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# Unbundling the W's: the interface between organisational crises, social media narratives, and image repair strategies

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## Abstract

Organisations are susceptible and vulnerable to crisis situations. These organisations have been able to exert resilience, and manage reputational damage, through crisis management protocols that include stakeholder engagement. However, given the rise of social media, a new cohort of stakeholders has emerged. Organisations are therefore faced with the task of managing new stakeholder relationships. This paper applies recent advancements in social media and crisis management discourse to investigate the prevalence of new, undiscovered stakeholders in crisis communications surrounding six prominent crisis situations. The results indicate that online stakeholders are becoming more powerful, urgent and legitimacy; thus shifting dynamics.

**Keywords:** Crisis Communication, Social Big Data, Stakeholder Salience

## Introduction

Previous studies on crisis management have sought to identify effective methods and strategies for crisis communication. Crises can be unexpected and non-routine events or activities that interfere with an organisation's normal business operations, jeopardise its public image and damage the bottom line (Faulkner, 2001). Managing crises is an important process to prevent or lessen such interference, repair images and disseminate the responding information. Therefore, 'the communication following a crisis plays an integral role in this success' (Ulmer, 2001, p592). According to Coombs (2015), crisis communication is 'the collection, processing, and dissemination of information required to address a crisis situation'.

The recent prevalence of social media platforms has created a new and low-cost channel for

communication. These platforms have also changed the way that people search, publish and share information during crises (Oh et al., 2013). The use of new types of social interactions to report real-time crisis information somehow is more influential than the mainstream news. Given this, the main organisations are no longer the only influencer, rather, there are peripheral influencers that can gain legitimacy and become important stakeholders by creating and propagating crisis information. Hence, there is a new challenge for the main organisations to identify and engage with these emerging stakeholders to communicate crisis information.

In addition, the social media platform can encompass large amount of unverified information, including lies and false rumour (Oh et al., 2013), which can then easily spread anger, threats and aversion emotions to further worsen the crises (Jin et al., 2014). Assessing and scrutinising such information is therefore important for organisations to control crises, develop responses, and repair images. Previous studies in crisis management have identified an array of strategies for crisis communication and image repairing (e.g., Benoit, 2018). This study builds on the key lessons of from these studies, and builds on stakeholder theory and image repair theory to propose new solutions for crisis communication and stakeholder engagement via social media platforms.

Given the new role of social media platforms in crisis communication, scholars have put emphasis on the complex interconnectedness and centrality of emerging stakeholders in crises (e.g., Sedereviciute and Valentini, 2011). Using the stakeholder salience model (SSM) and social network analysis (SNA), this study aims to advance our understanding of the interface between image repair strategies and stakeholder salience. As such, this study aims to unbundle the critical W's. These include: *what* is the conversation, *who* is framing the conversation, *why* do crisis-stricken organisations respond, and *when* they do.

To unbundle the W's, this study is anchored in a research agenda to address:

RQ1: How do (emerging) stakeholders shape the conversation about crises using social media platforms?

RQ2: What topics of conversation, and which stakeholder groups, encourage crisis-stricken organisations to respond?

RQ3: Is stakeholder mapping an effective tool? And, can crisis-stricken organisations use stakeholder mapping to identify salient stakeholder groups?

## Literature review

Grounded on traditional stakeholder theory, dominant logic in crisis communication discourse relates to the premise that: (i) a range of stakeholders will be involved in *ex-ante* and *ex-post* crisis communication (Wagner Mainardes et al., 2012), and (ii) organisations will attempt to communicate with certain stakeholder groups to manage the situation and reduce any reputational damage (Luoma-aho & Paloviita, 2010). To effectively manage crises, and reduce reputational risk (Benn et al., 2016), it is imperative for organisations to classify stakeholders and define dyadic stakeholder-organisation relationships. Parallel to the rise of social media platforms, however, interest and participation in crisis communication has become more accessible and fluid (Valentini & Kruckeberg, 2016), with organisations facing new challenges in stakeholder mapping procedures.

Traditionally, organisations could evaluate and categorise stakeholders with a scope to identify

the most salient stakeholder with prioritised stakeholder claims. Based on this evaluation process, an organisation could then respond directly to stakeholders with priori claims. Concomitant with the rise in social media, though, the evaluation of salience is becoming less static, with frequent changes in powerful, urgent, and legitimate stakeholders. What's more, social media has also introduced a new environment in which 'undiscovered', 'new', and 'unknown' stakeholders can emerge (Himmelboim et al., 2014).

