

# The Role of Information Visibility in Network Gatekeeping: Information Aggregation on Reddit during Crisis Events

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## ABSTRACT

As social media platforms witness more and more contributions from participants during developing crisis events, some platforms provide affordances that support visibility for specific pieces of information. However, the design of information visibility, especially in the context of controlling information flows (through gatekeeping), may shape how participants collect and share up-to-date information in these systems. This paper looks at the field site of reddit.com through trace ethnography methods to understand how the design of reddit's platform (from algorithms to user roles) impacts the visibility of information and subsequently how participants aggregate information in response to ongoing events. Through trace ethnographic analysis, we illustrate three themes related to tensions around visibility – behavioral, structural, and relational – and show how visibility shapes the work of producing information about crises in social news sites.

## Author Keywords

Network gatekeeping; visibility; crisis communication; aggregation; breaking news; information flows; trace ethnography

## ACM Classification Keywords

H.5.3. Computer-supported cooperative work

## INTRODUCTION

In crisis situations, such as earthquakes, shootings, and other natural and man-made emergencies, finding useful information remains a difficult yet critical problem. However, as social media adoption increases and more people share information during ongoing crisis events, surges of information make finding information more difficult. Though some online sociotechnical systems have designed affordances to make finding particular information

easier, the visibility of information continues to be a practical – and theoretical – issue, not only for people finding information but also for people producing information during crisis events. For designers as well as users, it is important to know how information visibility impacts how these contributors do their work.

Visibility therefore may be a crucial factor in information flows. One lens that provides insight into control over information production processes is the concept of “gatekeeping” [3,46,47,63], where particular actors (“gatekeepers”) permit or restrict certain information as it passes through “gates” in the process of reaching audiences (the “gated”). Contemporary analyses of gatekeeping such as “network gatekeeping” [3,4] have extended traditional theories of information flows in cases where ordinary participants – such as those in social media platforms – act as both information producer (“gatekeeper”) and consumer (“gated”) and interact with others who may have variable gatekeeping abilities. Network gatekeeping theories touch briefly on or usually evade issues of system design, and only some literature in CSCW captures the importance and influence of information visibility. Notably, “social translucence” argues that people have a sophisticated understanding of the visibility of social actions in the production of information [17], and focusing on how people understand the visibility of information may change the way that people use these systems. Especially when scholars have shown that engagement on social media platforms derives from access to particular pieces of information over others (i.e., visibility, such as retweets, reblogs, trending topics, promoted content, etc.), theories about information flows should recognize the tensions that designs introduce to the visibility, consumers, and producers of crisis information.

This paper therefore presents data on the impact of information visibility on how crisis communicators contribute information and how this evidence helps us rethink the role of information visibility in system design theory. In particular, it presents the concerns about and conflicts around visibility for participants who aggregate and respond to information produced in reaction to crisis events within the particular genre of social media platforms

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called “social news sites.” Social news sites, like reddit, Digg, and Slashdot, rely on the network of users to vote on individual pieces of user-generated content, which are then algorithmically ranked and displayed to readers, most often with the highest-voted links, media, etc. appearing at the top of the page [26,27,29,33,43]. While the network of participants helps filter the many pieces of information submitted per day, moderators and administrators enact privileges, like deletion, from their designed user roles that may also significantly shape the way that ordinary participants contribute to the system. In this paper, we ask the following research questions related to the labor of managing information visibility during crisis events:

*RQ1. How does the design of a social media platform impact the visibility of information during the network gatekeeping of a crisis event?*

*RQ2. How do people who share information about these events account for issues of visibility in their crisis communication work?*

Understanding the impact of design on information flows motivates this research, particularly when people on social media platforms play a larger role in information publication and circulation. As UGC platforms like Twitter, Facebook, and reddit become more widely used, in some instances they extend or even eclipse mainstream media reporting in speed of information circulation or access to new original sources [2,9]. Also, journalists increasingly are engaging with audiences themselves on these platforms in addition to – or instead of – using news organization websites [8,11,60]. One of the critical aspects though, is that access to crucial information (i.e., information visibility) may be restricted by the design of these systems. In particular, participation in platforms that employ designs that affect information visibility (e.g., Facebook’s News Feed) have consequences for people based on how much they understand these systems to work [18,44].

In studying people’s behaviors within the constraints of information visibility, we also investigate the details of reddit’s platform design and its impact on information visibility during breaking news situations. In particular, we are interested in the collaborative intersections between a variety of human and technological actors (from community member audiences, information aggregation participants, moderators, and administrators to ranking algorithms, designed user roles, bots, and bespoke code).

## **RELATED WORK**

Examining the implications of information visibility for crisis communication, we look to theories of network gatekeeping to understand the complex ecosystem of human and technological actors and their collaborative influence on information flows. We then look at information visibility and how it intersects with sociotechnical design as understudied elements in crisis communication.

## **Gatekeeping**

Gatekeeping describes forms of control in information systems, where “the process by which the billions of messages that are available in the world get cut down and transformed into the hundreds of messages that reach a given person on a given day” [46]. The basic concept suggests that a variety of actors can open or close the “gates” so that certain information passes through while others do not. In the era of broadcast mass media, early gatekeeping theories primarily focused on selection – when a message is moved from story selection to publication, an individual, group, or organization decides to continue or discard the message [63] – and the process of gatekeeping frequently involved multiple gatekeepers, each enacting different decisions at points in various channels [30]. As the complexity of information and media systems has increased since the mid-twentieth century, the presence and roles of multiple gatekeepers has shifted organizationally in order to address the management of even more information [47].

## **Network Gatekeeping**

Earlier gatekeeping theories did not focus on the evolving actors, fluid roles, and dynamics of control in digital networks. Barzilai-Nahon [3] identified that the focus of earlier theories “remains on the role of the gatekeeper rather than understanding how networks (human and technological) and information affect relations between gatekeepers and gated, and their impact on gated” (1495). The concept of network gatekeeping compensated for the traditional unidirectional and top-down assumptions of gatekeeping control, emphasizing instead the evolving network structures between actors in contemporary communication and organizational forms. Network gatekeeping extends gatekeeping theory to focus on how networks of actors – both human and technological – reflect different (or even previously overlooked) practices of control between gatekeepers and gated individuals or groups within the intersecting processes of gatekeeping, as well as the novel social effects of shifting from hierarchies to networks. A modern conception of gatekeeping therefore focuses on the ways that participants (formerly conceptualized as a static audience) can and do participate and provide feedback to information processes [47].

