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VOLKSWAGEN EMISSION CRISIS – MANAGING STAKEHOLDER RELATIONS ON THE WEB

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Abstract: Organizations establish their own profiles at social media sites to publish pertinent information to customers and other stakeholders. During a long and severe crisis, multiple issues may emerge in media interaction. Positive responses and prompt interaction from the official account of e.g. a car manufacturer creates clarity and reduces anxiety among stakeholders. This research targets the Volkswagen 2015 emission scandal that became public on Sept. 18, 2015. We report its main phases over time based on public web information. To better understand the online interaction and reactions of the company, we scrutinized what information was published on VW's official web sites, Facebook, and Twitter profiles and how the image of the company developed over time among various stakeholders. To investigate this, Twitter and Facebook data sets were collected, cleaned, and analysed. We also compared this crisis in several respects with the Toyota recall crisis in 2010-2011 that was caused by sticking accelerator pedals and floor mats, as well as the GM crisis in 2014 that was caused by faulty ignition switches. Further we compare our findings with the Malaysian airline crisis that was caused by the disappeared flight MH370 and downed MH14.

1 INTRODUCTION

Nowadays, all major organizations and businesses have established their own profiles at various social media sites in order to support the brand image and launch new products or services also through these channels. The major advantages of social media are the rapid information dissemination and interaction with customers and other stakeholders. When a particular situation turns to crisis, more and more public attention arises which might lead to harmful consequences for the organization. Indeed, the reactions of various social media user groups have sometimes exerted a profound impact on the organizations. In crisis communication, the responses by the involved actors are vitally important for the survival and growth of organizations. Therefore, major failures in crisis situations cause negative image spread and losses in reputation for the organizations involved (Schwarz, 2012). The management of e-reputation requires

continuous monitoring of social media and other Internet channels in order to anticipate the possible brand losses (Denis et al., 2014). This paper provides a case study of events around the VW emission scandal with various stakeholders' interaction, such as motorists driving VW cars, various authorities and politicians in the USA, Europe and Japan, shareholders owning VW group shares, ordinary consumers and environment protection groups. The observations on the roles and motives of the major actors in social media were performed based on several data sets collected since Sept. 18, 2015. The target platforms were Twitter, Facebook and some sites of VW and other stakeholders. The scandal attracted attention from many media; this research will elucidate the impact of crisis on VW, and the crisis management strategies of the company to mitigate the effects – as evidenced by the data from the target platforms. We will also analyse the data sets and how many times VW was mentioned in Tweets and what kind of

sentiment the comments and tweets had towards VW.

The 2015 Volkswagen emission scandal became public on Sept. 18, 2015 in the USA, as EPA issued a press release. On Sept. 23, 2015 several media platforms were chosen by the authors to be monitored in order to analyse how the scandal was reflected in social media and at some websites. The social media platforms included Twitter and Facebook (especially VW's official Facebook page), Volkswagen's official websites and websites of major news media companies.

The research questions addressed in this paper are as follows:

1. How has the VW diesel emission scandal (#dieselgate) evolved over time since Sept. 18, 2015?

2. What are the stakeholders in this crisis and what have their reactions been in social media (Twitter and Facebook) and at some other websites?

3. What crisis communication theories could be applied in this case to explain the online interaction observed?

4. What kind of crisis communication strategy has VW group followed in social media, as evidenced by its official Twitter and Facebook profiles and its official WWW pages?

To elucidate the above main questions we investigate also the following sub-questions:

5. How many followers/friends does the official VW group Twitter profiles and Facebook group have, i.e. what is VW's direct sphere of influence at these sites?

6. How many tweets and Facebook comments did different stakeholders issue during the crisis so far?

7. How many tweets or Facebook comments of ordinary users did contain URLs to web sources?

8. How many tweets were from ordinary users to VW (VW mentions) and vice versa?

9. What were the main contents of the messages of VW group in different phases of the crisis so far?

2 THEORIES ABOUT CRISIS COMMUNICATION IN SOCIAL MEDIA

The impact of social media on organizational communication has received considerable attention recently. Knowledge of crisis communication has great significance for the smooth development of organizations and their brands. Crises can be perceived as complex events with high negative

influence but low probability that threatens organizational viability and may have a shorter or longer duration (Pearson and Clair, 1998). Because of the potentially detrimental effects of a crisis on organizations, these work on systematic crisis response and recovery strategies. During a crisis the public discusses the crisis online and often questions the causes for the crisis and responsibilities of the organization towards consumers and other stakeholders (Schwarz, 2012). Social media is a challenging arena for crisis communication for organizations, because they cannot easily control the sentiment and the direction the communication takes in the social media during a crisis. The aim of this paper is to better understand the impact of the crisis as visible on the web and the crisis response strategies of the focal organization, in this case the interaction of Volkswagen group concerning the emission scandal at core social media sites and on the websites that are under its control. The results in this paper are tentative, because, at the time of writing this paper, the crisis is still going on.

