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Article

Public Frame Building: The Role of Source Usage in Times of Crisis

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Abstract

New media have markedly enhanced the public's capacity to influence the framing of an issue, especially within crisis situations. By relying on research triangulation, this study aims to map the comprehensive frame-building process of the public as an understudied domain within framing and crisis research. Study 1 uses advanced automated content analyses of crisis-related tweets ($N = 252,711$) to examine how the public built frames online with the use of information sources. Study 2 applies an innovative vignette study ($N = 772$) to investigate the conditions that influence the public's source selection during crises. The findings illustrate how the public uses sources to address certain frame functions and show that source usage is subject to external factors (i.e., crisis origin and magnitude) as well as internal factors (i.e., crisis involvement and habitual source use).

Introduction

The rapid development and diffusion of online communication technologies have changed the nature of mediated communication and consequently the communication of risk and crisis (Westerman, Spence, & Van der Heide, 2014). In those crisis times, an immense and immediate communication need is created (Thelwall & Stuart, 2007). Social media provide an ideal public environment for the dissemination and creation of unique and unfiltered breaking news and add the potential of a many-to-many

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communication channel during crises (Liu, Fraustino, & Jin, 2016). Thus, online users are no longer merely information consumers but have become prominent producers of information (Macias, Hilyard, & Freimuth, 2009). Accordingly, numerous recent cases highlight the public's[1] increasing usage of social media during crises and observe that computer-mediated communication plays a crucial role in socially significant events (Jin, Liu, & Austin, 2014; Porter & Hellsten, 2014).

The prominence that social media have gained as a tool for crisis communication has enhanced the public's potential to influence the societal understanding and consequences of a crisis (Saxton & Anker, 2013). Within the first few days in particular, public communication can play a significant role in assigning meaning to crisis events (e.g., Claeys & Cauberghe, 2014). Therefore, to understand how crises evolve, more detailed knowledge is needed regarding how the public produces and uses crisis information.

Recently, an emerging research avenue has applied the concept of framing to understand crisis communication (Kleinnijenhuis, Schultz, Utz, & Oegema, 2015; Van der Meer, Verhoeven, Beentjes, & Vliegenthart, 2014). At large, frame building has become one of the key theories to investigate the construction of media content (Scheufele, 1999). So far, framing is mainly studied from a news media perspective. Lately, framing research has started to acknowledge the increasing role that the public plays in framing an issue or event, partly as a result of the advent of social media (Karlsson, Bergström, Clerwall, & Fast, 2015; Neuman, Guggenheim, Jang, & Bae, 2014). These recent developments demonstrate that frame building is a useful concept to investigate the process of how the public produces potentially influential information, echoing calls for more public-centric crisis research (Liu et al., 2016).

Traditional frame-building research is interested in what influences how a given issue is framed (Shoemaker & Reese, 1996). Sources and the information they provide are listed among the most common building blocks in framing processes (Dimitrova & Stromback, 2011; Tuchman, 1978). As information sources are easily obtained and shared online (Chung, Nam, & Stefanone, 2012), it is likely that sources—that is, national and local news media, the organization central to the crisis, or other members of the public—play a significant role in the public's online framing. To understand how the public builds frames during a crisis, it is crucial to identify how source selection patterns influence the construction of public frames.

This study aims to model the comprehensive process of public frame building. Therefore, two fundamental steps in frame building related to the role of sources, are explored. In an effort to better understand the comprehensive process, this study draws on a dual study design and research triangulation. Study 1 applies a combination of manual and advanced automated content analyses for several crisis cases. The aim is to see how the public uses sources to address certain frame functions. The findings will show how the public uses certain sources to ask questions, provide content, and discuss, diagnose, and evaluate the crisis. Study 1 will exclusively provide information about the association between source usage and frame functions addressed by the public. To compliment this, Study 2 aims to explore the underlying mechanism of the public's source selection. By means of an innovative vignette design, Study 2

systemically explores the conditions under which the public uses crisis information provided by certain sources. The analyzed material and findings of Study 1 guided the creation of externally valid stimuli and direct the interpretation of results. This methodological combination goes beyond the isolated investigation of elements of the same process and provides a more complete overview of the comprehensive frame-building process of the public.

This study contributes to the development of framing theory in several ways. First, the study of how frames are produced is pertinent for an integrated understanding of framing theory. Despite the fact that this understanding of frame building is essential for a more complete picture of framing, the large body of framing research has mainly focused on frames used in media texts while relatively few studies have actually paid attention to how frames are built (Borah, 2011). Second, framing research is criticized for failing to fully consider how frames are created by different social actors (e.g., the public) as well as how significant or critical situations are framed (e.g., Borah, 2011; Carragee & Roefs, 2004). Especially the emergence of social media and online publics has generated renewed attention to the role of the public in the complex process of building frames (Neuman et al., 2014). By exploring frame building by the public at times of crisis, this study aims to fill the aforementioned gaps in the framing literature.

Theoretical Framework

Framing Literature

The well-established concept of framing offers a powerful approach for understanding how individuals interpret and make sense of relevant events and understand what is at stake (Gamson & Modigliani, 1989). A large body of literature in framing studies has emerged in recent years from a wide range of academic disciplines. Framing research grew from both a sociological as well as a psychological foundation (Borah, 2011). Subsequently, framing has gained momentum in the discipline of communication science, guiding the investigation of media content and the relationship between media and public opinion (De Vreese, 2005). Despite its omnipresence, the concept of framing is characterized by theoretical and empirical inconsistency (Borah, 2011; Entman, 1993; Scheufele, 1999). The term *frame* is frequently applied interchangeably with related concepts like schema, theme, package, or script (Zhou & Moy, 2007).

The main premise of the theory of framing is that issues can be viewed from multiple perspectives and be construed as having implications for a variety of values (Chong & Druckman, 2007b). As one of the first scholars to define framing, Goffman (1974) refers to frames as the "schemata of interpretation" that enable individuals to make something meaningful out of an otherwise meaningless succession of events. Gamson and Modigliani (1989) provide a comparable conceptualization of framing and refer to frames as "interpretative packages" that help individuals to give meaning to an issue. To frame is to make a persistent selection, emphasis, and exclusion (Gitlin, 1980). By emphasizing certain elements of a topic above others, a frame provides a way to understand an event or issue and can influence individuals to focus on those

particular elements (De Vreese, 2005; Druckman, 2001). In the end, Entman's (1993) classical definition of framing is often applied:

> To frame is to select some aspects of a perceived reality and make them more salient in the communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation for the item described. (p. 52)

Communication scholars commonly use framing in two ways (Chong & Druckman, 2007c; Scheufele, 1999). First, "frame in thought" refers to someone's cognitive understanding of a given situation. These frames relate to what an individual believes to be the most salient aspect of an issue, affecting one's overall opinion (Chong & Druckman, 2007a, 2007c). Second, "frames in communication" or "news frames" refer to the words, images, and phrases used by a speaker to communicate information about an issue to an audience, revealing a speaker's particular interpretation of an issue (Chong & Druckman, 2007c; Gamson & Modigliani, 1989). A content analysis of published framing literature showed that in the past decade, research has predominantly concentrated on the sociological aspect by focusing on "frames in communication" and how messages are designed (Borah, 2011).

As frames activate certain knowledge, stimulate values and morals, and create context, frames fulfill several functions (Cappella & Jamieson, 1997). As explicated in Entman's (1993) conceptualization, frames are defined by the omissions of four frame functions, frames define problems, diagnose causes and consequences, make moral judgments, and suggest remedies (Entman, 1993). The reason why certain elements of an issue are emphasized, the presence or absence of certain keywords and stock phrases, or the use of sources of information can be traced back to what function the frame serves. Studying frame functions provides an understanding of *how* individuals' processing of information is guided and *why* some features of reality are selected and highlighted while others are omitted (Scheufele, 1999). Hence, these functions highlight the process and purpose of the formation of frames. The focus on generic frame functions helps to explore framing processes that might hold across different events and issues. As compared with issue-specific frames, which are pertinent only to specific topics or events (De Vreese, 2005), frame functions can be addressed in any given context.

