commercialising access to its data; by effectively locking out most publicly-funded researchers, this has the potential to seriously stifle further research in this field. High-level support from government and academic authorities (peak university bodies, state and national libraries and archives, etc.) is required to encourage *Twitter* to renegotiate its access policies.
- While specific events can be studied by particular research groups, there is no systematic national infrastructure for the long-term storage of the resultant datasets. Access to social media data from the services themselves is ephemeral, and as a result, historically valuable information is lost. Already, previously accessible archives of #qldfloods data have become unavailable to the public. Institutions such as The National Library of Australia could assume leadership in developing processes for the long-term archival of social media data of national significance.

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BACKGROUND

The Australian state of Queensland received an unprecedented amount of rainfall during December 2010 and January 2011, resulting in widespread flooding across large areas – a flood emergency was declared for half of the Queensland territory, with an area the size of France and Germany combined estimated to be under water. While early flooding occurred in the relatively sparsely populated west of the state, later floods affected larger regional population centres like Rockhampton, on the central Queensland coast, and further heavy rain finally caused widespread flooding in the state’s south east corner, where the major regional cities Toowoomba and Ipswich, and finally the state capital Brisbane were severely affected. Arguably, the flood peak in Brisbane, in the early hours of 13 January 2011, also marks the peak of the overall flood crisis in Queensland in terms of its direct effects on residents; in Brisbane alone, some 30,000 properties were partially inundated by floodwaters.

- 10 January 2011:
 - Flash floods in Toowoomba
 - ‘Inland tsunami’ in the Lockyer Valley
- 11 January 2011:
 - Floods move towards Ipswich and south west Brisbane
 - Wivenhoe Dam at 191% capacity
- 12 January 2011:
 - Flooding begins in central Brisbane
- 13 January 2011:
 - Brisbane flood levels peak

As a major environmental crisis, the floods were covered extensively by the Australian and international mainstream media. As they began to affect major population centres, social media platforms such as *Facebook* and *Twitter*, as well as content sharing sites *Flickr* and *YouTube* began to play an important role, as locals used them to distribute first-hand footage of the situation in their local areas. In this, the South East Queensland flood events must be considered separately from the wider inundation of other parts of the state, as events here developed a somewhat more urgent dynamic. Flooding in central Queensland followed a familiar pattern of relatively gradual river level rises which – while devastating for affected residents and businesses – usually leave sufficient time for warnings and evacuations. By contrast, a number of South East Queensland towns, starting with the regional centre of Toowoomba, experienced rapid and devastating flash flooding which caused small creeks to swell to raging torrents within minutes, carrying off cars and other heavy items without warning. Here, following a pattern established in other unforeseen disaster events, social media played an important role in capturing and disseminating first-hand footage of the flash floods, in effect operating as an unofficial, distributed early warning system; later, social media users also shared further links to mainstream news reports and footage of the destruction caused by the same torrent in the Lockyer Valley below Toowoomba. Along with further heavy rainfalls and water releases from Wivenhoe Dam, the floodwaters washing through the area made their way to the downstream cities of Ipswich and Brisbane over the following 48 hours.

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As these initial reports of devastation heightened fears of flooding in Ipswich and Brisbane, social media became an increasingly important element of the flood mobilisation efforts. On *Twitter*, the #qldfloods hashtag rapidly emerged as a central mechanism for coordinating discussion and information exchange related to the floods.¹ Other hashtags such as #bnefloods (for information specifically relating to the *Brisbane* aspects of the overall Queensland flood crisis) or, with characteristic Australian humour in the face of adversity, #thebigwet were also used by some participants, but they did not become established as equally prominent alternatives – most likely indicating that *Twitter* users were concerned to avoid fragmenting the conversation, instead establishing one ‘official’ hashtag.

Notably, too, the *Twitter* accounts of several official sources quickly adopted the #qldfloods hashtag for their own tweets. Indeed, the social media use of several of these organisations underwent a rapid development process as the emergency unfolded; this is best illustrated using the example of the official *Facebook* and *Twitter* accounts of the Queensland Police Service (QPS).² Initially, QPS had mainly shared its own advisories and news updates through its *Facebook* page, with messages automatically crossposted to *Twitter*. This was problematic for a number of reasons, however: first, the lower 140 character limit for messages on *Twitter*, compared to *Facebook*, caused several of these crossposted messages to be truncated and thus unusable (especially when embedded hyperlinks were broken in the process); additionally, this also meant that users on *Twitter* may first have had to navigate from *Twitter* to *Facebook*, to see the full, original message, and then to follow any embedded links to their eventual destination; and even this may only have been possible for users who already had *Facebook* accounts. Further, for reasons of site design, *Facebook* messages are more difficult to share with a larger number of users than those on *Twitter*, where a simple click of the ‘retweet’ button passes on an incoming message to *all* of one’s followers; and similarly, ongoing conversations are more difficult to manage on *Facebook* – where the amount of commentary attached to each of the QPS’s posts was rapidly swamping important information – than on *Twitter*; indeed, *Facebook* knows no equivalent to the concept of the hashtag, which allows a large number of users to conduct an open, ongoing, public discussion centred around a common topic. These shortcomings were quickly (and courteously) explained to the QPS media staff by a number of vocal *Twitter* users, and the QPS used its @QPSmedia *Twitter* account prominently throughout the rest of the flood crisis.³

The comparatively simple network structure of the *Twitter* platform (where accounts are either ‘public’ (visible to all, and even to non-registered visitors) or ‘private’ (visible only to followers approved by the author) means that topically relevant tweets from public accounts can be found and reshared very widely. For the purposes of crisis communication, this compares favourably for example with the communicative structures of *Facebook*, where more complex visibility permissions mean that messages will not normally travel far beyond a user’s immediate circle of

¹ Hashtags are appended to tweets in order to make them more easily findable for other users, and many *Twitter* client applications provide the functionality to automatically receive all messages using a specific hashtag.

² Queensland Police reports a ten-fold increase in its *Facebook* followers on 10 January, for example (see Queensland Police Service, 2011).

³ Preceding text adapted from Bruns (2011c).

friends, or friends of friends. For researchers, this straightforward permissions model also simplifies (but does not remove altogether) considerations of research ethics: whereas on *Facebook*, complex layers of 'privateness' and 'publicness' must be negotiated at every turn, publicly visible *Twitter* messages are guaranteed to have been published to the Internet at large, at least technically, and archiving them in the course of research activities is therefore substantially less problematic, especially where hashtagged conversations about major public events are concerned.

The overall focus of this report is on the use of the social media platform *Twitter* for crisis communication during the South East Queensland floods in January 2011. As a platform, *Twitter* provides exceptionally flat and flexible communicative structures. The openness of the system allows users to 'listen in' (Crawford 2009; 2011) to a wide range of accounts – institutions, news agencies and individuals – and gain a multifaceted understanding of how an event is being experienced and reported. It also allows institutions, emergency services and journalists to listen in to the experiences of locals in the midst of the crisis. Users interested in specific topics can easily find one another through the rapid and *ad hoc* establishment of shared hashtags related to the topic (keywords, prefixed with the hash symbol '#', which users can include in their tweets to make these messages visible to others following the hashtag). Hashtags provide a mechanism for conversation and update threads between users even if these users are not already 'following' one another in the social network; indeed, hashtag streams may even be followed by visitors to the *Twitter* Website who are not themselves registered *Twitter* users (Bruns & Burgess, 2011a). The dominant *Twitter* hashtag to emerge during the December 2010 / January 2011 floods crisis in Queensland was #qldfloods. This hashtag was established already during flooding episodes in northern and central Queensland in the weeks preceding major flooding in the south east corner, and this early visibility also contributed to its rapid establishment as a central coordinating mechanism for *Twitter* activities during the latter events.

Crisis Communication Research at the CCI

Researchers at the ARC Centre of Excellence for Creative Industries and Innovation (CCI) are widely recognised as leaders in the development of innovative methodologies for researching social media. This work is supported by the Media Ecologies and Methodological Innovation project at the CCI, with further infrastructure and development assistance provided by a three-, year ARC Discovery project, DP1094281: New Media and Public Communication: Mapping Australian User-Created Content in Online Social Networks, led by Axel Bruns and Jean Burgess.

Documented at the project Website *Mapping Online Publics* (<http://mappingonlinepublics.net/>), this research has led to the development of advanced methods for tracking and analysing public communication through *Twitter* and other social media platforms; these methods have been applied to a wide range of communicative practices from political discussion (especially following the Australian Labor Party leadership spill in June 2010 and the subsequent federal election) through television audiencing (of shows such as *Masterchef* and *Get Back to Where*

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You Came From as well as major events such as the 2011 royal wedding) to sports. The project is also developing the first comprehensive map of Australia's Twittersphere.

Crisis and disaster events throughout 2011 have also led to a pronounced focus on research into the use of social media – and especially *Twitter* – during “acute events” (Burgess & Crawford, 2011), with particular attention paid to natural disasters such as the Queensland floods, Christchurch earthquakes, or Japanese tsunami, and to human-made crises including the Arab Spring and UK riots. This work clearly points to the significant utility of social media in facilitating *ad hoc* communication and coordination in response to, and in the aftermath of, such major disruptive events.

Further details about this research programme, and recent publications and presentations of this work, are available at <http://mappingonlinepublics.net/>.

EXISTING RESEARCH

The growing literature on social media and communication covers a wide range of methods, and an equally wide range of disciplines – including crisis information management, computer science, emergency management, geography, public relations/corporate communications, seismology, software development, and media studies.

It suggests a diversity of uses by different social actors, but while there is substantial literature on the potential uses of social media by institutions, and significant data on the actual uses of social media by citizens, there are gaps in studies of how institutions and individual users interact with and rely on each other in times of crisis, and on the new media ecologies created by these interactions. This highlights the potential for comparative case studies of different actors' uses of social media during different crisis events.

Major Research Areas

Several case studies highlight the precarious aspects to social media, and concerns around **monitoring and control** by authorities especially during political crises (Bianco 2009). Burns and Eltham (2009) discuss how *Twitter* was used during the Iranian election crisis in 2009. They argue that although social media have their uses for protest organisation, they can also be used for protest control, intelligence gathering, and human rights abuses, by actors such as the Iranian government, the U.S. State Department, and Iranian paramilitaries. Cheong and Lee (2010) argue that decision-makers can use social media analysis to “**harvest civilian sentiment**”, for example monitoring levels of sympathy for the Jakarta and Mumbai terror attacks. Emotional responses to significant crisis events propagate quickly and spread far beyond the localised boundaries of the event, as Crawford (2009) notes.

During emergencies, social media can supplement traditional information dissemination and sourcing methods by emergency services organisations. There is strong emphasis in the literature on the potential of **social geomapping tools** such as *Ushahidi Maps* for crisis response and monitoring. Liu's (2009) work on **sense-making** practices during crisis events is especially innovative, introducing the concept of “**grassroots heritage**” and preservation practices in social media. Liu *et al.*'s (2008) longitudinal study relates these practices to “disaster convergence theory”. Robinson's (2009) work also examines heritage creation and collective memory negotiation following Hurricane Katrina.

Much of the literature highlights users' demands for personalised information during emergency events. Individuals seek specific information about the whereabouts of friends and loved ones, and supplement their mainstream media consumption with social media to fill gaps in personalised knowledge. Mark and Semaan (2008) discuss how people use social media during wartime to develop what they call “**situational awareness**”. However, Oh *et al.* (2010) also argue that the sharing of **situational information** on social media is exploitable when individuals are vulnerable to attack, detailing how terrorists used situational information available online.

An important emerging theme in the literature is the idea of “**collaborative resilience**”: the processes through which technology users respond to disruptions of their life during a crisis (e.g. the use of their cars, workplaces, or even homes), leading to a greater reliance on IT and collaborative networks. Mark and Semaan (2008) use the example of Iraq to point to the development of new behaviours (such as blogging) and increased use of email and mobile phones after the war began. Work on communication practices during Hurricane Katrina produced similar findings (Shklovski *et al.* 2010).

Further important research concerns the use of social media for **rumour management**. For example, Mendoza and Poblete (2010) explore the behaviour of *Twitter* users after the 2010 earthquake in Chile, assessing how users dealt with true claims and false rumours differently. They find that *Twitter* users will “question” or “deny” rumours 50% of the time, making them easily distinguishable from truth claims, which are “affirmed” 95.5% of the time. Sutton *et al.* (2008) similarly discuss the phenomenon of “**collective error correction**”. These studies highlight the resilience of social media communities in the face of (deliberate or accidental) misinformation, and suggest that there is strong potential for further innovation in the creation of *ad hoc* tools for information quality control.

Analytical Approaches

Automated data extraction and analysis: Methods for *Twitter* data extraction and analysis continue to vary widely, with different approaches favoured for different research contexts. Hughes and Palen (2009) performed a comparative study of *Twitter* usage in the context of specific events by collecting data from two planned political events and two natural disasters. Kwak *et al.* (2010) harvested and performed network analysis of the entire *Twitter* Website for one month in 2009, and argue on that basis that *Twitter* is largely used for the diffusion and distribution of news. Palen *et al.* (2010) extracted and analysed 20,000 tweets during the Red River Valley floods, using a program called the E-Data Viewer to collect and analyse tweets (Vieweg *et al.* 2010). Earle *et al.* (2010) and Guy *et al.* (2010) use automated data extraction techniques of all geocoded tweets to show the accuracy of *Twitter* users in detecting an earthquake. This methodology harvests real time tweets through the *Twitter* API, filters for words relating to earthquakes, and filters for noise. From these, it mines identifying information from each tweet, which is then mapped to detect and report on seismic activity (Guy *et al.* 2010). It should be noted in this context, however, that explicit geolocation information (e.g. from GPS-enabled smartphones) is at present used only by a very small minority of *Twitter* users.

Content analysis: Mendoza and Poblete (2010) use content analysis to understand how social media respond to **rumour**. Oh *et al.* (2010) perform content analysis to show the **vulnerability** of *Twitter* users to being exploited in a terrorist attack, by sharing situational information online. Qu and Wu (2009) classified 2266 discussion threads from the Tianya discussion forum following the 2008 Sichuan earthquake, revealing 4 major roles of the online forum (information, opinion, action, emotion). Starbird and Palen (2010) conduct a content analysis of **retweeting practices** during emergency events, finding that widely retweeted messages are more likely to be about the event than non-retweets, and that users are more likely to retweet the messages of media organisations and emergency services. Zhou *et al.* (2010) study **tweet resonance** in the

Iranian election crisis, analysing retweeting patterns and organising retweets into breaking news, non-time-sensitive material, rumors and misinformation, spam, and others; they find that tweets by celebrities, regardless of content, had the greatest tweet resonance. Robinson (2009) uses structural textual analysis to determine patterns of social relations in **collective memory negotiation** in the Katrina/New Orleans blogging community. Sutton (2010) manually collected and analysed tweets iteratively surrounding a single issue, using keyword and hashtag searches.

Network analysis and visualisation: Kwak *et al.* (2010) perform network analysis particularly by examining “**retweet trees**” to explore how news and information is disseminated. Mendoza and Poblete (2010) also use retweet tree analysis to compare how truth and rumour are handled in a crisis. Dörk *et al.* (2010) develop a method of data visualisation that could be used by event organisers to monitor developments/problems as they arise during particular planned events.

Qualitative analysis and group work: Mark & Semaan (2008) conducted 49 **interviews** with Iraqis and Israelis to understand changing technology use during the Iraq war, supplementing this information with archival material from blogs. Fjeld & Molesworth (2006) conducted face-to-face interviews with public relations practitioners about their use of Internet media during corporate crises. Liu *et al.* (2008) studied 29 **eyewitness photography sharing** groups across six different disasters, and relate their study to convergence theory. Liu (2009) used the **probes method** to enable participants to self-document their user experience around particular social media platform designs. Liu & Palen (2010) relate recent innovations in mapping tools to existing methodologies of “**spatiotemporal analysis**” in the sociology of disaster: they analysed nine different crisis map mashups through interviews with site creators and gathering of secondary sources. Newlon *et al.* (2009) developed and tested a “**mega-collaboration interface**” by having participants act out various problem scenarios.

