

Social Media – Truly Viable For Crisis Response?

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ABSTRACT

On September 8, 2011 the Great San Diego/Southwest Blackout occurred. Approximately 5 million people were affected by this blackout. This paper explores the availability of social media following such a crisis event. Contrary to expectations, the cell phone system did not have the expected availability and as a result, users had a difficult time using social media to status/contact family and friends. This paper presents a survey exploring the use and availability of social media during the Great San Diego/Southwest Blackout event.

Keywords

Social media, crisis response, availability.

INTRODUCTION

To mitigate the unpredictability of crises and the complexity of crisis response affected individuals and first responders are using social media to communicate. Additionally, organizations are exploring formally incorporating social media into crisis response. However, on September 8, 2011 a wide spread blackout struck southern California, including San Diego, and parts of Baja, Mexico. San Diego State University was closed as a result in the late afternoon with students and faculty released to the congested freeways. During the drive home the author was contacted by local news stations for comment. This proved very difficult as cell reception faded in and out. Since this was not normal for this region it caused the author to wonder if the blackout was affecting cell availability. This led to contemplation on if other social media were experiencing availability issues and ultimately to wondering if the blackout was an opportunity to explore social media availability during a crisis. This paper reports on an exploratory study conducted on the availability of social media during the blackout and to help answer the question, is social media currently a viable option for crisis response.

SOCIAL MEDIA

Plotnick and White (2010) describe social media as generally being attributed to the collaborative applications supported by Web 2.0 technologies. These include, but are not limited to, Twitter, Facebook, My Space, wikis, and blogs. Blogs, wikis, and My Space were the first applications becoming popular in the early 2000s while Facebook and Twitter are more recent creations. Cloud computing infrastructure is making social media applications more resilient and available, however, the methods users utilize to interact with social media applications are not. Most users access social media applications using their laptops, home computers, or mobile/smart telephones. Cloud computing infrastructure can be supported by self contained back up power supplies to ensure they remain operational should grid power be lost. Home connections rely on grid power to run their computers. Should that power fail, batteries are usually available for laptops and some users have uninterruptible power supplies (UPS) for their desk tops. In both cases broadband users rely on their modems/routers to connect to their Internet Service Provider (ISP) and these modems/routers may not be connected to a UPS. Mobile connections rely on the cell phone infrastructure to connect to the Internet. The cell phone infrastructure relies on a series of cell towers to connect mobile phones to the telephony system. Back up batteries are included in cell phone towers should grid power be lost. Ultimately, social media application availability is not just reliant on having a reliable platform on which to run. Availability is also dependent upon having a reliable connection system (cell phone infrastructure, landline infrastructure, cable infrastructure) and interface system (mobile, laptop, desktop). The availability issue then becomes that of being a complex system of inter-reliabilities between multiple systems owned and operated by different, and sometimes, competing, companies.

THE GREAT SAN DIEGO/SOUTHWEST BLACKOUT

The Great San Diego/Southwest Blackout began at 3:38 PM on Thursday, September 8 2011 when a maintenance worker in Yuma, Arizona performing maintenance on a 500 kv transmission line caused that line to trip, stopping power flow to San Diego. The line was restored to operational status within several minutes but during that period of inoperability instabilities in the grid caused a power generator in Mexico to trip offline. The loss of the Mexican power generator caused further instabilities in the grid resulting in a low voltage situation that caused the San Onofre transmission substation and nuclear plant to trip offline. The San Onofre nuclear plant trip reduced available power while the trip of the transmission substation isolated the grid between San Diego and Los Angeles. The San Onofre transmission substation trip prevented the spread of instabilities to Los Angeles and Orange County but also resulted in insufficient power for San Diego with the result that the San Diego/Southwest power grid collapsed and the region went into blackout (CNN, 2011; Lee, 2011).

