Breaking news of disasters: How Stuff.co.nz and NZHerald.co.nz used Facebook and Twitter in the 2016 Kaikoura earthquake coverage in New Zealand

Ali Rafeeq* and Shujun Jiang

Abstract: This study looks at how media users reacted and engaged with Facebook and Twitter posts of two major New Zealand news websites—Stuff.co.nz and NZHerald.co.nz—during the coverage of the 7.8 magnitude Kaikoura earthquake in November 2016. Using posts (n = 975) on Facebook pages and tweets (n = 889) on Twitter handles of Stuff.co.nz and NZHerald.co.nz from 12 November to 17 November, we analysed how media users reacted to breaking news coverage of a major natural disaster. The results show that quake news gets significantly more interaction and reactions than non-quake news on both social media platforms. For Twitter, quake news gets significantly more interactions such as likes, and retweets, but not replies. However, for Facebook, quake news gets significantly more comments, likes, wow, sad, emotional feedbacks, but no significant difference in emotions such as love, haha, and angry. The emotions people have on Facebook indicate well the nature of the news. With Facebook's new function of reactions including, like, love, haha, wow, sad, angry, makes reactions more expressive and relevant. The study also shows a clear pattern of reactions on the two social media platforms across the timeline. While the number of posts keeps stable over the period, users' reactions soared in the first two days of the quake; The responses subsided after the chaotic period of the disaster was over. The study provides an insight into how mainstream news websites are using social media in reporting and engaging with users during major natural disasters. Limitations of the study and suggestions for future research are also discussed.

ABOUT THE AUTHORS

Ali Rafeeq is an assistant professor in the Department of Media and Creative Industries at the United Arab Emirates University. Dr. Ali received his Ph.D. in Mass Communication from the University of Canterbury. His research interest is on online journalism, visual journalism, international news flow, globalisation and social media.

Shujun Jiang is an associate professor in the Department of Media and Creative Industries at the United Arab Emirates University (UAEU). Dr. Shujun received her Ph.D. in Media and Communication from the City University of Hong Kong (2008). Her research focuses on online journalism, media credibility, and social media studies.

PUBLIC INTEREST STATEMENT

This is a research paper looked at how news media outlets use social media such as Facebook and Twitter in coverage of breaking news events. The researchers specifically analysed how two mainstream newspapers in New Zealand—The New Zealand Herald and The Press—used Social Networking Sites (SNS) in covering the breaking news of the Kaikoura earthquake in November 2016 in New Zealand. The news websites of these newspapers—NZHerald.co.nz and Press.co.nz—provided up-to-the-minute news and information and channelled some through Facebook and Twitter in their coverage of the natural disaster. The study shows that the public was interacting with the social media posts by sharing or expressing different kinds of emotions.
1. Introduction
In breaking news coverage of significant accidents and natural disasters, use of Social Networking Sites (SNS) by the news media and media consumers is extensive with the former using SNS for immediate dissemination of news updates and the latter for sharing and interaction. Facebook and Twitter are widely used by the news media to push and promote their editorial content. Social media updates from mainstream news websites not only attract more clicks to stories, but user interactions and engagement spread to social media ecosystem, creating a multiplier effect. Online newspapers today are capitalising on social media to share content and increase website traffic (Ju, Jeong, & Chyi, 2014). While social media have been defined as internet-based channels that help and facilitate users to interact and engage, perhaps a more relevant definition in the context of this research comes from Feng, Zhang, and Lin (2019) who see the journalistic functions of content creation and sharing. They defined social media as online platforms “that enable people to engage in networking, messaging, and/or creating (e.g., posting, tweeting, blogging), tagging, exchanging, evaluating (e.g., liking, commenting, voting, rating), and sharing content” (Feng et al., 2019, p. 2).

Social media have become an important part of mainstream journalism with extensive use of the platforms for online news distribution. Several studies (Gottfried & Shearer, 2016; Newman, Fletcher, Levy, & Kleis Nielsen, 2016; Taylor, 2016) have shown that more and more people, especially the millennials, get news through social media. Given the changing media consumption habits, news websites are extending to social media facilitating media users the options to share content on SNS such as Facebook and Twitter. Through social media platforms, news websites are facilitating immediate dissemination and promotion of news stories. Although online news websites are important sources of information during disasters, research also shows that individuals, especially young people are increasingly relying on SNS during crisis communication (Lenhart, Purcell, Smith, & Zickuhr, 2010). This may be partly due to the extensive use of SNS by emergency services and law enforcement agencies for crisis communication and management as well as unfiltered and immediate access to information shared by affected people. Unlike the mainstream news websites that follow journalistic news production routines, that slows the frequency of updates, information shared across SNS is comparatively fast (Bruns & Burgess, 2012) attracting people to read, view, share, and interact with what individuals are saying in the social media ecosystem. For example, within minutes of the major earthquakes that hit New Zealand in 2011 and 2016, people were sharing their experiences on Twitter and Facebook long before mainstream news outlets could break the story (Bruns & Burgess, 2012; Dowling, 2016; Garcia, 2011; Lee, 2017; Mathewson, 2012).