Barzilai-Nahon focuses on four primary differences from traditional gatekeeping which highlight the changing role of gated individuals and groups: political power, or who has control over information and how it changes in a network; information production, or how gated actors have the ability to create information; relationships between gatekeepers and gated, such as the ability to provide feedback; and alternatives, or other options for the gated, whether different gatekeeping rules, technologies, platforms, etc. While each of these gatekeeping attributes remains salient for peer production on reddit, this paper focuses primarily on “political power” to understand how design becomes a gatekeeper in relation to the varying modes of control that shapes and influences participation in sociotechnical

systems. Notably, political power can stem from technical and social influence: Barzilai-Nahon identifies facets of gatekeeping in the network context that map to visibility, such as addition, display, timing, and deletion. Still, when identifying mechanisms for gatekeeping, while she presents a range of categories, none encapsulate the *filtering mechanisms* of contemporary platforms that work at scale to present algorithmically-curated information to large audiences. This paper therefore explores further opportunities around extending “editorial mechanisms” into the socio-algorithmic realm of determining visibility.

### **Network Gatekeeping, Visibility, & Design**

The concept of visibility generally refers to “the means, methods, and opportunities for presentation” [7]. More information means “a scarcity of whatever it is that information consumes... it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention” [48]. People make decisions to direct their attention to specific information, or they put their trust in media organizations and platforms to provide the information they should see. While the agenda-setting function of mass media forces attention to certain issues [32,62], new media technologies provide audiences new routes for discovering important and relevant information.

In the network gatekeeping literature, some studies find that participants who are faced with immense amounts of information within large social networks “preserv[e] and amplif[y]” information through platform mechanics that afford visibility, like retweeting [6,36]. Participants can also help “elevate others to elite status” in social networks through conversational practices (like @-mentioning on Twitter) that help promote information and make it seem relevant to other audience members [34]. Though these studies address some of the implications of the platforms, they tend to avoid critical discussions of design and infrastructure, especially when it comes to what information ultimately becomes promoted through the platform.

This paper in particular focuses theoretically on the power, control, and access of participants specifically in relation to the design of the platforms in which they participate. Various aspects of digital system design can shape and influence behaviors of participants, so focusing on the affordances of these systems helps illuminate social conflict that may not stem solely from human interaction.

While platforms “allow code to be written or run,” they also “afford an opportunity to communicate, interact, or sell” [21]. A technological deterministic approach would argue that code controls all activity within sociotechnical platforms, and while systems involve material artifacts and properties, “systems of production are also social systems” [28]. Affordance perspectives help synthesize deterministic approaches by focusing on the relationship between technology and its participants [19]. Affordances “[force] the researcher to consider the symbiotic relationship between the action to be taken in the context and the

capability of the technology” [31]. A technology affordance mixes with the mediating powers of code to focus on “the mutuality of actor intentions and technology capabilities that provide the potential for a particular action” (39).

Many platforms afford visibility, whether through the amplification of information by multiple people (e.g., voting) or through aggregated calculations (e.g., trending topics). Visibility remains an important dimension of information systems, because as users in social media platforms increasingly create immense amounts of information year after year, attention increasingly becomes a commodity, since people vie for stardom, popularity, and accumulated metrics [22]. In online sociotechnical systems, visibility “is tied to the amount of effort people must expend to locate information... if people perceive that information is difficult to access, or they do not know what information exists for them to access, they will likely not seek it out” [58]. For instance, algorithms that recommend, rank, or filter information [5,33] can provide better visibility of particular types of information at scale, when thousands or millions of participants contribute information on a daily basis. Further, design might allow large communities to act collectively in similar ways as computational filters of information by calling attention to or rejecting information in real-time gatekeeping roles (e.g., through retweeting as an automatic feature on Twitter [60]).

The process of platforms’ construction of visibility possibly occurs in more-subtle ways than the traditional editorial processes of news organizations, since new media platforms and ecosystems deal in “mediated visibility,” where networked, digital technologies generate “a variety of new interactional situations which have their own distinctive properties” [56] depending on the technology in question. Especially in cases where the platform provides affordances of visibility to particular pieces of information, a “threat of invisibility” manifests where information contributed to the system might not be made visible [12]. Therefore, this paper aims to provide evidence that concerns about visibility impact the kind of work that older application of network gatekeeping may have overlooked.

### **Information and Visibility in Crisis Contexts**

In crisis contexts, promoting information remains a key concern for participants, as they wish for their intended audiences to stay informed about developments. During emergencies, natural disasters, and other immediate developing events, people go to networked social platforms to seek and share information [38–40]. However, every crisis is unique and may require improvisation [37]. As such, the information needs of participants change, both within a particular event over time and between events, as well as per type of participant (from emergency workers to volunteers and civilians [14,15,52,61]).

Information moves in a variety of ways based on participants’ needs. In the range of information seeking and sharing behaviors during disasters, people provide

situational awareness to emergency officials and other locals [15,27,61], recruit or organize volunteers [64], request donations [37], provide support [37,53], share news and conduct sensemaking [15,27], and provide emotional support [37,45].

All of these tasks rely in some part on making the information that is shared available to readers, and therefore a large part of these tasks results in participants learning the routines and becoming more cognizant of the role of information visibility in the platforms they use. Participants who use social media platforms to broadcast important information about the crisis adopt “features of information dissemination that support information broadcasting and brokerage” in order to achieve that goal [24]. Importantly, when information is available to particular individuals in specific moments, they can use that “actionable information” to make critical decisions through situational awareness [61]. Further, when people come together to collaborate in online systems, distant-but-networked individuals can help curate relevant information through collective intelligence or crowdsourcing [50,51]. Because information production and curation activities remain crucial for timing, though, producing information visibility in systems where there are massive surges in information remains a critical problem.

#### **METHOD & DATA**

This paper draws primarily from a trace ethnography analysis of reddit contributors. The first author spent over four years conducting participant observation of the reddit.com network (including some instances of active observation and participating in reporting of breaking news events, such as Hurricane Sandy (October 2012), the Boston Marathon bombing (April 2013), and the November 2015 Paris attacks) and conducted 53 interviews between November 4, 2015 and December 11, 2015 with reddit users who aggregated information in response to developing events in posts, comments, and live threads (a unique live blog format; see [26] for a larger illustration of all of these practices). In total, he identified over 350 posts, comments, or live threads related to a valid developing event and also identified subreddits and moderators of news-related communities. The sample also included moderators (volunteer community leaders), administrators (reddit employees), and professional journalists that had used reddit for reporting or experimentation (or as an ordinary participant). Additionally, the author messaged with another dozen reddit contributors and moderators to provide additional context.