Broader Methodological Frameworks

Case studies: Much existing work remains retrospective, examining the use of social and other media in crisis situations after the immediate crisis has passed. Karlsson (2010) presents a comparison of new media and traditional media in Sweden during a swine flu outbreak. Oh *et al.* (2010) apply **situational awareness** (SA) theory to the Mumbai terrorist incident, performing qualitative analysis of terrorists’ phone conversations and content analysis of *Twitter* posts to determine the vulnerability of social media users. Gens *et al.* (2009) study the MobMaps for MachsomWatch project at Israeli checkpoints.

Quick Response Research methodology: Quick response methods attempt to speed up the scholarly response to crisis situations by adapting disaster studies frameworks to combined onsite and online research. Data are collected onsite and online, through face-to-face interviews, focus groups, and class group discussions as well as in the form of online documents and artefacts. Researchers capture Interactions in social media spaces including *Flickr*, *Wikipedia*, *Facebook*, *Myspace*, *Orkut*, and *Second Life*, and examine the diffusion of information and narratives through these various social networks (Palen *et al.* 2009). QRR

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researchers developed a **typology of social media use during emergencies** that covers sense-making, social convergence, alliance, mourning, support, and information-seeking.

Crisis informatics research methodology: More advanced work towards the development of a comprehensive crisis information methodology is being undertaken at the University of Colorado's **ConnectivIT Lab**. This innovative methodological approach draws on sociology of disaster and emergency management disciplines, and incorporates ideas of sense-making alongside methods for automated data extraction, content analysis, on-site data collection, and spatiotemporal analysis.

OUR RESEARCH METHODOLOGY

The first challenge in doing research on the use of *Twitter* for crisis communication is to capture a rich and detailed dataset of tweets which relate to the crisis event under investigation. One relatively simple and straightforward approach to this challenge is to focus on tweets which contain the relevant topical hashtag (or hashtags) related to the crisis: as noted above, for the 2011 Queensland floods, this was #qldfloods (with additional, adjunctive and sometimes overlapping discussion also taking place using #thebigwet and other minor hashtags); for the Christchurch earthquakes, #eqnz; for discussion of the Arab Spring uprisings, hashtags referring to the countries in question (#egypt, #libya) were common.

By tracking topical hashtags and capturing hashtagged tweets, we may assume to establish a dataset of the most visible tweets relating to the event in question, since it is the purpose of topical hashtags to aid the visibility and discoverability of *Twitter* messages. In this we distinguish *topical* hashtags such as #qldfloods from other hashtag uses – e.g. from emotive hashtags such as #facepalm or #fail (cf. Bruns & Burgess, 2011a). This does not mean that we are able to capture *all* messages relating to the event or topic, however; it is virtually guaranteed that some users tweeting about the topic will be unaware of the existence of the central hashtag, or even unfamiliar with the concept of hashtags altogether. (Some of these limitations may be addressed by tracking a wider range of relevant hashtags or other keywords, of course.)

Additionally, anecdotal evidence also suggests that while hashtags may be used for the sharing of key information and opinion about the event, follow-on @reply conversations between participating users may well take place outside of the hashtagged stream of tweets (unless users specifically choose to again hashtag their public responses to one another, in order to give these messages greater visibility as well); further, of course, follow-on communication through private, direct *Twitter* messages or other communication media will also remain outside the scope of any research which can be conducted using the methods outlined here.

To track hashtags on *Twitter*, we use the open-source tool *yourTwrapperkeeper* (2011), or – until February 2011 – its predecessor *Twrapperkeeper.com*. Building on PHP and MySQL, it draws on *Twitter's* Application Programming Interface (API) to retrieve data for a set collection of hashtags (or other keywords). Mainly, it utilises the *Twitter* streaming API to retrieve a continuous stream of all tweets matching the search terms set by the researcher; additionally, it uses the *Twitter* search API to fill any gaps which may exist in the data received from the streaming API. Data captured through the tool can be exported in a number of formats, and for each tweet contains the following data points retrieved from the *Twitter* API:

- **archivesource:** API source of the tweet (twitter-search or twitter-stream)
- **text:** contents of the tweet itself, in 140 characters or less
- **to_user_id:** numerical ID of the tweet recipient (for @replies)
(*not always set, even for tweets containing @replies*)
- **from_user:** screen name of the tweet sender
- **id:** numerical ID of the tweet itself
- **from_user_id:** numerical ID of the tweet sender

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- **iso_language_code:** code (e.g. en, de, fr, ...) of the sender's default language
(not necessarily matching the language of the tweet itself)
- **source:** name or URL of the tool used for tweeting (e.g. Tweetdeck, ...)
- **profile_image_url:** URL of the tweet sender's profile picture
- **geo_type:** form in which the sender's geographical coordinates are provided
- **geo_coordinates_0:** first element of the geographical coordinates
- **geo_coordinates_1:** second element of the geographical coordinates
- **created_at:** tweet timestamp in human-readable format
(set by the tweeting client – inconsistent formatting)
- **time:** tweet timestamp as a numerical Unix timestamp

yourTwapperkeeper is the open source version of a platform previously made available at *Twapperkeeper.com*, to enable researchers to track, archive, and share datasets of tweets relating to various keywords. Following an intervention by *Twitter*, that platform functionality is now no longer publicly available, but *Twapperkeeper's* data format – which did not include the 'archivesource' data point – has become a quasi-standard for tweet datasets. Bruns (2011b) provides an extension of *yourTwapperkeeper* which enables it to export *Twapperkeeper*-compatible datasets in comma- and tab-separated value formats (CSV/TSV).

Tracking *Twitter* data using *yourTwapperkeeper* does not capture retweets made using *Twitter's* 'retweet button' (manual retweets, of the form 'RT @user original message' are included, however). 'Button' retweets constitute merely a verbatim passing-along of the original message, but do not enable retweeting users to include any additional comments with the retweeted message. While a tracking of the amount of button retweets for each individual message captured in our dataset might provide an interesting additional dimension to our analysis, it does not have significant relevance to the analysis of actively discursive interaction, which is of greater interest here.

It should be noted here that no retrieval methods guarantee a comprehensive capture of *Twitter* data: outages on the side of server or client, or transmission problems between them, cannot be ruled out altogether, and may result in message loss. Further, there are very few reliable means of comprehensively cross-checking the dataset for its veracity, since the *Twitter* API constitutes the only point of access to the *Twitter* stream which is available to external researchers. No dataset captured by using the *Twitter* API is guaranteed to be entirely comprehensive, therefore; especially where research focusses on identifying broad patterns in *Twitter* activity from a large dataset, however, such research nonetheless remains valid and important.

Twitter* Data Analysis Using *Gawk* and *Gephi

The calculation of statistics and metrics describing the *Twitter* activities captured in a given dataset relies mainly on processing these datasets to count and compare specific communicative patterns; further filtering of datasets for specific timeframes, users, or keywords may also be necessary. Our work uses the open-source command-line tool *Gawk* (2011), which provides a simple but flexible scripting language that can be used to process CSV/TSV-format files (a package of common *Gawk* scripts for processing *Twitter* datasets is available at Bruns &

Burgess, 2011b). The overall results of such data processing may be visualised in common spreadsheet software.

Data processing tools such as *Gawk* may also be used to extract network data from the *Twitter* dataset. Here, too, a number of different networks may be distinguished; additionally, due to the time-bound nature of *Twitter* datasets, for any such networks it is also possible to generate network analyses and visualisations which take into account the changeability of these networks over time (see e.g. Bruns, 2011a, for a discussion of how to generate and visualise the dynamics of network data on @reply and retweet interactions). To analyse and visualise network data, we use the powerful and flexible open-source network visualisation software *Gephi*.

Finally, another important analytical approach focusses specifically on the textual content of the tweets. While at a maximum length of 140 characters, tweets necessarily represent a highly compressed textual format, they nonetheless contain enough information for researchers to be able to extract a significant amount of valid information; some of that information also provides input to the other analytical approaches outlined here, in fact.

For the study reported here, we used the *Twapperkeeper* service during January 2010 to capture a dataset of #qldfloods tweets. We further filtered this dataset to focus primarily on tweets sent between 10 January (the day of the Toowoomba flash floods) and 16 January 2010 (one week after the start of major flooding in South East Queensland, at the conclusion of the major emergency situation in Brisbane). In the first place, we extracted from this dataset the overall patterns of #qldfloods activity, including the total volume of tweets per day or hour, mentions of specific placenames over time, and most active senders or recipients of tweets. We also examined the relative presence of different types of tweets (@replies, retweets, tweets containing URLs, etc.) during specific phases of the crisis event.

@QPSMedia Case Study

In a further, subsequent phase of our work, we conducted a detailed qualitative analysis of the content of #qldfloods tweets. Here, due to the substantial volume of tweets, we created a representative sample of #qldfloods tweets by selecting every twentieth tweet; separately, we also selected all tweets sent by or replying to the Queensland Police Service Media Unit account, @QPSMedia, for further analysis. These two sets of tweets were then coded for the presence of specific content types.

This part of our study draws on extant crisis informatics literature in its design and analysis. We build on a combination of automated data extraction and manual content analysis, and like Qu & Wu (2009) and Zhou *et al.* (2010) we categorised tweet genres. Rather than re-using the typologies developed for those studies, however, we designed a coding framework of our own which is responsive to the specific contexts of our case study and draws on our first-hand experience of #qldfloods and @QPSMedia communication during the flood crisis.

In designing the categories of this coding framework, Liu's work on sense-making (2009) was useful in understanding information dissemination not simply as a strategic practice but also as

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responding to personal affect and information needs. We therefore examined @QPSMedia's role in the crisis not simply as an extension of traditional, broadcast-style emergency communication activities, but also as part of a process of sense-making and collective memory negotiation involving a wider range of participating individuals. In this regard, our identification of tweets expressing thanks and gratitude becomes a significant marker of these cultural practices and purposes of information provision during emergency events. Similarly, the concept of collective error correction and rumour management became an important element, particularly in reference to @QPSmedia's uses of *Twitter* for "mythbusting" rumours circulating during the floods (Mendoza & Poblete 2010).

Our coding categories were first developed for the @QPSmedia sample, and then adjusted to be relevant to the overall #qldfloods sample, which we treated as a baseline. Our coding scheme includes five major categories – **Information**, **Media Sharing**, **Help and Fundraising**, **Direct Experience**, and **Discussion and Reaction** – which in turn divide into several distinct sub-categories. These categories are presented in detail in the @QPSMedia and #qldfloods analysis section.

#QLDFLOODS OVERVIEW

Overall Usage

Overall, more than 35,000 tweets containing the #qldfloods hashtag were captured during the period of 10-16 January (fig. 1). A sharp, early spike in activities occurred in the afternoon of 10 January, as first reports of the Toowoomba flash flooding and subsequent ‘inland tsunami’ in the Lockyer Valley were shared on *Twitter*. Overall activity levels peaked around midday on 11 January, however – at around 1100 tweets per hour between 12 and 2 p.m., as the Brisbane River began to burst its banks in Brisbane itself. Given the larger population size of the area then affected, combined with sociodemographic factors which may result in a higher percentage of *Twitter* users amongst the urban population in Brisbane, this high level of activity is unsurprising. Hourly activity patterns also indicate a marked diurnal pattern, with significant drops in *Twitter* activity during the early hours of each day; notably, however, *Twitter* volumes remain comparatively high (at close to 100 tweets per hour) during the early mornings of 12 and 13 January, as flood rescue and relief operations continue through the night.

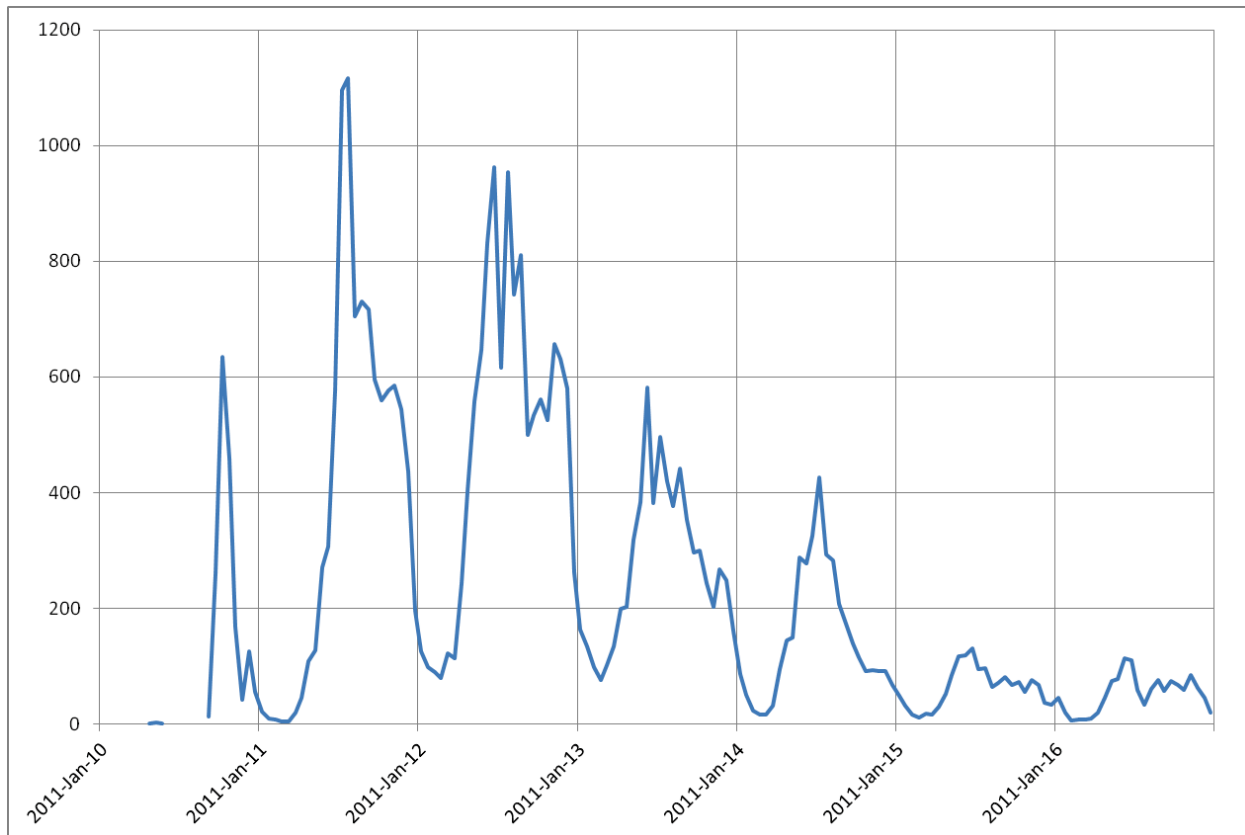


Fig. 1: #qldfloods tweets per hour, 10-16 Jan. 2011

Cumulative figures for each day also highlight 11 and 12 January as the most active days of the flood crisis in South East Queensland, pointing to 12 January (the height of the Brisbane flooding) as the day most notable for *Twitter* use (fig. 2); we recorded over 11,600 #qldfloods tweets on this day. Additionally, these days also see the largest number of unique *Twitter* users

#qldfloods and @QPSMedia

participate in exchanging #qldfloods-tagged tweets; 12 January saw nearly 7,000 *Twitter* users post (or retweet) at least one #qldfloods tweet. Such volume may be explained at least in part also by the greater national and international attention to the disaster event: as news coverage of the floods reached audiences outside of the immediately affected area, many users also expressed their support and condolences through social media, some using the #qldfloods hashtag as they did so.