1.1. NZHerald.co.nz and Stuff.co.nz—two major New Zealand news websites
This study looks at how media users reacted to and engaged with Facebook posts and tweets by two major New Zealand news websites—NZHerald.co.nz and Stuff.co.nz—on the breaking news coverage of the 2016 Kaikoura earthquake in New Zealand. New Zealand’s largest newspaper, The New Zealand Herald, with a daily circulation of over 104,000 runs the NZHerald.co.nz website (ABC, 2018). The print and online audience in 2014 stood at 844,000 readers a day and 1.34 million across the week while data for 2018 show that audience for NZHerald.co.nz has soared to a record 1.051 million people; and weekly audience reaching 1.668 million (2018; NZHerald, 2014). According to media rating agency Nielsen, Stuff.co.nz attracted more than 2 million victors in March 2016 while the figure for NZHerald.co.nz was 1.68 million in March, up from 1.4 million a year ago (Stuff, 2016). The Amazon-owned Alexa, a web traffic analysis company, ranks NZHerald.co.nz at 10 and Stuff.co.nz at 7 on the list of top New Zealand websites (Alexa, 2019). Stuff.co.nz is a subsidiary of Australian company Fairfax Media and hosts Fairfax’s New Zealand newspapers such as The Dominion Post (circulation of over 39,000) and The
Press (39,800), and several other regional publications. Both websites extensively use their Facebook pages and Twitter handles to promote some news stories as well as alert their subscribers to breaking news and major developing news stories. The number of followers of their social media channels has increased, with June 2017 data showing that NZHerald.co.nz has more than 765,408 people fans on Facebook while the figure for rival Stuff.co.nz was 568,300. Two years later, June 2019 data show that Facebook pages have attracted more followers with 987,000 for NZHerald.co.nz and 845,000 for Stuff.co.nz. As for the followers on their Twitter handles, NZHerald.co.nz has more than 260,000 followers in June 2017 while the data for June 2019 show the number of followers has increased to 294,000. For Stuff.co.nz, in June 2017, there were 155,000 followers on its Twitter account while the figure for June 2019 stands at 181,00. As the data show on Facebook and Twitter, NZHerald.co.nz leads in terms of followers and fans on Facebook and Twitter.

1.2. Kaikoura earthquake
A powerful earthquake of magnitude 7.8 hit Kaikoura, a coastal town in the South Island of New Zealand at 12.02 a.m. on 14 November 2016. The earthquake, which also generated a 7-meter tsunami in the area, affected thousands of people and disrupted transportation networks (Woods et al., 2017). And within minutes the public was sending their felt reports of the earthquake—felt in major cities such as Auckland, Wellington, and Christchurch—to GeoNet, New Zealand’s geohazard monitoring agency. Within 15 min of the earthquake, GeoNet received more than 15,000 felt reports from the public that also showed how fast people responded to disasters (Little, McBride, & Balfour, 2016; Woods et al., 2017). Many who experienced the earthquake and several aftershocks that followed took social media to share their experiences while news media started covering the event with updates on their news websites as well as social media channels. One of the first posts from Stuff.co.nz on its website was titled “Severe 6.6 earthquake hits Hanmer Springs, felt as far away as Auckland,” at 12.14 a.m. followed by NZHerald.co.nz at 12.21 a.m. with a breaking news ticker “Very large earthquake shocks much of country … details soon”. The first tweet from Stuff.co.nz about the earthquake came at 12.14 a.m. while for the NZHerald.co.nz it took more than an hour to post its first tweet “Photos have emerged of the damage from this morning earthquakes that have struck New Zealand #eqnz” that was linked to a news story on its website.

Natural disasters of this magnitude are high news value events, and in covering the breaking news mainstream media use social media in the initial reporting of the events. In the news production process, reporters and editors make news judgements based on the news values framework where values such as drama, impact, importance, proximity are some key aspects of the news selection routines (Golding & Elliott, 1979; Harcup & Neill, 2016; Harcup & O’Neill, 2001; Shoemaker, Lee, Han, & Cohen, 2007). Given the high-value nature of the breaking news events, the news media were mobilised all the available platforms—from their news websites to SNS—in covering the earthquake.

Soon the news media and the public were converging to SNS, such as Facebook and Twitter, for news of the earthquake and the aftershocks. For the news media, both local and international, these platforms are important news sources (Dowling, 2016)—eyewitness accounts of people who were affected and critical information from emergency response agencies—in covering the earthquake. Table 1 shows how New Zealand’s leading news websites started covering the breaking news event on Twitter.

1.3. Social networking sites and journalism
Social Networking Sites (SNS) are Internet-based websites and applications that provide users to share information, engage, and interact within a virtual community or globally in real time. SNS are also referred to as social media as people can freely and easily join such networks by creating a profile, connecting with people and community. According to Boyd and Ellison (2007), SNS are “sites as web-based [Internet-based] services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system” (p. 211). Some
examples of popular SNS include Facebook, Twitter, YouTube, and Instagram which are widely used by individuals as well as the media and institutions to share and disseminate information during natural disasters “to warn others of unsafe areas or situations, inform friends and family that someone is safe, and raise funds for disaster relief” (Lindsay, 2011, p. 1).