2.1 Response Strategies and Crisis Communication

Several researchers have proposed response strategies in general or specific cases. An online apology launch is one of the crisis response strategies that tests the sentiment of the customers (Coombs and Holladay, 2012). Providing solutions in different steps, from creating confidence and generating awareness, to enhancing understanding and gaining satisfaction of customers, is a wider framework to address the organization's appearance towards the public (Ledford and Anderson, 2013). Hiltz, Diaz and Mark (2011) discuss the criticality of the immediate reaction to emerging crisis and the exchange of valid information. Even though the timeliness of information is also underlined in the case of natural disasters, in organizational crises the timing is considered crucial while offering adequate response and synchronizing the activities with external stakeholders (Hiltz et al., 2011).

In crisis communication, the credibility of the source of mediated information plays a critical role in information diffusion. Confirmed organizational and governmental sources (such as the Environment Protection Agency) appear more trustworthy and thus have more impact than user-generated content (Freberg, 2012). Coombs and Holladay (2012) agree that credible sources have an effective role in crisis communication. Therefore, when it comes to the dissemination of information from confirmed

reliable organizations and governments, involved organizations should immediately begin to engage in social media communication counteracting negative tendencies in the crisis that threaten to go viral (Veil et al., 2012). With the development of crisis, the adoption of different response strategies are needed encountering various issues that may emerge over time. For instance, after a Malaysia Airlines MH370 flight vanished on March 8, 2014 the first reactions of the public and press concerned the fate of the victims, condolences to the families etc. Soon, though, the discussions about the reasons for the disappearance and about who is to be blamed for the presumable disaster began. Later questions arose about compensation to be paid to the families of the victims, the necessity of changes in safety procedures, etc.

The ability of an organization to monitor, understand and influence the fast evolving discussion threads in social media will be put to the test, while the organization attempts to update its messages to its social media profiles in order to reach various audience segments (Freberg, 2012). By monitoring social networks in suitable ways, organizations can reduce the reputational damages (Denis et al., 2014).

Monitoring of social media can be based on chosen key words and when their frequency in the message streams exceeds certain thresholds, alerts could be sent to organizations (Rappaport, 2010; Zhang and Vos, 2014). The mechanism would rely on APIs offered by social media platforms that allow keywords to be used to sieve out matching UGC streams and collections. For instance, Twitter offers a keyword based streaming API ("The Streaming APIs | Twitter Developers," 2012). Before the crisis, a branding monitor assists product or service's design, marketing and public relations (Divol et al., 2012). After that, organizations should constantly be informed of online discussions concerning them and react immediately before the sentiment is getting negative. In the market perspective, monitoring the reputation consolidation in social media also draws on the competitors' ideas which helps organizations to build a stable e-reputation (Zailskaite-Jakste and Kuvykaite, 2012). This activity could also strengthen financial performance.

2.2 Stakeholder concepts

Schwarz (2012) argues that stakeholders are those groups of individuals and organizations that engage in the stable development of organizations and reduce uncertainty. The internal stakeholders mainly

include owners, employees, wholesalers and retailers, and so forth if these are working within the organization. In contrast, customer groups, government agencies, and media houses belong to the external stakeholders. Elefant (2011) agrees to the influences from positive stakeholder engagement in social media dialogues. In critical times, specific decisions and actions are essential to stakeholders (Davenport et al., 2012). The exploration of stakeholder reactions in crisis communication has revealed different interest groups (Coombs and Holladay, 2012). In crisis contexts, attributions of responsibilities have critical influence to the judgement of organization (Schwarz, 2012). With long extreme negative process, the roles of internal stakeholders are vital for the crisis communication.

2.3 Communication Management

Issues that have a strong news value and that people want to be identified with, will trigger dissemination of information in social media. The emerging issues are framed by the participation of actors including influential users, organizations and some individual users. The CEO, as the representative of the organization, plays a key role in a managerial position and also in crisis communication. For example, Jeffrey Bezos, CEO of Amazon.com, played a positive role in the Kindle crisis cases in 2009 (Coombs and Holladay, 2012). In 2009 during the Toyota recall crisis, CEO Akio Toyoda took the utmost responsibility for the sticking accelerator pedals (Fan et al., 2013). Nadeem (2012) argues that the top priority for a CEO is to approach all customers in a crisis situation

Nowadays, the public begins to absorb news and information from social media in a crisis situation, as mentioned above. Users also seek confirmation from a reliable source of information, such as authorities and official organizations (Freberg, 2012). Therefore, various official social media accounts, such as Twitter and Facebook accounts of organizations are worth investigating. In this context we collected data from several verified Twitter accounts of Volkswagen group in the USA and Canada, as well and from the Facebook account of Volkswagen USA. The goal was to investigate the participation of the company in the crisis situation that evolved publicly after the Sept. 18, 2015 revelation of US Environmental Protection Agency (US EPA) that some diesel engines of VW person cars (notably EA189) emit much more NOx than allowed by the environment norms in the USA. To some extent, the responses from authorities may be

filtered and delayed in some situations (Hiltz et al., 2011), but in this case the issue was made public the authorities (US EPA). VW USA reacted on Sept. 20, 2015 by admitting publicly, that it had equipped certain diesel engines with cheating software that keeps the NOx emissions at an acceptable level in a laboratory/dyno test but lets them grow considerably during normal use. The company apologized for its behavior and announced that it would take a full responsibility for its actions.