The fundamental challenges for crisis-stricken organisations, therefore, are:

- i. Requirements to grasp – and difficulties associated with grasping – the complex relationship between crisis situations and social media platforms;
- ii. The emergence of new stakeholder groups, with Wan et al (2015) identifying new stakeholder labels, such as social media creators, social media followers, and social media inactives.

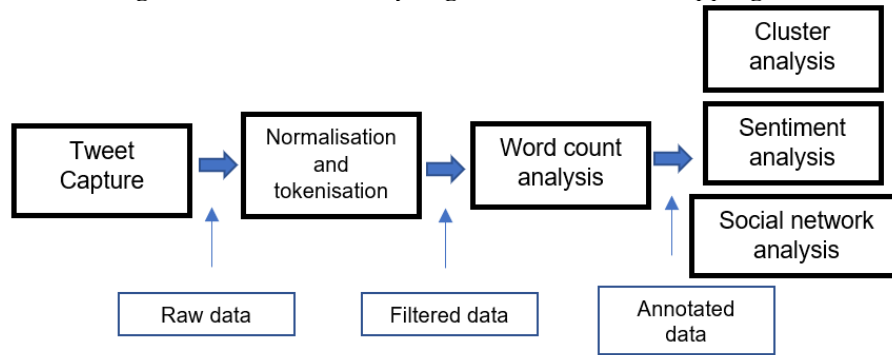
Addressing these challenges would make it possible for organisations to reconfigure their stakeholder maps, and thus recalculate salience calculations. Such possibilities could result in crisis-stricken organisations being better equipped to make optimal, rather than sub-optimal, crisis management decisions. An initial step toward providing a solution is provided by Sedereviciute and Valentini (2010). In their study, the author combined the Stakeholder Salience Model (SSM) and Social Network Analysis (SNA) to permit a mechanism to find and prioritise stakeholders on social media, with an emphasis on connectivity and content dimensions. The first dimension (i.e., connectivity), rooted in network theory, is based on connections between different online stakeholders on social media, as well as the dyadic connections between online stakeholders and the organisation. The core argument is that if an online stakeholder has a more prominent position in social media networks they will be viewed as more powerful. The second dimension (i.e., content), on the other hand, is preoccupied with the content and words propagated on social media platforms, such as Twitter, as well as the interest and relevance of this content for other online and offline stakeholders. Essentially, when an online stakeholder is seen as propagating interesting and relevant information on social media they will be deemed as urgent. When an online stakeholder is deemed both powerful (based on position) and urgent (based on content), they will be viewed as more legitimate by the crisis-stricken organisation, and thus will generally attract a response. As noted by Sedereviciute and Valentini (2010), these two dimensions will shift the traditional conceptualisation of powerful, urgent and legitimate stakeholders, and introduce new stakeholders into the mix, notably: unconcerned influencers (dormant stakeholders), concerned influencers (definitive stakeholders), unconcerned lurkers (non-stakeholder), and concerned lurkers (dependent stakeholders). This understanding will therefore be taken forward to assess *who* is important in crisis-related conversations on social media, and *how* they shape conversations on social platforms.

## **Methodology**

### *Data Collection*

This study develops a tweet analysing and stakeholder mapping tool to collect, extract and analyse the data from Twitter. The tool includes four analyses as illustrated in Figure 1: tweet word counts analysis (to classify trendy keywords); tweet cluster analysis (to identify dominant image repair strategies and prevalent crisis topics); tweet sentiment analysis (to identify the tweet sentiments and the pattern of information diffusion) and social network analysis (identify emerging stakeholders).

Figure 1. The tweet analysing and stakeholder mapping tool



The tweet datasets in this study are captured by a Twitter Application Programming Interface (i.e. QDA Miner and NodeXL), they contain seven recent crises and extreme events (Table 1). The software is selected based on their extensive features on exploring and analysing textual data.

Table 1. The Tweet dataset

Crisis or extreme events	No. of tweets	Date
Cathay Pacific data breach	39,819	7 days (25/10/2018-31/10/2018)
Marriot International data breach	30,916	7 days (30/11/2018-06/12/2018)
O2 UK day-long outage	25,243	7 days (06/12/2018-12/12/2018)
United Airlines overbook incident	55,083	48 hours (09/04/2017-11/04/2017)
Mars/Snickers product recall	10,930	10 days (23/02/2016-03/03/2017)
Fiat-Chrysler dieselgate	4,303	7 days (10/01/2019-16/01/2019)

Prior to the analyses, the Twitter datasets are normalised and tokenised (Liau and Tan, 2014) in the QDA Miner software package to stem and remove stop words. Other high frequency but pointless words (e.g., HTTP, HTTPS, RT, etc.) are also removed and common misspellings are corrected.