Frame Building and Frame Setting

The concept of framing is often grouped with research on agenda setting and building under the broad category of cognitive media effects (Borah, 2011). A conceptual difference exists between both approaches. Agenda-setting and agenda-building research mainly refers to public awareness of a set of issues (McCombs & Shaw, 1972), whereas frames involve cognitive schemas to understand particular issues (Borah, 2011). Decades of agenda and framing research have motivated researchers to recognize the stages in the process of framing and to reorganize the literature into research that

highlights the frame-building process or emphasizes the frame-setting process (De Vreese, 2005; Scheufele, 1999).

In general, framing research focuses on how news stories are constructed by news media and the effect these stories have on society. First, researchers interested in frame setting typically examine how frames can shape the interpretation of a given issue (Scheufele, 1999). Frame-setting scholars, exploring the correlation between media and audience framing, offer strong experimental support for how variations in news frames can create substantial differences in audiences' understanding and evaluation of issues (e.g., Davis, 1995). Second, frame-building research, about how frames emerge, has content analyzed media text to examine news frame presence and how journalists determine which parts of the story are to be emphasized (Scheufele, 1999). The outcomes of the frame-building process are the frames manifest in the text. Traditional frame-building literature is interested in how certain factors or sources shape and influence how journalists frame a given issue (Gans, 1979; Tuchman, 1978). The key question regarding frame building is what kinds of organizational or structural external factors of the media system (e.g., working norms and practices, cultural resonances, and sponsor activities), or which internal factors at the level of the individual journalist (e.g., ideological, political orientations, professional values, and journalistic routines), can influence the structural qualities of news frames (Scheufele, 1999; Zhou & Moy, 2007). The factors influencing the framing building process are considered critical in understanding the antecedents of frames. Hence, an understanding of the process of framing is incomplete unless the building of frames, and the factors that influence it, are addressed and analyzed (Borah, 2011). The present study focuses on the comprehensive process of public frame building. This communicative process refers to what influences the formation or modification of frames applied by the public.

Public Crisis Framing

In a world of evolving digital media and online publics, the dynamics of issue framing and frame building are becoming more complex (Neuman et al., 2014). With the advent of the Internet, and social media in particular, the public has gained the opportunity to engage in effortless and costless mass-to-mass communication. The public develops its own interpretations of events and talk about it online using available resources from personal experiences, common sense, or information sources (Borah, 2011). The information produced online can add meaning and news value to certain events and turn it into an issue (Zhou & Moy, 2007). The framing power of the public is no longer regarded as limited since the resources are no longer unequally distributed (McQuail, 2010) in competitive mass-communication framing environments (Chong & Druckman, 2007a, 2007c). Indeed, empirical studies confirmed the effects of the public's online frames on, for example, how news media frame an issue (Neuman et al., 2014; Zhou & Moy, 2007).

Especially in times of risk and crisis, the frames built online by the public might have far-reaching consequences. The frame-building process is generally of

fundamental importance for the avoidance of confusion or panic and the prevention of crisis escalation (e.g., Seeger, 2002). Hallahan (1999), in his discussion of seven models of framing (i.e., framing of situations, attributes, choices, actions, issues, responsibility, and news), shows how a crisis situation can be interpreted and framed, providing insights into how frames can potentially shape general crisis understanding and therewith crisis development. For example, the public can define whether the issue that occurred actually constitutes a crisis (situation), (de-)emphasize particular aspects of the crisis (attribution), outline significant choices (choices) and desirable steps to be taken (action), and address underlying issues behind the situation at play (issue) and the potential causes of the crisis (responsibility). Accordingly, communication researchers as well as disaster sociologists have posited that the public on social media can play a prominent role in how people learn about a crisis (Liu et al., 2016; Schultz, Utz, & Göritz, 2011) and how the crisis is actually framed (Van der Meer et al., 2014). People, and also news media, may turn to the online public as a timely and up-to-date source of crisis information. The broader audience might adopt the public frames presented online and use these interpretations to act upon the crisis and communicate about it. In sum, the frames built by the public can play a fundamental role in understanding and defining the crisis, which, in turn, can affect the crisis evolution and its impact.

Origin of Public Frames

In acknowledging the importance of public framing during crises, it is essential to gain understanding of how frames originate. As most members of the online public will not directly experience or witness the crisis, the construction of public frames will be based on information sources. So far, the effect of news sources on frames has predominantly been addressed in the context of news making processes. Mass communication and media research recognize that sources and the information they provide are the primary building blocks for the formation of news content. News sources perform several important functions in the news making process, such as verification of news accounts, providing multiple viewpoints, adding credibility to stories and reducing uncertainty, and providing quick information under deadline pressure (Dimitrova & Stromback, 2011). Because sources have an influence on the interpretations of the issue at hand, these sources play a decisive role in how frames are built (Archetti, 2010; Bennett, 1990; Gans, 1979; Hanitzsch, 2004). In fact, information sources are often listed among the most common framing devices in prior research (Tankard, 2001). Yet, scholars are still debating the actual influence of sources over news frames (Dimitrova & Stromback, 2011). On one hand, it is argued that the power of sources is limited because the choices regarding media coverage are in the hands of the journalists and news routines are most important. On the other hand, sources are seen as the main constructors of news frames. Despite this academic debate, there is no question that the usage of information sources impacts frame-building processes.

Hitherto, literature does not provide conclusive evidence on how public frames emerge in times of crisis and to what extent source usage forms the basis of these

frames. The impact of information sources would be especially important during crisis times with the potentially dramatic consequences of how the public understands and frames the crisis. In times of crisis, the online public has a wide variety of sources at its disposal. Especially in the online space, information and sources are easily obtained and shared, using, for example, links or retweets (Chung et al., 2012). Therefore, it is likely that sources play a significant role in determining the online construction of crisis frames. For example, an empirical case study (Van der Meer & Verhoeven, 2013) demonstrated that the public initially framed a crisis based on its personal speculation to define the problem. When the public started to use news media as a source for information, panic declined and the public addressed different frame functions.

The public typically uses a combination of different source types to make sense of a crisis (Palen, Vieweg, Liu, & Hughes, 2009). For example, national news media and the organization central to the crisis are favored sources for the online public during a crisis (e.g., Liu et al., 2016; Schultz et al., 2011). Furthermore, local news sources that are geographically closer to the crisis become an appealing source of information in times of a crisis (e.g., Col, 2007). Finally, in some crisis situations, social media and other members of the public are perceived as the most credible source (Austin, Liu, & Jin, 2012).

To understand how public frames are built during a crisis, it is essential to focus on the comprehensive framing process. To draw this bigger picture, this study will first need to explore to what extent source usage plays a role in public frame building. The question is how does source usage correlate with how the public diagnoses, evaluates, and prescribes an issue within the process of frame building. Therefore, this study emphasizes generic frame functions to reveal for what purposes the public uses sources in its online frame building. Arguably, the public uses some sources more often to address certain frame functions. For example, news media or the organization undergoing the crisis might be selected as sources to address frame functions as causal interpretation or treatment recommendation because these sources are often used for more detailed crisis information (Van der Meer et al., 2014). Other members of the public might be mainly used to guide the moral evaluation of crisis. In turn, these findings can be used as a starting point to gain new insights into the public's source selection mechanism. The first research question therefore reads as follows:

Research Question 1 (RQ1): How is source usage associated with the frame functions addressed by the public during a crisis?

The Public's Usage of Source Information

For the second part of mapping the comprehensive framing process, the preceding step of how the public selects source information for constructing frames needs to be addressed. Traditional frame-building research is interested in the conditions that determine when information provided by a source becomes part of the frame-building process (Gamson & Modigliani, 1989; Tuchman, 1978). Findings show that multiple factors, both at the external level of the news issue and the internal level of the

individual journalists, help to explain the variation in source selection across different situations (e.g., Bennett, 1990; Manning, 2001). Extrapolating this to public crisis framing, it can be assumed that several external and internal factors explain the selection of source information. Thus far, there is scarce research regarding the conditions that influence how the online public uses crisis information (Jin et al., 2014). To understand when sources are used to address frame functions, this study examines the effect of external and internal factors on the public's use of source information. The selection of sources and their information is considered a precursor to addressing the different functions of the frame-building process.