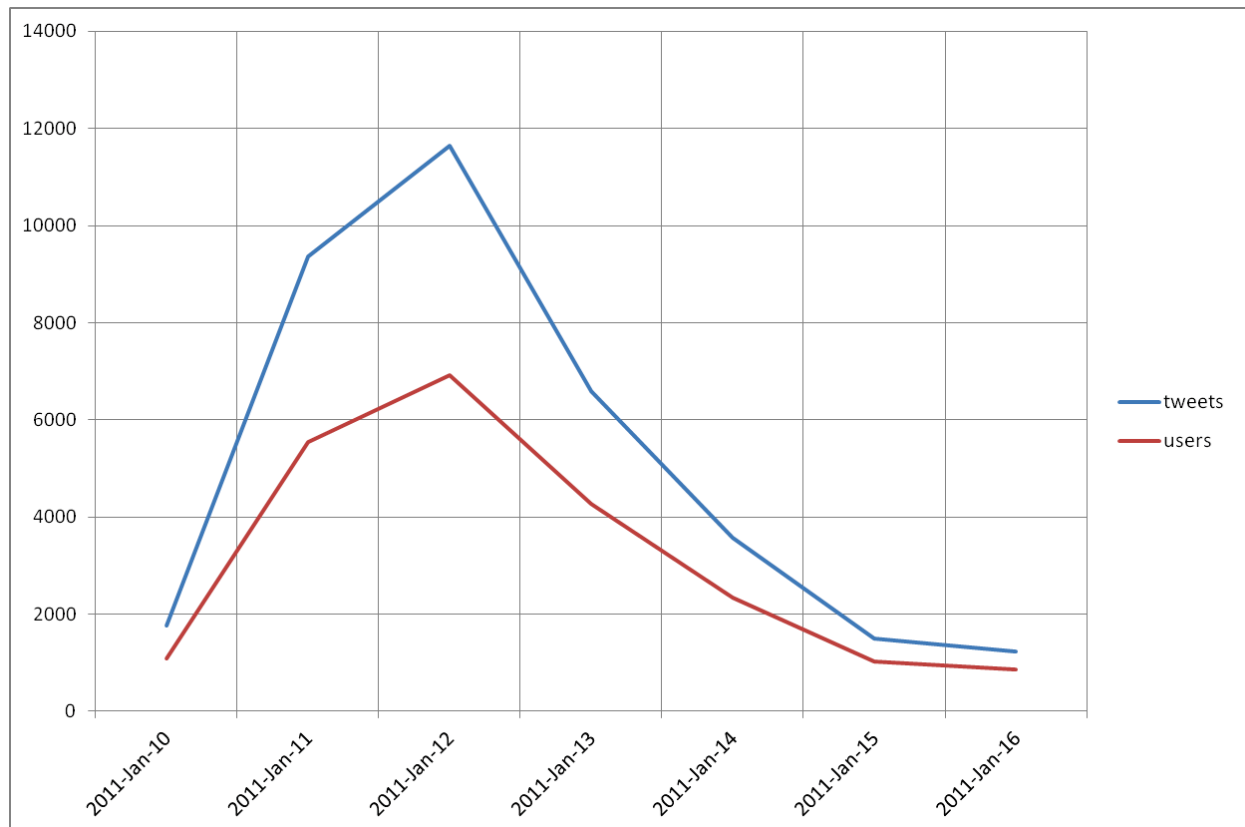


Fig. 2: #qldfloods tweets and unique users per day, 10-16 Jan. 2011

A simple analysis of the presence of key place names in #qldfloods tweets further documents the centrality of Brisbane in *Twitter* users' coverage of the flood event (fig. 3). While on 10 January, as news of the early flash flooding dominates the media coverage, Toowoomba and Lockyer are prominent on *Twitter* as well, on 11 and 12 January Brisbane is three to four times more likely to be mentioned than its nearest neighbour, Ipswich, and references to the upstream areas affected on previous days decline even further. At the same time, it should also be noted that on a *per capita* basis, Ipswich (at less than 10 per cent of the population of Brisbane) is comparatively overrepresented in #qldfloods at least during these two days, pointing perhaps to a highly active cluster of *Twitter* users focussing on that city. (At the same time, Brisbane's presence may be underestimated in fig. 3 if it was referred to by other terms – 'BNE', 'Brisvegas' – or not mentioned by name because to do so was deemed to be unnecessary.) Notably, too, at least from 13 January onwards, virtually all focus is on Brisbane, as the last city still to be affected by continuing flooding.

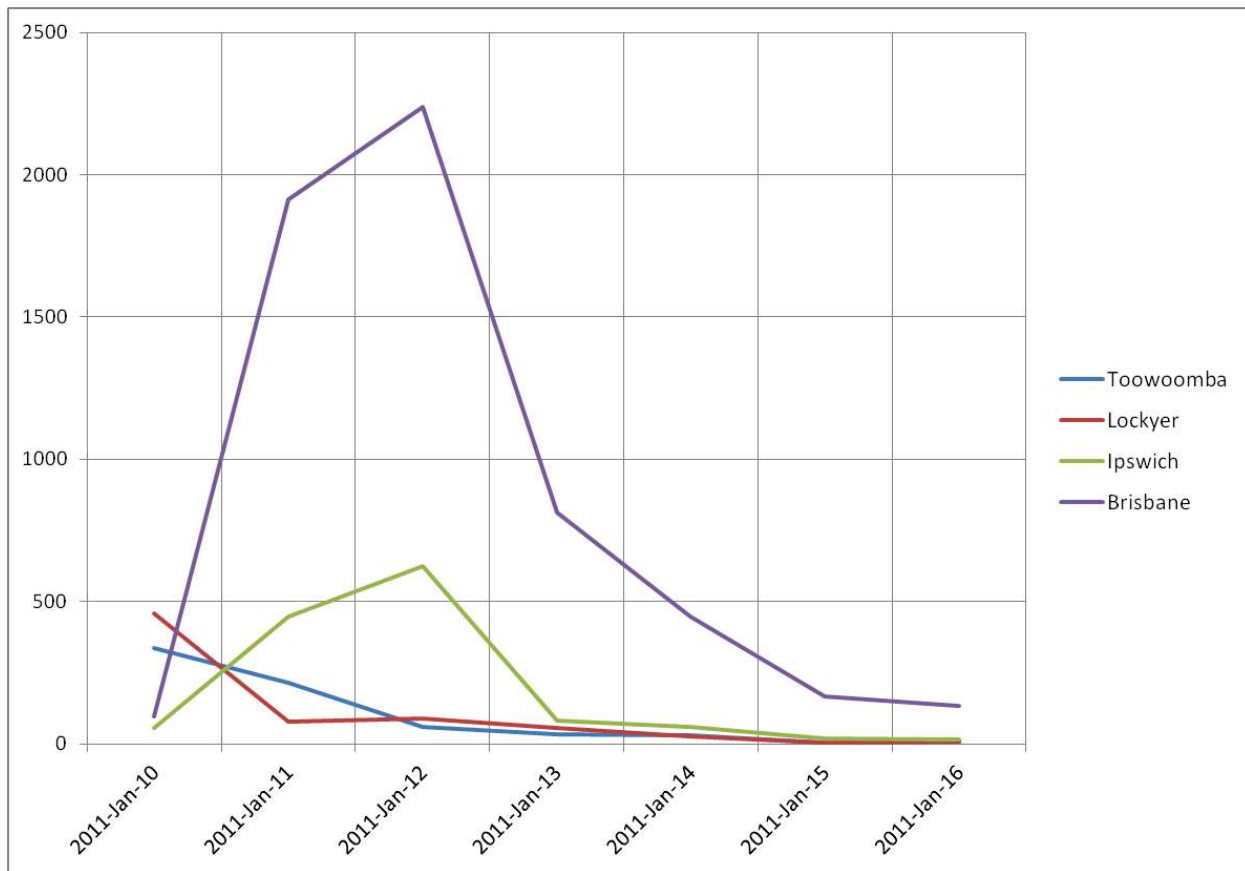


Fig. 3: Mentions of key place names in #qldfloods tweets, 10-16 Jan. 2011

In addition to these statistics on the overall volume of #qldfloods, it is also useful to track the presence of specific types of tweets, which indicate the uses made of *Twitter* during specific periods. In the first place, we distinguish between @replies (tweets responding to or mentioning another user, perhaps in the course of an ongoing conversation), retweets (a special form of @reply which passes along a message sent by the user mentioned, in part or in full and possibly with additional comments by the retweeting user), and original tweets (tweets which are neither @replies nor retweets); together, these three types of tweets account for one hundred per cent of all tweets, then. Further, tweets of any type may also contain references to further information available online, in the form of links to URLs (usually shortened using bit.ly or another short URL service).

Fig. 4 indicates the relative presence of these types of tweets, and of tweets containing URLs, in #qldfloods during 10-16 January 2011. There is a particularly high level of retweets during the early days of the crisis, which is unsurprising: during this time, *Twitter* would have been used especially to share the breaking news first of the Toowoomba and Lockyer Valley floods, and then of the latest flooding reports in Brisbane. With mainstream media coverage increasing, however, such retweeting – at least of basic information which could now be expected to be widely available through other media – could be allowed to decline somewhat; the fact that retweets consistently accounted for more than half of all #qldfloods tweets indicates that the hashtag continued to play an important role in the dissemination of information, however. It must

#qldfloods and @QPSMedia

be noted in this context that such retweeted messages would also have been visible well beyond the hashtag community itself, of course: for example to those followers of retweeting users who did not themselves follow the hashtag, or even to non-registered visitors to the *Twitter* Website who searched for specific users or keywords. Retweeting, in other words, amplifies information well beyond any hashtags which may already be present in a message.

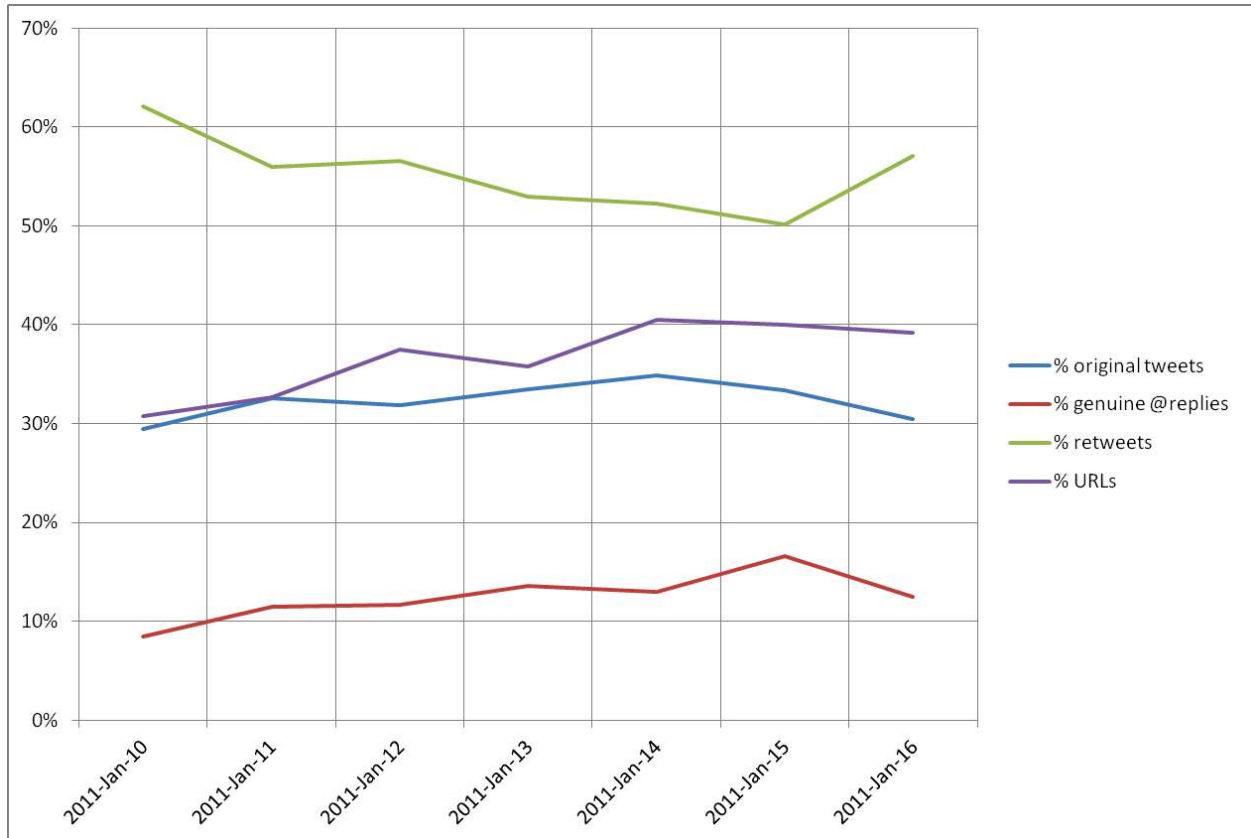


Fig. 4: Tweet types, 10-16 Jan. 2011

In line with these observations is the fact that some 30-40% of all #qldfloods messages contained links to further online information (ranging from official Websites through news reports to eyewitness photos and videos of the floods); this further points to the importance of *Twitter* for disseminating information and furthering the flow of news and other material across multiple media platforms. Here, a gradual increase can be observed over the course of the week; this is due mainly to the fact that towards the latter part of the week, the total number of messages (and participating users) declines, leaving only those with a relatively direct relation to the floods events and most involved in sharing further information about the floods and their aftermath. What remains at the end of the period are likely to be largely local users, beginning the process of recovery and rebuilding and sharing information about how best to do so.

This is also borne out by the gradual growth in genuine @replies between members of the #qldfloods hashtag community. For most hashtags, @reply numbers remain relatively low, and #qldfloods is no exception: while (sometimes lengthy) @reply conversations may be initiated by hashtagged messages, the individual tweets which make up those conversations usually do not

themselves carry the hashtag, since (in most cases) there is no need or intention to make the conversation visible to all followers of the hashtag. A lack of @replies in #qldfloods does not indicate a lack of interaction between participating users, therefore; it simply points to the fact that such interaction was largely likely to take place outside the hashtag itself, and thus outside of our hashtag dataset. That our data nonetheless point to a gradual rise of hashtagged @replies towards the end of the week (between 10 and 15 January, @replies double from eight to sixteen per cent of the total hashtag volume), in fact, seems to indicate that a greater sense of community may have developed between active #qldfloods contributors as they became more familiar with one another.

Key Participants

The emergence of such a sense of community, and of community structures along with it, is also evident from our analysis of key participants in #qldfloods. In the first place, we find typical ‘long tail’ distributions both of #qldfloods activity (tweets sent) and visibility (@replies and retweets received). A handful of #qldfloods participants account for a disproportionately high number of tweets (fig. 5), and similarly, a – different – group of participants receive far more @replies and retweets than the rest of the community (fig. 6).

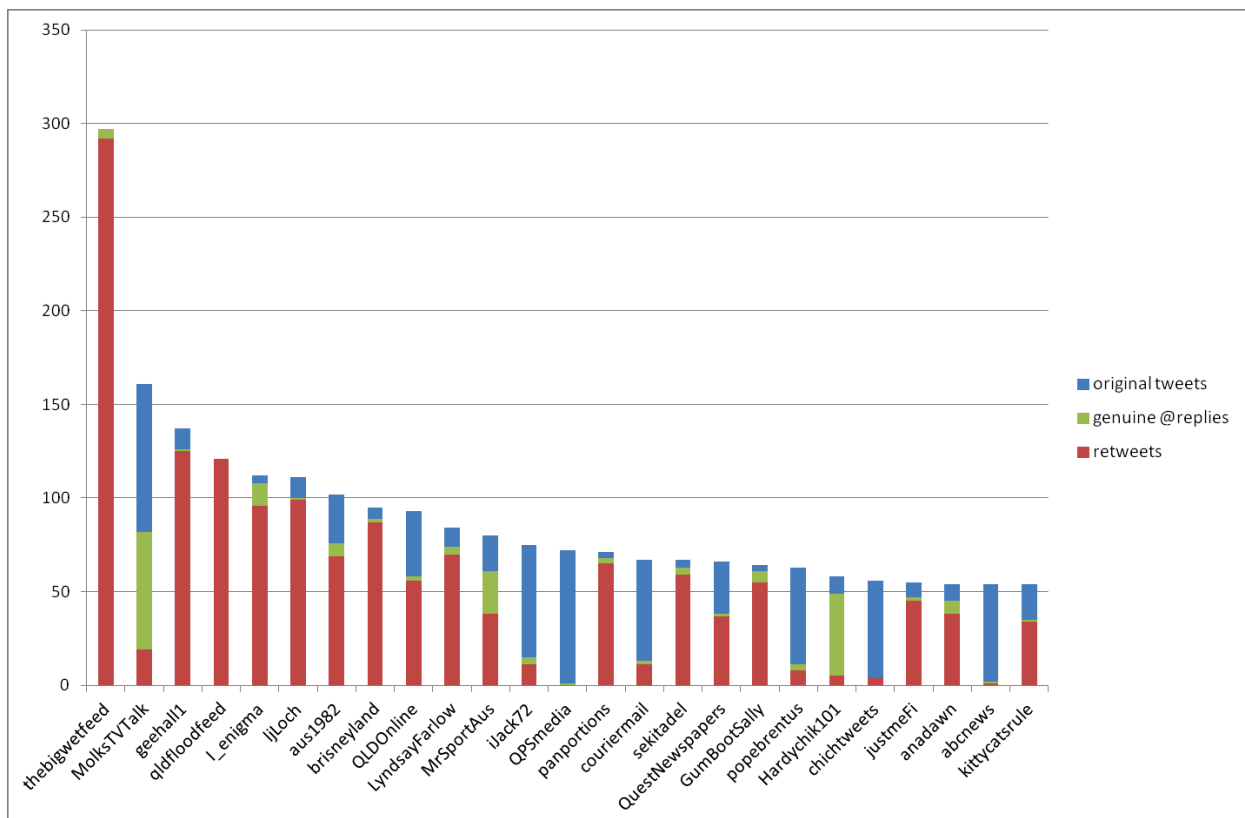


Fig. 5: Most active contributors to #qldfloods, 10-16 Jan. 2011

Fig. 5 indicates the distribution of tweeting activity (combining all three types of tweets: original tweets, @replies, and retweets). The field is led, by some distance, by @thebigwetfeed, a service account specifically set up to retweet flood-relevant messages and thereby make them

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visible to a larger group of users. While the effectiveness of this approach is disputable (and depends on how the account is managed), @thebigwetfeed could essentially function as an edited digest of relevant hashtags, allowing *Twitter* users (as well as visitors of the account's *Twitter* homepage) to follow this selective feed of messages rather than tracking the update streams of entire hashtags. Notably, then, virtually all of @thebigwetfeed's tweets are retweets.