The blackout lasted approximately 15 hours affecting approximately 5 million people, 1.4 million of them in San Diego (Lee, 2011; Page and Grieco, 2011). However, while the blackout was of relatively short duration, there were many significant problems. First, the blackout occurred at the start of evening rush hour and caused the failure of the traffic signaling system (virtually all traffic lights defaulted to blinking four way stops). This caused huge traffic congestion throughout San Diego with a dramatic increase in commute times (the author's commute time went from 40 minutes to 2 hours, a fairly common example). Additionally, the trolley system failed with all trolleys stopped where they were at the time of the blackout as well as all train signaling systems causing non-electrical trains to have to reduce speed drastically. Finally, airports were forced to suspend operations due to reduced communication and control systems. Second, elevators, escalators, automatic doors, etc. in all buildings without backup power failed stranding a large number of people between floors or in stalled elevators. Third, water and water treatment equipment failed allowing some backflow and causing many residents to have to boil water before using it for humans. Fourth, refrigerators, freezers, stoves, televisions, and all home appliances without backup power failed. Among these failures were home computers and routers without UPS and laptops without charged batteries. Finally, and an additional motivation for this paper, the cell phone system experienced a great deal of degradation as observed by the author as he attempted to communicate with the local television stations to provide expert opinion on the causes and expected duration of the outage.

An early concern during the outage was that the blackout was the result of terrorist action. The concern was due to the failure of both main transmission lines into San Diego failed at nearly the same time. The author as well as the power company authorities was quick to ally this fear once it was recognized that the San Onofre substation failed on low voltage (this was recognized to be the correct action for the substation given the known failures in the rest of the grid system). However, getting this information to the affected population proved to be difficult as cell phone communications were failing for the author as he moved from cell tower to cell tower, and for the authorities as cell phone circuits were overloaded. These cell tower failures occurring within several minutes to an hour following blackout initiation is another motivator for this paper.

Recovery from the blackout began as soon as the cause of the San Onofre substation trip was understood and the restoration of the Southwest Powerlink (the original failed transmission line). Restoration began with restart of power generators and then the expanding recovery of distribution loops radiating out from the recovered power generators. The power grid was restored within 15 hours of blackout initiation.

METHODOLOGY

This is an exploratory study that utilizes an exploratory survey to collect opinions and experiences related to the performance of social media during the Great San Diego/Southwest Blackout on September 8, 2011. The survey instrument was generated based on the research question of how available was social media during the Great San Diego/Southwest Blackout; and was distributed within three days of the event to the author's San Diego State University students. Responses were collected for two weeks with one follow up email. As this was an exploratory study survey results were analyzed using only descriptive statistics

Students were selected as respondents as they are representative of the population expected to use social media, they were available, and they could be contacted rapidly. Rapid access was considered to be the primary requirement as it was important to collect survey responses while the event was still fresh in the memory. Approximately 500 students were solicited. The exact number is not known due to the open invitation to pass the link on to acquaintances and family members as well as there being an issue with cross posting. A total of 370 responses were received. All responses were used although some respondents did not answer all the items. To protect the identity of the respondents no personal identifiable information was collected. This eliminates potential follow up but was considered important for guaranteeing anonymity.

Respondents were nearly evenly split on gender with 184 (49.9%) being male and 185 (50.1%) being female (3 respondents did not report gender). As expected, the majority of respondents were mid twenties, approximately 60%, although there was a spread of ages ranging from under 20 to over 70. The respondents also reflect a diversity of social relationships in the San Diego area with 70% having one too many family members in San Diego and 30% having only roommates. This data was collected as it was felt that the larger the local social network of the respondent the more likely the respondent was to utilize social media to contact/coordinate actions during the blackout. The respondents were users of various social media tools with 98% using cell phones, 73.4% using Facebook, 16% using Twitter, 65.4% accessing the Internet via their cell phone, 87.4% accessing the Internet from home, and 89.4% using texting. Combined with the family social networks of the respondents it was expected that these respondents would be representative of those affected persons in the San Diego area that would use social media to contact and coordinate during the blackout crisis. Burbary (2011) reports that 35% of United States residents age 18-25 use Facebook while 20% age 26-34 are users; additionally, 51.52% of Californians use Facebook. Also, Smith (2011) reports that 13% of adult online users and 18% of those age 18-29 using Twitter. (Note that these are 2011 demographics) Given the similarity in statistics it is concluded that the respondents are representative of the population that would use social media in a crisis. Additionally, the sample size of approximately 370 is sufficient for analysis.