External factors. Prior research observed that in the process of framing, external factors like working norms or cultural resonances can affect how sources are used by news media (e.g., Gamson & Modigliani, 1989). In a similar vein, the crisis context can play an important role in the public's selection of source information. Accordingly, the type of crisis is related to how people interpret and frame aspects of the crisis (Coombs, 2007). Crisis literature provides two fundamental crisis characteristics that relate to the frame functions *problem definition* and *causal interpretation* (Entman, 1993). First, crisis origin refers to the attribution of responsibility. Whether the crisis was initiated from internal organizational issues (e.g., mismanagement) or from issues external to the central organization (e.g., natural disaster) can alter public responses towards the organization and the crisis (Coombs, 2007; Lee, 2004). For example, Jin et al. (2014) found that the public's preferred information form and source were significantly affected by crisis origin. Second, the direct societal consequences can differ per crisis. The more severe the crisis, the more the public feels involved, which can alter the response to crisis information (Lee, 2004). Indeed, several studies on news values indicate the importance of "magnitude" (Helfer & Van Aelst, 2016) or "amplitude" (Galtung & Ruge, 1965). In sum, this study hypothesizes that crisis origin (**H1**) and crisis magnitude (**H2**) can affect the likelihood that the public uses source information during a crisis.

Internal factors. Besides contextual influences, internal factors can affect the selection of sources and their information. For example, the frames portrayed in news media, and the sources that form these frames, are influenced by factors such as journalists' individual ideology and professional values (Shoemaker & Reese, 1996; Tuchman, 1978). Also in times of crisis, some individuals might actively search for information from a certain type of source, while others prefer other types of crisis information (Macias et al., 2009). These differences raise questions about the influence of individual-level characteristics.

First, a key cognitive factor to further explore predictors of the public's information use is involvement. Personal involvement or relevance can determine how the public perceives and processes an issue (e.g., Petty & Cacioppo, 1986). Within crisis research, it was observed that involvement can influence the public's emotions, elaboration, attention, and crisis interpretation (McDonald & Hartel, 2000). Crisis involvement may depend on the public's prior experience with crisis coverage. Accordingly, Jin,

Fraustino, and Liu (2015) found that individuals' involvement with prior crisis coverage served as a strong motivator for crisis information seeking and sharing behavior. Second, the extremely varied environment that confronts the news consumer has resulted in habitual patterns of media and source usage to avoid repeatedly engaging in active selection (Diddi & LaRose, 2006). Once the public learns that it can get news information from a certain source, it falls into a pattern of behavior, which is strengthened by repetition. The automaticity of news consumption suggests that routine usage of sources might enhance the likelihood that these same sources are used for obtaining crisis information (Austin et al., 2012). Hence, crisis involvement (**H3**) and habitual source usage (**H4**) are expected to influence the public's use of source information during a crisis.

Two studies shall explore the comprehensive framing process of the public during crises. Using manual and automated content analyses, Study 1 will observe the frequency of source use and how source usage relates to addressing frame functions (RQ1). Study 2 will explore the underlying mechanism of the public's source selection. A vignette study shall test the effect of external (H1-2) and internal factors (H3-4) on source usage.

Study 1: Building Public Frames

Method

Study 1 applies four data sets of public tweets ($N = 252,711$) about Dutch crises that set in motion a significant chain of tweets. In each crisis, a specific actor or (governmental) organization is central to or responsible for the crisis. In this way, the potential source types that can actually be used by the public are more consistent among the cases. By including crisis cases related to both governmental and private-sector organizations, this study aims to draw conclusions that hold across different organizational types. The following crises are selected: (a) an explosion at chemical plant Chemie-Pack, (b) the collapse of FC Twente's stadium, (c) a shooting at shopping mall Alphen aan den Rijn, and (d) an assumed airplane hijacking. The tweets are professionally collected and stored by twetics.com and made available for this specific study. The tweets were real-time scraped from Twitter at the time the crises took place. The duration of collection lasted as long as the public online communicated about the crisis situations. Table 1 details the central actor, the number of tweets, the date, and a short description of the crisis.

Source selection. To find out what sources the public uses when communicating online about the crisis, three coders manually coded all individual tweets for source use. Two interactive Twitter features are used to detect what source is used in a tweet. First, people can use (shortened) hyperlinks in tweets that link to the source they used for that specific tweet. Hyperlinking allows Twitter users to include a link that can be clicked on by others to jump to a website. After sampling only the tweets that contain a unique hyperlink, all hyperlinks were opened to see the webpages behind the link

Table 1. Selected Crisis Cases.

Centered organization	Date	*n* Tweets	Description crisis
Chemie-Pack	05/01/2011 14:27 08/01/2011 21:03	101,128	The chemical plant Chemie-Pack exploded, resulting in toxic smoke emission injuring 170 people.
FC Twente	07/07/2011 12:15 10/07/2011 12:00	58,939	The roof of the stadium Grolsch Veste, of football club FC Twente, collapsed, killing two workers and injuring 14.
Municipality of Alphen aan den Rijn	09/04/2011 12:11 11/04/2011 10:59	70,324	In a mall in Alphen aan den Rijn, a 24-year-old gunman killed six people and injured 17, and then killed himself.
Airport Schiphol	29/08/2012 13:45 29/08/2012 21:17	22,320	A plane had to land at Schiphol Airport, escorted by two F-16 fighters, due to an assumed hijacking.

and were then coded for source type. Another frequently used feature is the retweet, referring to the reposting of tweets from another user. Retweets are often used to forward information. In case of a retweet, the source type of the original message was coded. As this coding showed a clear distinction in frequency of source use, this study focuses on the most prominently used sources: (a) national news outlet, (b) local news outlet, (c) organization central to the crisis, and (d) member(s) of the public—for example, ordinary citizens, eyewitnesses, public (online) groups.

Automated frame analysis. Study 1 applies inductive methods to automatically identify sets of frames in tweets. This statistical analyses identify latent patterns embedded in text by relying on interpreting word (co-)occurrences. This approach is based on the idea that meaning of a situation or issue is formed by words and the relative position of words in a network. The automated analysis maps a group of correlated words or articles that form a distinctive meaningful classification to describe a large data set of texts with fewer dimensions in a more replicable way with less subjective interferes. These groups or clusters of words and word (co-)occurrences represent a higher order structure within texts that can be interpreted as the frames used in the text of analysis (Hellsten, Dawson, & Leydesdorff, 2010).

Two broad classes of relevant Fully Automated Clustering approaches for identifying frames can be distinguished. First, probabilistic topic modeling refers to a suite of algorithms that can discover main topics of frames that pervade in large amounts of texts (Blei, 2012). The most widely used topic model is latent Dirichlet allocation (LDA). LDA assumes mixed membership; each document is a mixture of topics; one document exhibits multiple topics in different proportions (Grimmer & Stewart, 2013). Second, single membership models group and assign sets of documents or words in mutually exclusive and exhaustive groups so they become part of the same cluster (Kaufman & Rousseeuw, 2009). The most commonly used cluster analysis is K-means

clustering (Grimmer & Stewart, 2013). For each document, the algorithm assigns the cluster for which its distance to the cluster center is the smallest.

To emphasize the process of public frame building, Study 1 aims to identify the frame functions in the public's online communication as originally defined by Entman (1993). By looking at frame functions, this study strives to expose whether the public uses some sources to diagnose, evaluate, and prescribe a crisis. Identifying generic frame functions will provide insights regarding the general process of frame building and how these functions systematically relate to source usage across different contexts and crisis cases. The relation between source usage and issue-specific frames would expose correlations that are too context specific and issue sensitive to draw conclusions on the general level of public frame building (De Vreese, 2005). Therefore, Study 1 applies a combination of LDA and k-means cluster analysis to identify frame functions in tweets. In this approach, a cluster of multiple related topics or frames forms a frame function. Thus, combinations of multiple frames indicate which frame function the public is addressing. The identification of the frame functions addressed by the public provides valuable insights into how sources are used to guide information processing and why certain features of the issue are selected and highlighted.