Similarly, almost all of the leading accounts in fig. 5 focus mainly on retweeting information. These accounts, then, are largely amplifiers of existing information, and in doing so may perform a valuable service by allowing information to travel well beyond the #qldfloods hashtag or the follower networks of the original senders themselves. Depending on the reach of these retweeting accounts (which is determined largely by the nature of their existing *Twitter* follower networks, and on their ability to pick up further followers during the event itself), the number of *Twitter* users exposed to specific retweeted messages may increase substantially through the work of these accounts. Notably, as far as can be ascertained from the *Twitter* account profiles themselves, much of this retweeting work is undertaken by individual volunteers without established links to emergency or other relevant services.

Mere activity is an insufficient indicator of visibility and impact, however: any *Twitter* account may post updates at very high volume, but this does not mean that these messages reach an audience. A better measure of visibility is whether such messages are replied to and/or retweeted by other users: from this, a clear group of important influencers emerges (fig. 6).

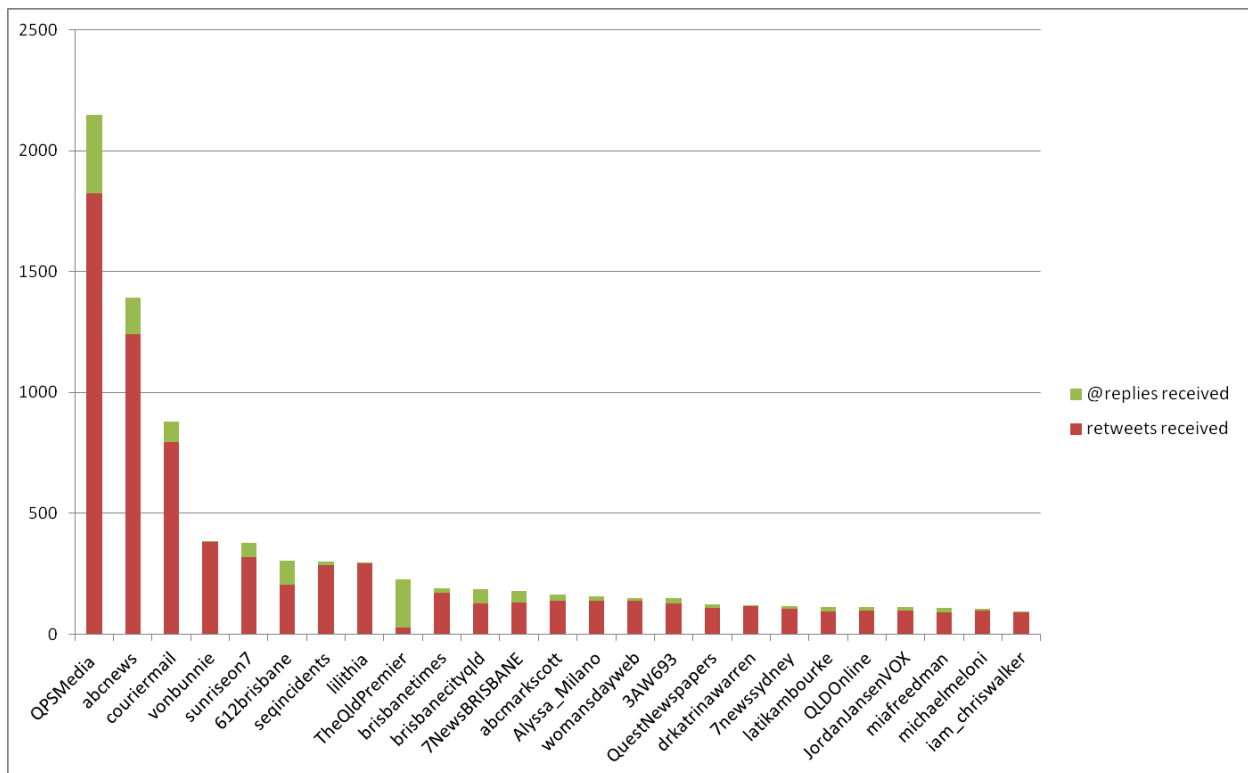


Fig. 6: Most visible contributors to #qldfloods, 10-16 Jan. 2011

In the first place, we again see a pronounced 'long tail' distribution even amongst the 25 most visible accounts: the Queensland Police Service's @QPSMedia account, as well as the

Australian Broadcasting Corporation's @abcnews and Brisbane-based metropolitan newspaper @couriermail are notable leaders. Almost all of these most replied-to accounts in #qldfloods mainly received retweets, rather than genuine @replies; however, fig. 6 shows only *hashtagged* replies, and a significant number of further @replies, without hashtags, may also have been received by these accounts. The single major exception is @TheQldPremier, the account of Queensland State Premier Anna Bligh; it received comparatively few retweets (which is not surprising, given that only one of its tweets contained a #qldfloods hashtag), but some 200 @replies. Many of these messages were not so much responding to the Premier, however, than merely mentioning her by her *Twitter* handle, for example in the process of reporting or commenting on her hourly press conferences:

'This event will test us as it has tested people in regional Qld - we will prevail' -
@TheQldPremier. #qldfloods #thebigwet

It is also notable that a significant majority of the most visible *Twitter* accounts in #qldfloods are 'official' accounts representing emergency services, media organisations, and their employees. At least ten of the accounts are operated by local, state, and national media, with further accounts by individual staff (from ABC social media reporter Latika Bourke to Managing Director Mark Scott); several others provide first-hand information from police, state, and civic authorities. A handful of non-aligned individuals are also visible, but should largely be considered to be outliers: in most cases, they are present here because a single tweet by (or about) them went viral. U.S. actress Alyssa Milano, for example, is present here only because her message about the floods was widely retweeted by her fans, who also inserted the #qldfloods hashtag:

RT @Alyssa_Milano: #qldfloods Australia needs help. www.qld.gov.au/floods information and donations. /via @Spitfire_King

Retweeting, then, is an especially important factor in amplifying the visibility of messages sent by 'official' media and emergency authority accounts. The Queensland Police account @QPSMedia sent some 72 hashtagged messages during the days examined here, for example, but received over 1800 retweets for these messages (an average of 25 retweets per message); this enabled its tweets to be seen well beyond the reach which they would have had from the @QPSMedia account or the #qldfloods hashtag alone. Fig. 7 shows that hashtagged messages sent by @abcnews achieved a similar amplification factor of 23, while the messages of several other leading accounts were also amplified more than tenfold by the *Twitter* community. (Again, we note here that our data only track *manual* retweets; even higher factors of amplification would be evident if 'button' retweets were also counted.)

This points to important lessons for emergency and media services informing the public during natural disasters and other crises: their network of followers, and the followers of the hashtags which are used in individual tweets, constitute important partners in disseminating information more widely than is possible for these services alone. Further, to maximise the possibility of retweeting, messages should be designed to be passed along easily (e.g. by leaving space in the tweet for adding 'RT @username'), and should contain hashtags relevant to the topic.

#qldfloods and @QPSMedia

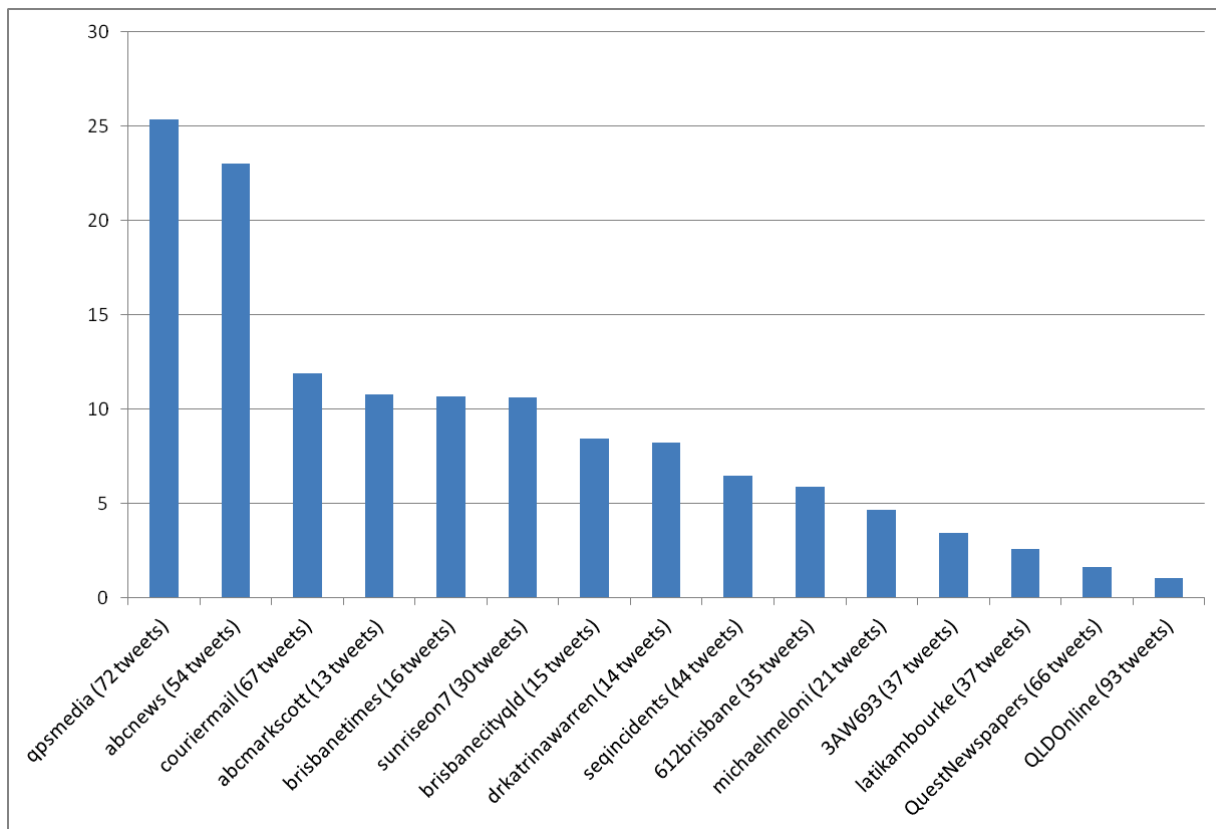


Fig. 7: Retweet amplification factors for leading #qldfloods accounts, 10-16 Jan. 2011

The present report examines activities within the #qldfloods hashtag; an assessment of the visibility of leading accounts beyond the hashtag itself is beyond its scope, therefore. Even for the hashtag dataset alone, however, the role of these most visible accounts is evident from the analysis above. A network visualisation of #qldfloods demonstrates this: here, we indicate the reach of five leading #qldfloods accounts by marking the extent to which other #qldfloods users have retweeted their messages or @replied to them.

The overall network graph (in grey) in fig. 8 shows retweet and @reply connections between all users participating in #qldfloods. Superimposed onto this graph are retweets of and @replies to @QPSMedia (in blue), @abcnews (in orange), @couriermail (in red), @sunriseon7 (in purple) and @612brisbane (in green). From this depiction of their reach throughout the #qldfloods network, it becomes immediately evident that a substantial number of #qldfloods users have drawn on information provided by these accounts, then; their retweets, in turn, would have reached an even larger percentage of the Australian Twittersphere.

At the same time, the large number of @reply and retweet connections which remain grey in this map (that is, which connect users other than these five leading accounts) also serve as an important reminder that while 'official' accounts are important during crisis events, a substantial amount of communicative work continues to be carried out by everyday users, alongside and independent of the activities of key services. While it is appropriate to applaud emergency and media services which perform well during natural disasters, the role of these volunteers in covering and responding to the crisis should not be underestimated.

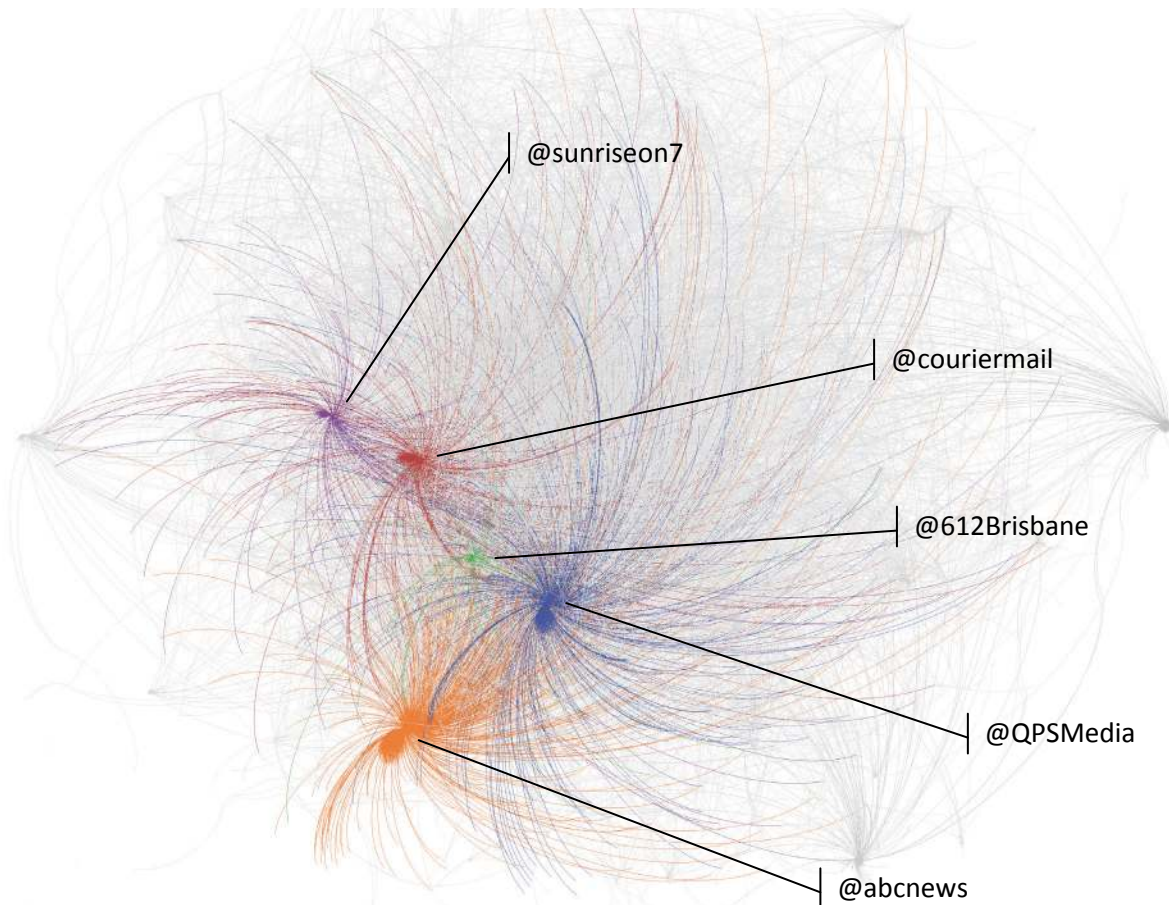


Fig. 8: Tweet dissemination for leading #qldfloods accounts, 10-16 Jan. 2011

Media Sharing

Twitter is deeply embedded in the broader media ecology, both drawing on and rapidly becoming a primary source of information for more mainstream news and media outlets. The South East Queensland Floods received worldwide mainstream media attention, as well as widespread attention from social media users around the world, who acted as observers – retweeting news stories and calls for donations, as well as expressing interest and concern. Meanwhile, users closer to the site of the disaster shared their own experiences and observations, often by including photographs and videos in their tweets.