The interviews were situated in ethnographic interpretive analysis of a rich, historical reddit dataset collected via the public API compiled by *Stuck In the Matrix* and released in July 2015 and September 2015. This dataset, first comprising all publicly available comment submissions and later including all publicly available post submissions, was collected via reddit’s API by querying the /r/all queue,

which is the only API endpoint that allows access to the data without limitations. The full dataset comprises 197,517,928 post submissions and 1,830,807,828 comment submissions from January, 24, 2006 through August, 31, 2015. The data was organized in an optimized PostgreSQL database on a local server. The 350+ posts identified above were procured through a combination of participant observation, a set of SQL queries (which searched for distinct patterns in the responses to breaking events), and applications of unsupervised anomaly detection algorithms (to detect spikes in activity around breaking events). We also conducted additional content analysis on a further data set from November 2015, focusing specifically on the details of the Paris terrorist attacks: after filtering from Paris-related keywords, we investigated 11,732 posts and 243,138 comments, which we used for additional context for interviews and participant observation.

Interviewees were recruited through reddit’s private messaging system and conducted over video call. Once all of the interviews were conducted, they were transcribed and then coded in MaxQDA. The first author conducted two rounds of coding: one to establish large categories of evidence and another with deeper investigation into the actual behaviors and conflicts observed based on the theoretical frameworks employed [13] using the constant comparative method [55].

Of the interview participant sample, 26 (49.1%) lived outside of the United States: countries included Mexico, England, Netherlands, France, Scandinavia, Norway, Switzerland, Italy, Romania, Turkey, Pakistan, India, Malaysia, Indonesia, Taiwan, and New Zealand. Of those within the United States, 22 (81.5%) identified as white or Caucasian. 5 (9.62%) of the interviewees were women. The sample’s ages ranged from 18 to 44 (with an approximate average of 26 years old). The interview participants were highly educated: of those in the sample, 48 (90.57%) had (or were in the process of getting) a bachelor’s degree. They ranged in experience on reddit from 1 to 10 years (with an approximate average of 4 years of experience).

#### **Reddit’s Affordances for Visibility**

As a genre of social news site, reddit allows users to contribute links, text posts, and comments, which the community votes up or down. The primary mechanism that structure’s reddit’s affordance of visibility is ranking algorithms, which will then display the most-upvoted contributions at the top of the platform’s page (and hides the most-downvoted ones) [27].

Reddit also exists as a network of community platforms (or subreddits), which are interweaved within reddit’s platform but possess distinct memberships, rules, content, and social norms. However, some subreddits are “default,” meaning that all new user accounts will see information posted to these (such as the /r/news subreddit, or the /r/Europe subreddit for accounts created with a European IP address).

While these affordances provide community members ways to bring visibility to particular pieces of information, in cases of developing crisis events, people must adapt their behaviors to respond to ongoing changes as new information emerges. In Dourish's definition, participants in these situations "appropriate" the platform for these new needs [16], following the "situated action" framework of responsive behaviors, where "the sequential organization of action as a moment-by-moment improvised affair, emerging in response to the circumstances of its production" (2). Below, we show how these responses play out given the tensions around visibility from peer participants, the platform's technical design, and the hierarchies of power present between users and those who govern.

## RESULTS

Drawing from data taken from interviews and participant observation, the results are organized according to three primary themes related to tensions of affording information visibility: behavioral tensions (participants' perceptions, expectations, and choices), structural tensions (unintended consequences from the constraints of designed technology), and relational tensions (human decisions from privileged accounts with particular control over deletion and promotion of other users' information). Each of these tensions shapes the possibilities of particular important information to be visible during the development of an ongoing crisis event.

### Behavioral Tensions on Information Visibility

Participants' perceptions and expectations around information visibility shaped the choices they made when doing information aggregation work. As visibility shifted in response to crowd voting preferences and timing, participants had to rework their strategies for broadcasting information.

#### *Voting and Ranking*

Information aggregation participants depended strongly on voting and upvotes. Many claimed that the primary reason for this dependency was visibility: the ranking algorithm used votes to determine what content could be seen by the most people. The standard sorting algorithms affect how much content a person must look through to see an individual post, as contributions with higher voting scores appear closer to the top of each page. As *P13* plainly described, "Based on the way reddit categorizes posts, if this didn't receive any upvotes, then it wouldn't have been seen." While there are many factors that contribute to visibility – like the amount of interest in a particular event, or the amount of people who decide to search for content – participants always assumed that reddit's ranking algorithms shaped audience readership.

For people contributing to peer aggregated information during developing events, votes tended to demarcate attention from their audiences, and they worked toward getting votes, because it meant readers were paying

attention. Thinking about his participation in collecting information about the revolution in Turkey in 2013, *P10* explained, "I remember [my contribution] being on the top front page for quite a while, on the top strip. That's how I knew people were seeing it, as well as the number of upvotes were constantly changing." When thinking about the massive audiences that appeared after the Boston Marathon bombings, *P31* explained that the additional snowballing of attention pushed his post's visibility platform-wide:

Visibility's a big part... it also started this snowball effect, where at first it was prevalent in that one comment, and then when I made the first thread, it got to the top of /r/news. Then, so many people were looking at it in /r/news, because it's a very popular subreddit, that people who weren't subscribed to /r/news were seeing it as well.

The snowballing of attention especially caused contributors to reconceptualize their work. In contributing to an aggregated comment about the capture of former Prime Minister Gaddafi in Libya, *P07* said at first that it took him a while to realize he was getting attention: "[B]ecause I was like early on into the thread, I posted a comment that started getting some upvotes initially. ...Then people started commenting under my comment, and I realized that I had started receiving upvotes." As time went on, and more people became interested in the story, he realized that getting more upvotes resulted in even more down the road, influencing his motivation: "I think it was kind of like a vicious circle, because now I was updating it, it was getting more upvoted, and because I was upvoted, I wanted to kind of provide people with whatever information that I could."

Importantly, the size of particular communities tended to shape the amount of competition needed to achieve visibility. A small amount of votes might have pushed a submission to the top of a smaller subreddit, compared to a larger community where hundreds or thousands of posts per day competed for the attention of a small initial subset of voters. *P28* participated in a medium-sized subreddit and helped collect information about a plane crash. He explained, "When people post these things, they remain fairly visible, especially they get upvoted... you get up to 10-20 points, they would be visible." However, in larger subreddits, it became more difficult: "Somewhere like /r/worldnews, that wouldn't happen, just because there would be hundreds – maybe even thousands – of comment replies to such comments. It would be a different format for somewhere like /r/worldnews or /r/news, versus in a smaller subreddit..."

#### *Voting as Filtering*

Generally, aggregation participants perceived voting on reddit as a filtering mechanism for good and bad content (using upvotes and downvotes, respectively). Votes provide a simple way for community negotiation, though occasionally this resulted in conflict amongst what content users ultimately upvoted. As *P40* explained, "I guess some

of [my trust in reddit] also is the fact that because of the upvotes, that will filter out in a proper way the content. You assume that the upvotes are going to do their job.” Even moderators explained that in certain circumstances, they paid attention less to content and more on other tasks, because they felt they could rely on the crowd to downvote and hide irrelevant content. *P43*, who volunteered in the /r/sandy subreddit, explained that the moderation team was able to depend on voting to monitor most of the posts, as the team spent time on taking care of other tasks (such as monitoring discussions for bad behavior): “I think that we kept the moderation of discussions down to a bare minimum, because the voting really did handle that.”