In practice, the analyses are divided into several steps. In the first preprocessing step, the vocabulary for the tweets was simplified with stemming. Punctuation and capitalization are removed as well as very common words using a stop-word removal list, including the organization's names and search strings. Next, the data are transformed into a document-term matrix. In these matrices, which serve as the input for the LDA analysis, the tweets are represented in the rows and the words (i.e., word stem, base, or root form) in the columns, indicating how often words occur in each tweet. In the second step, the LDA is performed using Python script (Rehurek & Sojka, 2010) that indicates that the model should classify the words in the documents in a maximum of 60 topics. In the python script, the gensim algorithm module (Rehurek & Sojka, 2010) is used for computing the LDA categorization. The output of the LDA provides 60 emphasis frames that are formed by a combination of words. In other words, the output shows a list of lists of words. Sixty combinations of words, which co-occur in these tweets according to certain patterns, are provided that can be interpreted as topics or emphasis frames. Each tweet automatically gets a score assigned to each frame. Next, the data are transformed into a matrix with in the rows the tweets and in the columns the 60 frames. The values in the matrices are the frame scores of each tweet on each frame as generated by the LDA (for a more detailed description of LDA, see, for example, Jacobi, van Atteveldt, & Welbers, 2016; Rehurek & Sojka, 2010). In the third step, the frames are clustered to further reduce complexity and identify frame functions. The generated frame scores are used as input for the k-means cluster analysis. In turn, this analysis provides six clusters of related frames that can be interpreted as the generic frame functions the public addresses online. A list is provided of six combinations of multiple frames that together form a cluster (for a more detailed description of k-means analysis, see, for example, Grimmer & Stewart, 2013). Then the cluster analysis automatically assigns each tweet to one of the six clusters. Finally, each cluster is given a function label based on the related frames and words

Table 2. Count of Source Use.

Crisis	Explosion chemical plant	Collapse stadium	Shooting	Assumed hijacking	Total
National news	9,183	9,057	8,956	3,541	30,737
Local news	1,947	1,135	719	488	4,289
Organization	187	1,152	1,831	76	3,246
Public	30,388	18,816	20,537	8,138	77,879
Total	41,705	30,160	32,043	12,243	116,151

that form the frames. The researcher determines what the clustering of frames refers to and thus how the frame function can be interpreted and labeled.

Analysis. Time-series analyses are conducted to assess whether the use of sources correlates with frame functions. Given that the data represent an ordered sequence of values of the dependent variable at equally spaced time intervals, time-series analyses are particularly appropriate. As the data represent tweets for almost every minute, the data will be analyzed on a 15-min level. The anticipated autoregressive character of frame building and how it is associated with source usage can be tested through estimation of partial adjustment (Koyck) autoregressive distributed lag (ADL) model. In this analysis, source usage is the independent variable and the addressed frame functions the dependent variable. The series were tested for absence of autocorrelation (in residuals) after analysis (i.e., white noise).

Results

Frequency source selection. The results of the manual coding of source selection can be found in Table 2. Overall, the public mainly used other members of the public as a source of information during these crises, followed by national media, local news media, and the organization central to the crisis. On average, sources were used in 46% of all tweets.

Frame functions identification. Table 3 provides an overview of the six identified public frame functions per crises. The table presents the function labels that are given to the clusters of related frames. These functions appear to be in line with the general frame functions as defined by Entman (1993). Recurring frame functions across the different crises, labeled as "information" or "clarification," fulfilled the function of *problem definition*. This function often clarified key facts related to the problem. For example, in the case of the hijacking, the "clarification function" was formed by related frames about the assumed hijack of an airplane (frame formed by words as hijack, hostages, airplane), clarification that the plane was actually not hijacked (e.g., nonhijack, assumption, media), and that the confusion started due to the absence of communication with the pilot (e.g., pilot, communication fail, control). In addition, functions labeled as "consequence" addressed underlying forces of the crisis, fulfilling the function of

Table 3. Identified Frame Functions in the Four Crisis Cases.

Explosion chemical plant	Collapse stadium	Shooting	Assumed hijacking
1. Information/update function ($n = 72,949$)	1. Response function ($n = 51,702$)	1. Response function ($n = 61,180$)	1. Alarming function ($n = 19,139$)
2. Response/ communication function ($n = 11,572$)	2. Information/update function ($n = 3,502$)	2. Bereaved function ($n = 3,256$)	2. Clarification/ definition function ($n = 1,890$)
3. Skeptical/humor function ($n = 7,758$)	3. Definition function ($n = 1,313$)	3. Evaluation/ aftermath function ($n = 3,193$)	3. Detail function ($n = 648$)
4. Health/environment function ($n = 7,288$)	4. Consequence function ($n = 832$)	4. Detail function ($n = 1,067$)	4. Action function ($n = 296$)
5. Consequence function ($n = 922$)	5. Humor function ($n = 800$)	5. Disorder function ($n = 1,035$)	5. Information function ($n = 276$)
6. Geographic function ($n = 569$)	6. Respect function ($n = 790$)	6. Notification function ($n = 593$)	6. Aftermath function ($n = 71$)

causal and consequential interpretation. For example, in the case of the collapse of the stadium, this function identified causes and consequences of the crisis based on frames regarding the death of construction workers (e.g., collapsed, injured, dead), fault in the construction (e.g., fault, construction), and the need to repair the roof (e.g., roof, repair, section). Moreover, the *moral function* was fulfilled using "skeptical" and "humor" functions. For example, in the case of the explosion of the chemical plant, the "skeptical/humor function" was formed by frames of reference to a Dutch comedy (e.g., fireball, mate), failure of crisis communication (e.g., hahaha, crisis communication, management), and attempts to cover up the happening (e.g., conspiracy, cover up). Finally, the *treatment recommendation* function was fulfilled by functions labeled as "response" that proposed solutions and discussed possible steps to be taken. For example, in the case of the shooting, this function was formed by frames referring to a moment of silence (e.g., silence, family, terrible), legal steps to prevent another shooting (e.g., shooting range, gun law, suicidal), and the description of typical gunmen (e.g., gunman, emotions, problems). Overall, the most frequently used functions discussed the crisis definition. Moreover, the repeated presence of the response function indicates that the public uses online platforms to discuss next steps in a crisis.

Association between source usage and frame functions. To explore the public frame building during a crisis, the association between source usage and the relative presence of frame functions in tweets is analyzed. In Table 4, the ADL models are shown, predicting the use of frame functions as a function of a constant term, plus a fraction of its

Table 4. Autoregressive Distributed Lag Model Predicting Addressed Frame Functions Based on Source Usage.

Explosion plant	1. Information R^2 = .21	2. Response R^2 = .27	3. Humor/ skept R^2 = .46	4. Health R^2 = .27	5. Consequence R^2 = .12	6. Geographic R^2 = .23
AR	.37 (.05)***	.40 (.06)***	.34 (.05)	.49 (.05)***	.06 (.06)	.17 (.02)***
National news source	.11 (.06)	−.07 (.05)	.04 (.05)	.10 (.05)	.36 (.06)***	.01 (.02)
Local news source	.03 (.05)	.07 (.05)	−.04 (.04)	.05 (.05)	−.04 (.06)	.00 (.02)
Organization source	.06 (.05)	−.01 (.05)	−.08 (.05)*	.00 (.05)	.02 (.06)	−.03 (.02)
Public source	−.09 (.06)	.22 (.06)***	.29 (.05)***	.08 (.06)	.03 (.06)	.00 (.02)

Collapse stadium	1. Response R^2 = .13	2. Information R^2 = .29	3. Definition R^2 = .13	4. Consequence R^2 = .33	5. Humor R^2 = .02	6. Respect R^2 = .19
AR	−.06 (.07)	.27 (.06)***a	.35 (.08)***	.23 (.06)***a	−.04 (.06)	.43 (.07)***
National news source	.27 (.06)***	.00 (.06)	−.04 (.06)	−.12 (.06)*	−.01 (.07)	.18 (.06)***
Local news source	.07 (.06)	.04 (.06)	−.03 (.05)	−.04 (.06)	.08 (.07)	−.05 (.06)
Organization source	.18 (.06)***	.01 (.05)	−.04 (.05)	.02 (.05)	−.05 (.06)	−.04 (.06)
Public source	.16 (.06)***	.08 (.06)	−.02 (.06)	.11 (.06)	.07 (.07)	−.05 (.06)