### Word Count Analysis

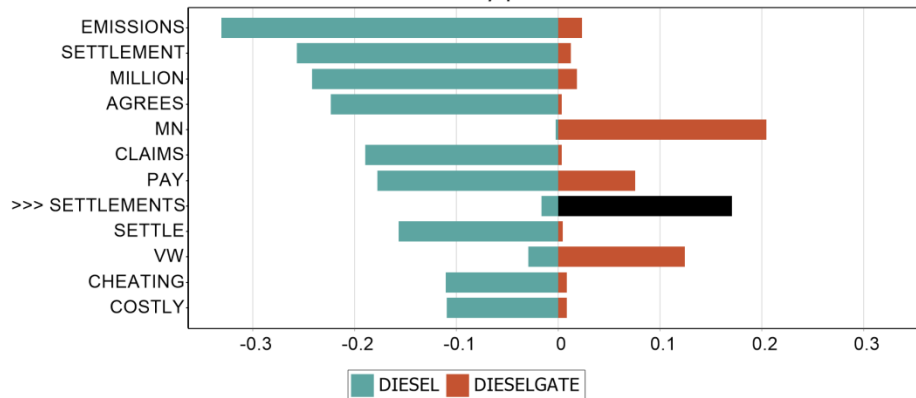
For word count analysis, the QDA Miner is used to generate word count frequency (Table 2) and predict the popular topics from the textual data. The major characteristics are also extracted in the proximity plot (Figure 2) (Mostafa, 2013).

Table 2. Word frequency table for the top 10 keywords

DATASET	KEYWORDS 1-5	FREQUENCY (CASE %)	KEYWORDS 6-10	FREQUENCY (CASE %)
Cathay Pacific Data Breach	MILLION	5383 (13.37)	INFOSEC	2833 (7.11)
	PASSENGERS	4589 (11.38)	USER	2728 (6.79)
	CYBERSECURITY	3817 (9.43)	SERVERS	2663 (3.39)
	REACH	3623 (7.43)	AIRLINE	2138 (5.18)
	RATAN	3369 (7.39)	PERSONAL	1990 (4.96)
Marriot International Data Breach	SECURITY	8634 (26.54)	GUESTS	4093 (12.98)
	MILLION	8418 (26.28)	AFTER	3604 (11.53)
	LEAK	6475 (20.69)	STARWOOD	3069 (9.56)
	GOOGLE	5368 (12.65)	CYBERSECURITY	2553 (8.07)
	HOTEL	5619 (17.76)	USERS	2363 (7.42)
O2 UK Day-long Outage	NETWORK	19828 (74.19)	OUTAGE	2378 (9.09)
	DATA	5283 (19.79)	EASILY	2294 (9.09)
	CUSTOMERS	3376 (11.88)	SIZE	2293 (9.08)
	MOBILE	3009 (10.54)	STRONGER	2293 (9.08)
	SERVICE	2431 (9.16)	JONNYGABRIEL	2288 (9.06)
United airlines Overbook Incident	PASSENGER	21111 (38.03)	PLANE	10965 (19.80)
	FLIGHT	20462 (36.42)	MAN	10269 (18.47)
	DRAGGED	16681 (30.19)	AFTER	7767 (14.04)

	CEO	12959 (22.93)	FORCIBLY	6645 (12.02)
	OVERBOOKED	11917 (21.52)	VIDEO	6511 (11.79)
Mars/Snickers Product Recall	CHOCOLATE	4264 (36.57)	ISSUES	1142 (10.39)
	BARS	3894 (33.91)	GERMAN	974 (8.90)
	COUNTRIES	3222 (28.59)	MASS	926 (8.48)
	PLASTIC	3275 (29.64)	PRODUCTS	868 (7.77)
	CANDY	1773 (15.89)	WIDENED	806 (6.58)
Fiat-Chrysler Dieselgate	EMISSIONS	2010 (44.95)	CHEATING	773 (17.78)
	MISSION	1478 (32.93)	VEHICLES	671 (15.22)
	PAY	1261 (27.31)	CASE	607 (13.06)
	DIESEL	1097 (23.36)	SETTLE	563 (12.74)
	SETTLEMENT	852 (19.36)	RECALLS	486 (10.13)

Figure 2. Proximity plot to compare the top keywords in the Fiat-Chrysler Dieselgate dataset



### Cluster Analysis

The popular topics are developed based on the keywords and their co-occurrence by using Multi-Dimensional Scaling (MDS). A matrix of distances between the popular topics are calculated to generate key topic groups (Table 4).