Importantly, though, people directly connected this crowd filtering mechanism to visibility driven by the platform’s design. In other words, downvoted information resulted in submissions being hidden, and participants took for granted that anything hidden was not important or worthy of their time. *P44* made this claim when discussing his experience covering a school shooting in Washington State: “Generally, the stuff that’s hidden, it’s stuff you don’t need to see. Yeah, I’d say it’s pretty important on the subreddit, because even the news stories – you know, how this [post] made it to the top – it’s because some people are interested in seeing that post, so it’s going to get an upvote.” In other words, people relied on and expected information – especially things that might be construed in any way as “breaking news” – to reach the top of any particular subreddit, because those interested would upvote a lot (and would upvote at all, rather than just reading the headline or comments and skipping the voting).

#### *Impromptu Decisions: Visibility with Multiple Posts*

While voting helped identify important information during developing events, this process took a while. At the onset of an event, dozens of people would contribute individual posts about the event. This process resulted in more posts that voters needed to look through and decide to vote on or contribute to, thereby impacting the potential visibility of these initial contributions.

When faced with multiple posts on the same subject, participants were forced to make crucial decisions about where to post or which thread to append new content to. However, the process tended to be more impromptu than calculated. When *P11* began his aggregation of information about a local shooting, he chose one post, but out of the various posts he could have commented on, he explained that he went with the one with the most initial traction: “I think [I chose this particular post to contribute to] because... it was the largest and the one on the front page. ... Probably the first one that had the highest amount of votes, that was probably the reason.” He then alluded to the difficulty of having to search through so many posts to begin with, so one with more initial upvotes might be the preferred one: “There’s always a ton of threads, and for me, it has been before really difficult for me to go through them

and figure out which one has the best people posting on it and all that kind of stuff.” Further, multiple threads might lead to ongoing conversations in distinct spaces. As *P17* explained:

You get a lot of that, simply because... when people go into the “new” [queue] to see which one people are actually talking on, and no one will have talked too much at that point, they’ll start contributing on both. And then people will go, “Oh, there’s eight comments here, and there’s nine comments here,” and they’ll pick one or the other. At that point, you kind of have two main threads emerge.

In addition to multiple posts being created, they might be created in different subreddits, meaning that distinct audiences would read and contribute to each of them. Subreddit-level considerations also factored into which posts participants chose to follow or contribute to. In discussing his contributions around the MH370 airplane crash, *P9* told me how he needed to choose between a few posts: “The actual news story itself: there was a link on /r/news and one on /r/worldnews.” He perceived that one subreddit might get more traffic than another, though. At the time, /r/worldnews was not yet a default subreddit, and therefore it was less popular (i.e., had less visibility) and had a smaller audience than /r/news. He simply said, “I saw the one on /r/news first, so that’s just kind of the one I went into. Just go with the flow of traffic, I guess.” He based an impromptu decision off of the immediate need for visibility.

Moderators in particular noticed trends around multiple simultaneous submissions and competition for visibility. When the November 2015 Paris attacks occurred, *P41* was a moderator in the /r/Europe subreddit, and he noted how these duplicates appeared one after the other, because so many news organizations reported on it, distributing the coverage across multiple websites and allowing multiple users to submit distinct links to each subreddit:

Pretty much every major news event that becomes breaking news has the same phenomenon... because every outlet reports it. Everyone sees it from a different outlet at different times, and they submit it right away without looking for duplicates or threads already on them.

Moderators, though, have to respond directly to these multiple choices to provide a balance of information between crisis updates and other relevant information in their subreddits. As users submit duplicates, moderators must go in and choose which stick around.

Additional difficulty with multiplicative coverage of a single event manifests when many more people are concerned about submitting new emerging information than helping evaluate and filter it. If people were not searching through all of these posts and then voting on them, any new updates that were just emerging from the event would not rise high enough to be seen (a conclusion that other scholars have also identified in empirical research; see [20]). During the Boston Marathon, for instance, a lot of information was

circulating, but not enough people seemed to be voting on the new information to surface it for others. *P15* complained how the lack of voters led to problems, where not enough people stepped up to look through all of the incoming submissions: “[I]t’s really hard for people to properly go through and upvote/downvote everything, especially if too many people are spending too much time commenting rather than reading. ... I think that’s where the upvote/downvote, mechanic fails, is whenever the number of people participating and reading shrinks compared to the number of people reporting.”

#### *Timing and Ranking*

Participants also explained that upvotes – and therefore visibility produced by voting – depended on timing. Participants were concerned with how long any post they contributed to might be sustained, based on the time at which it was initially posted. In other words, they perceived that visibility seemed to be strongly linked with how quickly any particular post was contributed, when compared to all the others. Especially when making impromptu decisions, they kept timing in mind most often. For instance, people mentioned that the “first” article that was posted about a particular event would often be the one that made it to the top of the subreddit. For *P47*, timing became particularly important during the November 2015 Paris attacks, and he noted that one of the first posts ended up getting humongous support, especially since it was such a charged event:

[T]he first bit of news, the first article that gets published, about a major event especially, that is going straight to the top of the subreddit. I think the initial BBC article about the Paris attacks, I think that ended up with five figures of upvotes. Normally, we only get 1,000 or 2,000. They were upvoted quite a lot. Then, nothing else really managed to get to that level.

Participants again and again noted other factors that came into play related to timing. For example, traction over time was an especially important facet of how successful a post might be. Even though initial timing was important, people noted that the timing of a post in relation to others – in particular to have people vote on it over a sustained period of time – was crucial. *P07* explained how the initial traction of votes on his post about Gaddafi helped bring it to visibility, again taking advantage of the cyclical nature of visibility to get even more votes later:

I think one of the reasons why I kept [updating], [...] was because I was early into the thread. When I commented, my initial comment got a bit of traction. ... [B]ecause I had that traction, a lot of people commented or replied to my comment, and I saw that I was getting karma. I thought, let me just add some more information. ... I mean it is because I was in the thread early, got some upvotes, my comment was the top comment in the thread so everybody entering the thread was looking at my comment first.

The particular amount of time that it took for a post to gain visibility was also a concern for contributors. For instance,

*P05* considered his participation across a dozen different events and explained how new information might take a while to bubble up after it was posted, because so many people needed to keep on voting on it compared to all the other upvoted submissions: “[I]t just takes a lot of time for it to be recognized. ... [Y]ou don’t really get new posts in the thread themselves that quickly get to the top. And upvoting still always takes a lot of time even in a thread itself, because it just has thousands of comments already. For a new one to get there with great information, it’s very hard to, and especially quickly, get to the top.”