Facebook, created in 2004, is the most popular social media platform with 2.2 billion users, followed by YouTube (1.9 billion), WhatsApp (1.5 billion). Twitter has 335 million active users (Statista, 2018). Many news websites use Facebook pages to share and promote editorial content to individuals who have liked

| Time   | Website             | Tweets                                                                 |
|--------|---------------------|----------------------------------------------------------------------|
| 12:14  | Stuff.co.nz         | #Breaking: Huge earthquake has rocked the country. Keep up to date with us. |
| 12:19  | Stuff.co.nz         | #Breaking: A “severe” earthquake has been felt throughout New Zealand. The magnitude 6.6 shake was centred 20km southeast of Hanmer Springs. [link](https://t.co/1Bj6CATfuE) |
| 12:22  | Stuff.co.nz         | #Breaking: Severe earthquake has rocked New Zealand. #eqnz [link](https://t.co/23JOU2W67) [link](https://t.co/FxScWSpwO) |
| 12:26  | Stuff.co.nz         | #Breaking: FB have activated safety check for NZ. #eqnz                |
| 12:39  | Stuff.co.nz         | Live: North Canterbury quake [link](https://t.co/3EqQ9vVa) [link](https://t.co/KUzsTH1zPF) |
| 12:39  | Stuff.co.nz         | Severe 6.6 earthquake hits Hanmer Springs, felt as far away as Auckland [link](https://t.co/Xw7Kx8Cz0) [link](https://t.co/f7VJoDKB1b) |
| 12:39  | Stuff.co.nz         | #Breaking: There is no tsunami threat to New Zealand following the cheviot earthquake #eqnz |
| 12:40  | Stuff.co.nz         | Keep up with #eqnz news LIVE: [link](https://t.co/XiQIKP4Hg8) [link](https://t.co/q1KEJ8D4ve) |
| 12:48  | Stuff.co.nz         | #Breaking: New Zealand police advise that all Emergency 111 lines are currently non operational. #EQNZ |
| 12:55  | Stuff.co.nz         | #Update on 111 calls—They have resumed.                               |
| 12:58  | Stuff.co.nz         | #EQNZ so far no reports of serious damage or injuries according to Civil Defence. |
| 12:58  | Stuff.co.nz         | #TSUNAMI UPDATE: Tsunami is possible. People near the coast in the south island should move to high ground or inland #eqnz [link](https://t.co/LI341EWmJ7) |
| 1:12   | Stuff.co.nz         | Severe 6.6 earthquake hits Hanmer Springs, felt as far away as Auckland [link](https://t.co/wbOPDVDmFh) [link](https://t.co/ntSZh0pVau) |
| 1:12   | Stuff.co.nz         | Live: North Canterbury quake [link](https://t.co/Q6rXPDo5d) [link](https://t.co/DBv3z816) |
| 1:32   | NZHerald.co.nz      | Photos have emerged of the damage from this mornings earthquakes that have struck New Zealand #eqnz [link](https://t.co/7QGsNyB5Qx) [link](https://t.co/pvFp6cR9Ww) |
| 1:43   | Stuff.co.nz         | Ice-cool Corey Webster nails overtime victory for NZ Breakers in Perth [link](https://t.co/YX6wm66WM) [link](https://t.co/GW5lccO1C1) |
| 1:43   | Stuff.co.nz         | Severe 6.6 earthquake hits Hanmer Springs, felt widely across New Zealand [link](https://t.co/9nxRDLhHL) [link](https://t.co/3Gf6stmXMG) |
| 1:52   | NZHerald.co.nz      | A tsunami has been generated, the first wave has arrived in the North Eastern Coast of the South Island. #EQNZ [link](https://t.co/QYGsNyB5Qx) |
| 1:54   | NZHerald.co.nz      | Tsunami warnings for the east coasts of both the north and south islands #EQNZ [link](https://t.co/QYGsNyB5Qx) |
their pages. One study shows that social media posts made by news websites have high user engagement (Jiang & Rafeeq, 2017). Of the mainstream news websites’ BBC News Facebook pages have 48 million Likes (followers) to its page while the figure for NYTimes.com is 17 million. In New Zealand, the Facebook page of the NZHerald.co.nz is followed by 890,000 people while the figure for Stuff.co.nz’s is 741,000. Any news shared by the news websites through Facebook pages will potentially reach the users who have liked the pages giving the news media outlets the opportunity for real-time one-to-many communication. Twitter as a micro-blogging service is widely used by news media and individuals to share news instantly during routine news production and distribution as well as during disasters and emergencies (Bhattacharya & Ram, 2012; Dowling, 2016; Kwak, Lee, Park, & Moon, 2010). Twitter messages—tweets—are limited to 280 characters and users can share photos and short video clips easily, making it one of the popular platforms in crisis situations. A Twitter account holder can tweet sharing information directly to followers and if another user retweets, that tweet would reach users who are not following the original tweet. This option of retweet “empowers users to spread information of their choice beyond the reach of the original tweet’s followers” (Kwak et al., 2010, p. 591) thus amplifying and multiplying the reach of the original tweet. And a single retweet, according to one study, can reach about a thousand users (Lerman & Ghosh, 2010). Twitter users also observe reactions of friends’ activities on the platform and follow the cues in spreading information and news.

Social media are widely used by mainstream news media as a news source in the production of news (Paulussen & Harder, 2014) and many larger newspapers use SNS as platforms to distribute news content (Kümpel, Karnowski, & Keyling, 2015). In breaking news coverage of disasters, social media are vital sources to access official sources, such as emergency services and police, who are often difficult contact for phone or face-to-face interviews. As a public space, Twitter also helps the public to share and communicate disaster news and information. In the 2011 New Zealand earthquake, that struck the South Island city of Christchurch, in the first hours of the event, people were tweeting using, hashtag #eqnz, two tweets every 2 s (7500 and hour) and with time in two to three days the volume declined.

