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Theoretical-empirical paper

Food crisis coverage by social and traditional media: A case study of the 2008 Irish dioxin crisis

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Abstract

The world of communication has changed significantly in the last decade due to the evolution of social media. Food crisis managers and communicators should be cognizant of the messages presented to the public by all media channels during a crisis. Using the 2008 Irish dioxin contamination incident as an example, a quantitative content analysis was carried out to investigate the relationship between social and traditional media. Messages published in printed newspapers ($n=141$), blogs & forums ($n=107$) and Twitter ($n=68$) were analysed to investigate: sourcing practice, story topic and use of tone. Results revealed that traditional media relied on diverse offline sources in reporting a wide range of topics. In comparison, social media responded faster and diminished faster, using offline and online media news messages as the primary sources in reporting very limited topics. No significant difference was found in the presence of negative tone across media.

Keywords: Food safety, crisis communication, traditional media, social media, content analysis

Introduction

With the increasing use of Web 2.0 technologies, media use in times of crisis has evolved from one way communication to multi-way interactions between a range of stakeholders and publics. Not only do media transmit crisis messages, they also interpret the story for the reader, by virtue of "what elements of a story they report, the types of sources they use in reporting the different sides, and how they package a story", thus functioning as an agenda builder (Driedger, 2008; McCombs & Shaw, 1972). This is widely acknowledged by journalists involved in reporting food crises: they do not simply reflect the communication strategies of stakeholders, but actively construct news stories (Hsu, 2008). Media professionals seek to respond to and reflect social preference in their reporting, and in so doing stake and maintain their position as dynamic interpreters (Petts et al., 2001)

In recent years, internet based peer-to-peer communication and specifically "social media" applications such as social networking sites like Facebook, Flickr and Twitter, serve as new information disseminators about crisis and food safety (Gassin & Van Geest, 2006; Hughes & Palen, 2009; Palen & Liu, 2007; Palen, Vieweg, Liu, & Hughes, 2009). A growing number of people have started relying on internet based media forms as the primary channel to seek out crisis information (Jin & Liu, 2010; Powell, Jacob, & Chapman, 2012). Social media may be better matched to crisis situations than traditional media, because the technologies allow for rapid information production and free uploading and downloading of content (Macias, Hilyard, & Freimuth, 2009; Palen et al., 2009). As web2.0 technologies have enabled any individual with internet access to generate, broadcast and share information, social media functions as an information aggregator representing and reflecting upon opinions from various stakeholders, including those traditionally less likely to be heard. Hence, social media has been described as 'a

parallel public discourse representing the unfiltered viewpoints of citizens'(Keelan, Pavri, Balakrishnan, & Wilson, 2010) and 'an instantaneous snapshot of the public's opinions and behavioural responses' (Chew & Eysenbach, 2010). Two distinct features of social media have enabled it to facilitate interaction: 1) it allows the continuous modification of content and applications by all users in a participatory and collaborative fashion; and 2) it facilitates the creation and exchange of user-generated content which results in enhanced interactivity (Ding, 2009). Therefore, social media provides new means of interaction between people within or outside the time-spatial boundaries of the crisis event (Palen et al., 2009). For instance, in crisis situations, survivors, victims, and observers connect with each other via social networking sites (Palen, 2008). Given that public perceptions and behavioural responses in a crisis are now potentially co-influenced by both traditional and social media, and there are both challenges and opportunities brought by social media in communication practice, it is critical for food crisis managers and communicators to develop a better understanding of its use. However, social media must be considered alongside the classical media channels (Barnett et al., 2011). As pointed out by some scholars, food safety related communicators should be cognizant of and understand the content presented in all media channels (Rhoades & Ellis, 2010). At this point in time, only a small number of studies have examined media coverage of food crises, with almost all of them concentrating on classical media channels, for example, national televised and newspaper coverage of food safety incidents including a Canadian *E.coli* contamination crisis (Driedger, 2007, 2008; Driedger, Jardine, Boyd, & Mistry, 2009), a dioxin crisis in Taiwan (Hsu, 2008), the recall of contaminated spinach in the United States (Nucci, Cuite, & Hallman, 2009), and bovine spongiform encephalopathy (BSE) and listeriosis outbreaks in Canada (Boyd, Jardine, & Driedger, 2009; Gauthier, 2011); and the complex relationship between food risk

reporting by traditional media and public reaction (Kitzinger & Reilly, 1997; Petts et al., 2001). There have been two studies addressing social media coverage of food crises. The first study focused on how social networking and sharing sites facilitated scientific collaboration which assisted pathogen identification (Casey, Hill, & Gahan, 2011). The second study looked at how trends in volume of social media data were used to estimate the epidemiological patterns in food-borne disease outbreaks (Chunara, Andrews, & Brownstein, 2012). To our knowledge, no published studies have compared the content of social media and traditional media messages during food crisis events. To address this, the current study set out to map out media discourse occurring on different media platforms during a food crisis.