3 CASE STUDY

3.1 Case description: Volkswagen emission scandal Aug. – Dec. 2015

The car emission norms both in the USA and Europe have been tightened since the beginning of the 90s, as concerns emitted nitrogen oxides (NO, NO₂), carbon dioxide (CO₂) and monoxide (CO), as well hydrocarbon (HC) and particle (PM) emissions (Delphi, 2015).

During 2014, the United States Environment Protection Agency (US EPA) got interested in the test results that certain certified VW person cars would not comply with the US environment norms, as set forth in the US Clean Air Act. These were based on the International Council on Clean Transportation (ICCT) mandated real world tests. The tests were performed by West Virginia University scientists using one 2012 VW Jetta and one VW Passat during 2014 (Thompson et al., 2014). As was observed during the real test drives, the engine of VW Jetta, for instance, generated up to 15-35 times more NOx into the air than the current US limit 0.043 g/km would allow, whereas in the dyno test the values remained clearly under the above limit. The VW group brands had been earlier certified to meet either the US EPA Tier 2 / Bin 5 emissions standard or the California LEV-II ULEV standard (see e.g. (Delphi, 2015)).

Based on the findings, US EPA asked VW for explanation on the issue. It was not satisfied with the response of VW. On Aug. 21, 2015 VW executives admitted unofficially to EPA officials that there are “cheating devices” installed to certain 2.0L TDI engines. On Sept. 3, 2015, EPA threatened VW that it will not certify 2016 diesel models any more. Next, VW admitted officially to EPA that some TDI engine control units had been equipped with software that detects testing situation and regulates the emissions under the given limits during the test, but lets them grow in normal use. On September 18,

2015 EPA ordered a recall for certain 2009-2015 VW cars equipped with a 2.0L TDI engine (of type EA189). The models included Jetta (2009-2015), Jetta Sportwagen (2009-2014), Beetle (2012-2015), Beetle Convertible (2012-2015), Audi A3 (2010-2015), Golf (2010-2015), Golf Sportwagen (2015), and Passat (2012-2015). Breaking news hit the headlines in news media that according to the announcement of USA EPA special emission testing software (cheating software) had been installed to certain VW person car models in order to cheat the emission tests. The engine control unit was using the information from several sensors to detect that the car was tested for (NOx) emissions and tuned the engine parameters so that the test was passed. The share value of VW group dropped on the market by 25 %.

On Sept. 20, 2015 VW admitted that 11 million vehicles were affected. Volkswagen encountered fines up to 18 billion dollars. That same day, Volkswagen Group of American, Inc., announced an immediate stop-sale of new 4 cylinder TDI vehicles in its dealer inventory.

The storyline in Table 1 contains the main events up to the end of December 2015. Two additional issues surface. First, COx emissions of certain VW engines are claimed to be higher than announced by the company. Further, some 3.0L TDI engines used in 2009-2016 models also have a cheating device installed. This is discovered by US EPA tests after Sept. 18, 2015 and announced on Nov. 2, 2015.

Table 1: Volkswagen emission scandal story line

Date	Events
2007	Volkswagen applies qualified software and system to meet the U.S. emission standard.
2008	Volkswagen publishes advertisement on clean diesel cars that presumably meet the US emission standards.
2011	Best Green Cars of 2011, VW Golf TDI; VW Jetta TDI. (“Best Green Cars, 2011,” 2011)
2009-2015	Strong diesel sales on US market, with clean energy. The affected engine types were primarily EA189 (1.2L, 1.6L, 2.0L TDI versions)
21.08.2015	VW group representative admits orally to the US regulators that VW has installed a cheating software to some of its TDI models. (Gartner et al., 2015)
03.09.2015	VW group admits officially the existence of the cheating software during a conference call with US regulators after the latter threaten to withdraw certificates from 2016 models (see above).
18.09.2015	Californian Air Resource Board sends a letter to VW (Hebert, 2015). U.S. EPA orders recall for certain 2009-2015 VW car models with 2.0L