Over time, it was also possible for certain posts, and especially comments, to undergo variations in voting patterns. For example, during observations of multiple threads throughout the course of the aftermath of the late 2015 Paris attacks, *P25*, who had posted updates in a comment, had his submission sit at one of the highest positions in the thread for hours. However, as the developments continued and more and more people – especially eyewitnesses – came to reddit to report additional information, other comments began to overtake his own (months later, his now sits in the 11th highest position). This visibility dynamic related to the shifting types of attention of voters during an event: here, people were initially concerned about aggregated informative updates, but eventually, they were intrigued by personal accounts from people who had witnessed the events firsthand (a phenomenon recognized as “affective news,” where personal reactions mix with information content; [41,42]).

Sometimes the timing of contributions did not mesh well with the speed of voting, given that the ranking algorithms take into account temporal dimensions of users’ contributions. Multiple posts provided a challenge for members seeking the most up-to-date information. During the November Paris attacks, members aware of users aggregating the most up-to-date information (usually highly-voted, edited comments) in different subreddits would share links to other posts across the reddit network (for instance, a comment<sup>1</sup> in /r/news said *Fantastic linking to everything found here: <URL to /r/worldnews>*; coincidentally, this comment only received 2 upvotes). Because of the rapid pace at which new information was posted, directly linking to these aggregated contributions and pointing users in other subreddits to them contributed must more quickly to this information’s visibility than waiting for the network to upvote them.

#### **Structural Tensions on Information Visibility**

Second, there were unintended consequences from the constraints of reddit’s platform design. As participants encountered issues with the technical infrastructure, these tensions resulted in shifting strategies for distributing information.

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<sup>1</sup>[https://www.reddit.com/r/news/comments/3spi33/shootings\\_reported\\_in\\_central\\_paris/cwzecon](https://www.reddit.com/r/news/comments/3spi33/shootings_reported_in_central_paris/cwzecon)

### *Character Limits*

For instance, one problem emerged around whether or not the attention given to a particular post would continue if the updates needed to be moved to another comment or post. Sometimes, due to character limitations, contributors would fill up a text box but run out of room (due to database architecture), resulting in the need to create new contribution threads to continue adding information. These spatial shifts between pages were surprisingly common. However, the key was that, when contributions multiplied, each relied on further stages of upvoting to gain visibility on the newest posts too. In other words, participants had to re-promote new comments or live threads to get others to see them and act in rapid, improvised fashion to address these conflicts.

Sometimes participants hit a character cap in their text submissions, and these limits significantly interrupted their workflows. For *P10*, who aggregated information related to the political uprisings in Turkey, he recounted:

I remember editing my post in the morning and trying to figure out where I can make it shorter, because as I hit the character cap, it just stopped me from writing, though I had to edit it again and again and again to make sure I could post. That also messed with the timing as well because... I remember having that for half an hour before I could post [a specific piece of information].

In another case, *P31* explained what issues he had encountered during updating on the Boston Marathon bombing incident. He explained to me that the character limit was one of the worst: “Definitely the space limitation. When all was said and done [I created] eight update threads. ... Just being able to make a post and say, ‘That was that post for this time,’ or whatever and then the site being like, ‘You ran out of characters. You can’t do that.’” For him, it was annoying to have to shift everyone to a new thread or comment and try to gain visibility again: “Then you have to direct everybody to the new thread because you’re like, ‘There’s nothing I could do about it.’ Some people were mad at that, too. They were like, ‘Just stay in one thread. Why do you got to keep making them?’”

### *Additional Promotion of New Threads*

As live threads appeared as a popular, easier way to respond to developing events, similar issues about visibility emerged. Because contributors often created live threads many minutes after an event began, they had to re-promote the live thread through linking and word-of-mouth (e.g., *Thanks for the link. (Haven't seen it, yay reddit search...) Everyone coming here, click the link!! Full info and discussion thread inside... Edit\*\* And here is the link to the reddit live feed*<sup>2</sup>). They also had to rely on the audience network to upvote the new URL submission higher (or wait until moderators or admins manually promoted the link –

<sup>2</sup>[https://www.reddit.com/r/worldnews/comments/3spruq/gunfire\\_bombings\\_and\\_host\\_age\\_taken\\_in\\_paris/cwzdmgb](https://www.reddit.com/r/worldnews/comments/3spruq/gunfire_bombings_and_host_age_taken_in_paris/cwzdmgb)

explored in the next section). Across many events, we saw participants struggle to raise awareness of these links, and participants steadily became aware of the need to draw in votes to get a critical mass of attention until admins were able to provide a link to the live thread on the reddit front page (which drove exponentially more traffic).

### *Server Stability*

Occasionally, due to surges in attention – especially around international breaking news events – reddit’s servers do not hold up against the increase in traffic. Uniquely, in the case of the November 2015 Paris attacks, even reddit’s core infrastructure introduced visibility issues. Because of the immediate surge in readers on the platform, the server collapsed, taking various subreddits offline. The unavailability sent moderators on a scramble to coordinate across time zones, trying to figure out where European moderators in various countries still had access:

[W]e had the times where reddit was going down... and we were trying to see who had access right then, because actually not everyone lost access at the same time. Several times, I had moderators in northern Europe [who] lost access, and like the guys in eastern and southern Europe still with access and [who] could work. We tried to shift actions that weren't going through from one group to the group that still had access.

For ordinary users, they also put their faith that any contribution would be seen (e.g., *I'm trying to update my thread but reddit servers are busy. Hopefully this comment goes through*<sup>3</sup>). Server crashes resulted in the most chaotic, improvised responses, because moderators and aggregation participants had to join in additional meta-conversations about who still had access and could continue updating.

### **Relational Tensions on Information Visibility**

Finally, human decisions from moderators and administrators [25,59,65] – user accounts and employees with unique privileges – resulted in tensions between them and ordinary users. The discursive and operational relationships between these users impacted information aggregation participants’ work to a significant degree.

### *Monitoring and Norm Enforcement*

In many cases, groups determined the manual visibility of particular information. Teams collaboratively discussed and decided what kinds of content to allow or reject, acting as strong gatekeepers to the visibility of specific information. For instance, *P50*, one of the moderators of the */r/sandy* hurricane community, explained that in reaction to an increase in the amount of humorous content contributed to the subreddit, the moderation team discussed what to do with content that they were not comfortable with (i.e., jokes), when they wanted the subreddit to be a space to share serious information and news:

<sup>3</sup>[https://www.reddit.com/r/worldnews/comments/3sphue/shootings\\_reported\\_in\\_central\\_paris\\_reports\\_of/cwzhvfi](https://www.reddit.com/r/worldnews/comments/3sphue/shootings_reported_in_central_paris_reports_of/cwzhvfi)



I was definitely on the side of, "We need to get rid of this shit," because it doesn't have a place here. You can post it to /r/funny if you've got anything funny. Yeah, my opinion is that Reddit shouldn't only be for jokes. And so there's a place for jokes, and that means you'd have a place for serious discussions as well. ... So, it was about our people in dire need and property being destroyed. You know? It was very, very easy to remove that stuff and not being like, "Oh, I'm being a party pooper." I'm cleaning up the trash.