The 2008 Irish dioxin contamination crisis, previously characterised as a media facilitated crisis (Jacob, Lok, Morley, & Powell, 2011), was taken as a case study. Biologically, dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer (WHO, 2010). On the 28th of November, 2008, contaminated animal feed fed to Irish swine led to the detection of elevated levels of a chemical indicator of dioxin contamination during routine testing of Irish pork. After the Food Safety Authority of Ireland (FSAI) confirmed that the presence of dioxins was as high as 200 times the EU recommended limit for food safety concerns, the Irish government announced a total recall of all potentially contaminated pork products on December 6th. For the following week, the Irish pork industry's business with foreign countries was at a standstill whilst a series of risk assessment and crisis management activities were carried out by key national and European level stakeholders. Irish pork was back on the market the morning of December 12th.

The Irish dioxin crisis represented one of the first food crises with international impact which was played out not only in traditional media, but also within social media. In 2008, social

media was experiencing a boom, with an unprecedented uptake of social media users, especially in social media applications such as Twitter (New Media Lab, 2009). Using the Irish dioxin crisis as an example, this study aimed to characterise the relationship between social and traditional media coverage of the dioxin crisis, specifically by investigating how the amount of coverage changed over time, and how the messages were constructed and shaped across different media channels.

Theoretical background and literature review

An elaboration of agenda setting theory, called "quantity of coverage theory," assumes that increased coverage turns public opinion in a negative direction, independent of the nature of the risk (Rowe, Frewer, & Sjoberg, 2000). Also, based on the Social Amplification of Risk Framework (SARF) and theories on complexity of the relationship between media and the public, a perceived risk can be influenced by quantity of media coverage if the media capture or resonate with an existing public mood (Petts et al., 2001). These theories suggest the importance of understanding how the amount of risk and crisis reporting rises and falls over time. Accordingly, the first research question was defined as: "how did the amount of coverage across the Irish dioxin crisis change in traditional and social media (RQ1)?" Following the precedent set in previous academic research on risk and crisis coverage, media content analysis in the current research mainly focused on three aspects, namely, source, story topic and tone of voice (Driedger, 2008; Kuttschreuter, Gutteling, & de Hond, 2011; Liu, 2010; McCarthy, Brennan, De Boer, & Ritson, 2008; Nucci et al., 2009).

Source

Source activity and the relationship between story tellers and their sources are historically central to the media production process (Kitzinger, 1999). The media, create a discourse of reality by relying on external sources to obtain important facts and interpretations. Previous work on sourcing routines in traditional news production has highlighted that, in crisis situations, news reporting shows a heavy dependence on messages from government officials and agencies (Li & Izard, 2003; Powell & Self, 2003). This can be explained by the model of the hierarchy of credibility (Becker, 1967, cited in Atton & Wickenden, 2005): those higher up the social hierarchies of power and privilege are regarded as more credible sources, and as such are more likely to be asked to present their knowledge. The consequences of this are outlined by Atton and Wickenden (2005):

"It holds that the pressure of deadlines and the professional demands of objectivity combine to produce an over-accessing of elite sources and thus a reiteration and perpetuation of dominant ideologies. This determinism ensures that primary definers are consequently drawn from elite groups and institutions who are both easily found and considered credible through their structural positioning and representative status." (p. 348)

The current study defines elite sources as those with power, legitimacy and authority, such as governments and politicians, public institutions, law enforcement institutions, and academic intellectuals (e.g. scientists, researchers, scientific advisors for the governments, etc) (Atton & Wickenden, 2005).

In relation to media reporting of food crises, whether the above insights apply is questionable. For example, the examination of TV news coverage of the spinach recall of 2006

revealed that non-governmental sources were more frequently represented than governmental ones (Nucci et al., 2009). There has been a penetration of social media use in relation to food safety communication (Newkirk, Bender, & Hedberg, 2012; Rhoades & Ellis, 2010), however little is known about what sources are being cited by social media users in a food crisis. As discussed, the people publishing on social media are not necessarily traditional trained journalists or experts alone, but can also represent the lay public. In conventional journalism practice, largely developed in relation to traditional media, there are normative and enforced practices in relation to sources which do not exist in social media. Most of those who operate through social media are not governed by such strict editorial guidelines or regulations. Thus, it is unclear whether patterns of source use in social media are generally similar to traditional media. There is some evidence in the general non-food crisis literature to suggest that social media cite less elite sources (Atton & Wickenden, 2005; Liu, 2010). However, little is known about source citation and linking practices in a food crisis.

Given that little research has been carried out to address sourcing patterns by different media in food crises, this current study poses the following research question: What sources were represented in traditional and social media coverage of the 2008 Irish dioxin crisis (RQ2)?