Table 3. Key topics of the datasets

DATASET	Key Topics
Cathay Pacific Data Breach	'MILLIONS of PASSENGERSHIT in WORST ever AIRLINE data hack link'
	'AIRLINE hack exposes 10 MILLION people's most personal information'
	'Cathay Pacific HIT by data leak affecting 9.4 MILLIONPASSENGER link'
	'Hong Kong carrier #CathayPacific is under pressure to explain why it took five MONTHS to admit it had been hacked and COMPROMISED the data of 9.4 million customers, including passport numbers and credit card details'
Marriot International Data Breach	'Just checked my email and yes, it turns out I am one of the 9.4 million Cathay Pacific passengers whose personal data has been COMPROMISED. Why wait 7 MONTHS to disclose this to the public? Link via @SCMPNews'
	'Post-breach, Cathay Pacific hit by GROUPACTION by UK LAW firm link via gcluley'
	'The world's biggest HOTELCHAIN Marriott INTERNATIONAL disclosed that unknown #hackers COMPROMISEDGUESTRESERVATIONDATABASE its subsidiary STARWOOD hotels and walked away with PERSONALDETAILS of about 500 MILLIONGUESTS. #CyberCrime link'
	'FACEBOOK exposed the PRIVATEPHOTOS of 6.8 million users back in September, but is only now admitting to the data breach'
	'Thanks to a second data leak, Google+ will shut down sooner than anticipated. Read more: <a href="https://t.co/9gyJ4GVmyt">https://t.co/9gyJ4GVmyt</a> #technology #GOOGLEPLUS Link'
O2 UK Day-long Outage	'Google will SHUT down GOOGLEPLUS four MONTHS EARLY AFTER second data LEAK #gafe Link'
	'DATABREACH: Marriott, between 2014-2018?? #security #databreach Marriott HIT By Massive Data Breach, One Of BIGGEST?'
	'Marriott's breach RESPONSE is so BAD, security EXPERTS are FILLING in the GAPS ? at their own EXPENSE'
O2 UK Day-long Outage	'DATA PROBLEMS HIT O2 MOBILE NETWORK LINK'
	'BREAKING O2 down ACROSSUK as CUSTOMERS HIT by NETWORK and 4G PROBLEMS LINK'
	'@O2 I can't make voice calls. It says I have no NETWORK. Why are o2 saying this is Only a DATA issue? Myself and my partner cannot make calls'