During crisis situations, another role for participating users is gatewatching (Bruns, 2005): identifying and disseminating news and information which they deem to be of interest and value to the wider community. Retweeting the messages of key emergency services and media accounts is part of this activity, and performs an important role of amplifying the reach of those messages. It is particularly common for such retweeted messages to contain links to further, external information available elsewhere on the Web – for example, to recent news updates, emergency advisories, or eyewitness photos or videos. By extracting the URLs being shared from the *Twitter* dataset, we were able to identify what types of information, from which sources, was disseminated most widely by the #qldfloods community. We were also able to identify some patterns in media-sharing over time.

#qldfloods and @QPSMedia

Within a total archive of around 40,000 tweets, there were around 15,500 links – a relatively high proportion in comparison to other hashtag discussions such as #ausvotes (the 2010 Australian federal election, which we have examined elsewhere). This is an indication that sharing and passing along information (rather than sharing personal opinions) was a high priority for people using the #qldfloods hashtag.

Most-Shared Media Resources

In order to get a sense of the overall mix of external media resources that were most frequently shared by *Twitter* users during the floods, we reduced specific URLs down to their base domain name (or its variations), calculated the total count for each domain name (and its variations), and produced a list of the 20 most-shared domains (fig. 9).

Domain Name	Total
http://twitpic.com	2013
http://www.facebook.com	1519
http://www.qld.gov.au	978
http://www.abc.net.au	817
http://yfrog.com	813
http://www.youtube.com	655
http://abc.net.au	258
http://www.brisbanetimes.com.au	234
http://fb.me	162
http://www.couriermail.com.au	149
http://qldfloods.org	145
http://cgi.ebay.com.au	144
http://www.smh.com.au	117
http://news.ninemsn.com.au	112
http://www.bom.gov.au	107
http://www.news.com.au	92
http://www.flickr.com	90
http://m.plix.com	88
http://itunes.apple.com	83
http://www.brisbane.qld.gov.au	79

Fig 9: Top 20 most-shared URLs (domain names)

In a further step, we categorised the top 50 domains according to their primary source and purpose (fig. 10):

- **Image/video sharing** – including all known image-hosting or video-sharing services; prominent examples included twitpic.com, youtube.com, flickr.com and so on.

- **Media** – including Websites associated with ‘traditional’ media outlets (ABC, the *Courier-Mail*) and online-only news and commentary Websites (*Crikey*).
- **Facebook** – the social media platform received its own category because of its overall dominance and diverse uses (from personal updates to official emergency services announcements).
- **Government** – government sources at the federal, state and local levels.
- **Unofficial info resource** – *ad hoc* or user-created Websites and applications designed to provide or coordinate emergency response, volunteering or location information (e.g. qldfloods.org).
- **Unofficial fundraising** – *ad hoc* or user-created Websites designed to coordinate or promote fundraising and other support efforts.⁴

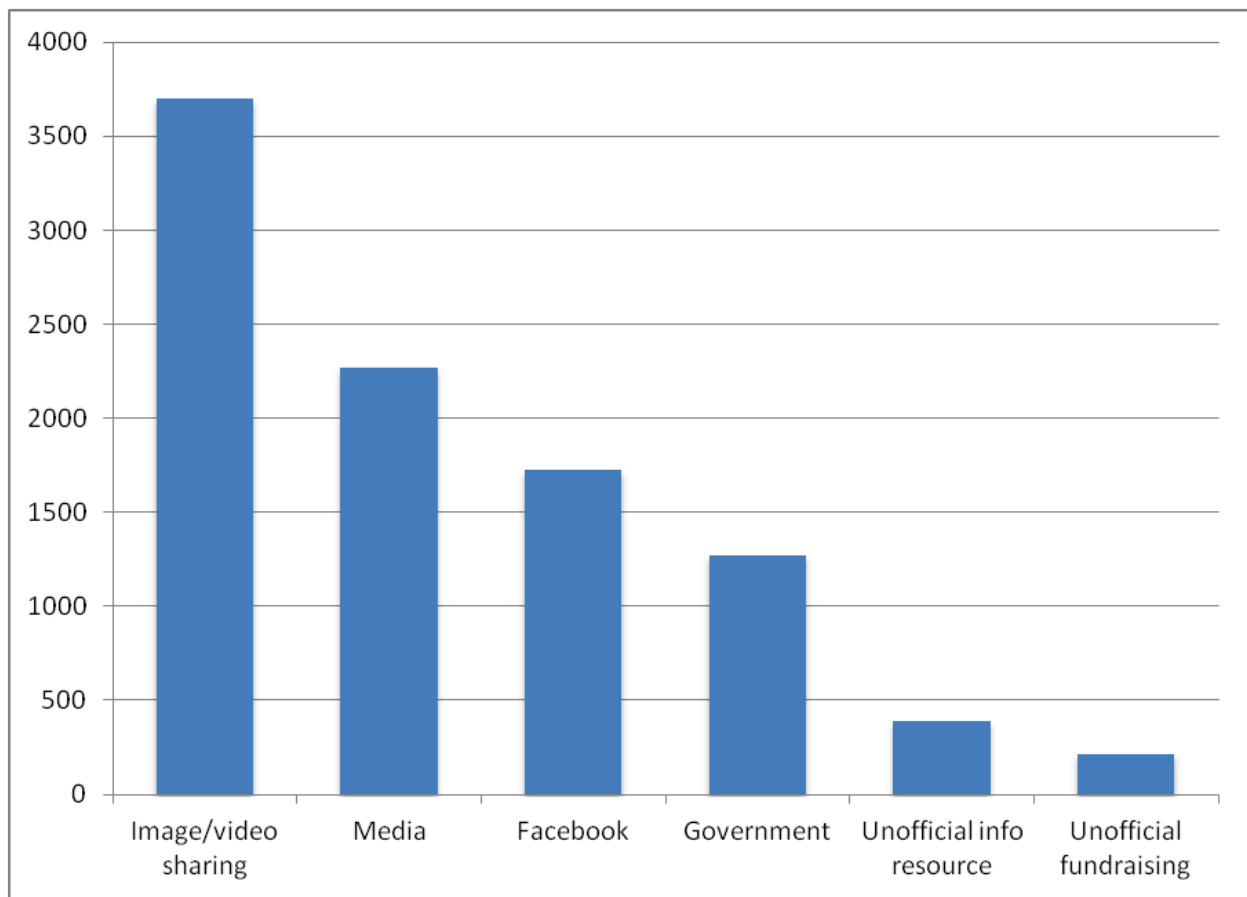


Fig. 10: Top 50 most-shared URLs (domain names), by category

The results show the continued importance of traditional media organisations (particularly the ABC as well as local or state-based newspapers like the *Courier-Mail* and the online-only *Brisbane Times*); as well as the willingness of users to pass on links to government resources or announcements. The Queensland Government Website features particularly prominently –

⁴ Three additional categories that were present in the data (albeit at very low counts) but that have been omitted from the charts as to aid readability were: ‘NGO’ (e.g. redcross.org); ‘Twitter-related’ (e.g. links to other tweets or *Twitter* ‘plugins’, etc.), and ‘personal Websites and blogs’.

#qldfloods and @QPSMedia

although many of the individual links pointed not to emergency information but to the official Website for the Premier’s Appeal (probably mainly due to it being retweeted by external observers). Also present are user-led innovations like the Qld Floods iPhone App (the iTunes link is present in the table above due links to this app in the App Store) and the unofficial information coordination Website qldfloods.org. One of the most striking results, however, is the dominance of image-sharing services like twitpic.com and yfrog.com – indicating a strong interest among *Twitter* users in first-hand images as well as news and information. *Facebook* was a platform for a range of media, information and interpersonal communication, and as the high number of *Facebook* links posted in tweets demonstrates, it is not separate from but integrated into the overall media ecology. As well as hosting images, donation appeals and so on, it was a primary channel of emergency communication for the Queensland Police Service.

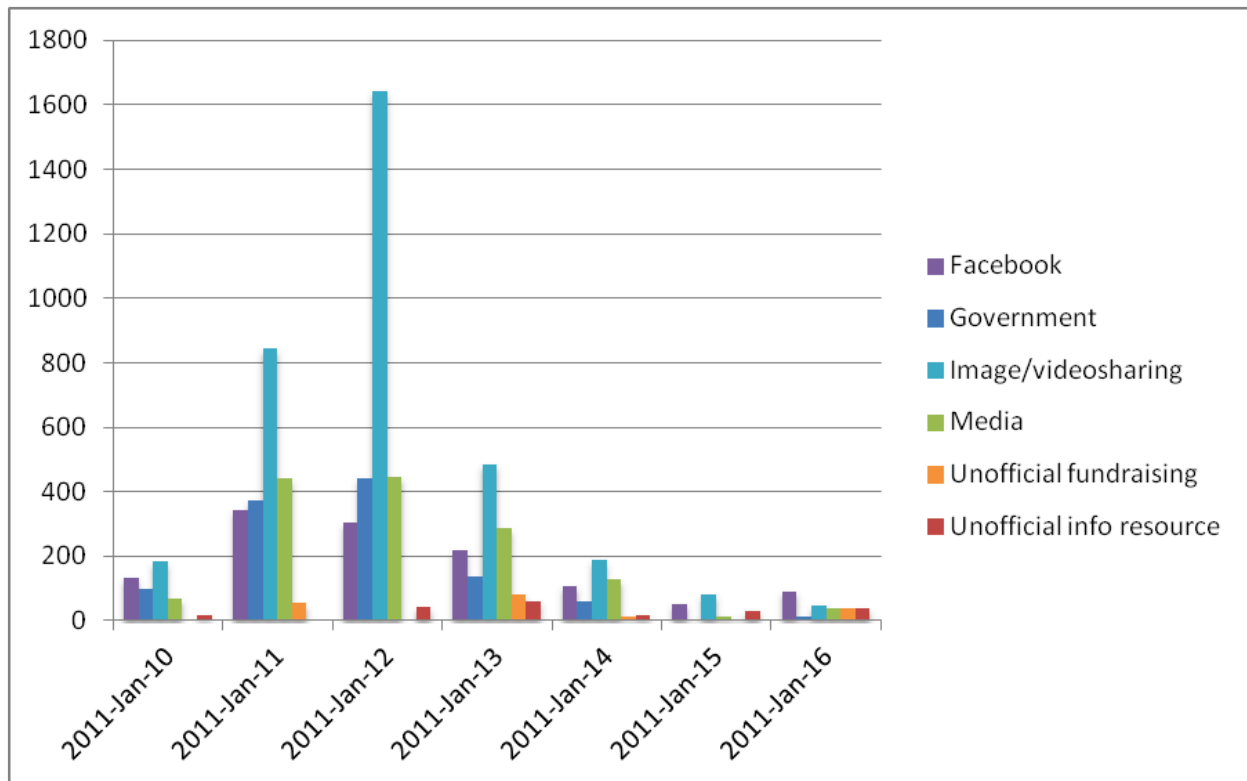


Fig. 11: Most-shared URLs (domain names) by category over time

The shape of media sharing shifted slightly over the main days of the South East Queensland emergency period (fig. 11). Early on, a smaller number of users were linking to news sources, user-uploaded images/videos, and relief-oriented Websites in response to the flash floods that had just torn through Toowoomba and the Lockyer Valley; this activity then merged with the sharing of news and information sources about the acute emergency occurring as the flood waters rose in Ipswich and Brisbane and media attention gathered steam; while at the height of the flood experience for Brisbane users on 12 January the links are dominated by first-hand images, which – alongside a dramatic overall drop-off in media attention and activity – then subside slightly by the 16th in favour of *ad hoc* relief and fundraising Websites, and a wider range of news outlets as emergency information gives way to commentary and analysis.

Image Sharing

As demonstrated by fig. 11, image sharing was one of the most popular uses of *Twitter* during the floods. Roughly one in every 5 links tweeted (or retweeted) was a link to an image on a known image-hosting service. First-hand flood images were posted and shared for a range of purposes, including what we might call ‘citizen journalism’ – from the spectacular to the informational and the mundane. Highly retweeted images included a photograph of the aftermath of Toowoomba’s flash flood, captioned “Showrooms of furniture floating into the street”. On 11 January – the day that saw the highest peaks in image sharing as users came to the realisation that Brisbane was likely to flood – one of the most shared images, captioned “People are starting to freak out, man”, captured scenes of people ‘panic buying’ in a local supermarket; followed the next day by an image of the flooded Suncorp Stadium (“Footy field or swimming pool?”), and “before and after” shots of a flooded backyard, giving locals and observers further afield a sense of scale.

The patterns of image-sharing activity matched those for *Twitter* activity overall, with strong peaks during the Australian daytime and a drop-off at night, and with the greatest activity on the days the floods began to affect Ipswich, and then Brisbane, in earnest – if anything, image-sharing appears to drop even more dramatically after 12 January than tweeting overall did (fig. 12). Overall, many more images were being both uploaded and tweeted about during the peak emergency period in South East Queensland than over the following few days, as global media attention subsided and residents gradually swung into recovery and cleanup mode.

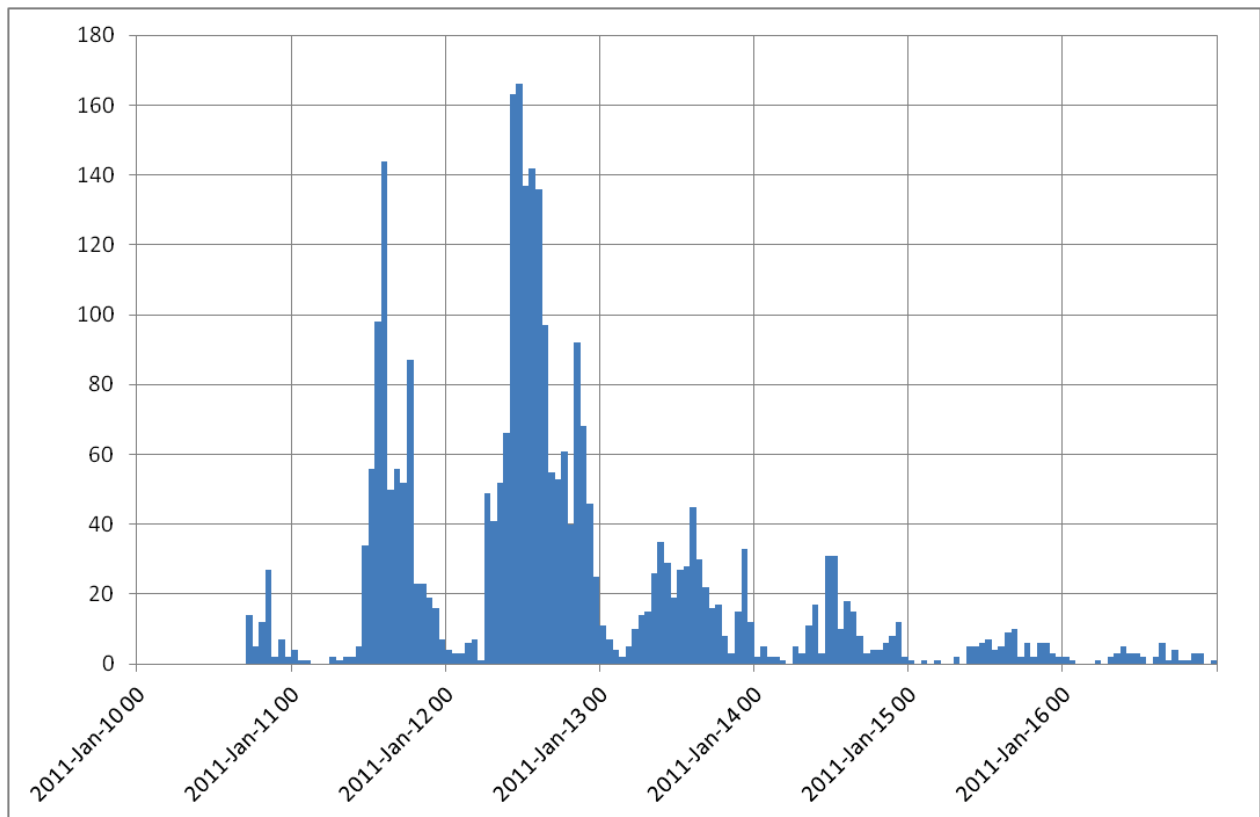


Fig. 12: Links to image-sharing services over time

#qldfloods and @QPSMedia

Users relied overwhelmingly on image-sharing services integrated into *Twitter* clients (and to a lesser extent on *Facebook* images). This dominance of social media-centric services raises questions related to public memory – and particularly the post-disaster collection, archiving and sharing of these historically significant images: such services come and go, and are designed for ephemerality (*Twitpic* lacks an export function, for example); and the copyright status of these images is uncertain and highly dependent on the terms of use of individual platforms.