Topic

As previously mentioned, not only do media transmit crisis messages, they can also actively interpret the story, by selecting which elements of a story they report and deciding how a story can be packaged (Driedger, 2008; McCombs & Shaw 1972; Craft & Wanta 2004). As a result of web 2.0 technologies, such processes are no longer restricted to journalists and editors working at the front of traditional media. Online users may highlight topics that concern them

most or may even introduce new topics. For instance, it has been shown that blogs can challenge the traditional media by introducing different topics and story angles (Liu 2010). Investigation into the selection of story topics by different media can help us better understand the degree to which these media may present different agendas. It should be noted that individuals vary in exposure to media channels and their sense making process might be influenced by the agenda held by the media (Craft & Wanta, 2004). In light of this, a third question the current research sought to answer is what topics were selected and highlighted by traditional and social media in reporting the 2008 Irish dioxin crisis (RQ3)?

Tone of voice

One important measure of crisis management is the amount of negative media attention it receives (Coombs, 2007; Liu, 2010). Research has shown that use of a negative tone is commonplace in news reporting, with a number of studies reporting use of negative tone in over half of headlines of health affairs articles using (Brodie, Brady, & Altman, 1998; Marcantoni, Bressanelli, Orizio, & Gelatti, 2011). In relation to food crises, evidence shows that a negative tone is extensively used in TV, radio, and newspapers (Verbeke, Viaene, & Guiot, 1999; Boyd et al., 2009). The negative sentiment was introduced by, for example, terms or sentences blaming governments (Kuttschreuter et al., 2011) (e.g. failure, cheat, mistake) and use of potentially sensational terms such as deadly, scare, panic, etc (Carslaw, 2008). By doing so, journalists created eye-catching messages, and as such, added news value (Kitzinger, 1999). Considering the explosion of new web technologies, crisis managers and communicators now face the additional possibility of negative attention from social media. Based on this challenge, the fourth research question was posed: did traditional and social media channels employ different tones of delivery in covering the 2008 Irish dioxin crisis (RQ4)?

Methods

Sampling procedures for traditional media

The investigation was restricted to English media content in UK and Ireland. Based on previous research, newspaper articles were used to represent traditional media in this research (An & Gower, 2009; Driedger, 2008; Gerhards & Schafer, 2010; Hsu, 2008; Kitzinger, 1999; McCarthy et al., 2008). Based on readership levels, readership demographics, types of newspapers, and data accessibility, 16 top circulated news publications in UK and Ireland were included in the traditional media audit. These included 6 daily broadsheets (*Irish Independent*, *The Irish Times*, *Daily Telegraph*, *The Times*, *Financial Times*, *The Guardian*), 4 daily tabloids (*Evening Herald*, *The Sun*, *Daily Mail*, *Daily Mirror*), 2 weekly broadsheets (*Sunday Independent*, *The Sunday Times*), and 4 weekly tabloids (*Irish Mail on Sunday*, *News of the World*, *The Mail on Sunday*, *Sunday Mirror*). This selection represented a wide range of readership.

The online newspaper archive LexisNexis and an Irish domestic news article database, SafeFood, were used to collate samples. Searches were performed in title, leads and the main text, using the term combination: Dioxin AND (Irish OR Ireland OR Pig OR Pork OR Crisis OR Contamination). This term combination was shown to achieve the best balance between data completeness and accuracy. The date frame was set between December 1st 2008 (one week before the first official food recall had been announced), and February 28th 2009, following a pilot study of global online news coverage on Irish pork and dioxin by the Irish Food Board, who found that 89% of coverage was concentrated in this period (Board Bia, 2010). Although a food crisis typically loses its attraction to traditional news agencies after a short period of time

(Gauthier, 2011), it is not known if this is the case with social media. A three-month period was chosen to allow sufficient coverage in case of any long lasting post-crisis discussions facilitated by internet users. The article search returned a dataset of 369 articles from the printed (offline) editions of specified publications. To reduce the data volume to a manageable level, a sampling strategy was introduced, where every second article in chronological order by publication (*n*=184) was selected. Articles were then read by two members of the research team to exclude articles that were incomplete or irrelevant to the Irish Dioxin incident. This resulted in a final sample of 141 articles. The article length ranged from 50 to 2474 words and the average was 513 words.

Sampling procedures for social media

Previous research has identified significant difficulties in sampling social media, especially when these samples are expected to be studied along with traditional media stories (Weare & Lin, 2000). The social media platform is regarded as a decentralised, all-purpose communication network, mixing a handful of media formats and activities (e.g. text-based, asynchronous multimedia messages, streaming audio, etc), and therefore selecting a true representative sample may be impossible (Weare & Lin, 2000). The sample characteristics are determined by sampling methods. Until now, researchers have demarcated a few categories of tools available for extracting social media contents for academic purposes, such as search engines (e.g. google, yahoo, etc.), self-developed open source infoveillance system (e.g. Inforvigil), search services of popular sites, (e.g. Twitter API, Facebook API, MySpace API, etc.), and commercial collector sites and software (Chew & Eysenbach, 2010; Keelan et al., 2010; Macias et al., 2009; Sutton, 2010; Weare & Lin, 2000). Out of all these possibilities, Weare suggests that collector sites are most useful for analyses concerning a particular topic