Shooting	1. Response R^2 = .26	2. Bereaved R^2 = .64	3. Evaluation R^2 = .17	4. Detail R^2 = .20	5. Disorder R^2 = .13	6. Notification R^2 = .14
AR	.24 (.07)***a	.03 (.08)	.26 (.07)***	.25 (.07)***	.32 (.07)***	.30 (.07)***
National news source	.12 (.07)*	−.12 (.08)	.20 (.07)***	.02 (.07)	−.11 (.07)	.04 (.07)
Local news source	.06 (.07)	−.05 (.08)	.00 (.07)	.17 (.07)*	−.03 (.07)	.16 (.07) *
Organization source	.09 (.06)	−.02 (.08)	.06 (.07)	.15 (.07)*	−.05 (.07)	.00 (.07)
Public source	.25 (.07)***	.06 (.08)	−.09 (.07)	.16 (.07)*	−.11 (.08)	.06 (.08)

Assumed hijacking	1. Alarming R^2 = .23	2. Clarification R^2 = .47	3. Detail R^2 = .35	4. Action R^2 = .29	5. Information R^2 = .46	6. Aftermath R^2 = .44
AR	.07 (.22)	.29 (.17)	−.22 (.17)	.16 (.18)	.66 (.21)***	−.06 (.17)
National news source	.03 (.24)	−.29 (.21)	.53 (.24)*	.21 (.25)	.24 (.22)	.79 (.23)***
Local news source	−.07 (.21)	.22 (.17)	−.16 (.18)	−.10 (.19)	.06 (.18)	−.20 (.17)
Organization source	−.27 (.19)	.23 (.16)	.32 (.18)*	−.12 (.20)	.12 (.17)	.12 (.17)
Public source	.40 (.20)*	.15 (.17)	−.29 (.19)	−.18 (.20)	−.28 (.20)	−.21 (.18)

Note. Cells contain standardized (B^*) regression coefficients with standard errors (*SE*). The constant and the independent trend variables are omitted from this table. AR = autoregressive term.
*p < .05. **p < .01. ***p < .001, a = additional lagged value(s) added to obtain white noise.

past values or autoregressive (AR) term, relative use of the four sources, a trend variable, and a random shock.

The reported coefficients of the AR term indicate that frame functions are generally an autoregressive process, meaning that past values are predictive of future values. This finding indicates a level of function stability in the dynamic setting of a crisis. Moreover, the results provide evidence for a significant association between source usage and several functions addressed by the public. For the majority of functions, the effect of the use of one of the sources is significant. National news media as a source was the most prevalent significant predictor for functions, followed by the public. For example, for the collapse of the stadium, the usage of national news media as a source significantly correlates with the use of three functions, namely, "consequence" ($B^* = -.12, p < .05$), "response" ($B^* = .27, p < .001$), and "respect" ($B^* = .18, p < .001$).

In some cases, a combination of different sources significantly predicted the presence of a single function. Furthermore, the use of sources can be positively as well as negatively associated with the functions addressed by the public. For example, in the case of the explosion, the presence of "skeptical/humor function" was positively related to the use of the public as a source ($B^* = .29, p < .001$) and negatively related to the organization as a source ($B^* = -.08, p < .05$). This finding suggests that the more the public (organization) is used as a source, the higher (lower) the probability that the "skeptical/humor function" was addressed. Thus, the use of a certain source can correlate strongly with addressing a specific frame function.

The main finding of Study 1 is that source usage can play a crucial role in the frame functions that are addressed by the public in the construction of frames. The public can use certain sources online to define problems, diagnose consequences, suggest remedies, and morally evaluate the crisis. Because Study 1 only provides information about how frames are built with the use of sources, the question remains why certain source information is selected. Study 2 examines the conditions that might determine the public's use of sources during a crisis.

Study 2: The Public's Usage of Source Information

Method

To disentangle under what conditions source information is used by the public during a crisis, Study 2 presents a vignette study, testing H1-4. This quasi-experimental design uses short fictional descriptions of crisis situations to uncover the social and individual structures of human judgments (Alexander & Becker, 1978; Helfer & Van Aelst, 2016). The vignettes, which are judged by the respondents, represent different combinations of various dimensions that are simultaneously manipulated. The systematic variation of several different factors is well suited to study the contexts and conditions affecting judgment and is arguably less subjective to social desirability bias.

Procedure. In an online survey, respondents were presented five short online messages (i.e., vignettes) of fictional crises. To gain understanding of public responses across different crisis situations, the vignettes described different crisis types. Four crises

were based on the crises in Study 1: chemical plant explosion, stadium collapse, shooting, and airplane hijacking. The content of the messages was based on the actual formulation of the textual material as analyzed in Study 1. The fifth message was about a product recall of cars that were involved in accidents with the airbags, as this crisis type is most commonly used in experimental crisis research. By including the product-recall crisis, the findings of this study can be compared or related to other crisis research that has predominantly applied this type of crisis in experimental settings. In addition, to test whether any differences exist between individual crisis cases, the other crisis cases can be compared with a commonly applied crisis case using a dummy regression analysis approach. Within these crisis messages, the following things were manipulated: Source of the message (website national news, website regional news, website central organization, or online message of a member of the public who witnessed the crisis), crisis magnitude (accidents or fatal accidents), and crisis origin (organization responsible for the crisis or not). No further individual characteristics of the sources were shown that could potentially be associated with credibility.

Each fictional message started with a mention of the source sending the message. Next, a general description of the crisis is presented that is kept constant among the different conditions. Afterward, the manipulation of the crisis magnitude and origin are presented. Participants saw a random order of the five messages and were randomly allocated to one of the 16 conditions for each crisis message. Thus, each participant was assigned to read one of the 16 conditions for each of all five messages.

Measures. The manipulated factors are expected to influence the likelihood that the public uses source information. Therefore, after exposure to each vignette, four indicators measured usage of source information ($M = 2.49$, $SD = 1.38$, *eigenvalue (EV)* $= 2.09$, $\alpha = .78$) as the dependent variable. Respondents were asked to rate on a 7-point Likert-type scale whether they would use this message as the basis for an (online) message for others, to share the message with other people, to tell their friends about the incident, and to leave a reaction (Liu et al., 2016). Measures for variables regarding internal factors and demographics were obtained after the experimental stimuli had been judged. Involvement with prior crisis coverage ($M = 4.80$, $SD = 1.31$, $EV = 3.12$, $\alpha = .91$) was measured by asking respondents on a 7-point scale how important, relevant, meaningful, and involving they considered crisis coverage (Jin et al., 2015). Regular source use was measured on a 7-point scale asking several items on how often respondents used certain sources for news consumption: National ($M = 5.27$, $SD = 1.54$) and regional ($M = 3.52$, $SD = 1.72$) newspapers, websites, television, and radio, message from the public on Facebook, Twitter, LinkedIn, YouTube, and blogs ($M = 1.85$, $SD = 0.99$), and messages or press releases from organizations ($M = 2.42$, $SD = 1.56$).

Sample. The participants in Study 2 were online recruited from a Dutch representative and certified sample from I&O Research. This sampling resulted in 772 respondents who fully completed the questionnaire and answered an attention check question correctly. In total, 40% of the sample was female and the average age was 55.74.

Analysis. For the analysis, the data were stacked and a multilevel approach with random intercept is applied. Each judgment that a respondent has given on a single vignette is regarded as a single case. As each respondent rated multiple vignettes, the final observations in the stacked data set are not independent. The responses are clustered within respondents.

Manipulation check. A pretest ($n = 30$, $M_{age} = 47.30$, 43% female) was conducted to examine whether participants perceive the manipulation as intended. Because including a manipulation check for the manipulated factors in all five messages might result in participants being aware of the purpose of the study, causing testing or learning effects, a pretest using manipulation-check items was conducted to determine whether participants perceived source of the message, crisis magnitude, and crisis origin as intended. First, in 94.1% of the cases, participants correctly indicated on a categorical scale that the message came from national news media, local news media, or the organization, and in 97.4% of the cases, it was correctly indicated that the source was a member of the public ($\lambda = .86$, $p < .001$). Second, an analysis of variance (ANOVA), $F(1, 115) = 18.13$, $p < .001$, showed significant difference among low magnitude ($M = 4.52$, $SD = 2.16$) and high magnitude group ($M = 5.96$, $SD = 1.42$) on a 7-point Likert-type scale item asking about how severe they perceived the crisis to be. Third, in 92.9% of the cases, participants correctly indicated on a categorical scale that the organization was or was not responsible for the crisis ($\lambda = .84$, $p < .001$). The satisfactory outcomes indicate a successful manipulation procedure for source of the message, crisis magnitude, and crisis origin.