Sometimes rules constrained the potentials of contributors' skills in reporting. *P16* described the early days of his aggregation activities and explained that some subreddits have strict rules about the kinds of links you can contribute. He lamented that, because URL links to expert, scientific sources of earthquake information are not links to news organization websites (a rule in /r/worldnews), he could not actually post the best earthquake information when it occurred. "If I can get an earthquake story out there through the USGS as a source, I'll do it. But most recently, we've actually been in contact with the moderators, and they've been saying it's not actually a news source." Instead, he had to respond in comments to individual posts that linked to news organizations' sites with the expert information.

#### *Deletion*

In developing news situations, the removal of content can be particularly critical, and this privilege sometimes contradicted and challenged the work of information aggregators by immediately shifting momentary task needs.

Immediate removal of visibility occurred against participants' expectations. Some participants told me that, on numerous occasions, a post or comment that they had been working on, even while they were in the middle of updating, suddenly became unavailable. Usually they were not informed by any moderator, and even on their own computer screens, it was not entirely clear that the contribution had been deleted. Instead, they found out through messages from other viewers, who were confused why the post had vanished. When updating about an active shooter situation, *P12* explained that he was told in private messages that his comment updates had been deleted: "I still had access to the thread. I could still update it, but people were asking me why I deleted it or why I took it down." He decided to edit the information he had included, but by the time he had reacted, the original thread reappeared. "I took it down kind of suspecting [I had broken a rule]. Then, by that time, I had duplicated the text and started a separate thread, but I ended up deleting that because they re-enabled the original thread..."

Contributors regularly expressed frustration with moderators' powers to delete content in cases when there was not necessarily a clear violation (a notable *lack* of negotiation). Especially in high-tempo situations, the removal of content meant that they needed to go out of their way to continue providing updates. Frequently, contributors would re-post aggregated information into new threads, to

continue providing the service of news updates. *P11*, who updated during a shooter situation in Washington, DC, expressed how difficult it was when he encountered a post that was deleted and the annoyance of having to direct attention to a new thread. "It is so stupid because sometimes there's posts that are on the front page for a while and have a lot of comments and then they get deleted by the moderators and then it just pops up on another one." In general, he explained that it was difficult enough to search for the one thread out of the many posted that would matter the most: "There's always a ton of threads, and for me, it has been before really difficult for me to go through them and figure out which one has the best people posting on it and all that kind of stuff."

Live threads in particular highlighted platform-defined powers related to deletion, because – uniquely – ordinary users that became editors within live threads gained temporary deletion permissions. One interesting distinction that I encountered when talking to contributors and moderators about live thread participation was that users tended not to remove content by other people, but moderators felt it was an imperative part of their role to intervene when necessary. For example, *P18* explained his role as a contributor where he avoided deletion of others' contributions. "[S]ometimes people would double post. ... And if that was the case, we would just have one person... crossing out. We never deleted." Another contributor to some live threads, *P39*, similarly recalled a focus on transparency rather than deletion when helping to monitor a live thread: "I'll usually go back and cross it out, if it turned out to be false. I think it's better than deleting it, because people can't see that it's false if it's deleted."

On the other hand, moderators did feel comfortable removing some things from live threads. In general, it seemed like moderators were much more keen on removing inaccurate or unconfirmed information. *P42* explained regarding one of the live threads used in the late 2015 Paris attacks, the goal was to focus on a higher quality feed with proper sources: "We would selectively filter and/or remove stories from better sources. So if one story was posted three times, we would opt for BBC News or Reuters or someone like that. We want to filter down so things weren't repeated, but we'd also want enough content."

To provide balance in lieu of visibility, some moderators would also focus on deleting duplicates in response to ongoing events. In the /r/aviation subreddit, one moderator *P23* explained that, after the MH370 incident, they decided to delete posts that contained overlapping content. He said: "Yeah, [we ended up deleting] a little bit of it. Usually our submitters are pretty good. We tend to delete maybe 20-30% of the stuff that comes in, just as sort of an offhand guess. I don't recall it being significantly different; there was just a lot more material coming in."

Finally, sometimes the confusion around the deletion of a contribution stemmed from an actual mistake on the part of

moderators. For instance, one URL submission related to the Boston Marathon bombings was added to the /r/worldnews subreddit, and it was promptly deleted after receiving a significant number of upvotes and comments, reaching the top of the subreddit. Many of the top comments reflected viewers' anger at the sudden disappearance, such as the most-voted comment, which suggests that the thread disappeared multiple times:

Mods, stop deleting these posts! Are you fucking kidding me. Edit: now that this thread is sticking around, get something with real info to the top. Edit 2: Again?! Now this thread is deleted? Mods should be ashamed of themselves. Some of us have loved ones in Boston and turn to Reddit for information.

On the following day, a moderator in the /r/worldnews subreddit contributed a text post titled "RE: recent events at /r/worldnews." In the description, the mod explained the reason for its removal, which apparently stemmed from disagreement over breaking the rules, from automated removals (spam filter), moderators (who make a decision to delete it), as well as users (who had apparently sent in "40+ reports" to take it down).

#### *Moderated Visibility*

During developing crises, it is common to see a link on the reddit front page to an ongoing live thread. In earlier years, though, admins bypassed reddit's algorithmic structure with temporary workarounds (for instance, by adding a direct front-page advertisement to the /r/sandy hurricane subreddit in 2012).

Some features allow ordinary participants to provide better visibility to particular information or tasks at hand. For example, user accounts can write in a comment the format /u/<username> to instantly send a direct private message to another user about that comment. In developing events, participants recognize the need for more contributors for information aggregation tasks; in the case of the Paris attacks, many users who had worked together during prior events alerted each other about participating in newly-created live threads (e.g., *Somebody needs to get /u/orion4321 on this Live thread.*<sup>4</sup> and *Replying to my own comment to page /u/DrSalted and /u/unclepedo If either of you are available start this ball rolling please.*<sup>5</sup>).

More recently, the admin team has created features called "sticky" links that allow moderators to promote specific posts or comments. While moderators regularly used sticky links in news subreddits, the general idea of needing to provide immediate visibility to content – especially by a method that circumvents the platform's ranking algorithms – pervaded many conversations with peer information

aggregation contributors and moderators, and frequently they mentioned decisions around what and when to sticky. For example, when asked about how moderators react to big events like the 2015 Paris attacks, P53 explained how the moderation team of /r/worldnews usually considers a number of options to promote information immediately. However, because of the immediate nature of crisis events, it requires improvisation to suit a solution to the particular needs of the moment: "There are all sorts of resources we try to link to to make as much information available to the subscriber base as possible." However, moderators do not necessarily need to create a new thread. As P35 explained, acting as a moderator after a major earthquake in Pakistan, one thread in particular "was posted by a user, and it ended up getting lots more comments, so we just made it the main thread and stickied it."