@QPSMEDIA AND #QLDFLOODS

From our overall analysis of the #qldfloods data, the Queensland Police Service Media Unit's *Twitter* account, @QPSMedia, clearly emerged as the most visible participant in #qldfloods; it became a major source of information for Queenslanders and others following the unfolding floods crisis on *Twitter*, and introduced innovations such as the #Mythbuster series of tweets, which aimed to intervene in the spread of rumour and disinformation. The evident success of the QPS Media Unit's use of *Facebook* as well as its *Twitter* account @QPSMedia has been widely noted in the media, with team members Kym Charlton and James Kliemt making regular public appearances to discuss the social media strategies of the organisation in the context of crisis communication.

To further examine the specific role played by @QPSMedia in the context of overall #qldfloods activities, we undertook a detailed content analysis both of tweets in the overall #qldfloods hashtag, as well as of tweets which form part of the conversation with @QPSMedia (that is, tweets from and to the @QPSMedia account). We coded these tweets for the presence of a number of content categories, outlined below. For our analysis of #qldfloods, we worked with a representative sample drawn from the total dataset, coding every twentieth of all tweets. For our analysis of @QPSMedia, we coded all tweets containing the term "@QPSMedia", and/or sent by the @QPSMedia account.

Coding Categories

Our coding categories were first developed for the @QPSmedia sample, and then adjusted to be relevant to the overall #qldfloods sample. All tweets in both samples were then coded using this coding system, and cross-checked for consistency. Our coding scheme includes five major categories – **Information**, **Media Sharing**, **Help and Fundraising**, **Direct Experience**, and **Discussion and Reaction** – which in turn divide into several distinct sub-categories.

Information

A – Advice: Tweets that provide information about what to do (e.g. during evacuations), safety tips, and how best to act to streamline the relief and recovery process. Includes tweets that contain information about services to contact for assistance or information.

Advice for drivers stranded Wittcott #thebigwet #qldfloods <http://fb.me/yq10t405>

S – Situational Information: Tweets that provide information about the location of floods, road closures, areas to avoid, and other risks. Includes maps and other visualisations. Specific, tailored information for locals. Includes information about rescue, response and recovery from a service-oriented angle, and reports on this process from official sources. Pertains to information from official sources.

RT @seqincidents: **EMERGENCY RED MESSAGE** 7M Wall of Water to come down Lockyer Creek within 10 minutes. ALL PERSONS SHOULD EVACUATE AREA NOW.
#qldfloods

#qldfloods and @QPSMedia

RI – Requests for Information: Where individuals ask questions about the current situation or about specifics, such as looking for particular individuals, postings about lost dogs, etc. Includes requests from MSM for content or interviews.

are CBD hotels safe? with power? #qldfloods

Media Sharing

NM – News Media: Media updates, news reports, press releases and press conferences. Includes both links to other sources and headline-like tweets from official and media sources that contain statistics and provide news information independently of links.

Sydney: 'Inland tsunami' devastates Queensland towns <http://bit.ly/f36OHX> #qld #thebigwet #qldfloods

MM – Multimedia: Links to photo galleries, videos and images of the flooding.

RT @rowangbrand: This is INSANE. Cars floating down the rapids <http://bit.ly/gQySIX> #TOOWOOMBA #qldFLOODS

Help and Fundraising

H – Help: Tips for how to help as well as requests for help, volunteers, etc. Both from official sources or individuals.

RT @ftfloods: Anyone who needs help with cleanups should post on <http://fightthefloods.com> there's over 150 people ready to help #qldfloods

FR – Fundraising: Requests for donations, invitations to fundraising events, deals with help to raise money for the floods, announcements of donations.

RT @mintie: You can give a donation to #qldfloods when you pay for your groceries at Woolies. Money goes to the Salvo's appeal and is tax deductible.

Direct Experience

PNE – Personal Narrative and Eyewitness Reports: Includes tweets about direct, personal experience of the floods and eyewitness reports on the ground of events as they happen.

Just returned from Coles & picking D up & I must say the creeks in The Gap area are filling up pretty darn quickly O.o #qldfloods #thebigwet

Reactions and Discussion

AD – Adjunctive Discussion: Use of the event in question to spark off other discussions about e.g. environmental politics or the performance of the federal government.

@JuliaGillard and @TheQldPremier (Anna Bligh) suspend the #NBN and give that \$1b to help QLD rebuild! #QLDFLOODS

PR – Personal Reaction: Expression of reaction to the events as they unfold. Pertains to people who are responding to information about the event.

Total Chaos. Never thought I would see this in Toowoomba. <http://t.co/LP77d4w>
#qldfloods #thebigwet Lucky not 2 B driving home at this time.

T – Thanks: Expressions of thanks and appreciation to particular actors for their role during the flood crisis. Includes referrals and recommendations to *Twitter* users to follow particular official users.

RT @nicmclachlan: I am in jaw-dropping awe of the fire and rescue guys (& girls) working in the #qldfloods #justsaying

SP – Support: Expressions of support toward those affected by the event.

thoughts go out to those who have fallen victim to the floods in some way. and you're cats. #Qldfloods

META – Meta-Discussion: Discussions on *Twitter* and in the media about the significance of social media and its role in crisis response.

This sounds stupid but it kind of feels important to be on Twitter today. #qldfloods

Overall Patterns

Overall tweet patterns in #qldfloods over the key days of the crisis (fig. 13) are generally consistent with the patterns of activity identified in fig. 2 above: 11-13 January constitute the most active days for #qldfloods, coinciding with the height of the flood crisis in Brisbane.

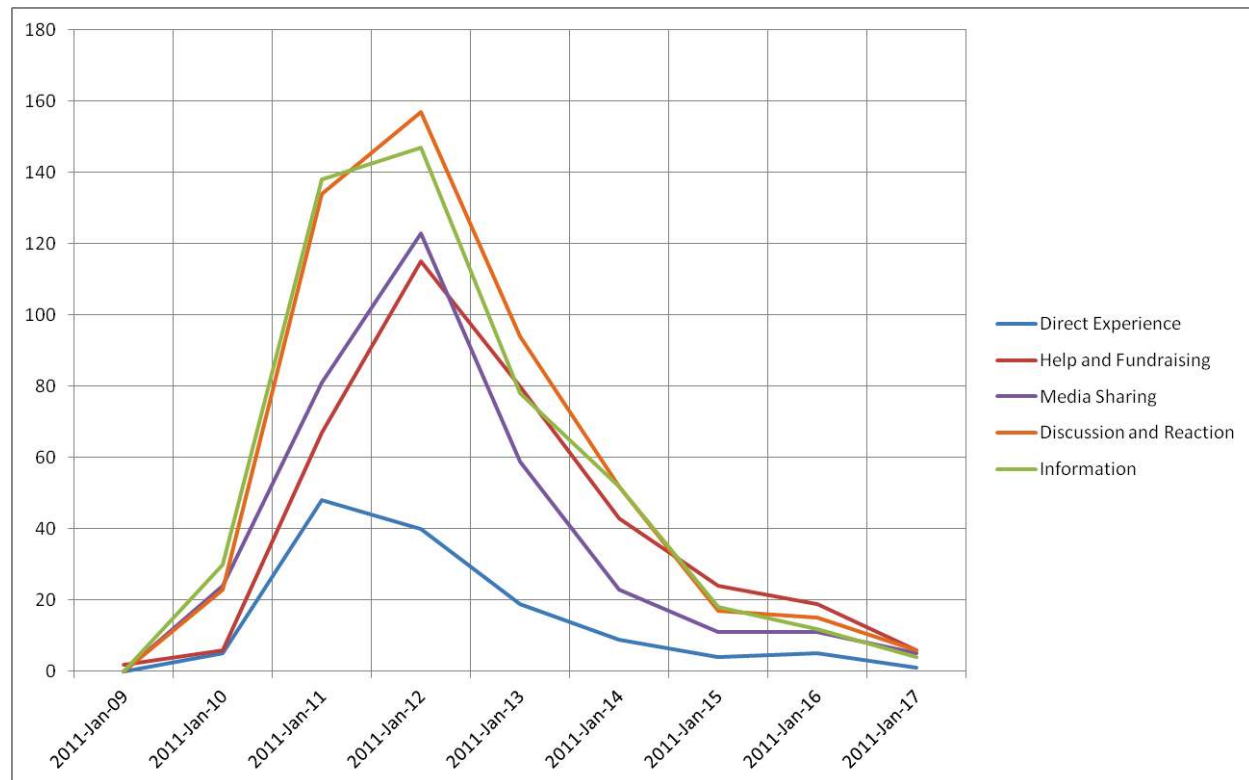


Fig. 13: #qldfloods tweet types over time (from representative sample: every 20th tweet coded)⁵

There are, however, notable differences in the trends which can be identified for the five major categories: **Discussion and Reaction** and **Information** already become prominent by 11 January, while **Media Sharing** and **Help and Fundraising** still grow substantially on the following day, as a greater range of media coverage emerges and the relief effort swings into action. The latter category, in particular, remains strong on 13 January, too – showing the gradual shift from emergency information to relief and recovery over the course of the week. By contrast, **Direct Experience** – the most minor category overall – is comparatively strong mainly on 11 January, as Brisbane floodwaters rise and several affected locals use *Twitter* to report on the current situation, resulting in widespread retweets of their messages.

A comparison of these overall content patterns with the content of tweets by and directed at the @QPSMedia account shows some clear differences in how that account was positioned within the #qldfloods discussion (fig. 14).

⁵ Note that volume numbers shown in fig. 9 indicate the number of matching tweets in the representative sample; with every twentieth #qldfloods tweet coded, they should be multiplied by a factor of twenty to obtain an indication of the total volume for each category. For example, the ~160 **Discussion and Reaction** tweets on 12 January suggest a total volume of $\sim 160 \times 20 = \sim 3200$ tweets in that category.

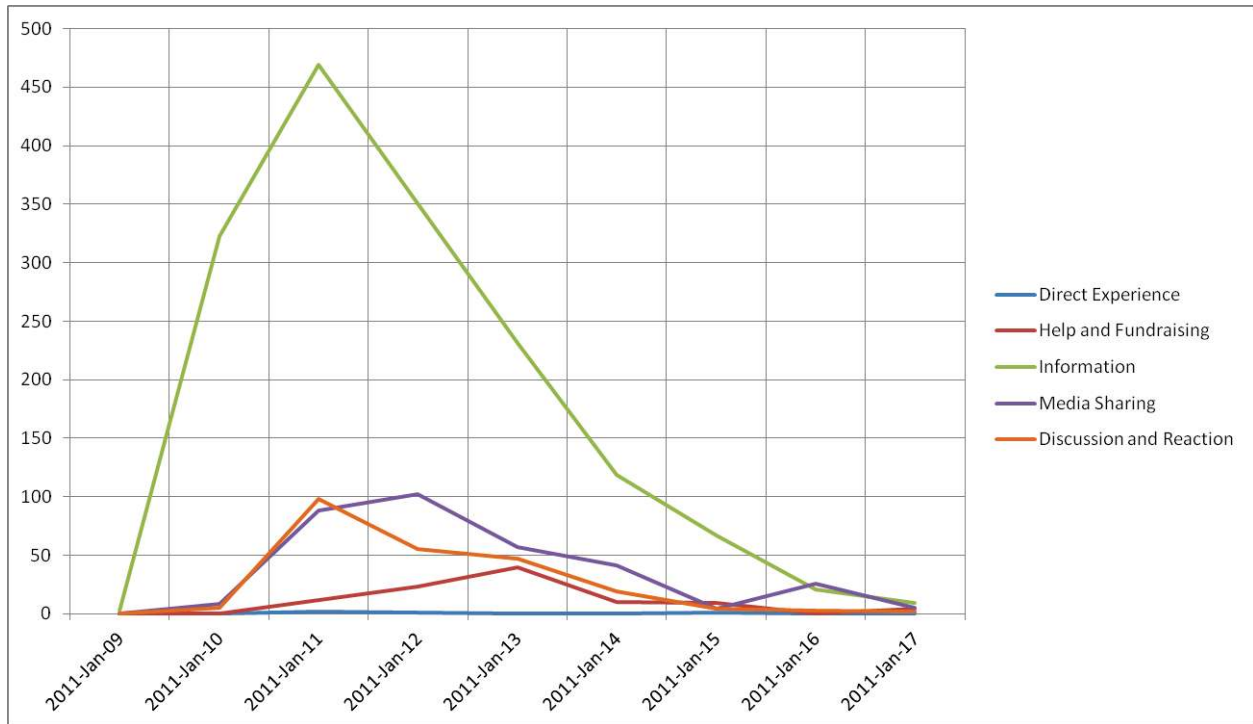


Fig. 14: #qldfloods tweet types by and directed at @QPSMedia, over time (all tweets coded)

The vast majority of tweets sent by and to @QPSMedia focus on sharing or requesting information on the floods crisis. Cumulative data for the whole week also bears this out (fig. 15).

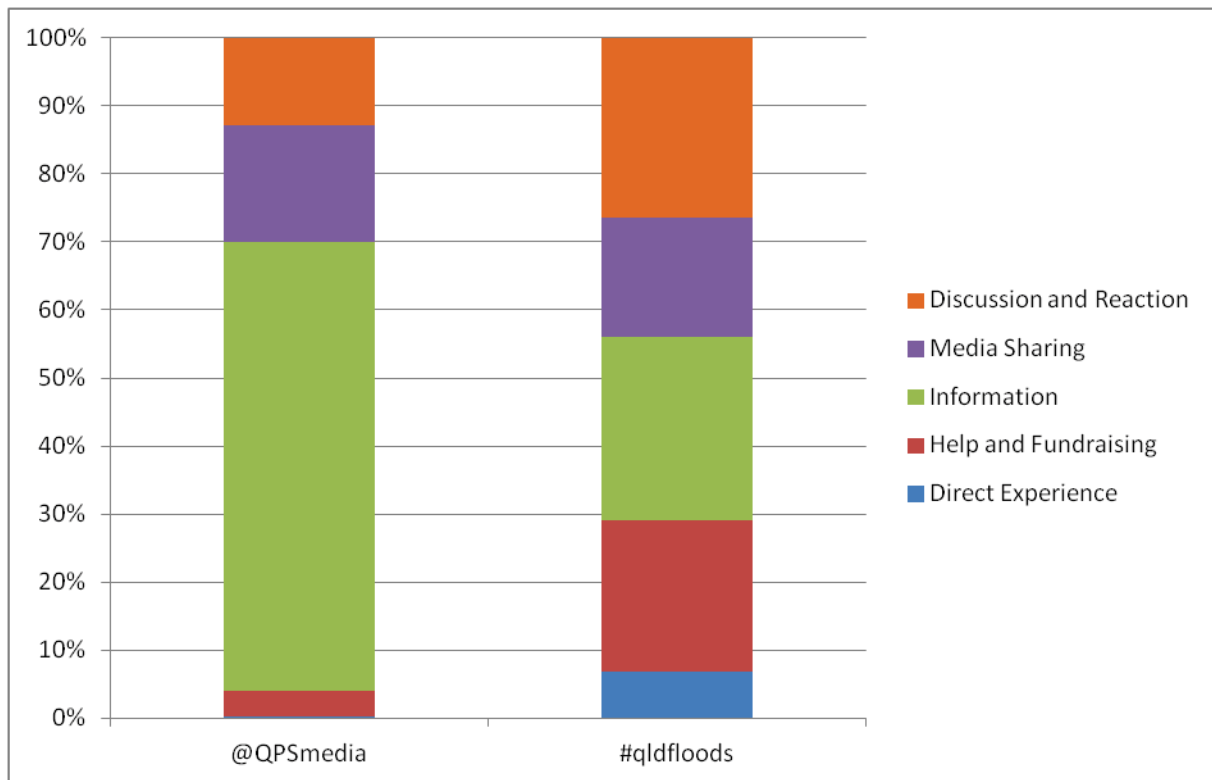


Fig. 15: Distribution of tweets by/to @QPSMedia and in #qldfloods for the week of 10 Jan. 2011

#qldfloods and @QPSMedia

Clearly, then, general uses of #qldfloods and specific conversations around the @QPSMedia account differ quite considerably. Whereas activity in the hashtag #qldfloods shows a fairly even distribution of tweet types, activities around @QPSmedia overwhelmingly consisted of **Information** tweets, complemented by a much smaller number of **Media Sharing** tweets. The third category of any note, **Discussion and Reaction**, mainly captured meta-discussion tweets acknowledging how well @QPSMedia performed during the floods crisis.