	TDI engines and makes the issue public. Public discussion on the Volkswagen scandal explodes; Volkswagen Group of America, Inc. announces an immediate stop-sale on new 4 cylinder TDI vehicles in dealer inventory. (EPA, 2015; "EPA, C., 2015, EPA, California Notify Volkswagen of Clean Air Act Violations / Carmaker allegedly used software that circumvents emissions testing for certain air pollutants," 2015)
20.09. 2015	CEO of Volkswagen group Martin Winterkorn issues an apology for cheating during the emission tests on a video, ("Volkswagen CEO apologizes for cheating Business DW.COM 20.09.2015," 2015)
21.09. 2015	Volkswagen Canada launches stop-sale policy as above; the share value of Volkswagen group drops 23% after admitting diesel emission cheating (Weiss, 2015)
23.09. 2015	Mr. Winterkorn resigns and takes the responsibility as the CEO for the scandal. ("Martin Winterkorn resigns as Volkswagen CEO," 2015)
25.09. 2015	Volkswagen USA launches a webpage with information and possibility to identify the affected vehicles and – later- to claim goodwill packages https://www.vwdieselinfo.com/ . The same day in the US, EPA starts testing all light duty diesel vehicles with a new testing procedure in order to detect cheating devices (EPA, 2015)
29.09. 2015	New CEO of VW group, Matthias Müller announces a refit plan for emission rigged vehicles. ("New VW CEO says cars hit by emissions-rigging scandal to be refitted," 2015)
07.10. 2015	Volkswagen announces the recall strategies to start in January 2016 and promises to by the end of 2016 fix the affected vehicles. (Houston-Waesch, 2015)
08.10. 2015	President and CEO of Volkswagen US had the testimony before the house committee on energy and commerce subcommittee on oversight and investigations. (Twitter, 2015)
22.10. 2015	The emergence of new engine emission scandal; the CO2 emissions are also larger than announced in certain VW person cars. This is a follow up issue. (Kottasova and Thompson, 2015)
02.11. 2015	More branches from Volkswagen were found to have a similar cheating system on 3.0L TDI engine for 2014-2016 models (EPA, 2015)
09.11. 2015	VW announces a \$1000 goodwill package for the owners of affected vehicles in USA (Beene, 2015)
19.11. 2015	VW admits to US EPA that the cheating device for the 3.0L TDI engines has been in use since 2009 (EPA, 2015)
25.11. 2015	Audi, Porsche, VW ordered by CARB to recall in order to repair emissions software. ("CARB Forcing VW, Audi, Porsche to Fix More Diesels TheDetroitBureau.com," 2015)
09.12.	The company explains that the CO2 issue is over

2015	(Zollino, 2015)
10.12. 2015	VW explains that the corporate culture and some lower level managers were responsible for the scandal. Schedule for recalls of cars equipped with 1.2L, 1.6L and 2.0L diesel engines announced for 2016 (Ruddick, 2015)

3.2 Twitter Data Set Collection and its analysis

In Twitter, the tweets were collected relying on the streaming API using the selection predicate: [(‘VW’ or ‘Volkswagen’) and (‘scandal’ or ‘reputation’) and (‘diesel’ or ‘software’)]. Another collection was performed using hashtags #dieselgate or #dieselfraud after the first clause ‘VW’ or ‘Volkswagen’. These collections produced about 7 million different messages from Sept. 23 to Dec. 28, 2015 (in about 10 different, partially overlapping files). Although the Twitter selection criteria were in English, and messages in other languages should have been excluded, many collected messages in the data set were in German and in other languages.

An overall raw data table was created by parsing the above raw tweet files. Each tweet content was stored only once. The table contains data from about 7 Million tweets, among them also job announcements, and discussions or advertisements concerning general-purpose software such as Windows or Android.

Therefore, a cleaning procedure was run based on the above table that only selected those tweets where the text fulfills the following predicate: (@VW or @Volkswagen) or ((‘olkswagen’ or ‘vw’ or ‘EA189’ or ‘VW’) and (‘oftware’ or ‘candal’ or ‘iesel’ or ‘gate’ or ‘pollut’ or ‘raud’ or ‘fine’ or ‘stock’ or ‘mission’ or ‘heating’ or ‘CEO’ or ‘share’ or ‘hief’)). This resulted in about 703000 tweets that qualified. These still contained tweets in German and other languages, but most of them, about 537000, were in English. The graphs below in Fig. 1 are based on this English subset.

In Figure 1 there is a clear peak on September 24 and 25, 2015 with about 34000-35000 relevant English tweets collected on both days. Our collection was discontinued because the collector crashed unnoticed for 48 hours on Sept. 26, 2015. The next reliable value is for Sept. 29, with about 21000 tweets. After that, the number of tweets per day mostly remained below 20,000 tweets. The peaks correlate quite nicely with the timeline of major events.

The primary verified active accounts of VW group are:

- Volkswagen Verified account @Volkswagen (55K followers)
- Volkswagen Group Verified account @vwgroup_en (about 4000 followers) (German @vwgroup_de has about 2500 followers)
- Volkswagen USA Verified account @VW (about 450K followers)
- Volkswagen Canada Verified account @VWcanada (47K followers)
- Volkswagen USA News Verified account @VWnews (5300 followers)
- Volkswagen UK Verified account @UKVolkswagen (127K followers)
- Volkswagen India Verified account @volkswagenindia (50K followers)
- Volkswagen Motorsport Verified account @VolkswagenRally (74K followers)