(Weare & Lin, 2000). Based on this rationale and the need for retrospective access to data back to 2008, Radian 6, a social media monitoring tool and information aggregator, was employed. Using exactly the same search terms, time span and geographic restrictions that were used with online newspaper archives around sixteen hundred records were pulled out by Radian 6 from a number of internet-based media formats consisting of online news, forums, blogging and micro-blogging sites. Online news was excluded because the raw data file showed a large proportion of them were from mainstream news agencies (e.g. CNN, BBC, Yahoo news, official sites of newspapers) operated by traditional journalists. The final decision to include weblogs, forums and Twitter posts (short text-based messages of up to 140 characters, known as "tweets") followed the precedent set in previous academic research on the use of social media in crises (Chew & Eysenbach, 2010; Ding, 2009; Hughes & Palen, 2009; Jin & Liu, 2010; Keelan et al., 2010; Liu, 2010; Palen et al., 2009; Sutton, 2010), and in experimental research where Twitter and blogs were studied together with traditional media to measure public perceptions of and reactions to crisis communication (Schultz, Utz, & Goritz, 2011). All tweets ($n=75$), forum postings ($n=38$), and blog postings ($n=100$) published on three popular weblog sites collected by Radian 6: Blogspot, WordPress (originated from MSN Space) and Live Journal were extracted. In addition, a 25% systematic sample (every 4th posting) from less structured generic blogs were included ($n=123$). The operation of giving priority to three widely adopted weblog sites is similar to a previous study looking into blog function during Hurricane Katrina (Macias et al., 2009). As the next step, unwanted data were removed, based on the identical criteria used for printed newspaper articles, yielding a final dataset size of $n=175$ social media postings ($n=68$ tweets, $n=107$ forum and blog posts), which accounted for 48% of all data before cleaning. The average length of selected blog and forum posts that ranged from 23 to 1105 words was 318

words. The final social media dataset for analysis was comparable in size to the traditional media sample included.

Coding protocol development

A coding protocol was developed based on a hybrid process of inductive and deductive approaches. Firstly consideration was given to existing literature and the main research questions. Following this a pilot study was undertaken for which 90 media stories from both traditional and social media platforms were analysed. The main variables of interest in the coding document were source, primary story topic and tone of voice. Additional descriptive variables included title, date, and media type. For the variable 'source', 8 categories of source (see Table 1) were inspired by previous work in relation to food risk and crisis (Antunovic, Rubil, Poljak, & Dobranic, 2008; FAO/WHO, 1999; Kornelis, de Jonge, Frewer, & Dagevos, 2007). For the variable 'story topic', four categories (see Table 1) were based on interpretation patterns constructed in a study comparing printed media and online mass media (Gerhards & Schafer, 2010). These top level categories were then further developed based on the findings from the pilot study, which identified a range of more specific sources and story topics. Lastly, three codes for examining tone of delivery were developed: neutral, negative and positive.

[Table 1]

Coding and inter-coder reliability

Following training, two independent coders both coded a systematic sample of approximately 17% of the stories of different media formats. Each newspaper article or social media postings was read twice to code for all sources, the primary topic, and the tone used in the headline and the main body. If several topics were equally addressed in one story, the topic

highlighted in the headline (if present) and at the beginning of the main text was recorded. Tone was coded based on the manifest positive or negative wording and subjective feelings after viewing. Negative terms included terms such as disrupting, scare, disaster etc. Examples of positive words were ease, safe, correct, praised. Media stories that were absent of positive or negative tone and stories that presented a mixed tone, in which neither positive nor negative tone dominated, were treated as neutral (De Brun, McKenzie, McCarthy, & McGloin, 2012; Kuttschreuter et al., 2011). The inter-coder agreement was 99.1%, 85.2% and 80.9% for source, primary topic and tone, respectively, Cohen's Kappa = 0.87, 0.83 and 0.65 respectively, which indicates reliability in the coding process (Lombard, Snyder-Duch, & Bracken, 2002).

The coders then coded the remaining stories, entered the results into Excel, where they were reformatted and transferred into SPSS v18 (SPSS, Chicago, IL) for statistical analysis. Using SPSS, frequency analyses were performed to count the numbers of media stories in which a certain source was cited, a certain topic was emphasized, and a certain tone was used. The Chi-square significance test was used to examine differences between social and traditional media in crisis coverage. Conflicting codings were discussed between the two coders. When consensus could not be achieved (this only occurred with codes relating to tone of voice), a third person in the author team was involved to make the final decision.

Results

Media coverage timeline

RQ1 focused on coverage dynamics occurring in social and traditional media. The number of analysed newspaper articles and social media postings were charted to reveal how the reporting of the 2008 Irish dioxin crisis rose and fell. The media coverage was concentrated

within the first week of the official announcement, accounting for 70% and 85% of total media stories for traditional and social media respectively, with a peak occurring between December 8th and 10th (Figure 1). Following this, the coverage dropped dramatically. Taking a closer look at the time period, social media was shown to surge and reach a high point earlier than traditional media, but did not climb to its highest point until traditional media had peaked.