	<p>'O2, <b>BRITAIN's</b> second <b>BIGGEST</b> network, reported network outages, leaving many customers unable to access internet services. h?'</p> <p>'Customers on one of <b>BRITAIN's</b> <b>BIGGEST</b> mobile <b>NETWORKS</b> have found themselves with no service. O2 says it's <b>INVESTIGATINGISSUES</b> with its 4G network. Customers on Tesco Mobile and GiffGaff have also been hit by the outage.'</p> <p>'thank you for doing your best in restoring your network Appreciate the effort your teams put into it! Too many people rely on their mobile phones nowadays...it's not the <b>END</b> of the <b>WORLD</b>'</p> <p>'@O2 so I went a day without 4G, lost a days work, missed <b>IMPORTANT</b> emails and then I receive this today. Are you actually having me on? #o2outage'</p> <p>'Avengers 4: We're very sorry for Thursday's network issues. We <b>UNDERSTAND</b> how <b>IMPORTANT</b> it is to stay <b>CONNECTED</b>, especially this time of year. You'll receive a credit for two days of your monthly airtime subscription charges by the end of January.'</p> <p>'O2 blames network borkage on <b>SOFTWARE</b> glitch affecting third-<b>PARTY</b> supplier'</p> <p>'O2 network down: O2 blames '<b>GLOBALSOFTWARE</b> issue' for O2 data <b>OUTAGE</b> that prevents people from using 3G or 4G across the UK   City A.M.'</p> <p>'@O2 Whatcompensationcanweexpectfrom yesterday's outrageous network blackout? Have a <b>BUSEINSS</b> to <b>RUN</b> here!'</p> <p>'@O2<b>IRUN</b>my<b>BUSEINSS</b>onyournetwork, I assume you'll put out a link for compensation?'</p> <p>'We survived the war we can survive a no deal <b>BREXIT!</b>.... though admittedly we'll struggle if the O2 network goes down for a few hours...'</p> <p>'Fights when there's no chicken, People losing their <b>SHIT</b> without the O2 network. No <b>DEAL BREXIT</b> is going to be carnage.'</p>
United airlines Overbook Incident	<p>'United <b>DRAGGING</b> a <b>PASSENGER</b> from <b>OVERBOOKEDFLIGHT</b> was lesson in stupidity - LA Times'</p> <p>'That <b>PASSENGERDRAGGED</b> Off That <b>FLIGHT</b>'</p> <p>'MAN gets <b>DRAGGED</b> off of United Airlines just bc FLIGHT was <b>OVERBOOKED</b>&amp; no one voluntarily got off so they picked a guy and <b>DRAGGED</b> him out'</p> <p>'@united CEO OSCAR MUNOZ issued a <b>LETTER</b> defending his <b>EMPLOYEES</b>, saying the passenger was being ???<b>DISRUPTIVE</b> and <b>BELLIGERENT</b>. Seriously?'</p> <p>'@Mikel_Jollett @united <b>CEOMUNOZ</b> CALLS him "<b>DISRUPTIVE</b> AND <b>BELLIGERENT</b>" in EMAIL TO EMPLOYEES #LIAR RESIGN NOW! #united3411 #wtf #cnn'</p> <p>'MUNOZ is a moron United <b>CEODEFENDSACTIONS</b> of STAFF in VIRAL video, as lawmakers CALL for investigation'</p> <p>#<b>NEWUNITEDAIRLINESMOTTOS</b> FLY United - Now with a free, priority <b>DRAG</b> off <b>SERVICE</b> randomly available to all <b>PAYINGPASSENGERS</b>'</p> <p>'Non-PAYING #United Airlines employees more important than PAYING CUSTOMERS. FLY with #United and get ASSAULTED. The not so <b>FRIENDLYSKIES</b>.'</p> <p>'FLY the <b>FRIENDLYSKIES</b>...on Some Other AIRLINE. #<b>NEWUNITEDAIRLINESMOTTOS</b>'</p> <p>'I'm absolutely disgusted, @united! I HOPE that POOR man will SUE the <b>HXXL</b> out of the <b>COMPANY</b>. #unitedAIRLINES #disgusting'</p> <p>'@united HOPE you get the <b>SXXT</b> sued out of your COMPANY, <b>FXXKING</b> disrespectful degenerates. <b>FXXK</b> you and your employees #neverflyunited'</p> <p>'I HOPE HE SUES THE <b>HXXL</b> OUT OF THIS <b>FXXK</b> AXS AIRLINE'</p> <p>'Unbelievable. "Reaccommodate?" WATCH: <b>JIMMYKIMMEL</b> created a brutally honest COMMERCIAL for United Airline'</p> <p>'I had to share this. Too funny last night! United Airlines <b>COMMERCIAL (JIMMYKIMMEL LIVE)</b>'</p>
Mars/Snickers Product Recall	<p>This is the focal group which has the highest frequency words - "<b>CHOCOLATE</b>", "<b>BARS</b>", "<b>PLASTIC</b>", "<b>RECALL</b>", "<b>GERMAN</b>" – 'chocolate recall: Mars and Snickers bars in Germany contain plastic.'</p> <p>"<b>BIGGEST</b>", "<b>FOOD</b>", "<b>DRINK</b>", "<b>HISTORY</b>" – 'Mars recall spans 55 countries: is this the biggest food and drink recall in history?'</p> <p>"<b>CHOCOCY</b>", "<b>HORROR</b>", "<b>CONFECTIONER</b>" – '<b>CHOCOCYHORROR</b>, the recall of chocolates by confectioner Mars makes several front pages'</p> <p>"<b>ANNOUNCED</b>", "<b>MASSIVE</b>", "<b>BITS</b>" - 'Mars has issued a massive recall of chocolate bars after bits of plastic were found.' and 'Mars and Snickers just announced a massive recall in 55 countries.'</p> <p>"<b>NETHERLANDS</b>", "<b>PRODUCTS</b>" "<b>MANUFACTURED</b>" – 'AVA issues recall of Mars chocolate products manufactured in the Netherlands.'</p> <p>"<b>FUN</b>", "<b>SIZED</b>", "<b>WORSE</b>" – 'the mars candy bar recall is anything but fun-sized...and it just got worse.'</p> <p>"<b>MILKY</b>", "<b>SINGAPORE</b>" – 'AVAsg issues recall of Dutch-made Mars, Snickers and Milky Way chocolates in Singapore.'</p> <p>"<b>WIDENS</b>", "<b>SUPERMARKET</b>", "<b>MULTIPACKS</b>", "<b>UK</b>" – 'Mars chocolate recall widens to supermarket multipacks.' and 'Mars widens recall of chocolate to include UK after plastic found in bars.'</p> <p>"<b>CONTACT</b>", "<b>CARE</b>", "<b>HAPPY</b>", "<b>TEAM</b>", "<b>GOOD</b>" - 'Please check your product if it is labeled with Mars Netherlands, if it is, please contact your local consumer care team.' and 'Hi Ami, that's no good! Give our UK chocolate team a call at 800-862-6293. We'd be happy to help you out.'</p>