The digital nature of the internet means that multimedia content such as photos, videos, and animations can also be shared and distributed through the SNS and the visual nature of the content also may be a factor in the uptake of user engagement. Compared to the text narrative, visual form of storytelling is better in attracting audiences (Pincus, Wojcieszak, & Boomgarden, 2017; Segel & Heer, 2010; Tandoc & Maitra, 2018). Research also shows that the pictorial superiority effect has a better memory for visuals (such as photos, videos) compared to words or text (Levie, 1987). In addition to the format of the content, SNS also provide features that facilitate user interactions. Social media share buttons, likes, and retweets and other features to express emotions have become an integral part of the SNS ecosystem aimed at increasing user engagement.

1.4. User engagement

One of the defining features of social media is interactivity offered to users with options to easily express feelings through, in the case of Facebook, likes and other reaction options. In February 2016, Facebook gave its users more options for reactions with “love,” “haha,” “wow,” “sad,” and “angry” (Stinson, 2016). Each of these reactions is represented by a unique emoji with love, for example, shown as a heart. Users can comment and share the posts, the latter option helping to further expand the reach of news media posts. These options allow Facebook users to express their views in symbols. Active interactions—such as liking, sharing, commenting, and reacting—on Facebook are a form of positive feedback or reaction to a post that may be textual or visual (Sumner, Ruge-Jones, & Alcorn, 2018). On Twitter, users are able to like, retweet and retweet with comments giving the public opportunities to engage with users. In disasters and emergencies, individuals communicate and interact to gain situational awareness so that they will understand what was happening in disaster areas (Vieweg, 2012). In the recent two largest earthquakes in New Zealand in 2011 and 2016, the public, mainly from New Zealand, widely used social media, especially Twitter, for communication and interaction (Dowling, 2016; Mathewson, 2012).
In the context of social media use and engagement in relation to coverage of the 2016 Kaikoura earthquake on Facebook and Twitter by NZHerald.co.nz and Stuff.co.nz, we asked the following research questions:

Q1: How do media users react to social media posts on Kaikoura earthquake?
Q2: How does post type affect user engagement?
Q3: Which social media platform is more engaging?
Q4: How do the news websites differ in their user engagement?

1.5. Methods
The 2016 Kaikoura earthquake was a magnitude 7.8 (Mw) earthquake in the South Island of New Zealand that occurred two minutes after midnight on 14 November 2016. To see how media users engage in social media on this major disaster coverage, data were collected from Facebook pages and Twitter handles of two mainstream media outlets in New Zealand: Stuff.co.nz and NZHerald.co.nz. From 12 November to 17, 975 Facebook posts and 889 Twitter tweets from the two media outlets were collected through Socialbakers. Socialbakers is a social media marketing company that provides social media analytics such as the type of data used in this research (Socialbakers, 2018). The type of data for Facebook include the number of comments, shares, likes, love, haha, wow, sad, angry, and the total of all eight interactions. For Twitter, the number of likes, replies, retweets, and the total of all three interactions were collected. No coders are involved since the rest of the variables are non-subjective. The researchers identified the post categories and whether the news is about earthquake or not.

The six-day time frame allows us to see the changes in social media updates before and after the earthquake. User engagement metrics for Facebook and Twitter, for the posts and tweets from NZHerald.co.nz and Stuff.co.nz, were collected in the week of the earthquake.

1.6. Measurement
User engagement with social media posts is measured according to the available functions on each platform. Specifically, on Facebook, it is measured as the number of comments, shares, like, love, haha, wow, sad, angry, and the total of all eight interactions; On Twitter, it is measured as the number of likes, replies, retweets, and the total of all three interactions. All updates are categorized into one of the post types: link, photo, video, and status. In this research, for coding purposes, the post type of link is defined as a hyperlink in a Facebook or Twitter post that would take a media user to a news story or image on an external website. The external websites are not limited to NZHerald.co.nz or Stuff.co.nz as some tweets provided links to emergency services. The post type of photo is coded as the use of a still photo on a Twitter or Facebook post while the type of video is the use of moving images, video, or animation; The type of status is an update without any links. For example “#Breaking: Huge earthquake has rocked the country. Keep up to date with us” is a status update from the Twitter handle of Stuff.co.nz posted at 12:14 am.

Each update, either from Facebook or Twitter, was manually coded into two categories—earthquake news or non-earthquake news—according to their content; the source of the update, either from Stuff.co.nz or NZHerald.co.nz is also coded.

2. Results

2.1. Users reaction to Kaikoura earthquake news
To answer the first research question, which is how media users react to social media posts on Kaikoura earthquake, T-test was conducted to compare user interactions on earthquake news and non-earthquake news on Twitter and Facebook.

2.2. Twitter
The means for Twitter likes for earthquake news and non-earthquake news were $M = 18.81$ (SD = 41.21) and $M = 5.11$ (SD = 10.19) respectively. T-test showed that Twitter likes for earthquake
news scored significantly higher than non-earthquake news, $t(496.87) = 6.80, p < .001$. The means for the Twitter retweets for earthquake news and non-earthquake news were $M = 28.34$ (SD = 2.04) and $M = 3.59$ (SD = 2.14) respectively. The result showed that the Twitter retweets for earthquake news scored significantly higher than non-earthquake news, $t(460.30) = 9.83, p < .001$. T-test showed no significant difference between the Twitter replies on earthquake news and non-earthquake news, $t(887) = 1.36, n.s.$ (Table 2).