RESULTS

Table 1 reports on how respondents used social media during the blackout crisis. It is somewhat surprising that so few used Facebook to update their status given the number of users of Facebook. The lower numbers using Facebook and Twitter could be a reflection of those using Facebook and Twitter via home/work computers versus a Internet enabled phone.

Activity	Yes (Number/Percent)	No (Number/Percent)
Attempt to update status or comments on Facebook?	141 (39.7%)	214 (60.3%)
Attempt to tweet status or questions?	39 (11.1%)	313 (88.9%)
Attempt to use your cell phone to make a call?	333 (93.5%)	23 (6.5%)
Receive a call?	287 (80.8%)	68 (19.2%)
Attempt to send a text message?	323 (90.2%)	35 (9.8%)
Receive a text message?	313 (87.7%)	44 (12.3%)
Attempt to use your phone for Internet access?	250 (69.8%)	108 (30.2%)
Attempt to use Skype/other VOIP?	13 (3.7%)	334 (96.3%)

Table 1: Social Media Activities Attempted During the Blackout

Table 2 reflects the observed availability of the social media services used. Over 70% for every social media tool reported loss or degradation of service with additional data showing approximately 60% attempted to use social media at least hourly to every few minutes. This reflects the observation of frequent messages of “all circuits are busy” or “service unavailable” received during the crisis and possibly reflects a saturation of capacity condition as the affected population attempted to contact and coordinate with their social networks.

Observation	Yes (Number/Percent)	No (Number/Percent)
My cell phone coverage was normal	81 (23.0%)	270 (77.0%)
My Internet availability was normal	55 (15.7%)	296 (84.3%)
I had no trouble making or getting phone calls	75 (21.4%)	276 (78.6%)
I had no trouble sending or receiving tweets	29 (8.7%)	305 (91.3%)
I had no trouble updating my status	58 (17.2%)	278 (82.8%)
I had no trouble staying connected to my family/friends	73 (20.8%)	277 (79.2%)
I had no trouble sending or receiving text messages	97 (27.8%)	252 (72.2%)
I had no trouble getting updates/news using my Internet via phone	64 (18.5%)	282 (71.5%)

Table 2: Observed Social Media Service Availability

DISCUSSION

The first issue is if San Diego is representative of modern cities and that if experience with social media availability during a blackout is applicable to other cities. San Diego is the 14th most wired city in the United States (Forbes, 2010) while the United States is ranked 7th (OECD) in wireless users and 15th in broadband users (IT-Hall). This doesn't make San Diego a leading city for being wired, but it is in the top tier of wired cities. This has a couple of implications. The first is that for other wired cities the San Diego experience is applicable and perhaps a harbinger that reliance on social media for crisis response following a major disaster that severely disrupts power distribution will not be successful. The second is that for those cities much less wired than San Diego and thus more reliant on traditional media such as television and land lines the situation following a disaster that severely disrupts power distribution may be even worse given the very poor availability of these media/services in San Diego. However, it is a fair assumption to consider San Diego a representative city and that the Great San Diego/Southwest Blackout is representative of what may occur during blackouts.