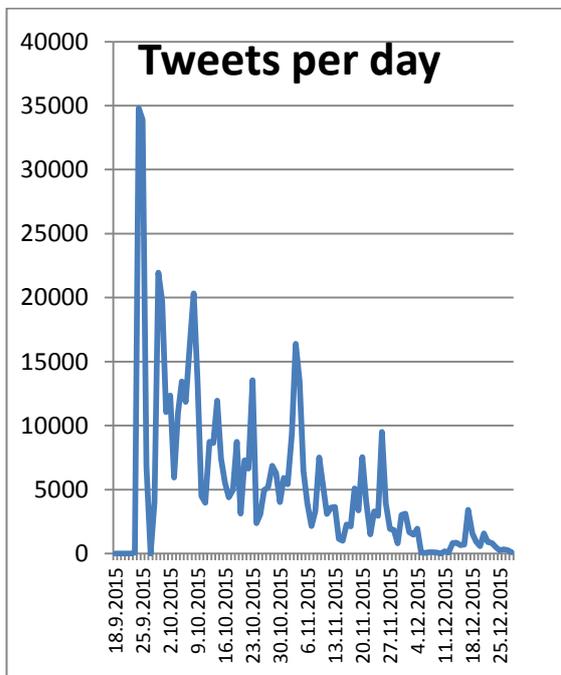


Figure 1: Qualifying English tweet set frequency 23.9.-28.12.2015

The major profiles of Volkswagen group in North-America are @vwgroup_en; @VW; @VWcanada; @VWnews. (@VWOfficial is a verified account of Vanessa Williams with about 293000 followers at the time of writing that has nothing to do with Volkswagen). The content of tweets from the verified accounts mainly falls under strategic

communication activity and re-direct to other websites with solutions in the collection period. For example on September 27, 2015 @VW tweets: “Visit <http://VWDieselInfo.com> for information regarding affected TDI vehicles”, with image on Das Auto and words explaining the situation and affected TDI vehicles. The site mediates official information to customers and general public about the crisis. On the front page the company apologized (for betraying customer’s trust - but not for polluting the air!), offered a 2.0L goodwill package, and shared answers to FAQs raised by the emission fraud. The web sites are the central vehicles in taking care of the crisis. Twitter messages are just used to guide the customers to the web sites or people are asked to contact the call center or a local dealer.

About 471000 English relevant tweets include one or more URLs that refer to earlier Twitter contents or redirect to another website. There are about 161000 retweeted tweets in the above subset, i.e. circa 30 per cent of all qualifying are retweets. Roughly 10000 tweets in this set are sent by verified users, whereas about 60000 retweeted tweets and 3500 quoting tweets refer to verified users. Only 1400 tweets retweet a tweet from @VW, none from @Volkswagen. Further, only roughly 33000 tweets were in that respect original, that they did not quote any other tweet, and were neither a reply to, nor a retweet of earlier tweets.

On Sept. 18, when the crisis became public, VW USA published tweet linking to a video with the text “Adam Scott is throwing a party. Are you on the list? #VW#VWAppConnect”. Nothing is said about the crisis. The next tweet is from Sept. 25, 2015 where the site publishes an apology of Mr. Michael Horn, the CEO of VW USA, concerning the emission scandal. It starts “Volkswagen would like to offer our deepest apologies to those affected by our violation of CARB and EPA emissions standards. We will remedy the issue, and we will make things right in order to win back the trust of you, our customers, our dealers, the government, the public, and our employees.”

In the above text fragment VW USA admits that it has violated emission standards and promises to correct the issue so that the trust of the named stakeholders can be regained.

3.3 Facebook Data Set Collection

The official Facebook account of Volkswagen makes use of the chat platform. One can argue that the posts from the official VW account attempt to set

the discussion agenda. User comments are primarily related to the official agenda. For instance, at the beginning of the crisis on Sept. 24, 2015 the original post contains the key words of “CARB and EPA emission standards”; therefore, there is a huge amount of comments about the standards and questioning whether a particular car is among those affected. On Sept. 27, the post is about launching the <http://VWDieselInfo.com/> website. Comments are mainly about how the website works and how to contact the company. As discussed above, the above site offers functionality, through which car owners can insert the VIN of their vehicle to be informed about whether their car is among those affected.

The verified account controlled by Volkswagen USA is <https://www.facebook.com/vw>. There are about 24 million Facebook users who like the page. Our group collected posts, comments and replies using the FB Graph API (<https://developers.facebook.com/docs/graph-api>). We targeted 9 posts published from September 16 to November 17, 2015 by VW USA on the above page. The posts attracted 13,122 comments and 6,954 replies, where 85 replies were published by Volkswagen USA. Figure 2 is built on the number of comments and replies by date.

The reason for collecting the data from the Facebook account above, is because there, unlike in Twitter, VW USA sets the agenda itself.

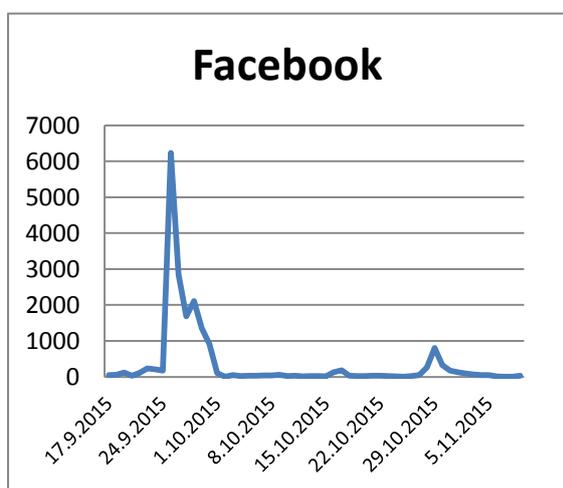


Figure 2: Facebook Collection Set

The content of comments from Volkswagen USA was categorized into three initial groups:

- Apology strategy
- Redirection to the website about emission recall:

https://www.vwdieselinfo.com/goodwill_package; www.vw.com/contact

- Customer services (other car related issues except emission scandals).