For particularly notable events, administrators would also become involved in promoting content manually. Unlike a stickied post within a particular subreddit, though, admins had the ability to post links directly to the front page of the platform, accessing exponentially many more viewers. A secondary reason was to take the load off of reddit's server infrastructure. As a former admin, P30, explained to me, reorienting people to live threads with a link on the front page was ultimately better for the site's stability, and once there was a process to provide those links, promoting them in this way became more frequent.

However, stickying involves judgment. In speaking briefly with another member of the admin team, they explained how the team doesn't "want to sticky just any thread," and lately – due to very political topics that have come up (like the refugee crisis in Europe), they are particularly careful about evaluating who is updating in a particular live thread, what exactly they are posting, and how that might change over time and more people are added. In the case of the late 2015 Paris attacks, for instance, the admin team looked at a few live threads that users created within different subreddits, and they chose one with moderators from /r/Europe that they recognized and knew they could trust with not posting biased information, taking into account particular reputational factors (promoting the visibility of their information over that of other users, but also recognizing the efforts of participants who themselves were already visible and recognizable contributions in the system).

#### *Promoting Paris's Multiple Live Threads*

Paris presented a unique instance of crisis communication due to the massive global response. As moderators and users scrambled to respond, multiple live threads were created: three threads dominated in different subreddits (/r/Europe, /r/worldnews, and a generic one in /r/live). Founding multiple live threads is not inherently detrimental, but it does split attention across multiple simultaneous spaces and duplicates the work of aggregation volunteers. Moderators from the /r/Europe live thread talked directly

<sup>4</sup> [https://www.reddit.com/r/live/comments/3spp0k/live\\_paris\\_shootings\\_live\\_thread/cwzdivo](https://www.reddit.com/r/live/comments/3spp0k/live_paris_shootings_live_thread/cwzdivo)

<sup>5</sup> [https://www.reddit.com/r/worldnews/comments/3sphue/shootings\\_reported\\_in\\_central\\_paris\\_reports\\_of/cwzch8z](https://www.reddit.com/r/worldnews/comments/3sphue/shootings_reported_in_central_paris_reports_of/cwzch8z)

with reddit admins, who then reached out to other moderators and users helping in other live threads in an attempt to consolidate the efforts.

*P41* was active as a moderator during the live threads, and he explained that it wasn't a problem for them: "[Multiple live threads] wasn't a problem for us... the threads don't conflict with each other. They don't steal space or any kind of resource from each other, so it's not a problem. It was mostly to avoid duplication of effort and provide the users the best live feed, because that's what a live thread is: it's a feed of information." The decision to converge around one primary live thread, however, was not a decision in which moderators were included:

The admins decided I think (but I don't know because they didn't tell us, and to be honest we didn't ask) to stick ours at the top of reddit and ask the others to join ours. I think they did it [because] ours had more viewers, but I don't know. It doesn't cause any particular problems, it was just kind of a duplication of effort that could be and was solved.

By manually promoting one live thread, though, admins provided immediate visibility (and an exponential amount of readers) to one particular space, giving preference to the activities of some users over others and enacting a precise gatekeeping decision.

#### *Participants' Reactions to Moderated Promotion*

A few users also mentioned their experiences with having posted stickied by moderators and administrators. They tended to express worry about potential lack of visibility for posts, but overall they were energized by the immediate help to their information aggregation work brought about by stickying. For instance, *P51* explained how the act of having a post promoted via the sticky feature made him aware of just how much an impact visibility had in this system: "I got a message from the reddit admins asking me if it would be okay if they stickied the live thread to the front page of reddit. ... I told them it was fine, go ahead and do it, but I realized the stakes had just gotten a lot higher." And the significant increase in perceived audience meant that he started to pay greater attention to the work he was doing:

Any information that I posted would go out to a lot more people and would affect a lot more people. I started being a lot more thorough and a lot more careful with what I was posting. I started making sure, like checking my posts twice before actually putting them up to make sure that it wasn't anything that I would regret posting later.

## **DISCUSSION**

Many factors influence the difficult process of making information visible on social media. Crisis events may increase the difficulty as many people flock to social media to get and share information. In this paper, we explored crisis events on reddit through the lens of information visibility, and we identified three dimensions of tensions related to this visibility: behavioral, structural, and

relational tensions. We showed how the design of reddit impacts the work of information aggregation contributors, both in changing participants' expectations, assumptions, and perceptions as well as momentary interactions with information, software, or other individuals. Visibility had a large impact on the conceptual and practical work of information aggregation participants, which suggests that scholars should pay increased attention to the processes of making information visible or hidden. These processes must include a recognition of the role of platform affordances and system mechanics when taking into account ad-hoc information flows like those that emerge from crisis situations.

### **Gatekeeping as Constraint on Information Visibility**

To answer RQ1 (how design impacts information visibility), this paper demonstrates that gatekeeping actions – whether originating from individual decisions of participants or the mechanisms of the platform's technical design – shape the visibility of particular types of information. Whether or not a platform like reddit is useful for sharing information during a breaking news event depends on 1) if the platform's design affordances can be adapted in the moment for particular needs, and 2) if the behavioral, structural, and relational constraints of gatekeeping actors can synchronize toward common goals with a set of shared values.

As we saw in the evidence presented above, peer information aggregation participants were able to adapt the platform to their needs with moderate success. In most cases, members of the reddit collective were able to work together to overcome barriers of visibility through coordinated voting and surfacing of information in response to new developments. However, the moments when participants were not successful manifested when there was a conflict along our three tensions. For instance, submitting multiple posts at the same time (behavioral), hitting a character count limit (structural), or having a post deleted by a moderator (relational) all caused significant negative impact toward the goals of promoting specific information. Making their work more difficult, ordinary users could not change the algorithms nor did they often work closely with moderators or administrators.

On a theoretical level, in Barzilai-Nahon's network gatekeeping framework [3], she focuses on the salience of the four gatekeeping dimensions, of which political power is one. In this paper, though, we might posit the identified tensions as subdimensions of her political power dimension, which conflict with each other to affect and complicate gatekeeping practices even more. Designers need to remain cognizant of how each of our three tensions impacts the way in which users are able to take up ad-hoc collaborative practices within particular sociotechnical systems. Special consideration should be paid to the various values on all sides of the tensions. For example, if moderators' values around information balance conflict with the values of the

user collective around providing visibility to as many sources as possible, then there is a collapse in coordination resulting in failure to bring visibility to needed crisis information.