[Figure 1]

Source: whose messages were cited in reporting the dioxin crisis on different media types?

RQ2 investigated whether differences in sources used existed between traditional and social media during the Irish dioxin crisis. Over 89% of analysed newspaper articles and blog & forum postings relied on external sources to create stories. However, the type of source used differed amongst the selected media types (Table 2). Across all eight source categories, the most frequently cited sources represented in newspaper articles were expert sources, political sources and food suppliers, cited by 58.9%, 56.0% and 44.0% of analysed articles respectively. No other source was employed by more than 10% of articles. In contrast to this, blog and forum postings used offline and online media news (e.g. BBC, Reuters, newspapers, TV & radios, Yahoo news, etc.) most often (42.1%) followed by political sources (39.3%) and expert sources (32.7%) at a comparable level, with no obvious mentions of other sources including food consumers. Chi-square tests suggest that newspaper articles were more likely to directly cite experts ($\chi^2=16.69$, $p<0.001$), political sources ($\chi^2=6.85$, $p<0.01$), food suppliers ($\chi^2=33.25$, $p<0.001$), law enforcement officials ($\chi^2=4.31$, $p<0.01$) and some other sources ($\chi^2=5.04$, $p<0.05$). Blog and forum posts were more likely to cite offline and online media news ($\chi^2=47.92$. $p<0.001$).

[Table 2]

The top sources were National Food Safety Authority (41.1%), Department of Agriculture & Food (35.5%), National or local central government (e.g. Prime Minister, city and county councils, etc) (26.2%), toxicologists, chemists, biologists and food safety experts (17%), farmers and their associations (16.3%), chief scientific officer and advisor in governmental departments (15.6%), food board and food industry consultants (14.9%), food retailers, supermarkets and their associations (14.9%), Millstream Power Recycling (MPR) Limited, the company that introduced the dioxin contamination (12.8%) and political parties (12.8%). Compared with such a wide range of sources cited by newspaper articles, there were only four main sources cited by blog and forum posts. They were offline and online media news (42.1%), national food safety authority and food standard agencies (27.1%), national or local central government (22.4%), Department of Agriculture & Food (14.0%). Our observations revealed that, the majority of tweets (88%) relied solely on offline and online media news as the external sources, with the following scheme widely adopted in many: "name of news agency + highlights + link". In tweets, it is worth noting that there was a sharp peak in the daily number of citations of online and offline news on December 9th.

Topics: what topics were emphasized across media types?

RQ3 aimed to reveal the similarities and disparities between traditional and social media in story topic. Media mentions of certain topics were expressed as the proportion of media stories where a certain topic was the primary focus (Table 3). Data indicates that four topics dominated 88% of all analysed social media postings: governments' handling (27.4%), global reaction (25.1%), public reaction and perception (18.3%), health facts (14.9%). None of the remaining topics exceeded 4%. In comparison, there was no single topic that occupied over 20% of newspaper articles, with mentions of 'governments' handling' and 'health facts' as the primary

focus slightly higher than the others. Looking at the results in more detail, no significant difference concerning the presence of different topics was found across media types, but scientific topic was more stressed in traditional media (χ^2=6.57, p<0.05). However, in terms of individual topics, analysis indicates that there were significant differences between different media types. Social media differed from traditional media in placing greater focus on global reaction (χ^2=27. 80, p<0.001), governments' handling (χ^2=4.13, p<0.05), and public reaction and perception (χ^2=11.23, p<0.01), but paid less attention to cause (χ^2=10.82, p<0.01), macroeconomic impact (χ^2=8.49, p<0.01), victimization description (χ^2=16.46, p<0.001), evaluation on government's handling (χ^2=4.90, p<0.05), and lessons learned (χ^2=5.25, p<0.05).

[Table 3]

Tone: which tone of voice was employed on different media formats?

RQ4 asked about tone of delivery across media types. Analysis of the data indicates that neutral tone was employed most, by over half of media stories in their main bodies regardless of media types, and by 48.9% of newspaper articles and 66.0% of social media postings in their headlines (Table 4). Negative tones were slightly less used, even though the dioxin crisis in nature was a negative incident. Statistically, social media generated more neutral headlines (χ^2=7.19, p<0.01), but less positive main texts (χ^2=10.01, p<0.01) than traditional media.

[Table 4]

Discussion

This study is one of very few case studies where a systematic and comprehensive analysis was conducted to examine the content of different media in times of food crisis. More

importantly, this study represents an early attempt to understand how traditional and social media differ in covering food risk and crisis issues. The results of this study clearly demonstrate a differential between social and traditional media reporting of a food crisis event.