The content of all Facebook comments could be divided into four categories:

- Arguments of fans of the brand
- Arguments of critical consumers
- Reactions of Volkswagen group
- Others

3.4 The role of official VW Websites

This section is about the collection of official website of Volkswagen in USA, Canada and Europe.

- **Volkswagen USA:**

www.vw.com

The first page contains a direct link to <https://www.vwdieselinfo.com/>; the latter is about the emission scandal and explanations of the current status. <http://media.vw.com/>

This is an official media site of VW USA. On the first page it has a button *TDI Updates* that exposes press releases concerning the diesel scandal from <http://media.vw.com/releases/>. The latter contains all press releases.

- **Volkswagen Canada:**

www.vw.ca

The first page again offers a direct link to <https://www.vwemissionsinfo.ca/> but at the bottom of the page.

Similar to VW USA, it has a direct link to the emission scandal solution, it provides FAQ and a channel to send questions to the company... Interestingly, the section “What happened” ends with “No one in Canada is responsible for what occurred.”

- **Volkswagen Europe:**

<http://en.volkswagen.com/en.html>

The site first asks whether the user wants to the English or German version of the site. The first page on both versions offers EU rules and regulations on the CO2 emission tests and fuel consumption (but no information on NOx issues). Under the button *Current Customer Information* the site publishes text where the company promises to sort out issues as soon as possible and press releases of the Executive Committee of VW concerning the emission scandal. It also offers a button *Check if*

your car is impacted that takes the user to a page where one can insert VIN and see whether the vehicle is one of those with the cheating software or has CO2 emission issues.

Volkswagen media press: (Crisis response strategies in the first page)

<https://www.volkswagen-media-services.com/en/>
The site offers two buttons on the first page, *Information on Diesel-Issue* and *Information on CO2-Issue*. Once clicked, they return search results from the media pages, mainly metadata to press releases and links to pdf-documents. It also contains a 6 minute long video, where the functioning of EA189 engine exhaust gas processing is explained and the corrective measures to remove the cheating device are described, along how much time the correction takes for each engine subtype (30-60 min).

4 FINDINGS

In this section, observed behavior of VW group and other stakeholders while the emission crisis evolved, is discussed. It is not easy to render the response strategies for this thorny crisis which touches many sub issues. The root cause of the scandal is VW group's attempt to deliberately break the environment norms and show its engines clean during tests. The cheating was exposed and the crisis became public with the breaking news announced by EPA revealing that Volkswagen's diesel cars violate Clean Air Act. The confirmed information triggered a heated discussion in public and multiple issues began to emerge with questions and rumors in social media.

The first response strategy of Volkswagen is issuing an apology towards customers and other stakeholders and a stop in selling affected diesel models. According to Coombs and Holladay (2012), the apology strategies are considered a clear acceptance of the responsibility for the crisis. Volkswagen admitted its responsibility in the scandal and began to investigate and provide solutions. In crisis communication terms, the apology response strategies of Volkswagen are clearly structured and planned from the moment that the news broke.

The reactions seem to have been planned since August 2015. Already on September 18, 2015, Volkswagen stopped selling 4 cylinder TDI vehicles and took them from dealer inventory (which makes

sense, as certain diesel models may not necessarily have a valid environment certificate any more). Two days later, Volkswagen issued its apology concerning the cheating software. Five days later, the former CEO Winterkorn resigned and accepted to take the responsibility for the scandal. Even though the apology strategy was implemented quickly, a huge number of people began to discuss the scandal in social media. Our tweet collection started on Sept. 23 and we could observe a peak of around 35000 matching English tweets on 24th and 25th of September (and further tweets in German, Spanish, etc.). On Sept. 29 and 30 there still were around 20000 matching tweets in our data set. 6235 Facebook comments and replies were observed on 25th September on the official account of VW. One can argue that the crisis became widely known after the CEO Winterkorn resigned and the CEO of VW in the USA, Horn, issued a public apology after which the company launched a special web site <https://www.vwdieselinfo.com/> that shared information and later offered a "2.0L goodwill package". On October 7 and 8, there is another peak of 16000-20000 tweets when Volkswagen Group announced that the recall will start in January 2016, and promised to provide fixes before the end of 2016. At the same time the President and CEO of Volkswagen U.S. gave testimony before the House committee on energy and commerce subcommittee. On November 3, over 16000 tweets were observed, as on Nov. 2 more car types from Volkswagen were found by EPA to have a similar cheating system on 3.0L TDI engine for 2014-2016 models.

Subsequently, Volkswagen re-directed questions to the above webpage from both Twitter and Facebook. In addition, other webpages of VW were provided with specific FAQ questions; exact affected vehicles; recall methods, fixing times, and more.