The second issue is what does this mean? It is clear that access to Internet sites was severely hampered. Home users virtually had no Internet so any Internet based communication would have failed. Additionally, any Internet based crisis response systems that can be accessed by home users would have been unavailable to those reliant on home based connections. However, over 65% of respondents access the Internet via their cell phones and almost 90% use text messaging. This implies that a large number of respondents would have been able to access the Internet and use social media. Given that almost 70% of respondents attempted to contact someone within a few minutes to an hour of the blackout starting it is fairly safe to say there were many attempts to use social media (about 35% tried Facebook, 11% Twitter, and 90% text messaging). The observation is that users expected to use their social media and phone during a crisis. It is interesting that users did not expect a blackout to affect their phones or social media. Given that cell tower infrastructure uses battery backups it is interesting that there was so much cell phone degradation (77% reported less than usual signal strength, 83% reported lost coverage or degraded service). This wouldn't be expected although circuits being busy would be expected. It is suspected that batteries failed to perform as expected. This is troubling from a crisis response viewpoint as it is expected that cell phone service should be fully available (as long as the cell phone tower infrastructure is physically intact) for 8 hours (per FCC order and as confirmed by FCC order 07-177 based on a review of communication failures following Hurricane Katrina) (Note that this rule also requires that phone switches and routers have 24 to 48 hour backup power supplies with additional fuel for generators on site with the equipment) (compliance with the FCC orders was to be within 12 months of the date of the order, approximately October, 2008). The implication is that perhaps the cell phone system is much more complex than expected and that battery backups are not all that are needed to ensure system operability following loss of grid power. Another possibility is that cell phone tower back up battery maintenance and testing is not sufficient.

CONCLUSION

Ultimately the Great Southwest Blackout can be considered a massive, unplanned, backup battery test. Did cell phones and social media pass the test? This is somewhat debatable. 83.4% of respondents lost or had their cell phone service degraded, 93.4% had their Internet service lost or degraded, and 60.5% were not satisfied with their level of service or coverage following the blackout. However, 78.5% of respondents had some degree of cell phone service, 35.5% had some degree of Internet service, and 32.5% were satisfied with level of service or coverage. Ultimately, judging these results from a crisis response lens the blackout test is failed. The duration of the blackout was less than 24 hours. It is proposed that for a service to be considered for crisis response support it should be available for a sufficient period of time to allow for utility/maintenance first responders to either preserve the system or implement backup systems. Less than 24 hours is not sufficient to ensure this. Backup power supplies should provide the time for this to occur and FCC rules require it. However, it does not appear that backup power supplies worked as anticipated resulting in the widespread system/service outages. The recommendation is that government and industry experts evaluate cell phone battery backup maintenance and test procedures for improvement.

Additionally, social media providers generally did not expect that their services would be used for crisis response. Facebook, Twitter, wikis, etc. were designed to be used to create communities, communicate with friends, and collaborate. The companies that created them did not design them to be available in crisis situations. This creates a problem for crisis response managers. Users will use the systems they are familiar with and use every day during a crisis (as evidenced by this study). It is only natural that users will use their social media first. The United States Emergency Broadcasting System does not include social media nor does most government managed crisis response plans, however, given the widespread unavailability of television and to some degree radio following the loss of the power grid, they should assess the viability of including social media as part of emergency broadcasting. Jennex (2010) noted that individuals have led the way in applying

social media to crisis response and proposed that organizations use a knowledge management strategy approach to incorporate social media into their crisis response planning. Howe, Jennex, Bressler, and Frost (2011) discuss how self organizing groups are using social media to plan and prepare for large scale crises. The issue is users using innovative systems to do innovative things that the system designers never intended. The conclusion is that a discussion needs to occur between the crisis response community and the social media companies as to what is being done with social media in the field and what changes/enhancements. etc. are necessary to make social media available during crises. Included in this discussion should be infrastructure concerns including how to harden and improve the availability of social media in a crisis situation.

The title of this paper is social media: truly viable for crisis response? The conclusion of previous papers is that functionally the answer is yes, social media provide communication functionality that users want in crisis response (Plotnick and White, 2010; Jennex, 2010; and Howe, Jennex, Bressler, and Frost, 2011). However, the conclusion of this paper is that while the functionality of social media is useful, the maturity of social media availability is not sufficient to warrant including social media as operational crisis response systems. Social media are fine for crisis response planning, but it will take some thoughtful redesign of social media infrastructure before they are acceptable for operational crisis response.

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