	<p><b>"REMOVE", "SHELVES", "DFS"</b> – 'DFS in Singapore removes Mars products from shelves following global recall.' and 'Mars, Snickers Milk Way and Celebrations pulled from shelves after plastic found in chocolate.'</p> <p><b>"COST", "FIRM", "MILLIONS"</b> - 'Mars, Snickers and Celebrations recall could cost firm millions.'</p> <p><b>"CHILD", "FINDS", "FREE"</b> – 'Mars, don't recall your Mars Bars, simply offer any child who finds a plastic ticket a free Wonka-style tour of your chocolate factory.'</p> <p>This is the focal group which has the highest frequency words - <b>"CHOCOLATE", "BARS", "PLASTIC", "RECALL", "GERMAN"</b> – 'chocolate recall: Mars and Snickers bars in Germany contain plastic.'</p> <p><b>"BIGGEST", "FOOD", "DRINK", "HISTORY"</b> – 'Mars recall spans 55 countries: is this the biggest food and drink recall in history?'</p> <p><b>"CHOCOCY", "HORROR", "CONFECTIONER"</b> – '<b>CHOCOCYHORROR</b>, the recall of chocolates by confectioner Mars makes several front pages'</p> <p><b>"ANNOUNCED", "MASSIVE", "BITS"</b> - 'Mars has issued a massive recall of chocolate bars after bits of plastic were found.' and 'Mars and Snickers just announced a massive recall in 55 countries.'</p> <p><b>"NETHERLANDS", "PRODUCTS", "MANUFACTURED"</b> – 'AVA issues recall of Mars chocolate products manufactured in the Netherlands.'</p>
<b>Fiat-Chrysler Dieselgate</b>	<p>'FinancialReview .fiat Chrysler will <b>PAY</b> about \$US800 <b>MILLION</b> in fines and costs to <b>SETTLE US LAWSUITS</b> that said the <b>COMPANY</b>'s cars violated clean-air rules.'</p> <p>'Fiat Chrysler <b>AGREES</b> to <b>EMISSIONSSETTLEMENT</b> WORTH \$800M'</p> <p>'Fiat Chrysler to pay \$515 MN in US '<b>DIESELGATE</b>' <b>SETTLEMENTS</b> Link'</p> <p>'Fiat Chrysler agreed to pay <b>HUNDREDS</b> of <b>MILLIONS</b> of <b>DOLLARS</b> to settle lawsuits accusing it of rigging certain diesel-powered pickup trucks and Jeeps with illegal software to pass emissions tests.'</p> <p><b>'EPS</b> for Fiat Chrysler <b>AUTOMOBILES</b> N.V. (<b>FCAU</b>) Expected At \$1.01'</p> <p>'Fiat Chrysler <b>AUTOMOBILES</b> N.V. <b>\$FCAU</b> Analysts See \$1.01 <b>EPS</b>'</p> <p>'It's hard to give credit to this administration for this settlement when @EPAAWheeler's EPA is still working to roll back emissions and fuel economy standards that will harm our <b>PUBLICHEALTH</b>, especially our children. #MomsDisapprove'</p> <p>'Fiat Chrysler to pay around \$650M in emissions cheating case \$FIATY #FIATY #<b>POLLUTION</b> #Environmentalconcerns #<b>ENVIRONMENT</b><a href="https://t.co/BUvgfNID8c">https://t.co/BUvgfNID8c</a>'</p> <p>'38,000 people a year die early because of diesel emissions testing failures   <b>ENVIRONMENT</b>   The Guardian #vw #dieselgate #<b>POLLUTION</b> #diesel #volkswagen #Germanauto #dasauto #citypollution'</p> <p>'FCA Will Pay Nearly \$800 Million to Settle Diesel Emissions Claims <b>VOLKSWAGEN</b>'s emissions-cheating <b>SCANDAL</b> may have <b>GARNERED</b> the most <b>HEADLINES</b>, but it's not the only <b>AUTOMAKER</b> that's gotten into <b>TROUBLE</b> with its diesel <b>ENGINES</b>. In a <b>STATEMENT</b>, Fiat CHR?'</p> <p>'Dieselgate is back? <b>VOLKSWAGEN</b> again suspected manipulation of diesel'</p> <p>'Fiat Chrysler <b>RECALLS</b> 1.6M <b>VEHICLES</b> to <b>FIX</b> TAKATA AIR BAGS \$TM #TM #Automobilerecalls #Automobilesafety #Productsafety'</p>

### Sentiment Analysis

The sentiment analysis is applied to understand the motive behind the tweets. This study uses the lexicon-based method to the tweets to measure the semantic orientation, adopts the SentiStrength classifier (Thelwall et al., 2010) to analyse the sentiment expressed in the tweets.