To note, there is little discussion between participants (both users, mods, and admins) about whether rules and norms *should* change during crisis events in order to promote visibility in an ad-hoc way. Recently, in response to the Orlando, Florida shootings at the Pulse nightclub, moderators removed particular pieces of information when users were updating about the situation, causing a vivid stir within the reddit community and prompting admins and the CEO to respond with proposed changes to reddit's technical system. These announcements demonstrate that coordination between behavioral, structural, and relational aspects of gatekeeping is possible, though it needs to be explicit and allow for agency amongst all participants.

### **Information Visibility as Tension on Gatekeeping**

To answer RQ2 (how information visibility impacts crisis work), this paper also shows that the negotiations around the visibility of information constrain how participants produce information and make gatekeeping decisions. As gatekeeping actors – both people and software – mediated information visibility, the expectations of peer information aggregation participants adapted to optimize for the best ways to get information to audiences. For example, during the Boston Marathon bombings, P31 and other participants split updates across multiple submissions to keep the most recent information visible, while linking to other information. Similarly, moderators during the November 2015 Paris attack promoted a single live thread by putting a link on the front page, in an effort to manage attention and server stability. In other words, visibility on reddit became a tension on gatekeeping throughout the developing stages of ongoing events. People's reactions fell in line with the "situated action" framework of ad-hoc responses [54]. Information needs changed depending on timing, the type of event, the amount of volunteers involved, etc., as seen in prior literature.

In crisis situations, the needs of information broadcasters revolved primarily around making information visible. The evidence presented earlier suggests that, because social platforms are not set up to address crisis situations, the reactions and decisions of participants – in the face of visibility issues – tended to be impromptu and improvised. That improvised aspect of crisis communication work was in part due to the high-tempo nature of this work (i.e., it is difficult to pivot when new information emerges quickly) but especially was due to the momentary and unexpected consequences of gaining or losing attention to contributed information.

It is helpful here to remember that technical mechanisms and designs produce platform affordances, and these affordances introduce tensions in crisis situations, since needs for visibility to particular information change over

time. Without mechanisms that adapt to immediate information needs, members of the community must learn how to respond within the constraints of the platform and its current affordances for visibility. For instance, the reddit live thread format can afford quick collaboration amongst a small team. However, in the case of multiple live threads during the Paris attacks, as multiple teams responded to the bombings and shootings, and as mainstream media – and attention on reddit – converged on a single narrative, multiple threads had to be collapsed to focus the efforts of peer aggregators into one space on the platform.

In this situation, a distinct separation of political power remained between the ordinary users, algorithms, and moderators/administrators. However, the ability for mods and admins to directly change the code (e.g., by choosing to promote one live thread to the reddit front page) actually helped gatekeepers in this situation achieve their goal, instead of complicating it.

### **The Tradeoffs of Designing for Visibility**

A solution to problems of attention on reddit is not as simple as giving participants the ability to provide maximum visibility to information. While information visibility remains a strong factor driving the expectations and decisions of peer information aggregation participants, the interviews and observational data above present conflicting but intertwined perspectives. Three conflicts seemed to encompass participants' crisis work when people wanted visibility:

- 1) Certain information will be seen *over other information*
- 2) While people want information to become more visible more quickly, *rapid visibility creates additional problems*, such as evaluating new contributions
- 3) People want a balance of information (given the platform's general use), where *crisis information may not be relevant* to everyone

Visibility of crisis information in the case of reddit was largely negotiated by the needs of community members and moderators. In the case of */r/sandy*, members of the subreddit debated through voting and commenting what kinds of information they wanted to promote and hide (e.g., getting rid of humor posts) [27]. As communities scale larger, however, reddit's voting model and negotiations through conversation become more complicated.

The three tensions around information visibility – behavioral, structural, and relational – provide areas where designers can look to see where some issues may arise and also to understand how competing interests among users might manifest. While designers might provide new tools or mechanisms for participants and moderators to tweak information visibility (for instance, reddit's recent changes around stickied threads), these designs will continue to draw of the tensions identified in this paper. Instead, design interventions that further allow participants to negotiate norms and understand how the system becomes influenced

by changing information flows (i.e., increased social translucence [17] during crisis events) may provide better support for these unique but increasingly frequent situations.

### **Information Visibility as Theoretical Lens for CSCW**

Information visibility is a design choice: for instance, even at the scale of millions of users, for many years Twitter maintained a chronological timeline of messages, whereas Facebook made a critical decision to implement a curated feed of a select subset of friends' posts. Whatever the delivery mechanism, users' access to particular information in a social system impacts how they interact with that information (for instance, retweeting contagion relies on tweets being seen [23]). Further, even when we know if information was presented, people will still only select a small portion of those to engage with [1]. Especially in the case of crisis situations, when particular people need to see specific information, visibility can have significant consequences. Reddit presents a novel way to surface relevant information – through crowd voting – but a variety of filtering algorithms and the power of moderators and administrators (in addition to unexpected collective behaviors) may impact the information visibility expected by the community.

In CSCW work, particularly in crisis communication, we frequently recount how many messages people wrote without any context for how many of those messages people saw or decided to look at. While these metrics may be difficult to come by, scholars should strive to focus on information visibility as a framework for both how people react to crisis events as well as participate in information aggregation about them. Network gatekeeping provides a strong framework for understanding the factors that lead to decisions about information visibility, but further investigations must understand the negotiations that occur around points of tension. This paper introduces one framework of visibility that can help reveal points of tension in the values of different gatekeeping actors within larger sociotechnical systems.

### **Study Limitations**

There are some limitations to this study that should be recognized. First, it is difficult to quantify instances of information aggregation and conflicts around visibility, since the former is uncommon and the latter a further uncommon subset. Particularly for developing events with unique features, like the Paris attacks, instances like this event illustrate how practices around crisis communication are always evolving to meet the immediate needs of participants.

Second, generalizability in relation to platform visibility and design remains important. Platforms beyond reddit with different affordances and mechanics for visibility would produce different issues, conflicts, and limitations. However, this research does act as an entry point in considering these issues by not only suggesting contexts for

designing better systems but also addressing information visibility as an extension of traditional theoretical problems for understanding information flows.

### **CONCLUSION**

Information visibility significantly impacts the work of computer-mediated crisis communication, and there are various tensions around how people can make certain information visible. Even for participants with privileges (like moderators), visibility remains a major concern during crisis events, because everyone wants to get the most important information to audiences as fast as possible. Understanding the impact of political power in gatekeeping [3] that shapes information flows and information visibility in large, sociotechnical systems allows us to see where collaboration might break down or fail. The design of platforms provides affordances for people to help broadcast and circulate information during crises, but novel theories of information flows [10,49,57] are helping to uncover the complexities of how those flows become negotiated through the interaction of social behavior and technology.

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