On September 22, 2015 @vwgroup_en tweets: "See video: Statement Prof. Dr. Martin Winterkorn <http://ow.ly/2bvosA>". In the video the CEO issues the apology for customers, addresses the main stakeholders and promises to cooperate with the authorities and clear the issue to the bottom. On September 25, the profile tweets: "Matthias Müller appointed CEO of the Volkswagen Group #VWGroup <http://vwgroup.to/SFKtS>" and "The Volkswagen Group is restructuring: Supervisory Board passes resolutions for new organization #VWGroup <http://vwgroup.to/SFOj4>". This confirmed the resignation of the previous leader, introduced the new CEO, and presented possible solutions.

As mentioned before, @VW, the official account of Volkswagen USA tweeted on September 24: “Update from Volkswagen regarding the EPA investigation:”; on Sept. 27 it tweeted: “Visit <http://VWDieselInfo.com> for information regarding affected TDI vehicles.” It thus first apologized and then provided solutions to customers. @VWcanada followed the same strategies. Moreover, @VWnews retweets @VW’s “update from ...” tweeted the above and @vwgroup_en’s “Matthias Müller...” and so on, to provide transparency to the general public.

At the same time, fierce discussions between loyal customers and critical haters grabbed attention on the Facebook chat platform. It is, on the one hand, observable that a “brand supporters” group defended the brand by posting former experiences intended to protect the brand’s reputation. On the other hand, a critical “brand haters” group commented negatively, spreading rumors and negative information that harmed the brand’s reputation.

A controlled sample was selected to provide a sentiment analysis of the tweets. The categorization was based on three values, positive, neutral, negative. The targeted data set consisted of about 25800 tweets in any language where @VW is mentioned. Every 100th tweet in ascending order of the time stamp was selected resulting in 258 tweets to be manually checked. The results show that the sentiment neutral occurs in 152 tweets, positive in 28 tweets, and negative in 78 tweet. The latter tweets contain complaints about the crisis or the reaction of VW group to it. Positive sentiment thus forms a clear minority.

The German government was being blamed for taking no action and it was demanded that it should also take responsibility in the emission scandal. It is commonly known that Volkswagen is the largest automaker in Germany and aims at becoming the largest in the world. Several news media have reported that Angela Merkel’s government had known about the Volkswagen cheating software in July 2015, but this has been denied by the German government. The discussion of the role of the German government is still going on and damage control strategies appear to have been set up. For instance, demands are made that certain software should be made public by automakers. This is in order to protect the reputation of “Made in Germany” technology exports. From the economic point of view, this crisis could be the Volkswagen investors’ nightmare because of the rapid share price drops. The value loss affects stakeholders, not only in Germany, but also in the USA and in other countries.

In summary, Table 3 lists different stakeholders’ reactions along with each stakeholder’s role.

Table 3: Stakeholders’ reaction in detail

Stakeholders	Reaction
VW group	CEO Apology issuance; Response immediately; solution offering (through web sites).
VW retail car dealers in the USA	Stop-sale to affected vehicle and Volkswagen buys back used diesel vehicles at pre-crisis prices.
German government	2014, Auto industry listed a turnover of 384 billion euro, around 20% of German industry revenue, 2.7% of German GDP.. Several damage control strategies are followed by the government officials.
Environmental authorities of USA (EPA) and EU countries	EU is in contact with EPA on emissions tests and seeks energy cooperation in environmental protection, test standards are reformulated.
Consumer group with affected vehicles	Arguments of fans of the brand, arguments of critical consumers, complaints and questions of the affected car owners.
Other authorities, like tax authorities	Car tax is in some countries based on emissions, especially in the European Union, e.g. Volkswagen drivers run away from higher emissions tax in UK, governmental organizations face tax losses.
General public and environmental groups that are concerned about the air pollution	Protests and negative voices arise; health related aspects are mentioned, with concerns for continuous long-term economic growth.
Competing car manufacturers	After the scandal, Toyota addresses long run emission-free hydrogen cars; Mercedes, BMW and Peugeot are accused over fuel efficiency cheating; Volvo, Renault and Hyundai worry about the future EU tests and update car parts.
Traditional media	TV stations, newspapers, media companies are operating in mostly neutral voices with major headlines to monitor the growth of the crisis.

There are similarities and differences between the current VW crisis and the Toyota crisis in 2009-2010. The latter was caused by an unintended acceleration of the vehicle. The first found reason for this was a floor mat incursion that gave rise to the recall of 5.2 million vehicles on Nov. 2, 2009. A bit later it was discovered that the gas pedal itself was also sticking and the recall was amended with

2.3 million vehicles due to these problems in January 2010. The National Highway Traffic Safety Administration reported that the problems had caused 37 deaths in the USA (Healey, 2010). Around 1.8 million vehicles were recalled in Europe, and 75,000 in China. The massive recall cost approximately 2 billion U.S. dollars in lost output (new model manufacturing) and sales. During the crisis, Toyota had established a website to inform relevant consumers. Blogs were a leading indicator of the negative image of Toyota (Fan et al., 2013) in the social media. Only on Feb. 5, 2010, about 3 months after the first recall, Akio Toyoda, the CEO of Toyota announced an apology to consumers for the massive recall. Toyota had lost 22% market share since January 21, 2010, its stock dropped 12% in February 2010.