Table 4. the overall sentiments of the datasets

Crises or extreme events	Overall sentiments
Cathay Pacific data breach	-0.570
Marriot International data breach	-0.704
O2 UK day-long outage	-0.502
United Airlines overbook incident	-0.413
Mars/Snickers product recall	-0.262
Fiat-Chrysler dieselgate	-0.581

### Social Network Analysis

The social network analysis (SNA) (Coombs, 2002) is performed to identify the key stakeholders who are accounted for the information distribution. NodeXL is employed to calculate the in-degree (the total mentions of a twitter account), eigenvector centrality (the total connections to other influential accounts) and betweenness centrality (the numbers of shortest connections with other non-neighbouring accounts) of each account in the network.



Figure3. The O2 UK Day-long Outage dataset network based on Mention (@)

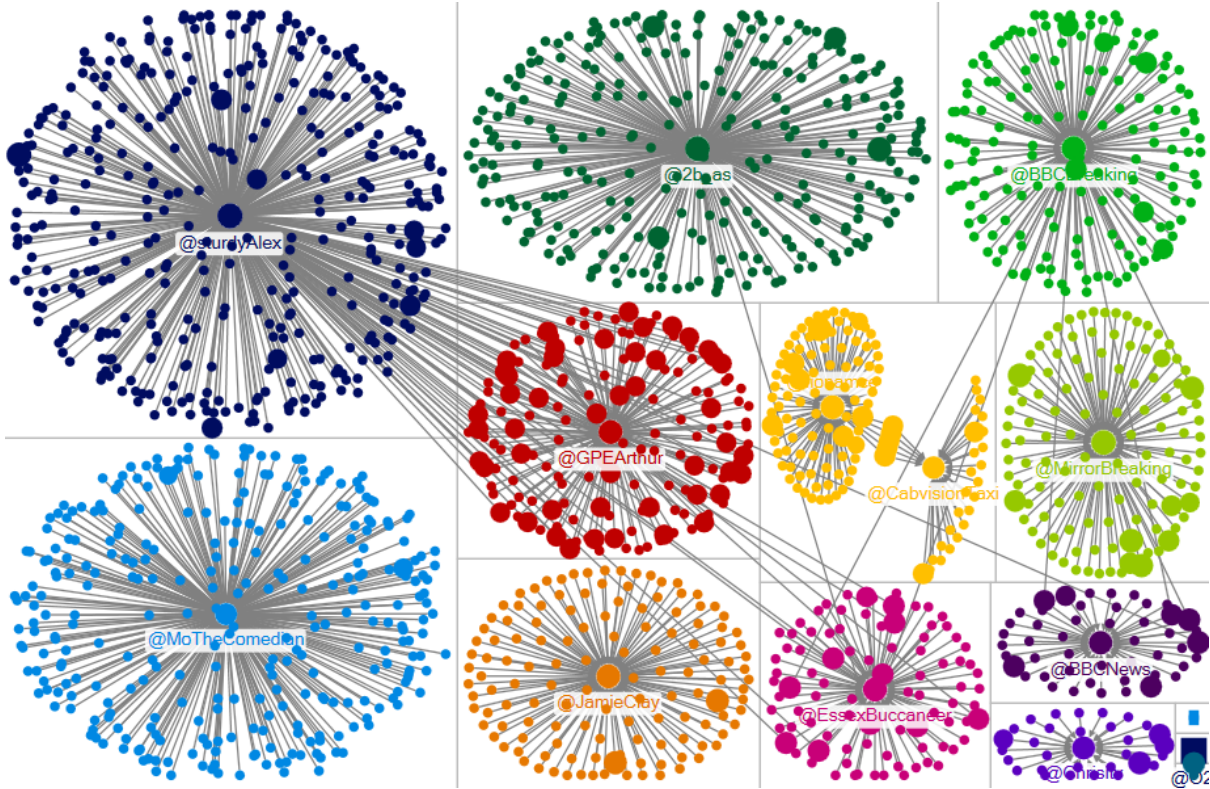


Table 5. the top 10 stakeholders based on in-degree, eigenvector centrality and betweenness centrality for the O2 UK Day-long Outage dataset