No time like the present in food crisis

Understanding how media coverage changed over time is essential; one factor that can influence risk perception is the volume of media coverage (Bakir, 2005; Kasperson et al., 1988). Similar to previous food contamination incidents (Demko, 1998; Verbeke et al., 1999), the results of this investigation suggest that, after the first official announcement confirming the presence of dioxin on December 6th 2008, media attention climbed dramatically and peaked between December 8th and 10th, the very three days that most official press releases and ministerial statements were announced (MacKenzie, 2010), and then quickly diminished to a low level on December 11th, which corresponded to the day the last official statement was made. Collectively, this suggests a link between official communications and high media coverage, as has previously been suggested (Nucci et al. 2009).

There are a number of considerations to bear in mind given the study's findings. First, social media responded faster, which is understandable as social media enables instantaneous responses without time lag inherent in editorial processes. Second, it is perhaps somewhat surprising that social media coverage of the crisis didn't last longer than traditional media. It is well understood that traditional media works in an environment where commerce is an important driver (Carslaw, 2008). Newspapers have to sell, and as such journalists choose news stories based on the "value" of the news. One factor influencing news value is timeliness, in other words

journalists are more likely to report the most recent events than reflect on earlier happenings (Curtin & Rhodenbaugh, 2001). In comparison, social media isn't necessarily bound by such restriction. Coverage amount analysis in this study suggests little evidence of follow-up posts. Thirdly, social media did not reach its highest coverage level until traditional media had already peaked. Given that social media made heavy use of offline and online media news, especially on the day after traditional media had peaked, it is reasonable to hypothesise that traditional media stimulated the second boom of social media by providing abundant resources as reference points. Communication professionals might thus need to take into account the mutual influences between traditional and social media when thinking about communication strategies. One could consider such strategies more like a communication system than two separate communication channels.

Social media: a parallel public discourse or information disseminator?

It has been found that journalists within traditional media agencies tend to rely on elite sources such as governments and scientists, and by contrast, social media has more citations from "speechless people" (Atton & Wickenden, 2005; Li & Izard, 2003; Liu, 2010; Powell & Self, 2003). However, this only holds partly true in the current study. The current study found that social media used fewer elite sources than traditional media, but still placed considerable emphasis on them, second only to its use of news media sources. Furthermore, social media did not use as many non-elite sources as expected: blog and forum posts gave much less attention to food suppliers and similar to newspapers, social media rarely cited food consumers. This insight is in agreement with a media comparison investigation by Gerhands and Schafer (2010), who argued that in both media, communication is dominated by expert actors and popular inclusion does not occur. Findings from the analysis of the story topics showed that social media posts

demonstrated higher reporting of public perceptions and reactions to the crisis than traditional media. However, in 2008, the level of reporting was not high enough to be considered as a parallel public discourse that allows authorities and researchers to become fully aware of and monitor public concerns, as suggested by more recent studies (Chew & Eysenbach, 2010; Keelan et al., 2010). It's evident that, in 2008, social media were far from a heterogeneous public sphere gathering voices from a wide range of stakeholders. What the current study found was that social media users were mainly reflecting the information from expert sources rather than the opinions and reactions of the public. It is plausible to think that these findings may be an artefact of the fact that it is difficult to distinguish between those social media users who represent the 'true' lay public and those who are experts (e.g. conventional journalists, food industry leaders, etc.). The current study did not attempt to make such distinctions; however, it does represent a challenge for future research with social media, if the aim is to use social media to capture public opinion on a topic.

Results from this study showed that a large majority of tweets referred to online news media messages with URL included. This finding corresponded to a previous study by Chew and Eysenbach (2010). They found that during the 2009 H1N1 outbreak 90.2% of tweets provided URL references with the majority of those linked to mainstream and local news websites. Blog and forum users also intensively relied on news media as their primary source. As discussed earlier, the media are not simply an information disseminator but can also play a number of other roles such as building agendas, facilitating interaction and aggregating general opinion. However, from the results of this study, it can be suggested that in the 2008 Irish dioxin crisis, Twitter mainly functioned as a news information disseminator, with blog and forums also playing such a role, but at a lower intensity.

Different interpretation of the Irish dioxin crisis

It seems clear that the Irish dioxin crisis was differently interpreted by traditional media and social media via emphasizing and excluding certain topic elements, and thus they functioned to build slightly different agendas. Overall, traditional media represented by newspaper articles showed a broadly equal distribution of attention among various topics, which implied it offered a more thorough perspective on food crisis events. Most of the differences in selecting and highlighting story topics between media types is explicable in terms of the insights of previous research. For instance, macroeconomic impact, victimization description, governments' handling and lessons learned were highlighted by traditional journalists as economic consequences and identifiable victims are vital triggers that captures their attention, and evaluations and responsibility distribution adds news values in crisis reporting (Driedger, 2007, 2008; Littlefield & Quenette, 2007). In comparison, discourses on blog and forum sites laid more focus on global reactions, facts on governments' handling, and public reactions. These latter findings are likely to reflect the global nature of the internet and social media and also to reflect individuals concern about the effects of the crisis and its management, on them personally. Historically, one assessment of risk and crisis management was the amount of negative media attention received. With the boom in social media, food risk managers need to monitor negative discourse on social networking sites. Tone of voice analysis on mass media coverage of the 2008 Irish dioxin crisis didn't show notable differences between media types. This is in contrast with Liu's findings, which showed that blogs were more likely than mainstream newspapers to use a negative tone when covering crises (Liu, 2010). It's interesting to see that newspaper articles presented more negative tones in headlines than in the main text, and blog and forum postings were the opposite. The reason behind this might be that some editors in traditional media succumb to the temptation

of creating eye catching headlines and fail to think carefully about the use of negative words (Carslaw, 2008).