### 2.2.1. Facebook

The means for the number of Facebook comments for earthquake news and non-earthquake news were $M = 336.53$ (SD = 819.75) and $M = 219.52$ (SD = 631.90) respectively. T-test showed that the comments for earthquake news scored significantly higher than non-earthquake news, $t(965.48) = -2.51, p < .05$. The means for the Facebook share for earthquake news and non-earthquake news were $M = 667.12$ (SD = 2449.54) and $M = 102.76$ (SD = 435.55) respectively. T-test showed that the Facebook share for earthquake news scored significantly higher than non-earthquake news, $t(570.04) = -5.21, p < .001$. The means for the number of Facebook likes for earthquake news and non-earthquake news were $M = 1088.46$ (SD = 2252.94) and $M = 41.58$ (SD = 160.41) respectively. No significant differences were found between the three pairs of comparison: Facebook love on earthquake news and non-earthquake news, $t(969) = -1.11, n.s.$; Facebook haha on earthquake news and non-earthquake news, $t(680.14) = 1.57, n.s.$; and Facebook angry on earthquake news and non-earthquake news, $t(969) = -6.37, p < .001$. (Table 3).

The results from both social media platforms show that quake news gets significantly more engagement than non-quake news. For Twitter, quake news gets significantly more likes, and retweets, but not replies. For Facebook, quake news gets significantly more comments, shares, likes, wows, and sad emotional feedbacks, but no significant difference in expressions like love, haha, and angry.

### 2.3. Post type and user engagement

To answer research question two, which is about how the types of posts affect user engagement, one-way ANOVA was conducted to see whether different types of posts, i.e. links, status, videos, photos, affect user engagement on each social media platform.

#### 2.3.1. Twitter

The number of likes was statistically significant between different post types as determined by one-way ANOVA ($F(3, 885) = 20.902, p < .001$). A Tukey post hoc test revealed that the number of

| Variables  | Yes       | No        | t value | df     | Significance |
|------------|-----------|-----------|---------|--------|--------------|
| Twitter like | 18.81 (41.21) | 5.11 (10.19) | 6.80 | 496.87 | $p < .001$ |
| Twitter replies | .96 (2.04) | .77 (2.14) | 1.36 | 887 | ns |
| Twitter retweets | 28.34 (52.52) | 3.59 (7.35) | 9.83 | 460.30 | $p < .001$ |
likes was statistically significantly higher for status (M = 44, p < .001) and video updates (M = 31, p < .01) compared to link updates (M = 11). There was no statistically significant difference between other groups. The number of replies was statistically significant between different post types as determined by one-way ANOVA (F(3,885) = 16.333, p < .001). A Tukey post hoc test revealed that the number of replies was statistically significantly higher for status (M = 2.07, p < .001), video (M = 2.34, p < .001), and link updates (M = 1.19, p < .001) compared to photo updates (M = 0.56). The number of replies is also higher for video than links (p < .05). There was no statistically significant difference between other groups.

The number of retweets was statistically significant between different post types as determined by one-way ANOVA (F(3,885) = 29.115, p < .001). A Tukey post hoc test revealed that the number of replies was statistically significantly higher for status (M = 61, p < .001), video updates (M = 45, p < .001) compared to link updates (M = 17). The number of replies is also higher for status (M = 61, p < .001) and video updates (M = 45, p < .001) than photo updates (M = 11). There was no statistically significant difference between other groups.

As the study explores what type of content was more engaging, it turns out that on Twitter, tweets with status and videos were more engaging than with links and photos, indicating Twitter is a good platform for status updates; Also, video updates were more engaging than photos and links on Twitter.

### 2.3.2. Facebook

The number of comments was statistically significant between different post types as determined by one-way ANOVA (F(3,971) = 12.446, p < .001). A Tukey post hoc test revealed that the number of comments was statistically significantly higher for video (M = 646, p < .001) and photo (M = 530, p < .01) updates compared to link updates (M = 220). There was no statistically significant difference between other groups.

The number of shares was statistically significant between different post types as determined by one-way ANOVA (F(3,971) = 21.345, p < .001). A Tukey post hoc test revealed that the number of shares was statistically significantly higher for video (M = 1200, p < .001) and photo (M = 1716, p < .001) updates compared to link updates (M = 208). There was no statistically significant difference between other groups.

### Table 3. T-test of comparing the number of Facebook comments, shares, likes, love, haha, wow, sad, and angry on earthquake news and non-earthquake news

| Variables            | Earthquake News | Non-earthquake News | t value | df    | Significance |
|----------------------|-----------------|---------------------|---------|-------|--------------|
| Facebook comments    | Yes (336.53)    | No (219.52)         | −2.51   | 965.48| p < .05      |
|                      | (819.75)        | (631.90)            |         |       |              |
| Facebook share       | Yes (667.12)    | No (102.76)         | −5.21   | 570.04| p < .001     |
|                      | (2449.54)       | (435.55)            |         |       |              |
| Facebook like        | Yes (1088.46)   | No (666.51)         | −2.71   | 887.61| p < .01      |
|                      | (2252.94)       | (2542.52)           |         |       |              |
| Facebook love        | Yes (54.62)     | No (40.51)          | −1.09   | 969   | ns           |
|                      | (231.164)       | (157.81)            |         |       |              |
| Facebook haha        | Yes (14.47)     | No (29.02)          | 1.57    | 680.14| ns           |
|                      | (100.17)        | (171.33)            |         |       |              |
| Facebook wow         | Yes (186.68)    | No (41.58)          | −6.37   | 697.00| p < .001     |
|                      | (485.62)        | (180.98)            |         |       |              |
| Facebook sad         | Yes (244.21)    | No (36.69)          | −5.62   | 576.05| p < .001     |
|                      | (831.07)        | (160.41)            |         |       |              |
| Facebook angry       | Yes (45.20)     | No (42.68)          | −0.11   | 969   | ns           |
|                      | (408.93)        | (268.515)           |         |       |              |