Results

Multivariate analysis of variance (MANOVA) test, $F(3, 4591) = 3.18$, $p < .05$, revealed that, on average, crisis information from national news media is significantly more likely to be used ($M = 2.70$, $SD = 1.40$) by the public compared with the sources local media ($M = 2.45$, $SD = 1.37$), the organization ($M = 2.44$, $SD = 1.38$), and the public ($M = 2.48$, $SD = 1.38$).

   Table 5 summarizes the results from the multilevel analyses attempting to explain the public's use of source information. To allow source comparison, the findings are separately presented for each source. The intra-class coefficients range between .492 and .644, indicating that a considerable portion of the variance was explained on the second level.

   External factors were assumed to influence information use. First, crisis origin was found to only have a significant effect on the public's information use in the case of the organization as a source ($B^* = .21$, $p < .001$). When the organization communicates that it is responsible for the crisis, the public will be more likely to use its information compared to when the organization communicates that it is not responsible. This finding only supports H1 for the organization as a source. Second, for all sources, information about crises with a higher magnitude has a significantly higher chance to be used by the public, supporting H2. When the crisis consequences are more severe, it is more

Table 5. Multilevel Models Explaining the Public's Use of Sources' Information.

Hypothesis	Random effects	National news media as source	Local news media as source	Organization as source	Public as source
	Constant	−.21 (.08)**	−.24 (.08)**	−.28 (.09)**	−.31 (.07)***
H1	Crisis magnitude	.18 (.05)***	.09 (.05)†	.21 (.07)**	.19 (.04)***
H2	Crisis origin	.04 (.05)	−.07 (.05)	.15 (.07)*	.08 (.04)
	Crisis1: Explosion	.23 (.07)***	.22 (.07)**	.24 (.09)**	.13 (.06)*
	Crisis2: Collapse	.04 (.07)	.10 (.07)	−.04 (.09)	−.01 (.06)
	Crisis3: Shooting	.24 (.07)***	.22 (.07)**	.32 (.09)***	.14 (.06)*
	Crisis4: Hijacking	.25 (.07)***	.31 (.07)***	.21 (.09)*	.06 (.06)
H3	Crisis involvement	.37 (.04)***	.34 (.03)***	.38 (.04)***	.32 (.03)***
H4	Habitual source use	.08 (.04)*	.14 (.04)***	.10 (.04)*	.05 (.03)
	Age	.05 (.04)	.08 (.04)*	.11 (.04)**	.17 (.03)***
	Education	−.17 (.04)***	−.14 (.03)***	−.20 (.04)***	−.13 (.03)***
	Gender	.06 (.07)	.08 (.07)	−.02 (.08)	.05 (.07)
	Intercept	.52 (.04)***	.43 (.04)***	.38 (.04)***	.47 (.04)***
	ICC level	.644	.556	.492	.590
	LL null model	−4,351.518	−4,351.518	−4,351.518	−4,351.518
	LL full model	−1,147.979	−1,163.566	−863.251	−1,463.78

Note. Cells contain standardized (B^*) regression coefficients with standard errors (*SE*). IIC = Intraclass correlation coefficient; LL = Log likelihood.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

likely that the public uses information provided by all four sources. This effect was the strongest for the organization as a source ($B^* = .21$, $p < .01$), followed by the public ($B^* = .19$, $p < .001$) and national news media ($B^* = .18$, $p < .001$).

Internal factors were also expected to influence the public's information use. First, as H3 predicted, involvement with prior crisis coverage had a significant effect on the public's use of source information. The strength of the effect of crisis involvement is comparable among the four sources: national ($B^* = .37$, $p < .001$) and regional ($B^* = .34$, $p < .001$) news media, organization ($B^* = .38$, $p < .001$), and public ($B^* = .32$, $p < .001$). Second, regular source use for news consumption was found to predict the public's use of source information in times of crisis, except in the case of the public as source ($B^* = .05$, n.s.). The effect of regular source use was most profound for local news media as a source ($B^* = .14$, $p < .001$), followed by the organization ($B^* = .10$, $p < .01$) and national news media ($B^* = .08$, $p < .01$). Hence, H4 is supported for all source types except the public.

The analysis controlled for crisis type presented in the vignette stimuli. The results show that the use of sources' information differs among the different crisis types. Generally, the crisis messages involving an explosion, shooting, or hijacking were significantly more likely to be used by the public as crisis information compared with the product-recall message.

Discussion and Conclusion

Discussion for Study 1

Study 1 provides some initial insights into how the public uses social media in crisis situations. The public most prominently addressed frame functions as "information," "consequence," and "response" to frame the crisis cases. These findings indicate that the public predominantly uses online platforms to fulfill the problem definition and causal interpretation frame functions to mutually define aspects of a crisis. The fact that social media offer quick means of communication and easy sharing of information makes it a suitable channel to discuss the understanding and consequences of critical and fast-moving crisis situations.

The results of Study 1 illustrate that source usage is strongly associated with the frame functions that the public addresses online to frame a crisis. The use of sources can determine the likelihood that the public addresses and discusses functions as the definition of problems, causes and consequences, remedies, and morally evaluation of the crisis. These findings are consistent with prior research in other contexts. For instance, mass communication and media studies recognized that sources play a decisive role in the process of frame building (Bennett, 1990). Furthermore, controlling for crisis type showed that differences in the effect of source usage can exist between individual crisis cases. However, no conclusions can be drawn regarding the systematic differences between crisis types. Future research should include multiple cases of comparable crises in an experimental set up to test whether the dissimilarities can be explained by crisis type and if the effects are comparable among cases of the same crisis types.

All four sources—that is, national and local news, the organization central to the crisis, and other members of the public—were found to play a significant role in whether the public addressed certain frame functions. Hence, the public showed itself receptive to a variety of sources when it comes to making sense of a critical situation and online communicating about it (Palen et al., 2009). In line with previous research (Austin et al., 2012), the public primarily used other members of the public as a source. However, the use of news media as a source was most significant and powerful in explaining the frame functions addressed by the public. This finding is in line with other research that points to national news media as the most preferred source of crisis information (e.g., Schultz et al., 2011). Arguably, when posting online, the public favors national news media as a source but mainly uses other members of the public because they are more readily available or accessible at that time.

The public uses sources more often to address certain frame functions. As implied in Entman's (1993) conceptualization and as found in empirical findings of other

studies (e.g., Zhou & Moy, 2007), frames usually develop over time from defining problems to looking for causes, suggesting remedies, and making judgments. Functions relating to problem definition, labeled as "information," "definition," or "clarification," were frequently not initiated by source usage. Apparently the functions associated with the initial phases of a crisis, where the situation needs to be defined and understood, are independently addressed by the public without the usage of external information (Van der Meer et al., 2014). Frame functions linked to later phases of a crisis are more commonly related to source usage. For example, functions in line with causal interpretation and treatment recommendation, labeled as "response," "consequence," "evaluation," "detail," and "aftermath," are strongly correlated with the public's source usage, especially with national news media as a source. In contrast, the discussion of more specific frame functions such as "humor," "geographic," "bereaved," "disorder," and "action" are not subject to source usage. These cases seem to illustrate the public's autonomous processes of frame building to communicate about specific topics of public interest. In addition, other members of the public are occasionally used as a source to address the moral evaluation function.

Discussion for Study 2

The results from Study 2 enrich the findings of Study 1. Study 2 illustrates the public's dynamic source selection mechanisms that precede the actual use of sources to address frame functions. The crisis context and personal features affect the public's use of source information. Furthermore, in line with Study 1, Study 2 observed the public's preference for national news media as an information source.

External factors were found to affect what information the public selects. First, supporting previous research and news value theory (Galtung & Ruge, 1965; Lee, 2004), the magnitude of a crisis was found to increase the likelihood of source information to be used by the public. Second, the communication of responsibility of the crisis only significantly increased the likelihood that the public uses organizations' information. Thus, only if the source is potentially responsible for the crisis, the communication of responsibility can increase the usage of this source. This positive effect of communicating guilt is in line with previous crisis research that demonstrates the effectiveness of crisis-response strategies where the organization takes full responsibility and apologizes (Coombs, 2007).