Comparing the Toyota and VW crises, in both cases there were failures in crisis response and internal communication inside the corporation. In the case of Toyota it has been noted, that because of the lack of internal communication, decision makers could not immediately receive alarm signals from the market (Anthony P. Andrews et al., 2011), whereas it is not clear how well the top management of VW was informed about the discussions with EPA during 2014-2015 concerning the observed high emission values. This underlines how significant communication is with customers and authorities, but also points to the role of frictionless internal communication. According to some reports, the corporate culture inside VW was not healthy, or pressure to perform so high, that this kind of cheating software could be deployed for many years.

General Motors (GM)'s ignition switch scandal in 2014 is also in some sense similar to the VW and Toyota crisis. It began in February 2014. The GM scandal was caused by an ignition switch that could accidentally turn off the engine while driving and stop airbags from inflating. This led to 124 deaths (as opposed to zero passenger or driver casualties in VW case). 30 million cars were recalled worldwide, and it did cost the company around 4.1 billion U.S. dollar to fix the problem. GM immediately established websites to inform consumers, just as VW did after the scandal broke. The new GM CEO, Mary Barra, issued a video with an apology – like Winterkorn did later - and a new vehicle safety chief was announced one month later. In March 2014, GM shares were down approximately 14 % since the Barra took the CEO position on January 15, 2014. This scandal is still developing. It revealed a lack of internal communication in the organization, as voices from the safety department were neglected by

decision makers, who in spite of the warnings applied low cost strategies. As to VW, the senior managerial level would have to be strongly aware of activities of the entire organization to prevent detrimental design decisions.

Compared to the case of Malaysia Airline “MH370”, all the above crises have a negative impact on organizations, but the organizations' reactions are totally different. Especially Volkswagen's responses were immediate and efficient, several apologies and resolution strategies were applied, relevant car owners could easily be located and technical solutions were developed. Compared to the slow and inefficient handling of MH370 crisis, VW seems to have done better. Malaysia Airlines seldom replied on the official Facebook account during the crisis to people that posted messages and it neither set up special web pages to inform the public. Malaysia Airlines is “technically bankrupt” since June 2015, although not only the fate of MH370, but also MH17's downing in East Ukraine on July 17, 2014 has been of importance in this respect.

5 CONCLUSION AND FUTURE RESEARCH

In this work, we have presented a specific case study in crisis communication that is still going on, namely the VW emission scandal and compared it to similar cases. The scandal became public on Sept. 18, 2015 and went through several phases while new issues surfaced. We have taken the information concerning the crisis from media outlets, official web sites of VW, Twitter streams and official VW USA Facebook page. From the latter two we have collected larger data sets. It also turned out that the company did not engage much in private communications with customers through social media (Twitter or Facebook), but rather set up web sites and shared links to them. However, on some of their web sites the company collects questions from audience and answers them in a FAQ section. It is worth noticing that VW had at least a month time to plan a crisis strategy, because it admitted already in August 2015 to the EPA that a cheating device was installed. VW probably also studied the Toyota and GM cases. In conclusion, various response strategies of VW group could be observed, including apology making, acting immediately, and offering solutions to affected customers. VW was active online in preventing further reputation damage. The case

provides hints how to design and implement crisis response strategies when an organization is facing a similar crisis in the future.

A limitation of our study is that we only collected data from one account in Facebook and had challenges in getting collected a reasonably representative set of tweets. A further limitation is that we did not study extensively major media outlets and the way they handled the VW, Toyota, or GM crises. The vast majority, 88 %, of tweets related to VW contained a URL, most of which might be web sources belonging to various media houses. The exact distribution of the referenced web sources is for future study. For future research, we also suggest to analyse the emerging sub issues to shows how different issues evolve during the crisis.

The first challenge of keyword based stream collection from Twitter is to start the collection right from the beginning of the crisis and continue it throughout the crisis. We started the collection on Sept. 23, 2015 when the tweeting activity was still rising. The second challenge is to find the right keywords. In this case the hashtags such as #dieselgate, #vwgate, #dieselfraud appeared rather soon after Sept. 18, but not all the relevant tweets contain them. The keywords 'VW' or 'Volkswagen' appeared rather often in relevant tweets, but also in various ad tweets. We took all the tweets into the final set that mentioned @VW or @Volkswagen, because most of them seemed to concern the crisis. There were over 30000 of them. Our entire data set only contained about 200 tweets sent by @VW, but a manual check showed that the account had sent over 1000 tweets between Sept. 17, 2015 and Dec. 28, 2015; only 7 were clearly relevant. In them the company announced the major events, like Winterkorn's video speech, the establishment of the VWdieselinfo.com, the recall schedule and the goodwill package.

In general, Twitter and Facebook data collection suggests the growing tendency towards state-of-the-art heated latest issues. Monitoring Twitter might be a part of an early warning system for organizations to be able to generate accurate responses later. This research evidenced the high impact of current crises in the online environment and highlights the relevance of social media monitoring to facilitate organizational crisis response strategies.

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