Research difficulties, limitations and directions for future work

One difficulty encountered was to demarcate the boundary of 'social media'. There are many descriptions of the concept of 'social media' (Kaplan & Haenlein, 2010), however none of them set up a clear boundary between social and traditional media. From the researchers' perspectives, media platforms being distinguished as 'social media' should possess at least two features: free participation and interactivity. Free participation means a majority of internet users are allowed to engage into media publishing activities, and interactivity means media users are enabled to communicate freely with authors or other users on the same platform. Based on these two propositions, in the present study, online news was excluded from social media, because the raw data file showed a large proportion of online news were from professional news agencies (e.g. BBC, Yahoo news) and the official sites of printed newspapers, which were obviously mainly operated by traditional journalists. Facebook is a largely popular social networking site that meets the previously defined social media criteria. However, it was not included, as the majority of Facebook posts back in 2008 were, and indeed still are, protected by privacy settings.

There is a limitation of note in the current study. Given that the task of trying to characterise the identity of authors of social media posts is often impossible, this study was unable to carry out in-depth author analysis. This made it impossible to report that all online content was from ordinary citizens. In fact, based on the researchers' familiarity with the dataset, it is believed that a proportion of social media posts were written by users with considerable

expert knowledge on food safety, food manufacturing and related legislation and regulation systems.

It is expected that this study will encourage further investigations into similarities, disparities and synergies between different media types in reporting food crises. In conjunction with well-established psychological theories addressing issues such as risk and crisis perception and behavioural intentions, gaining knowledge about media content on different platforms could benefit stakeholders in speculating about media effects and possibly enable more successful management of future crisis events. For instance, it may be suggested from the present study that the Irish dioxin crisis was perceived more as a threat to international trade of Irish meat than a domestic disaster by those who learnt about it from social media, insofar as social media content focused more on global reaction, and less on national economic impact and victims in the food supply chain. Having suggested ways in which traditional and social media differed in their coverage of a food risk issue, the question of the effects of these differences is raised. As such, future investigations, as well as seeking to deepen the consideration of how coverage of risk issues is differentiated across traditional and social media, are encouraged to consider the impact of this. As social media continues to expand, the effect of relying on this rather than traditional media as a source of information in food risk crises will assume great theoretical and practical interest.

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Table 1. Main coding categories, codes and descriptions.

Sources

(1) Expert sources

 European Food Safety Authority

 National Food Safety Authority or Food Standard Agency

 Chief scientific officer or advisor in governmental departments

 World Health Organization

 Laboratories that participated in dioxin contamination test

 Health experts, medical experts and doctors

 Toxicologists, chemists, biologists and food safety experts

 Scientific publications and books

 Correspondents with expertise in food and health care

 Other expert sources

(2) Political sources

 European Commission

 Other political departments on EU level

 National central governments and local governments

 National Department of Health

 National Department of Agriculture & Food

 Political parties

 Environmental Protection Agency

 Joint Oireachtas Committee

 Other political sources

(3) Offline and online media news

(4) Food suppliers

 Millstream Power Recycling company where the dioxin contamination was introduced

 Food board or food industry consultants

 Farmers and their associations

 Food processors and their associations

 Restaurants, hotels and their associations

 Food retailers, supermarkets and their associations

 Other sources from food industry

(5) Food consumers

(6) Law enforcement officials

(7) Non-governmental organizations (NGOs)

(8) Other types of sources

Primary story topics

(1) Scientific topic

 Cause: explanation of how contaminants enter the animal herds and related investigations and law

suits

Health facts: discussion on dioxin, tests of possibly contaminated food and associated health risks

Health warning: suggestions for not taking or selling food that is potentially contaminated

(2) Economic topic

Macro-economic impact: the influence on Irish food and agricultural industry, employment and international trade

Victimisation description: references to how performers in food supply chains were influenced

Global reaction: other countries' reactions and actions towards this crisis

(3) Political topic

Government's handling: measures taken by governing bodies, e.g. product recall, funds seek and compensation

Evaluation of crisis management: positive or negative judgements on governments and authorities' handling

(4) Social topic

Public reaction and perception: how the lives of the public were affected and their psychological feelings

Lessons learned: insights gained to improve food safety control, crisis management and welfare of the society

Ethical and environmental issues: discussion over animal welfare, ethics and environmental impacts

Table 2. Presence of categories of sources in newspaper articles and blog and forum postings.

