The impact of focus, function, and features of shared knowledge on re-use in emergency management social media

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Abstract

Purpose – *The purpose of this study is to investigate how organizations use social media such as blogs to share and re-used knowledge during contingencies, disasters, and emergencies. The factors related to the knowledge itself – rather than the media – which lead to more and less re-use (particularly in the fast-paced and uncertain context of emergencies) are not well known.*

Design/methodology/approach – *Integrating theories of social media, knowledge management and mass communication, the author develops a model of the characteristics of knowledge (focus, function and features), characteristics of knowledge sharers and the user's needs, which influence the extent to which knowledge is re-used.*

Findings – *A study of 645 blog posts revealed why some knowledge is re-used in emergencies more than other types of knowledge. Surprisingly, non-event-related knowledge is re-used more often than event-related knowledge, perhaps because users are less certain about how they would re-use non-event knowledge and, thus, are paradoxically more interested in what it might offer. Results also indicate several other factors which impact re-use.*

Practical implications – *Traditional mechanisms used to evaluate knowledge for reuse such as rank and organizational status are less important than the focus and function of the knowledge itself; they offer practitioners strategies for more efficient knowledge sharing during emergencies and identify opportunities for more effective employment of emergency management social media.*

Originality/value – *One of the first studies to dig deeper into factors of knowledge shared and re-used during emergencies, this research integrates several theoretical streams to explain why some knowledge is more valuable for re-use. It increases the understanding of knowledge sharing during disasters and offers strategies for development of knowledge systems for future emergencies.*

Keywords *Social media, Emergency management, Blogs, Knowledge re-use, Mass communication theory*

Paper type *Research paper*

Introduction

Social media is increasingly being used to share knowledge during contingencies, disasters and emergencies (Leidner *et al.*, 2009; Simon *et al.*, 2015; Yates and Paquette, 2011). This includes knowledge sharing to and from the public (Palen *et al.*, 2011) and also between organizations, including government, non-government and corporate (Alberghini *et al.*, 2014; von Krogh, 2012; Graham *et al.*, 2015; Leidner *et al.*, 2009; Yates and Paquette, 2011). Although social networks have been more popular for public knowledge sharing, social media such as wikis blogs has enabled different parts of an organization or multiple different organizations that are loosely connected but interdependent (Majchrzak *et al.*, 2007) to find knowledge others have and reuse it quickly for their own decision-making purposes (Shan *et al.*, 2012; Yang *et al.*, 2012).

Knowledge sharing between organizations can be challenging, particularly during contingencies, disasters and emergencies (hereafter referred to as "emergencies") (Bharosa *et al.*, 2010; Simon *et al.*, 2015; Turoff, 2002). Users seek knowledge from a variety of disparate organizations in a short amount of time while under pressure to make important

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> **"Social media has proven its worth as an enabler of knowledge sharing and re-use for several contingencies, disasters, and emergencies of late."**

decisions quickly (Day *et al.*, 2009; McKenzie *et al.*, 2011; Xie *et al.*, 2011). Responders must make decisions as an emergency unfolds, relying on what knowledge is available and trying to make sense of different sources of knowledge (OECD, 2015). As such, they increasingly rely on information technology such as social media to access and reuse knowledge. Although social media as an enabling platform makes access to knowledge easier than in past emergencies, evaluating it for re-use is difficult, as knowledge is shared from a variety of sources and for a variety of purposes, which may or may not be clear to an end-user (Yates and Paquette, 2011). The features of social media that make it useful as a knowledge-sharing mechanism may render re-use of shared knowledge more difficult.

This research explores factors of knowledge shared during emergencies between organizational users via social media. These include characteristics of the knowledge contributor, the knowledge re-user and the knowledge itself, and the study attempts to identify which characteristics are associated with greater re-use. When knowledge is socially constructed (Yang *et al.*, 2012), the needs of the end-user are important for determining why knowledge is valuable, as is the context of the individual who shares the knowledge. As users come from various organizational backgrounds and are often loosely connected through the technology itself (Majchrzak *et al.*, 2007), the knowledge and what problem or issue it is associated with may drive re-use (Turoff, 2002). Thus, the goal is to identify how knowledge is shared and re-used during emergencies via social media, why that knowledge is valuable to users and to offer a theoretically based justification that may be used in a further study and in the design of emergency management social media.

Literature review

The combination of a post-9/11 response mindset with lessons learned from a series of worldwide disasters in the 2000s has made both researchers and practitioners aware of the need for better inter-organizational knowledge sharing during emergencies (Leidner *et al.*, 2009; Majchrzak *et al.*, 2007; Simon *et al.*, 2015; Turoff *et al.*, 2004). Leidner *et al.* (2009) note that decision makers need a lot of information quickly, yet shared knowledge can be difficult to interpret. Cumbie and Sankar (2012) and Turoff (2002) note that every emergency is different, and the inter-organizational knowledge sharing necessary requires open coordination. For example, Xia *et al.* (2011) explain that the increased task complexity faced by decision makers in emergencies requires specific tools and strategies for knowledge sharing, else response actions may fail. Majchrzak and More (2011) showed that marked-up Google maps shared between citizens and first responders significantly improved the availability of valued information and led to knowledge re-use. Majchrzak *et al.* (2007) specify that in emergencies, organizations need a mechanism by which to share their perspectives and knowledge, a common platform that enables swift-trust type sharing, and a means to develop a running narrative of what has occurred to aid in shared understanding. Thus, although emergencies create a mandate for organizational knowledge sharing and re-use, they also create conditions which make those processes difficult.