Table 3. T-test of comparing the number of Facebook comments, shares, likes, love, haha, wow, sad, and angry on earthquake news and non-earthquake news

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https://doi.org/10.1080/23311886.2020.1731121
| Twitter | Type  | N   | Mean | Std. Deviation | Sum of Squares | df  | Mean Square | F    | Sig.  |
|---------|-------|-----|------|----------------|----------------|-----|-------------|------|-------|
| Likes   | Link  | 248 | 11   | 13.91          | Between Groups | 3   | 18,531.81   | 20.902 | .000  |
|         | Photo | 571 | 9    | 29.55          | Within Groups  | 885 |   886.59    |       |       |
|         | Status| 41  | 44   | 60.62          | Total          | 888 |             |       |       |
|         | Video | 29  | 31   | 57.42          |                |     |             |       |       |
| Replies  | Link  | 248 | 1    | 2.67           | Between Groups | 3   | 67.89       | 16.333 | .000  |
|         | Photo | 571 | 1    | 1.24           | Within Groups  | 885 |   4.16      |       |       |
|         | Status| 41  | 2    | 4.26           | Total          | 888 |             |       |       |
|         | Video | 29  | 2    | 3.35           |                |     |             |       |       |
| Retweets| Link  | 248 | 17   | 24.54          | Between Groups | 3   | 41,388.20   | 29.115 | .000  |
|         | Photo | 571 | 11   | 33.24          | Within Groups  | 885 |   1421.56   |       |       |
|         | Status| 41  | 61   | 70.07          | Total          | 888 |             |       |       |
|         | Video | 29  | 45   | 100.58         |                |     |             |       |       |
The number of likes was statistically significant between different post types as determined by one-way ANOVA (F(3,969) = 3.649, p < .05). A Tukey post hoc test revealed that the number of like was statistically significantly higher for photo (M = 1737, p < .05) updates compared to link updates (M = 796). There was no statistically significant difference between other groups.

The number of love was statistically significant between different post types as determined by one-way ANOVA (F(3,969) = 3.684, p < .05). A Tukey post hoc test revealed that the number of love was statistically significantly higher for photo (M = 115, p < .05) updates compared to link updates (M = 40). There was no statistically significant difference between other groups.

The number of wow was statistically significant between different post types as determined by one-way ANOVA (F(3,969) = 36.123, p < .001). A Tukey post hoc test revealed that the number of wow was statistically significantly higher for video (M = 219, p < .01) and photo (M = 541, p < .001) updates compared to link updates (M = 74). There was no statistically significant difference between other groups.

The number of sad reactions was statistically significant between different post types as determined by one-way ANOVA (F(3,969) = 11.162, p < .001). A Tukey post hoc test revealed that the number of sad was statistically significantly higher for video (M = 420, p < .001) and photo (M = 389, p < .01) updates compared to link updates (M = 98). There was no statistically significant difference between other groups.

The number of haha and angry reactions was not statistically significant between different post types (Table 5).

In conclusion, the number of all three user engagement variables on Twitter, i.e. likes, replies, and retweets are significantly different among the four types of news updates including photos, videos, links, and status. Especially, tweets about status and with videos were more engaging than with links and photos. On Facebook, there is a significant difference in the number of comments, likes, shares, and emotional expressions including love, wows, and sad among four types of news updates including photos, videos, links, and status. Yet the number of haha and angry was not statistically significantly different. Specifically, news updates with photos and videos were more interacted with those with links, indicating that visual content is more engaging.

It seems, Twitter by the very nature of the platform is different than Facebook, in that status becomes one of the highly engaging and powerful news forms. This is probably due to the short nature of a Twitter message.

2.4. Comparing user engagement on Twitter and Facebook
When comparing user engagement on Twitter and Facebook, the data show that, in the six days before and after the earthquake, Facebook has 975 updates and Twitter has 889 updates. Facebook is obviously more engaging since the mean number of each user interactivity variables is much higher than Twitter (Figures 1 & 2).