	Traditional media Newspaper articles $n = 141(\%)$	Social Media Blog & forum postings $n = 107(\%)$	χ^2
Presence of sources	134(95.0)	96(89.7)	2.55
Categories of sources			
Experts	83(58.9)	35(32.7)	16.69***
Political	79(56.0)	42(39.3)	6.85**
Offline and online media news	8(5.7)	45(42.1)	47.92***
Food Suppliers	62(44.0)	11(10.3)	33.25***
Food Consumers	8(5.7)	9(8.4)	0.71
NGOs	0(0)	1(0.9)	N/A
Law enforcement officials	11(7.8)	2(1.9)	4.31**
Other	12(8.5)	2(1.9)	5.04*

*p<.05. **p<.01.***p<.001.

N/A: failed to meet the Chi-square test requirements as less than 5 observations were found in some cells.

Table 3. Distribution of primary story topics in newspaper articles and social media postings.

	Traditional media Newspaper articles $n = 141(\%)$	Social media blog and forum postings and tweets n = 175(%)	χ^2
Scientific topic	47(33.3)	36(20.6)	6.57*
Cause	19(13.5)	6(3.4)	10.82**
Health facts	24(17.0)	26(14.9)	0.28
Health warning	4(2.8)	4(2.3)	0.10
Economic topic	36(25.5)	50(28.6)	0.36
Macroeconomic impact	14(9.9)	4(2.3)	8.49**
Victimisation description	17(12.1)	2(1.1)	16.46***
Global reaction	5(3.5)	44(25.1)	27.80***
Political topic	37(26.2)	53(30.3)	0.63
Governments' handling	25(17.7)	48(27.4)	4.13*
Evaluation on governments' handling	12(8.5)	5(2.9)	4.90*
Social topic	21(14.9)	36(20.6)	1.70
Public reaction and perception	8(5.7)	32(18.3)	11.23**
Lessons learned	11(7.8)	4(2.3)	5.25*
Ethical and environmental issues	2(1.4)	0(0)	N/A

*p<.05. **p<.01.***p<.001.

N/A: failed to meet the Chi-square test requirements as less than 5 observations were found in some cells.

Table 4. Use of tone by placement by media type.

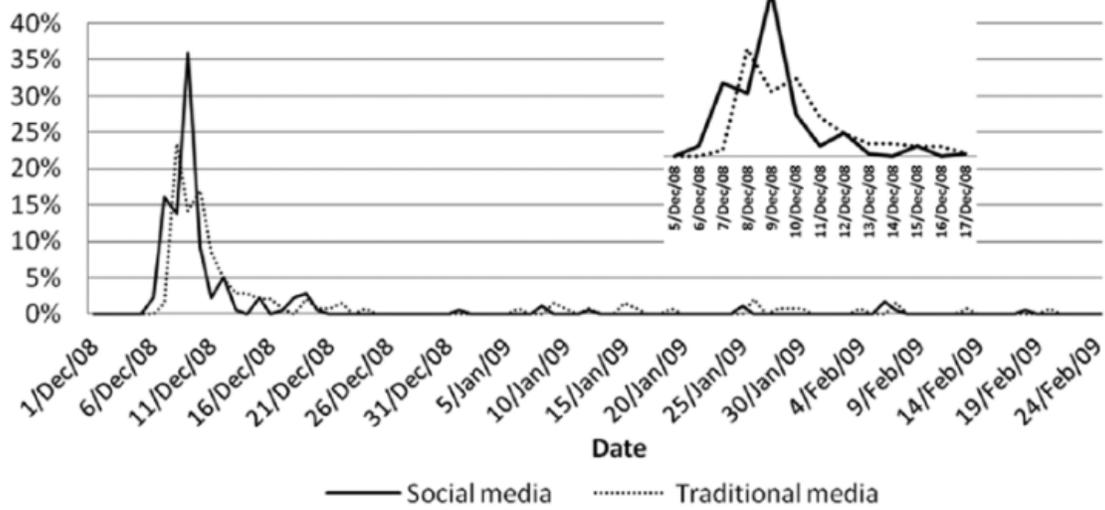|	Headline		χ^2	Main text		χ^2
	Traditional media $n = 141$ (%)	Social media $n = 106$ (%)		Traditional media $n = 141$ (%)	Social media $n = 175$ (%)	
Neutral tone	69(48.9)	70(66.0)	7.19**	83(58.9)	99(56.6)	0.17
Negative tone	57(40.4)	31(29.2)	3.30	46(32.6)	74(42.3)	3.10
Positive tone	15(10.6)	5(4.7)	2.85	12(8.5)	2(1.1)	1.01**

*p < .05. **p < .01. ***p < .001.

Figure 1. Percentage of analysed traditional (n= 141) and social media stories (n= 175) covering the Irish dioxin crisis by date.