Researchers have noted that social media, in particular, is effective for organizational knowledge sharing during emergencies (Grabowski and Roberts, 2011; Graham *et al.*, 2015; Rathi *et al.*, 2014) and potentially helps compensate for those difficulties. Yates and Paquette (2011) found that social media enabled knowledge re-use without having to rely

on formal sharing mechanisms or boundary spanners. They also found that users decided what knowledge to re-use by constructing their own valuations of the knowledge. Graham *et al.* (2015) note that social media enabled sharing "broadly and fast" and was used by responding organizations in a variety of contexts, including natural disasters and plane crashes. Yates *et al.* (2010) found that social media users made different types of incremental contributions expecting the organization would benefit from their shared knowledge without specifically knowing who, when or how that knowledge would be re-used. Leidner *et al.* (2009) relate how social media was used to build a collaborative network across government agencies when responding to the SARS outbreak (SARS – severe acute respiratory syndrome).

Although research has identified the successful use of social media by organizations in disasters, it has not specifically identified what factors of the knowledge (or the context of its sharing/re-use) make it successful. Majchrzak and More (2011) note that the map files created by one user were highly useful to other users, as users could connect "hastily" with others, access the maps and re-use the knowledge in new ways that the original sharer did not have to know about (or foresee). Yang *et al.* (2012) note that emergency response systems have to be dynamically and socially constructed, as organizations do not know ahead of time what they need from other organizations (Turoff, 2002); thus, the structure of the system may be less important than the type of knowledge shared on it. Rathi *et al.* (2014) examined how partnerships among non-profit organizations develop through overlapping knowledge shared in social media but do not report on the knowledge characteristics that make it appealing across organizational boundaries. Finally, Day *et al.* (2009) report that organizational users do not often know where useful knowledge will come from during emergencies; thus, users have to scan for knowledge. This leads to the question "how does the social media impact why some knowledge is sought for re-use, whereas other knowledge is not?" The literature has not yet addressed this question, except for attempts to understand how the social media platform enables knowledge sharing and re-use. This research attempts to answer that question by developing a model of knowledge sharing and re-use via social media during emergencies, focusing on the knowledge itself and why users find it valuable for re-use.

Model development

According to Alberghini *et al.* (2014), social media in organizations (such as weblogs) creates informal networks of knowledge re-users, who adapt knowledge shared by others by making sense of it and applying it to their own knowledge needs. In an emergency, management tasks differ in their complexity and routineness, suggesting multifaceted knowledge needs (Xia *et al.*, 2011). Thus, a model is needed that identifies the various ways knowledge may be re-used in emergencies and which theorizes the reasons why that knowledge would be more or less useful in emergencies. The model described below develops three categories of factors which potentially influence re-use – knowledge focus, knowledge function and knowledge features (which may be features of the poster, the post itself or users' needs). These three categories, building on a foundation of knowledge re-use, social media and emergency management, offer a way to differentiate and test the value of knowledge contributions in emergencies for subsequent re-use. When organizational users share knowledge via social media, they understand that others, potentially individuals unknown to them with different purposes, will access and re-use that

"While useful in some circumstances, elaborating information shared via social media may overload users and discourage re-use."

"For practitioners, this research helps identify strategies for sharing knowledge between organizations, and offers insights on how users evaluate postedknowledge."

knowledge (Majchrzak *et al.*, 2013; Markus, 2001). It is not always clear how the knowledge will be re-used. However, the structure of knowledge sharing enabled by social media creates the opportunity for re-use. What factors that may influence re-use are described in the next several paragraphs.

Knowledge focus

Lockwood and Dennis (2008), in a study of corporate blogs, identified a number of pertinent dimensions for how blog posts may be categorized. Drawing on the functionalist theory of mass media (Lasswell, 1948; Wright, 1960), they noted that focus describes the actual content of the blog. Three types of focuses are applicable to emergency blogs: events, non-events and time-based focus. Lockwood and Dennis explain events as discrete posts describing something the organization is responding to at the moment. According to Majchrzak and More (2011) and Turoff (2002), events drive specific knowledge re-use requirements in others looking to guide their own organizations' emergency response. The second type of focus is non-events. In contrast to events, non-events are informational posts not tied to a specific and discrete event. Non-events may describe plans, general efforts or knowledge-related to but not directly resulting from response actions (Shan *et al.*, 2012). As such, they will be of interest for re-use, but their direct value will be harder to realize than events. The third type of focus is a time-based focus, a post that provides a summary of actions to date or a regularly scheduled update on capability or function or status. Timed-based posts are routine in nature, often supporting organizational routines such as shift changes and daily briefings (Pan *et al.*, 2012; Yates and Paquette, 2011). Thus, their value may be limited to narrow situations or a subset of users only. Although all three types of knowledge focus will often be present, event-focused posts will likely be re-used more frequently, as their value will be more easily evident to a re-user, which leads to the first hypothesis:

H1. Event-focused posts will be re-used more often than non-event-focused and time-based-focused posts.