The findings of Study 1 help to explain the effects of external factors found in Study 2. Information about crisis origin can be linked to the frame function of problem definition. To understand the crisis, the public needs to define the origin of the crisis. Study 1 found that these types of functions were frequently not associated with source usage. Similarly, Study 2 showed that crisis origin could only alter organizations' likelihood of becoming a source for the public. Study 1 might not have observed the association between using an organization as a source and definition functions, as organizations are often not available for communication in the initial phase of a crisis when the public intends to define the situation and when the situation is unclear (Van der Meer et al., 2014). Furthermore, the magnitude of the crisis can be related to the

causal interpretation function. Study 1 and 2 combined showed that the public mainly uses sources to address these causal and consequential interpretation functions and is indeed more likely to use information provided by sources when the crisis consequences are larger.

Internal factors were also found to play a significant role in the public's information usage during a crisis (Shoemaker & Reese, 1996). First, personal involvement with crisis coverage increased the use of crisis information for all sources. Second, when selecting crisis information, the public was found to have the tendency to rely on sources it regularly uses. However, in the case of the public as a source, habitual use of this source did not predict its selection during a crisis. This behavioral habit might be broken by a change in daily routine. A change in information need might occur, occasioned by a major news event such as a crisis (Diddi & LaRose, 2006). Due to the increased need for information, the public might look for any information available about the crisis. As information of the public is often readily available via platforms as social media, the public's tendency to use this source might increase during a crisis despite it not forming part of the regular news diet.

General Discussion and Conclusion

In conclusion, the combination of Studies 1 and 2 provide a more complete understanding of the comprehensive public framing process and the role of sources. Study 1 provides considerable insights into how the public uses some sources more often to address certain frame functions. The role sources play in public interpretation and frame building implies that the source itself can subsequently influence the formation of public frames. In addition, Study 2 exposes the preceding step of how the public actually selects source information during a crisis. External and internal factors determine which sources the public uses. Therefore, the formation and potential effects of public frames are partly dependent on source usage, which is, in turn, dependent on the situation and the characteristics of the individual.

The primary finding of this study was the existence of a significant association between source usage and public framing, meaning that the use of certain frames coincide with (or are preceded by) the presence of certain sources. This observation confirms that also in public framing processes sources play a decisive role in how frames are built, dependent on both internal and external factors. The public's interpretations and frames regarding a crisis are, therefore, to a certain extent, guided or influenced by information provided by certain sources or actors. Especially national news media, but also (governmental) organizations central to the crisis, local news media, and other members of the public can potentially guide the public's understanding of the crisis and how it should act upon the situation. Hence, information provided by for example news media can, under the right conditions, have a soothing effect and subsequently correct online misinformation or reduce public panic. Hence, with the potential negative consequences of a crisis, the content spread by information sources during a crisis has arguably more impact than under normal circumstances. However, sources only play a role in whether the public addresses frame functions related to later stages of the

crisis when causes and consequences are diagnosed and remedies are suggested. In the initial phase of the crisis, when problems are defined, the public autonomously interprets and frames the crisis. Hence, it should be acknowledged that in this crisis phase, false information or rumors could spread in no time via online platforms. The diffusion of unverified information could easily result in widespread panic or crisis escalation.

A number of shortcomings in the two studies need to be acknowledged. First, Study 1 only incorporates frequency of source usages to understand the process of public frame building. Looking at the content offered by sources could enrich the findings and provide insight into whether the public actually adopts frames provided by sources. Second, Study 2 only includes a selection of conditional factors influencing the public's information usage. There are numerous other potentially influential variables. However, the selection of these external and internal factors is considered to provide a valuable starting point for understanding the public's source usage. Third, both studies focus on a selection of four sources. Despite that the content analysis showed that the public most prominently used these sources, multiple other sources could affect how public frames are built.

This research contributes to the general research field of framing. The findings illustrate how the public uses social media as a communicative platform to build frames in hectic situations. The emphasis on the as yet underinvestigated role of the public in framing processes (Neuman et al., 2014) provides new insights into how public frames are built and how source information is used. Understanding of public frame building might help information providers to steer the public's (crisis) interpretation and framing to potentially avoid panic or escalation of an issue. In terms of the method, Study 1 contributes to automatically identifying frame functions in tweets by introducing the combined cluster analysis. This method can help analyzing large-scale data required to understand the complicated dynamics of the contemporary public communication (Neuman et al., 2014). Second, the vignette design in Study 2, which has only been occasionally applied in social science (Helfer & Van Aelst, 2016), was useful in overcoming previous shortcomings of studies in crisis research that were limited to the investigation of a single crisis case.

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Note

1. The public refers to a general body of free citizens of a given society (McQuail, 2010). The members of the general public are free to associate, converse, organize, and express themselves on all subjects, both offline and online. The terms *audience* and *(mass) publics* are often used in other studies, fields, or contexts to refer to a comparable concept.

References

Alexander, C., & Becker, H. (1978). The use of vignettes in survey research. *Public Opinion Quarterly*, *42*, 93-104. doi:10.1086/268432

Archetti, C. (2010). Comparing international coverage of 9/11: Towards an inter-disciplinary explanation of the construction of news. *Journalism*, *11*, 567-588. doi:10.1177/1464884910373536

Austin, L., Liu, B. F., & Jin, Y. (2012). How audiences seek out crisis information: Exploring the social-mediated crisis communication model. *Journal of Applied Communication Research*, *40*, 188-207. doi:10.1080/00909882.2012.654498

Bennett, L. W. (1990). Toward a theory of press-state relations in the United States. *Journal of Communication*, *40*, 103-127. doi:10.1111/j.1460-2466.1990.tb02265.x

Blei, D. M. (2012). Probabilistic topic models: Surveying a suite of algorithms that offer a solution to managing large document archives. *Communications of the ACM*, *55*(4), 77-84. doi:10.1145/2133806.2133826

Borah, P. (2011). Conceptual issues in framing theory: A systematic examination of a decade's literature. *Journal of Communication, 61*, 246-263. doi:10.1111/j.1460-2466.2011.01539.x

Cappella, J., & Jamieson, K. (1997). *Spiral of cynicism: The press and the public good*. New York, NY: Oxford University Press.

Carragee, K., & Roefs, W. (2004). The neglect of power in recent framing research. *Journal of Communication*, *54*, 214-233. doi:10.1111/j.1460-2466.2004.tb02625.x

Chong, D., & Druckman, J. N. (2007a). Framing public opinion in competitive democracies. *American Political Science Review*, *101*, 637-655. doi:10.1017/s0003055407070554

Chong, D., & Druckman, J. N. (2007b). Framing theory. *Annual Review of Political Science*, *10*, 103-126. doi:10.1146/annurev.polisci.10.072805.103054

Chong, D., & Druckman, J. N. (2007c). A theory of framing and opinion formation in competitive elite environments. *Journal of Communication*, *57*, 99-118. doi:10.1111/j.1460-2466.2006.00331.x

Chung, C. J., Nam, Y., & Stefanone, M. A. (2012). Exploring online news credibility: The relative influence of traditional and technological factors. *Journal of Computer-Mediated Communication*, *17*, 171-186. doi:10.1111/j.1083-6101.2011.01565.x

Claeys, A.-S., & Cauberghe, V. (2014). Keeping control: The importance of nonverbal expressions of power by organizational spokespersons in times of crisis. *Journal of Communication*, *64*, 1160-1180. doi:10.1111/jcom.12122

Col, J. (2007). Managing disasters: The role of local government. *Public Administration Review*, *67*, 114-124. doi:10.1111/j.1540-6210.2007.00820.x

Coombs, W. T. (2007). Protecting organization reputations during a crisis: The development and application of situational crisis communication theory. *Corporate Reputation Review*, *10*, 163-176. doi:10.1057/palgrave.crr.1550049

Davis, J. J. (1995). The effects of message framing on response to environmental communications. *Journalism & Mass Communication Quarterly*, *72*, 285-299. doi:10.1177/107769909507200203

De Vreese, C. H. (2005). News framing: Theory and typology. *Information Design Journal*, *13*(1), 51-62. doi:10.1075/idjdd.13.1.06vre

Diddi, A., & LaRose, R. (2006). Getting hooked on news: Uses and gratifications and the formation of news habits among college students in an internet environment. *Journal of Broadcasting & Electronic Media*, *50*, 287-304. doi:10.1207/s15506878jobem5002_2

Dimitrova, D. V., & Stromback, J. (2011). Election news in Sweden and the United States: A comparative study of sources and media frames. *Journalism*, *13*, 604-619. doi:10.1177/1464884911431546

Druckman, J. (2001). The implications of framing effects for citizen competence. *Political Behavior*, *23*, 225-256. doi:10.1023/a:1015006907312

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, *43*(4), 51-58. doi:10.1111/j.1460-2466.1993.tb01304.x

Galtung, J., & Ruge, M. H. (1965). The structure of foreign news: The presentation of the Congo, Cuba and Cyprus crises in four Norwegian newspapers. *Journal of Peace Research*, *2*, 64-91. doi:10.1177/002234336500200104

Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, *95*, 1-37. doi:10.1086/229213

Gans, H. J. (1979). *Deciding what's news: A study of CBS evening news, NBC nightly news, newsweek and time*. New York, NY: Vintage.