These findings clearly indicate that @QPSMedia was successful in reaching its target audience, and that the members of that audience treated the account with considerable care and respect. @QPSMedia tweets themselves were appropriate to the task at hand, containing timely and relevant information, and as a result were also widely retweeted, as we have already shown. Responses to @QPSMedia, in turn, remained consistently constructive and on-topic, as well as expressing support and gratitude to the Queensland Police Service staff operating the account.

Detailed Patterns

A further breakdown of the major categories into their elements reveals further details about the specific focus of *Twitter* discussion in #qldfloods and of conversations around @QPSMedia.

Information

Across both the overall #qldfloods dataset and the specific tweets by and to @QPSMedia, informational categories were roughly similarly distributed (fig. 16); however, as we have shown above (fig. 15), the **Information** category played a vastly more important role in @QPSMedia communication, compared to the overall #qldfloods hashtag feed.

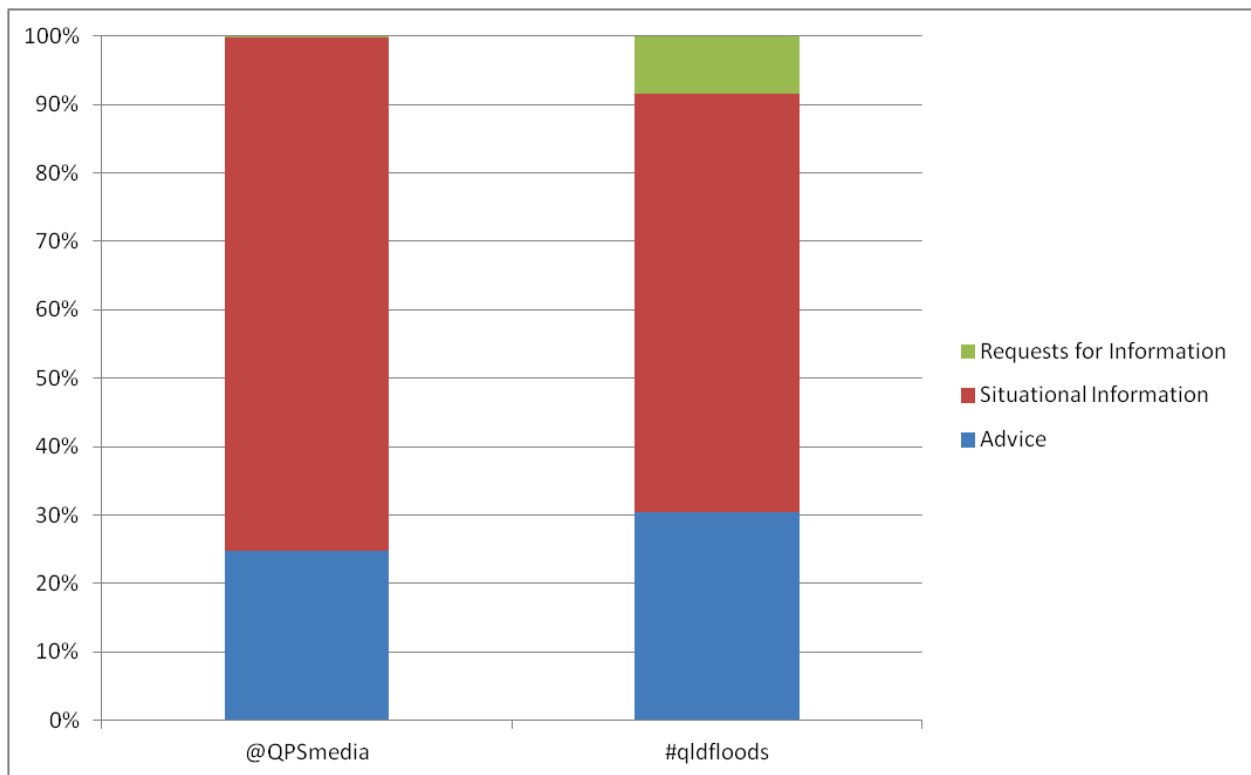


Fig. 16: Breakdown of tweets in the Information category

Amongst the sub-categories of **Information**, it should also be noted that there was considerable overlap between “Advice” and “Situational Information”. Many situational awareness messages implicitly contained advice (for example notifying residents of drinking water contamination in a particular region, without necessarily containing specific instructions to boil water). At the same time, advice tweets peaked one day later than situational information tweets.

Tweets encouraging others to check facts and not to spread rumours were among the most resonant “Advice” tweets. In coding these tweets, we also noted gradual changes in the tenor of advice tweets: as the event moved from crisis to recovery, messages from @QPSMedia began to include more law and order messages, along with survival and emergency notices.

“Situational Information” tweets, by contrast, provide information about the emergency situation as it develops. Such tweets kept users up to date on flood levels, locations of flooding, and other risk factors during the floods. During the latter stages of the crisis, as such resources became available, they also included links to flood maps and other forms of visualisation. Situational awareness tweets were related, but treated separately from, news and media updates (in the **Media Sharing** category): news updates often resembled article headlines, and contained information which did not specifically provide emergency information, but rather presented more general news about the flood disaster; such tweets became more common in the later days of the floods crisis, sharing links to articles which summarised the disaster’s effects (tracking human and economic impacts, etc.), or provided human interest stories.

“Situational Information” and “Advice” tweets were amongst the most retweeted types of tweets we observed in our data. Particular mention must be made in this context of a specific type of tweet initiated by @QPSMedia in the evening of 11 January: its series of #Mythbuster tweets (using that hashtag in addition to #qldfloods) responded directly to rumours and misinformation circulating on *Twitter*. Along with official notices to evacuate, these #Mythbuster tweets were the most widely retweeted @QPSMedia messages.

Discussion and Reaction

In #qldfloods overall, **Discussion and Reaction** tweets (fig. 17) were much more likely to be personal reactions to the emergency – expressions of shock, horror, or amazement. By comparison, the conversation around @QPSmedia in this category of tweets centred more on the role of @QPSmedia and others in helping to provide information and support during the floods: we describe these tweets as engaging in “Meta-Discussion”.

Unsurprisingly, too, of the “Thanks” (directed specifically at identified stakeholders) and “Support” (general expressions of support for affected locals) categories, “Thanks” is more prominent in the @QPSMedia dataset, where such thanks are generally directed at the Queensland Police Service itself. In the broader #qldfloods sample, on the other hand, expressions of thanks are also directed towards other actors, such as Premier Bligh, rescue workers, and other official online sources, while – appropriate to the more general discussion taking place in #qldfloods – there is also a greater level of general expressions of support.

#qldfloods and @QPSMedia

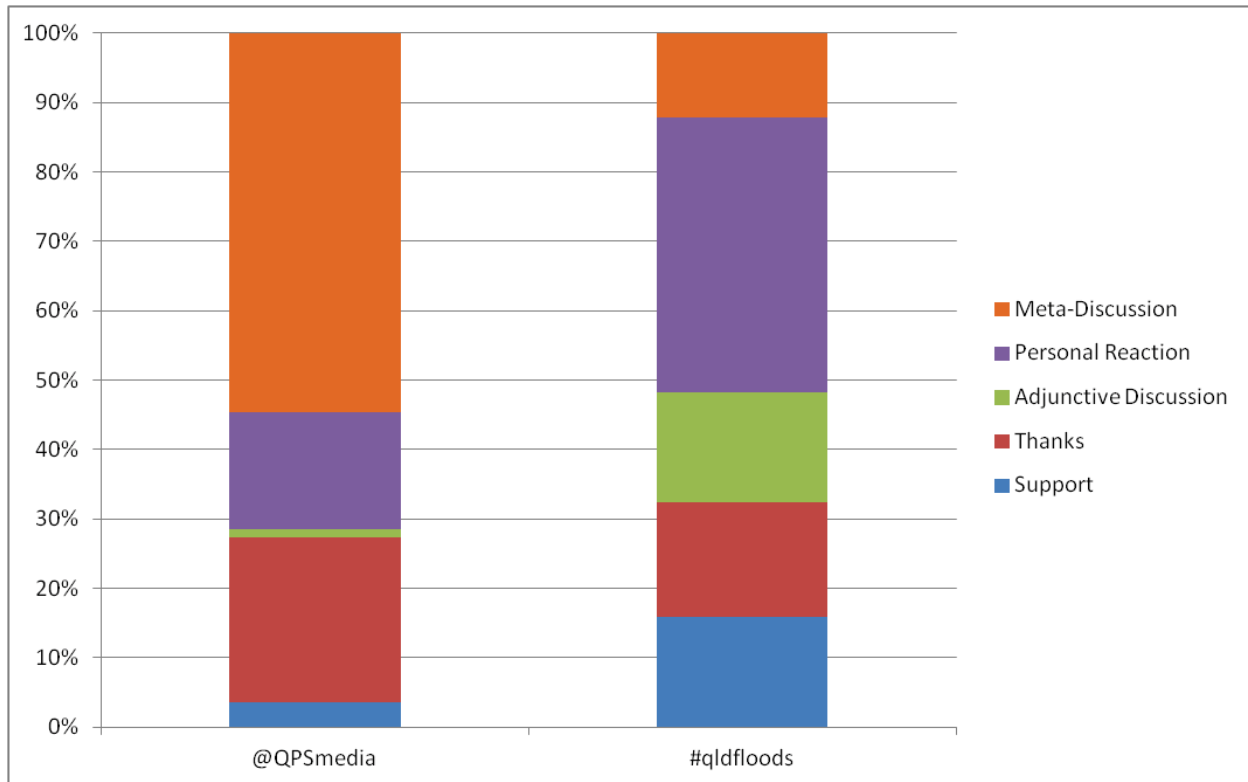


Fig. 17: Breakdown of tweets in the Discussion and Reaction category

Within the @QPSMedia conversation, overall discussion topics in this category of tweets included expressions of shock and sadness about information posted by @QPSMedia (or of gratitude when news was good), comments about how particular information related to users' own circumstances (e.g. "this is the street next to our practice!", "That's cut me off"), and questions about particular rumours and requests for safety information (e.g. "Do you think it will be safe to drive from the Gold Coast to Brisbane Airport tomorrow evening?!"). @QPSMedia's own engagement in these discussions was generally limited to a few apologies for errors and miscommunication. "Meta-Discussion" tweets showed that users were extremely appreciative of the role which @QPSMedia played in providing information during the flood crisis. Particular admiration was expressed for the mythbusting activities initiated by @QPSMedia.

Media Sharing

As fig. 15 showed, the sharing of information in more news-style formats (as both text and multimedia) constituted a more minor activity in #qldfloods than might have been expected, given the significant news coverage which the floods generated; this may be due in large part to the fact that in its focus on the speedy dissemination of the latest updates the hashtag community predominantly shared first-hand situational information and advice, provided not least also by @QPSMedia directly from emergency services situation briefings, rather than the write-ups of such information which would have become available a short time later on the Websites of major Australian and international news organisations. Tweets in the "News Media" category were more likely to summarise the events of the floods and provide less specific information for a broader audience; the frequency of such tweets in the #qldfloods hashtag

stream increased largely during the later days of the floods crisis, *after* the immediate threat had passed.

Where they did post **Media Sharing** tweets, #qldfloods users also disseminated a substantial amount of links to multimedia resources (including photos and videos of the floods and their aftermath); more than one third of these tweets pointed to such resources (fig. 18). Tweets in the @QPSMedia conversation, on the other hand, focussed overwhelmingly on conventional news reports in textual form.

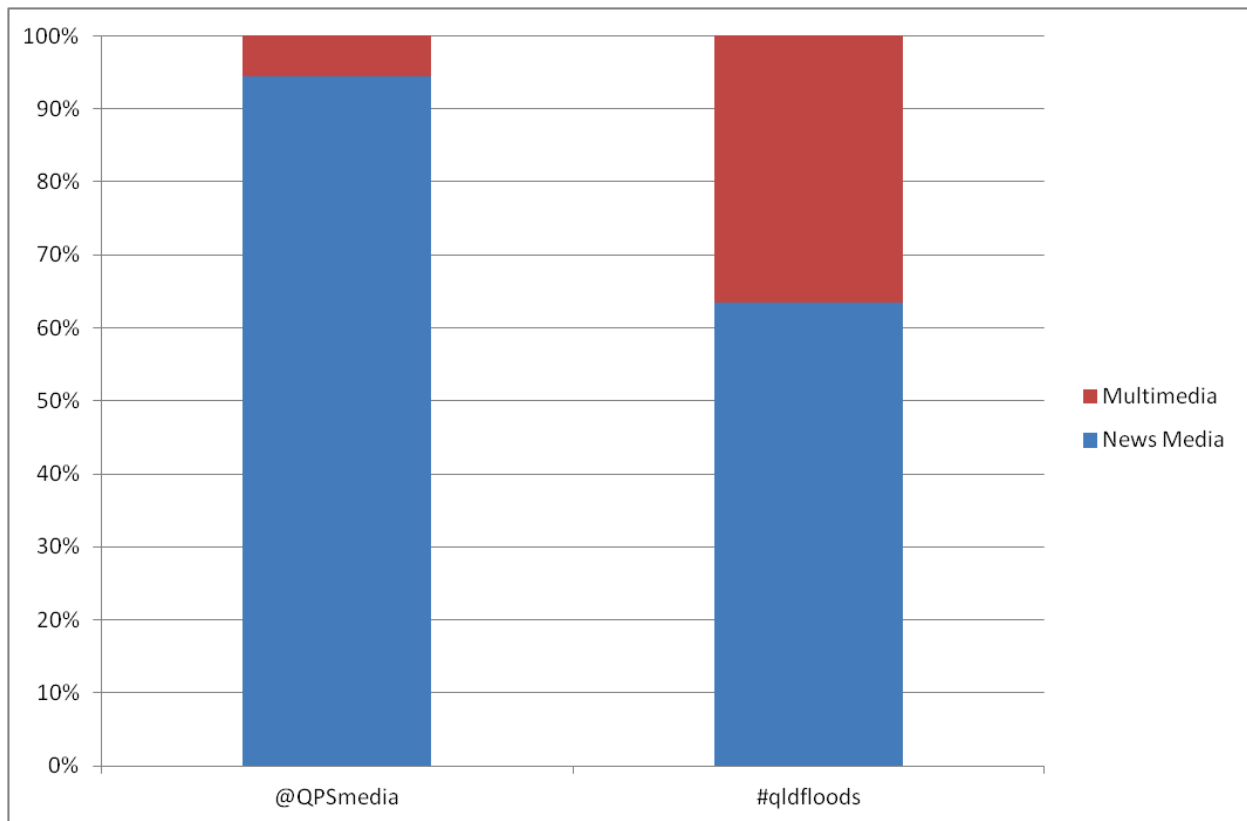


Fig. 18: Breakdown of tweets in the Media Sharing category

Help and Fundraising

In keeping with the implicit purpose of the @QPSMedia *Twitter* account, tweets in the **Help and Fundraising** category (fig. 19) accounted only for a very minor percentage of the messages by and to this account; less than four per cent of the #qldfloods tweets contributing to the @QPSMedia conversation were coded as belonging to this category. Of these, in turn, only some ten per cent dealt with fundraising matters; it appears that the purpose of @QPSMedia as an informational account, and the operational issues which would prevent the Queensland Police Service from engaging in the promotion of active fundraising efforts, were well understood by both police personnel and @QPSMedia followers. Information about volunteering and other forms of help, on the other hand, was more widely shared by and with the @QPSMedia account, even if it still constituted only a minor element of the overall conversation around @QPSMedia.