2.5. News websites and user engagement
In terms of the activity of the two news websites, Stuff.co.nz. has more updates than NZHerald.co.nz on both social media platforms, e.g., on Twitter, Stuff.co.nz has 578 (65%) updates while NZHerald.co.nz has 311 (35%); On Facebook, Stuff.co.nz has 512 (52.5%) updates and NZHerald.co.nz has 463 (47.5%). However, user engagement is high on NZHerald.co.nz than Stuff.co.nz on both platforms. On Twitter, all three user engagement variables—like, reply, retweet—are significantly higher on NZHerald.co.nz than Stuff.co.nz (Table 6). On Facebook, user engagement variables including comments, likes, haha, wow, and total interaction—are significantly higher on NZHerald.co.nz than Stuff.co.nz; other variables, such as share, love, sad, and angry are not (Table 7). These results show that more updates do not guarantee more user engagement.
Table 5. Mean numbers and one-way analysis of variance of Facebook comments, shares, likes, love, haha, wow, sad, and angry on four types of news updates.

| Facebook Type | N  | Mean | Std. Deviation | SS             | df  | MS             | F    | Sig. |
|---------------|----|------|----------------|----------------|-----|----------------|------|------|
| **Comments**  |    |      |                |                |     |                |      |      |
| Link          | 806| 220  | 567.02         | Between Groups | 19,878,814.161 | 3   | 6,626,271.39   | 12.45| .000 |
| Photo         | 67 | 530  | 653.18         | Within Groups  | 516,981,306.266 | 971 | 532,421.53    |      |      |
| Status        | 95 | 646  | 1560.86        | Total          | 536,860,120.427 | 974 |                |      |      |
| Video         | 7  | 397  | 407.49         |                |     |                |      |      |
| **Shares**    |    |      |                |                |     |                |      |      |
| Link          | 806| 208  | 660.95         | Between Groups | 206,696,713.674 | 3   | 68,898,904.56 | 21.35| .000 |
| Photo         | 67 | 1716 | 3062.88        | Within Groups  | 3,134,279,587.643 | 971 | 3,227,888.35  |      |      |
| Status        | 95 | 1200 | 4794.98        | Total          | 3,340,976,301.317 | 974 |                |      |      |
| Video         | 7  | 590  | 608.82         |                |     |                |      |      |
| **Likes**     |    |      |                |                |     |                |      |      |
| Link          | 804| 796  | 2401.01        | Between Groups | 62,328,703.793  | 3   | 20,776,234.60 | 3.65 | .012 |
| Photo         | 67 | 1737 | 2118.53        | Within Groups  | 5,516,535,138.852 | 969 | 5,693,018.72  |      |      |
| Status        | 95 | 1164 | 2498.42        | Total          | 5,578,863,842.645 | 972 |                |      |      |
| Video         | 7  | 1036 | 853.30         |                |     |                |      |      |
| **Love**      |    |      |                |                |     |                |      |      |
| Link          | 804| 40   | 152.46         | Between Groups | 442,988.906     | 3   | 147,662.97    | 3.68 | .012 |
| Photo         | 67 | 115  | 510.90         | Within Groups  | 38,840,791.151  | 969 | 40,083.05    |      |      |
| Status        | 95 | 76   | 177.13         | Total          | 39,283,468.058  | 972 |                |      |      |
| Video         | 7  | 5    | 5.32           |                |     |                |      |      |

Continued
| Facebook | Type   | N  | Mean | Std. Deviation | SS            | df | MS           | F    | Sig.  |
|----------|--------|----|------|----------------|----------------|----|--------------|------|-------|
| Haha     | Link   | 804| 24   | 150.29         | 35,433,920     | 3  | 11,811.31    | .63  | .597  |
|          | Photo  | 67 | 8    | 21.43          | 18,239,719.353 | 969| 18,823.24    |      |       |
|          | Status | 95 | 9    | 27.60          | 18,275,153.272 | 972|               |      |       |
|          | Video  | 7  | 3    | 3.89           |                |    |              |      |       |
| Wow      | Link   | 804| 74   | 214.26         | 14,509,303.238 | 3  | 4,836,434.41 | 36.12| .000  |
|          | Photo  | 67 | 54   | 817.40         | 129,737,141.45 | 969| 133,887.66   |      |       |
|          | Status | 95 | 219  | 718.74         | 144,246,444.689| 972|               |      |       |
|          | Video  | 7  | 68   | 189.89         |                |    |              |      |       |
| Sad      | Link   | 804| 98   | 376.03         | 12,930,699.240 | 3  | 4,310,213.08 | 11.16| .000  |
|          | Photo  | 67 | 389  | 533.67         | 374,166,916.516| 969| 386,137.17   |      |       |
|          | Status | 95 | 420  | 1603.32        | 387,097,555.755| 972|               |      |       |
|          | Video  | 7  | 154  | 176.98         |                |    |              |      |       |
| Angry    | Link   | 804| 47   | 376.43         | 112,690,140    | 3  | 37,563.38    | .30  | .823  |
|          | Photo  | 67 | 54   | 306.26         | 120,076,722.808| 969| 123,918.19   |      |       |
|          | Status | 95 | 14   | 32.63          | 120,189,412.948| 972|               |      |       |
|          | Video  | 7  | 4    | 7.25           |                |    |              |      |       |
3. Discussion
The study clearly shows that the public is highly engaged in social media interactions in disasters. From the very beginning of the earthquake users on both platforms—Facebook and Twitter—were actively engaged with the content with shares, comments, and other interactions.

One of the findings is that on both Twitter and Facebook, earthquake news got more engagement than non-earthquake news, indicating that SNS are heavily used and interacted for breaking news. Specifically, Twitter likes and retweets are significantly higher on earthquake news and non-earthquake news, but not replies. Due to the nature of Twitter, users tend to use it as information sharing during the time of emergency and are more likely to spread the news rather than spending time on comment and discussion, which is in the form of replies on Twitter platform. In terms of Facebook, all other interactions including comments, shares, likes, sad, and wow, are significantly higher on earthquake news than non-earthquake news except love, haha, and angry, which are irrelevant to the emotions people have towards earthquake.