In-degree	Eigenvector Centrality	Betweenness centrality
<b>@sturdyAlex</b> (425)	<b>@sturdyAlex</b> (0.00252)	@tomthemac (2828340)
@MoTheComedian (299)	@Un1v3rs4L (0.00067)	@chriswb (1673679)
<b>@2b_as</b> (271)	@AshleyW12945493 (0.00067)	@ioniqman (1193729)
@BBCBreaking (159)	@kerrybroughton (0.00067)	@xa329 (995606)
@GPEArthur (147)	@HammerForLife (0.00067)	<b>@sturdyAlex</b> (838681)
@JamieClay (130)	@squired (0.00067)	@Shomer1Steve (838460)
@MirrorBreaking (114)	@A_Munn (0.00067)	@shellwinfrey (838460)
@fionamce (95)	@dentin_dentin (0.00067)	<b>@EssexBuccaneer</b> (618772)
<b>@EssexBuccaneer</b> (89)	@ruskin147 (0.00067)	<b>@2b_as</b> (572130)
@BBCNews (48)	@Jojobkk17 (0.00067)	@paracord_pete (555424)

### Results and implications

The word count frequency presented in Table 2 provides the basic tweet information on each dataset, the results help to construct key topics, identify main stakeholders, compare relationships between incidents and lay down the foundations for later sentiment analysis. In Table 2, the top keywords from each dataset are those mainly used to describe the crisis

situations, the cause of the crisis and the public expectations. They form the main topics during the crises which link to the main stakeholders. For instance, the keywords used in the Fiat-Chrysler Dieselpgate dataset are related to the RECALL due to the VEHICLES EMISSIONS CHEATING, and expecting SETTLEMENT PAY. In Figure 2, these keywords are compared against 'DIESEL' problem and the 'DIESELGATE' crisis. It can be noted that stakeholders have mentioned more about whether or not AGREES have been given to SETTLE the DIESEL problem, compare the stakeholder in the DIESELGATE who are more concerned with the cost in MN (millions) to SETTLE.

Table 3 highlights the important and related keywords and how they form popular topics. For instance, tweets to describe the crisis incidents, provide information about the impacts are affected areas, products are focal topic groups in every datasets. However, there are also tweets, although less, that form topics to offer suggestions and give feedback (to reduce the crisis impacts), asking questions (to fix the problem). In addition, there are also tweets represent groups to express jokes (schadenfreude) and sending disappointed messages (blame).

From the results of the SentiStrength classifier illustrated in Table 4, the overall average sentiment of all between the band distribution of circa -1/+1, which may indicate that some tweets are not very affective (Mostafa, 2013) and suggest a more detailed analysis to look into the sentiment score of each topic group/stakeholder group and at different timeframe for more meaningful explanations (Cao et al., 2018).

The results of the SNA to the O2 UK Day-long Outage dataset is illustrated in Figure 3 and explained in Table 10. Each of the three metrics used in this study indicate the influence of the tweeter users, such as a high in-degree indicates a high fluence of the account, a high eigenvector centrality represents a large number of connections with other influential accounts, and a high betweenness centrality shows an account with the most numbers of shortest connections with other non-neighbouring accounts. In this study, the key influential stakeholders are listed in Table 10. In particular, **@sturdyAlex** is the most influential stakeholder, as this account has the highest in-degree and eigenvector centrality, and a high betweenness centrality within the top 10 range. **@2b\_as** and **@EssexBuccaneer** are two other important influential stakeholders.

## Conclusion and recommendations

By adhering to Sedereviciute and Valentini's (2010) holistic approach to stakeholder mapping, within the context of several novel and important crises, this research has uncovered a few important research notes. These are:

- i. Concerned and definitive stakeholders have the capacity to shape crisis-related conversations based on their position within social media networks. For example, **@sturdyAlex** was seen to influence the narrative through a central position.
- ii. Once categorised as non-powerful, non-urgent, and illegitimate, these undiscovered online stakeholders require responses from crisis-stricken organisations in order to control and mitigate reputational damage, as was seen in the O2 outage case.
- iii. The combination of SSM and SNA facilitates the identification of new, undiscovered online stakeholders, which are integral in the narrative, tone, and longevity of crisis situations and their manageability.

To advance this research effort, and to generate managerial implications, the authors call for

further research on online stakeholders, especially those on Twitter, to identify the timeframe in which they are *powerful, urgent, and legitimate*. This can then be mapped against company response. Scholarship could also compare online stakeholders with offline counterparts to review salience across channels.

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