Gitlin, T. (1980). *The whole world is watching: Mass media in the making and unmaking of the new left*. Berkeley: University of California Press.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Cambridge, MA: Harvard University Press.

Grimmer, J., & Stewart, B. M. (2013). Text as data: The promise and pitfalls of automatic content analysis methods for political texts. *Political Analysis*, *21*, 267-297. doi:10.1093/pan/mps028

Hallahan, K. (1999). Seven models of framing: Implications for public relations. *Journal of Public Relations Research*, *11*, 205-242. doi:10.1207/s1532754xjprr1103_02

Hanitzsch, T. (2004). Journalists as peacekeeping force? Peace journalism and mass communication theory. *Journalism Studies*, *5*, 483-495. doi:10.1080/14616700412331296419

Helfer, L., & Van Aelst, P. (2016). What makes party messages fit for reporting? An experimental study of journalistic news selection. *Political Communication*, *33*, 59-77. doi:10.1080/10584609.2014.969464

Hellsten, I., Dawson, J., & Leydesdorff, L. (2010). Implicit media frames: Automated analysis of public debate on artificial sweeteners. *Public Understanding of Science*, *19*, 590-608. doi:10.1177/0963662509343136

Jacobi, C., van Atteveldt, W., & Welbers, K. (2016). Quantitative analysis of large amounts of journalistic texts using topic modelling. *Digital Journalism*, *4*, 89-106. doi:10.1080/21670811.2015.1093271

Jin, Y., Fraustino, J., & Liu, B. (2015, May 21–25). *The scared, the outraged, and the anxious: How crisis emotions, involvement, and demographics predict publics' conative coping*. Presented at the annual conference of International Communication Association. San Juan, Puerto Rico.

Jin, Y., Liu, B. F., & Austin, L. L. (2014). Examining the role of social media in effective crisis management: The effects of crisis origin, information form, and source on publics' crisis responses. *Communication Research*, *41*, 74-94. doi:10.1177/0093650211423918

Karlsson, M., Bergström, A., Clerwall, C., & Fast, K. (2015). Participatory journalism—The (r)evolution that wasn't. Content and user behavior in Sweden 2007-2013. *Journal of Computer-Mediated Communication*, *20*, 295-311. doi: 10.1111/jcc4.12115

Kaufman, L., & Rousseeuw, P. J. (2009). *Finding groups in data: An introduction to cluster analysis*. New York, NY: John Wiley.

Kleinnijenhuis, J., Schultz, F., Utz, S., & Oegema, D. (2015). The mediating role of the news in the BP oil spill crisis 2010: How U.S. news is influenced by public relations and in turn influences public awareness, foreign news, and the share price. *Communication Research*, *42*, 408-428. doi:10.1177/0093650213510940

Lee, B. K. (2004). Audience-oriented approach to crisis communication: A study of Hong Kong consumers' evaluation of an organizational crisis. *Communication Research*, *31*, 600-618. doi:10.1177/0093650204267936

Liu, B. F., Fraustino, J. D., & Jin, Y. (2016). Social media use during disasters: How information form and source influence intended behavioral responses. *Communication Research*, *43*, 626-646. doi:10.1177/0093650214565917

Macias, W., Hilyard, K., & Freimuth, V. (2009). Blog functions as risk and crisis communication during hurricane Katrina. *Journal of Computer-Mediated Communication*, *15*, 1-31. doi:10.1111/j.1083-6101.2009.01490.x

Manning, P. (2001). *News and news sources: A critical introduction*. London, England: Sage.

McCombs, M., & Shaw, D. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly*, *36*, 172-187. doi:10.1086/267990

McDonald, M. L., & Hartel, C. (2000). Applying the involvement construct to organisational crisis. *ANZMAC 2000 Visionary Marketing for the 21st Century: Facing the Challenge*, 799-803.

McQuail, D. (2010). *McQuail's mass communication theory*. London, England: Sage.

Neuman, W. R., Guggenheim, L., Jang, S. M., & Bae, S. Y. (2014). The dynamics of public attention: Agenda-setting theory meets big data. *Journal of Communication*, *64*, 193-214. doi:10.1111/jcom.12088

Palen, L., Vieweg, S., Liu, S. B., & Hughes, A. L. (2009). *Crisis in a networked world: Features of computer-mediated communication in the April*, 16(2007), Virginia Tech event. *Social Science Computer Review*, *27*, 467-480. doi:10.1177/0894439309332302

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, *19*, 123-205. doi:10.1016/s0065-2601(08)60214-2

Porter, A. J., & Hellsten, I. (2014). Investigating participatory dynamics through social media using a multideterminant "frame" approach: The case of climategate on YouTube. *Journal of Computer-Mediated Communication*, *19*, 1024-1041. doi:10.1111/jcc4.12065

Rehurek, R., & Sojka, P. (2010). Software framework for topic modelling with large corpora. In *Proceedings of LREC 2010 workshop new challenges for NLP frameworks* (pp. 46–50). Valletta, Malta: European Language Resources Association.

Saxton, G. D., & Anker, A. E. (2013). The aggregate effects of decentralized knowledge production: Financial bloggers and information asymmetries in the stock market. *Journal of Communication*, *63*, 1054-1069. doi:10.1111/jcom.12060

Scheufele, D. (1999). Framing as a theory of media effects. *Journal of Communication*, *49*, 103-122. doi:10.1093/joc/49.1.103

Schultz, F., Utz, S., & Göritz, A. (2011). Is the medium the message? Perceptions of and reactions to crisis communication via twitter, blogs and traditional media. *Public Relations Review*, *37*, 20-27. doi:10.1016/j.pubrev.2010.12.001

Seeger, M. W. (2002). Chaos and crisis: Propositions for a general theory of crisis communication. *Public Relations Review*, *28*, 329-337. doi:10.1016/s0363-8111(02)00168-6

Shoemaker, P. L., & Reese, S. D. (1996). *Mediating the message: Theories of influences on mass media content*. New York, NY: Longman.

Tankard, J. W. (2001). The empirical approach to the study of media framing. In S. D. Reese, O. H. Gandy, & A. E. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world* (pp. 95-105) Mahwah, NJ: Lawrence Erlbaum.

Thelwall, M., & Stuart, D. (2007). RUOK? Blogging communication technologies during crises. *Journal of Computer-Mediated Communication*, *12*, 189-214. doi:10.1111/j.1083-6101.2007.00336.x

Tuchman, G. (1978). *Making news: A study in the construction of reality*. New York, NY: Free Press.

Van der Meer, T. G. L. A., & Verhoeven, P. (2013). Public framing organizational crisis situations: Social media versus news media. *Public Relations Review*, *39*, 229-231. doi:10.1016/j.pubrev.2012.12.001

Van der Meer, T. G. L. A., Verhoeven, P., Beentjes, H., & Vliegenthart, R. (2014). When frames align: The interplay between PR, news media, and the public in times of crisis. *Public Relations Review*, *40*, 751-761. doi:10.1016/j.pubrev.2014.07.008

Westerman, D., Spence, P. R., & Van der Heide, B. (2014). Social media as information source: Recency of updates and credibility of information. *Journal of Computer-Mediated Communication*, *19*, 171-183. doi:10.1111/jcc4.12041

Zhou, Y., & Moy, P. (2007). Parsing framing processes: The interplay between online public opinion and media coverage. *Journal of Communication*, *57*, 79-98. doi:10.1111/j.1460-2466.2006.00330.x

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