The other finding is that on Twitter, videos and status were more engaging than posts with links and photos in all three forms of engagement, i.e. likes, replies, and retweets. Multimedia content such as video and photos is popular in terms of user engagement. The findings of this study also affirm a US study that multimedia is popular among Twitter users (Armstrong & Gao, 2010). A similar trend can also be seen on Facebook where posts with photos and videos were more engaging than posts with links, indicating visual content is more attractive. Videos on Facebook
pages of news outlets have been shown to work best in engaging users and Facebook’s preference for promoting videos may also be a factor. These findings of the videos and photos in relation to user engagement also confirm studies that show visual content is a more appealing stimuli and attracts users than text, making video a dominant mode of journalism (Pincus et al., 2017; Segel & Heer, 2010; Tandoc & Maitra, 2018).

Comparing the two SNS—Facebook and Twitter—the mean number of interactions of Facebook is way more than Twitter indicating Facebook is way more popular than Twitter in breaking news coverage in New Zealand. Facebook is not only the most popular SNS in the world but in New Zealand as well, with over 2.9 million New Zealanders having an active account on the platform as of 2017 (Cooke & Henry, 2017). Data available in June 2017 show that NZHerald.co.nz has more than 765,408 fans on Facebook while for its main Twitter handle there were only 260,000 followers. For Stuff.co.nz, its Facebook page has more than 568,300 fans compared to 155,000 followers on its Twitter account.

### Table 6. T-test of comparing NZHerald.co.nz and Stuff.co.nz on Twitter user reactions

| Variables      | Stuff.co.nz | NZHerald.co.nz | t value | df      | Significance |
|----------------|-------------|----------------|---------|---------|--------------|
| Twitter likes  | 8.29 (22.01)| 18.75 (41.68)  | −4.13   | 405.12  | p < .001     |
| Twitter replies| .56 (1.52)  | 1.43 (2.78)    | −5.16   | 412.54  | p < .001     |
| Twitter retweets| 9.60 (24.87)| 27.74 (55.62)  | −5.47   | 377.92  | p < .001     |
| Total interactions | 18.45 (46.08)| 47.93 (94.02) | −5.20   | 391.81  | p < .001     |

### Table 7. T-test of comparing the number of Facebook comments, shares, likes, love, haha, wow, sad, and angry on Stuff.co.nz and NZHerald.co.nz

| Variables       | Stuff.co.nz | NZHerald.co.nz | t value | df      | Sig     |
|-----------------|-------------|----------------|---------|---------|---------|
| Facebook comments | 203.16 (531.11) | 373.93 (913.62) | −3.52   | 726.20  | p < .001 |
| Facebook share  | 330.96 (1317.00) | 499.07 (2301.79) | −1.38   | 719.06  | ns      |
| Facebook like   | 630.06 (1629.66) | 1196.83 (3001.39) | −3.60   | 692.69  | p < .001 |
| Facebook love   | 43.23 (219.96)  | 53.85 (177.75)  | −0.83   | 971     | ns      |
| Facebook haha   | 10.41 (52.51)   | 32.85 (190.79)  | −2.44   | 522.71  | p < .05  |
| Facebook wow    | 73.31 (183.31)  | 173.35 (520.55) | −3.91   | 562.14  | p < .001 |
| Facebook sad    | 128.01 (752.41) | 173.71 (459.93) | −1.13   | 971     | ns      |
| Facebook angry  | 25.64 (219.86)  | 64.32 (454.75)  | −1.66   | 648.15  | ns      |
| Total interaction | 1444.77 (3698.49)| 2560.83 (5984.99)| −3.46   | 754.80  | p < .001 |
The conflicting results that Stuff.co.nz has more updates than NZHerald.co.nz on both social media platforms, while user engagement is the opposite, indicate that more updates do not guarantee more user engagement. NZHerald.co.nz is the digital edition of the New Zealand Herald which is the most circulated newspaper in the country (ABC, 2018). However, Stuff.co.nz is the main digital platform for several print newspapers from across New Zealand, thus giving it more resources and access to news content from regional publications. Several of the print publications that are affiliated with Stuff.co.nz, such as The Dominion Post, The Press, Nelson Mail, Marlborough Express were published in the regions where the earthquake had a huge impact, compared to the Auckland-based New Zealand Herald newspaper. The engagement for NZHerald.co.nz posts is higher because it has a larger audience and social media following compared to Stuff.co.nz.

User engagement evolves over time. The interaction dramatically increased in the first three days after the earthquake happened, it immediately decreased on the fourth day, and thereafter. The evolvement of the interaction echoes with the situation of the earthquake. As the major news event was earthquake itself, the coverage naturally started declining with time, as there were no developing news events that were related to the disaster. This study is limited to one incident and thus the findings should be looked at in the context of the earthquake coverage in New Zealand. Future research into disaster and non-disaster news events coverage and audience engagement on Facebook and Twitter would give a broader and useful picture on the nature of news distribution via SNS by mainstream news outlets.

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**Author details**
Ali Rafeeq¹
E-mail: dirafaeq@uae.ac.ae
ORCID ID: http://orcid.org/0000-0002-6176-3365
Shujun Jiang¹
E-mail: shujun.jiang@uae.ac.ae
¹ Department of Media and Creative Industries, United Arab Emirates University, Al Ain, United Arab Emirates.

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