#qldfloods and @QPSMedia

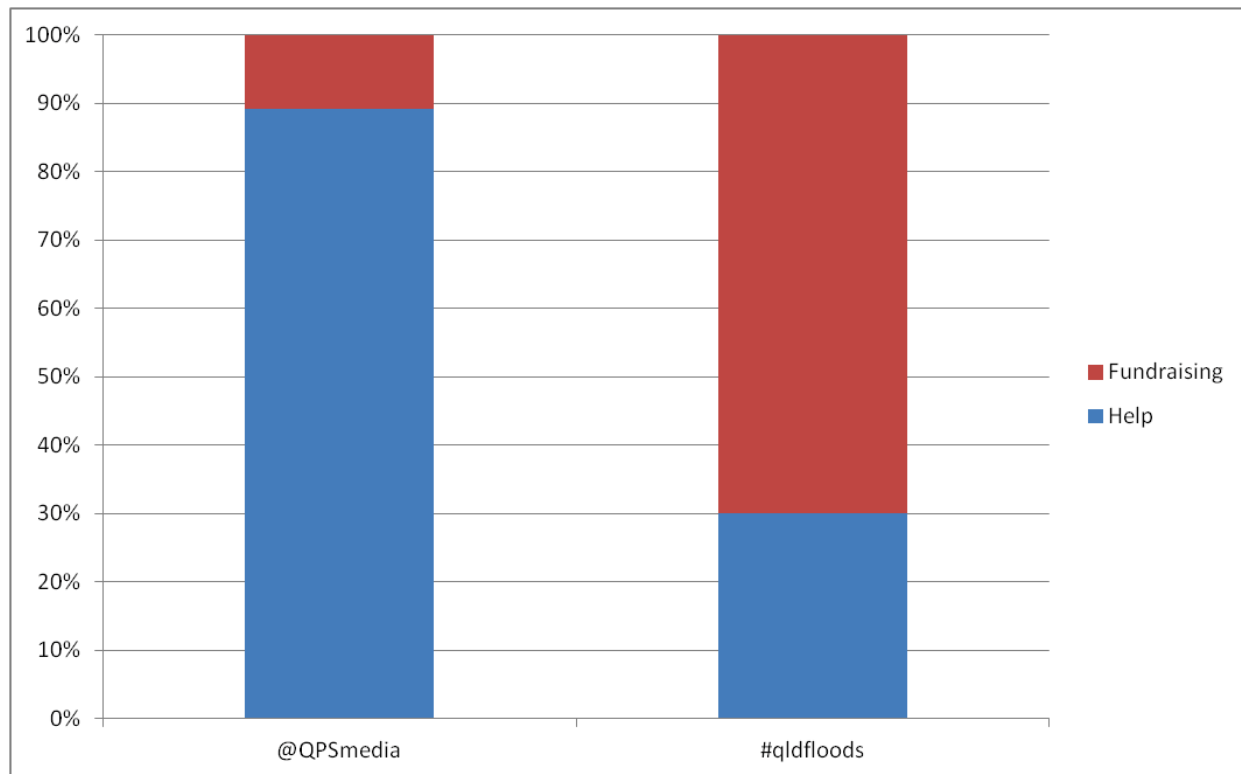


Fig. 19: Breakdown of tweets in the Help and Fundraising category

By contrast, almost one quarter of the overall #qldfloods feed consisted of **Help and Fundraising** tweets, peaking on Wednesday and declining less quickly than other tweet types, as fig. 13 showed. This clearly indicates the shift of focus from rescue to recovery, and the strong response to the crisis from affected communities as well as more distant onlookers. Notably, the overall #qldfloods feed focussed considerably more strongly on fundraising activities than on organising immediate volunteering and other help activities; some 70% of tweets in this category shared fundraising information, with that number boosted also by a substantial number of retweets. This may also indicate the continuing presence of *Twitter* users outside of South East Queensland, unable to engage in hands-on volunteering activities but could contribute through donations (or at least points to a perception amongst the #qldfloods community that such more distant users were still paying attention to the hashtag).

Direct Experience

At less than one per cent of the total, messages of the **Direct Experience** category – which covers largely personal narratives and experiences, as opposed to more immediately situational advice and information – were almost entirely absent from the @QPSMedia conversation; even within the larger #qldfloods sample, they accounted for less than seven per cent of the total update stream. This is likely to indicate that: first, the #qldfloods discussion involved a pool of participants that extended far beyond directly flood-affected residents; and second, where local *Twitter* users did share personal experiences in the floods, they were more likely to do so in the form of shared eyewitness images and videos, or as situational information and advice for others (leading to their tweets to be counted towards those categories rather than Direct Experience), than as ‘merely’ personal narratives.

Amplification by Retweeting

The prominence of certain categories of tweets both in the overall #qldfloods sample and in the conversation around @QPSTMedia is due in part also to the substantial amount of message sharing through retweeting. Retweeting not only increases the visibility of messages in the #qldfloods hashtag itself, but especially also passes them along to new recipients: the personal *Twitter* followers of each retweeting user. Retweets, in other words, play a significant role in amplifying *Twitter* messages well beyond the reach of the original sender or hashtag.

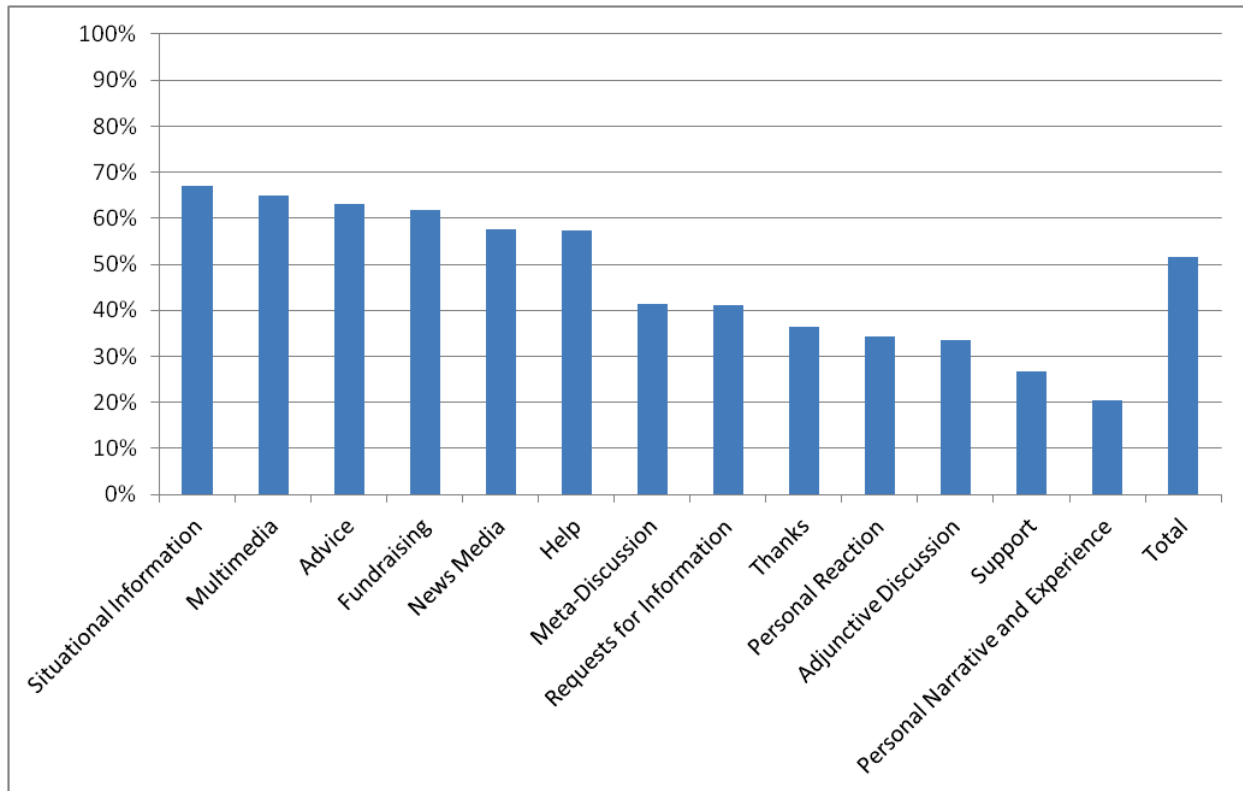


Fig. 20: Percentage of retweets amongst messages across the #qldfloods content categories

Retweeting patterns for the overall #qldfloods sample (fig. 20) are healthy, for the type of conversation which #qldfloods represents: of all tweet categories, those containing the most immediately important information are also the most widely retweeted. More than two thirds of tweets providing “Situational Information” are retweets, for example, and similar visibility is also achieved by the other **Information** sub-category, “Advice”; similarly, both the “Multimedia” and “News Media” sub-categories of **Media Sharing**, and the “Fundraising” and “Help” sub-categories of **Help and Fundraising** are prominently positioned here. By contrast, tweets containing more personal narratives, expressing general support, or engaging in other, less immediately crucial commentary are considerably less likely to be retweeted; only some twenty per cent of “Personal Narrative” tweets are retweets, for example.⁶

⁶ Again, we note that in this discussion we count *manual* retweets – of the format ‘RT @user *original message*’ – only; adding ‘button’ retweets would further boost these numbers across the board, and it is likely that ‘button’ retweet rates would follow a distribution pattern similar to that for manual retweets.

#qldfloods and @QPSMedia

This focus on retweeting the most salient information is even more pronounced when only tweets in the @QPSMedia conversation are considered. Fig. 21 shows the average amplification factor for all significant sub-categories in the @QPSMedia dataset: it shows clearly that each message in the **Media Sharing** and **Information** categories within this dataset received more than six retweets, with “Multimedia” and “Advice” tweets even receiving more than ten retweets on average. By contrast, while significant numbers of “Meta-Discussion”, “Thanks”, and “Personal Reaction” tweets are present in the @QPSMedia conversation, these did not receive substantial numbers of retweets; overall, they are likely mainly to constitute individual users’ comments *to* or *about* the efforts of the Queensland Police Service Media Unit, while the widely retweeted messages are much more likely to have originated *from* @QPSMedia itself.

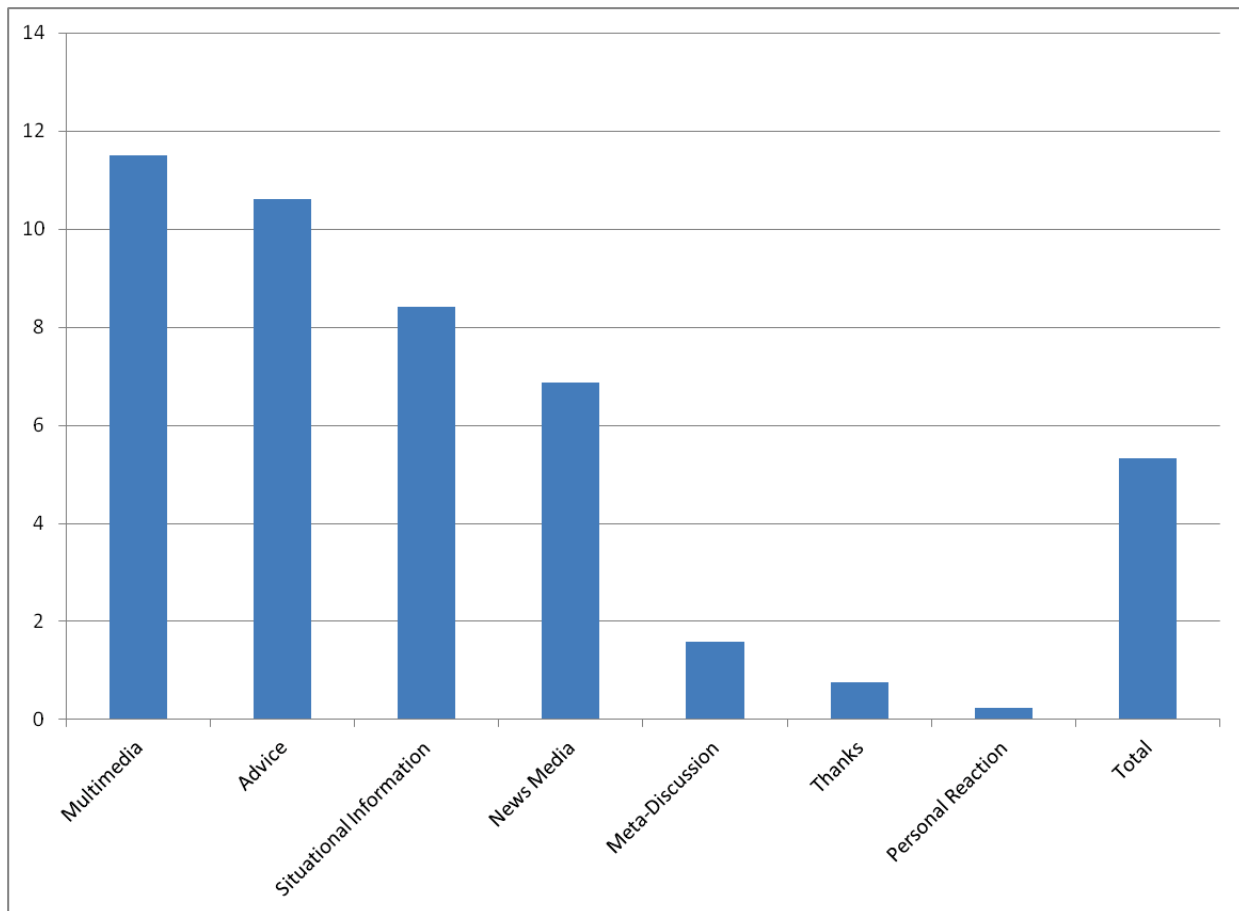


Fig. 21: Average retweet rate of for tweets in the @QPSMedia conversation

Conclusions

Taken together, these observations clearly document that the information posted on *Twitter* by the Queensland Police Service, as well as by other authoritative sources, was able to ‘cut through’ effectively: to reach its immediate audience as well as be passed along and thus amplified many times over, with the help of other *Twitter* users acting as further information disseminators especially at the height of the crisis. Even more notably, tweets containing situational information and advice, pointers to news media stories and multimedia updates, but

also notably advice on how to help or donate funds, were particularly “resonant”; while @QPSmedia itself did not provide much information related to help and fundraising, many other *Twitter* users provided and shared such information in their stead.

These data also confirm that the tweets posted by @QPSMedia, in particular, were as useful and authoritative as the crisis situation urgently required; they provided timely and important information and advice for flood victims and other information-seekers. At the same time, given that the Queensland Police Service’s approaches to using *Twitter* during the flood crisis were developed *ad hoc* and with little prior planning, these successes also suggest that there is significant scope for official agencies to play an even greater role in providing up-to-date information and coordinating relief and volunteer efforts through social media, alongside their more established emergency management procedures.

Sadly, 2011 has seen a number of further natural disasters and other crises, and social media have played a substantial role in many such events, too; stories similar to that of the South East Queensland floods could be told for these events as well. The experience of the Christchurch earthquakes (in September 2010 and February, June, and December 2011), for example, points to a growing confidence and sophistication in civic authorities’ use of *Twitter* and other social media tools as channels for providing and receiving information (cf. Bruns & Burgess, 2011c); overall, research into the use of social media for crisis communication also highlights time and again the important role of social media exchanges in facilitating a communal process of sense-making which begins with the immediate disaster event and continues for weeks and months after it. Further work should now be done by Australian emergency management authorities and researchers to understand the lessons from these events, and implement more advanced strategies for using social media in crisis communication, from the immediate rescue phase to the long-term recovery process.

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