Knowledge function

The functionalist theory of mass media (Lasswell, 1948; Wright, 1960) specifies that users may value knowledge, because it serves as a specific function for them. Lockwood and Dennis (2008) identified four functions of corporate blogs applicable to emergencies: information, correlation, mobilization and continuity. Information is simply news or something factual the user needs to know. Correlation provides an interpretation, opinion or insight from the perspective of the poster. Mobilization is a post which advocates for a cause, position or action. Finally, continuity is a post that passes on organizational values or norms.

Theory suggests that each function appeals to users for different reasons depending on circumstances. For re-use in emergencies, information provides the widest potential appeal, as users are scanning for relevant facts they can combine with what they already know to make decisions. Correlation would also be highly valued in emergencies; however, information from other organizations will have different perspectives (Majchrzak *et al.*, 2007) and interpretation will help make sense of it. Mobilization and continuity, by contrast, are not as likely to be valuable functions during emergencies. If the social media is primarily

an emergency forum, advocacy and declarations of values and norms are less likely to be re-used and are probably more likely to be communicated via other media or face to face.

H2a. Information function posts will be re-used more often than mobilization and continuity posts.

H2b. Correlation function posts will be re-used more often than mobilization and continuity posts.

Elaborating information

Chou *et al.* (2014) posit that knowledge re-users are positively influenced by their evaluation of knowledge quality. Social media allows users to embed elaborating information such as links or files in their knowledge posts, which may aid in evaluations of the posted knowledge itself. These provide additional information, often in visual or interactive formats such as websites, maps, pictures or source documentation (Grabowski and Roberts, 2011; Yates and Paquette, 2011). Users may potentially re-use the elaborating information in any number of ways that the poster may not know about (Majchrzak and More, 2011). Cumbie and Sankar (2012), for example, found that geospatial data such as Google Earth KML files have value as a boundary object helping users interpret and integrate new knowledge with knowledge they already possess. Panahi *et al.* (2013) note that multimedia such as images help users make tacit knowledge explicit. Indications that elaborating information is included in the post should increase interest in re-use by others, leading to the third hypothesis:

H3. Posts with elaborating information (links, documents, images and map files) will be re-used more often than posts without elaborating information.

Characteristics of the poster

In addition to knowledge quality, re-users are influenced by evaluations of source credibility (Chou *et al.*, 2014). Palen *et al.* (2011) and Majchrzak *et al.* (2007) suggest that users collaborating via social media make inferences about the value of the knowledge from indicators about the poster. Levina and Arriage (2014), for example, show that status markers on social media can be a significant indicator. One such status marker is a mark of position or rank. Many first responder organizations such as military, police, fire and governments include their rank or position in their interaction. Medical and academic fields also use rank or qualification to indicate expertise. In emergencies, rank may signify that an individual has access to more important or expert knowledge to share. Further, research suggests that knowledge shared by specific individuals within organizations rather than organizations themselves is more interesting to users; thus, it may be re-used more often. Panahi *et al.* (2013) and von Krogh (2012) note that individual representation in social media such as blogs is important for knowledge re-use. Although social media used in emergencies connects organizations, it is the organizational users who share and re-use the knowledge. Posts that come from an organizational account, not an individual account, may be viewed as enabling the network or as a coordination mechanism but not as conveying useful information. Thus, the fourth and fifth hypotheses:

H4. Posts from individual accounts will be re-used more often than posts from organizational accounts.

H5. Posts from individuals of higher rank will be re-used more often than posts from individuals with lower rank or no rank.

Characteristics of the post title

The last hypothesis concerns the title of blog posts that users see and evaluate when seeking to re-use knowledge. Faced with a constantly updating list of posts as new knowledge is continually added to a blog, users scan for the most relevant knowledge for their needs, balancing their limited time and cognitive effort. Pan *et al.* (2012) describes "information flow intensity" as a problem when reusing knowledge, suggesting that

information indicators may help users decide to re-use. Palen *et al*. (2011) note that users seek to reduce ambiguity; thus, they may look for key words and be concise to the point titles when evaluating knowledge for re-use. Therefore, both the presence of keywords and more concise (shorter) titles of blog posts should be associated with greater re-use of a post. Thus, the sixth hypothesis:

H6a. Posts with concise titles will be re-used more often than posts with longer titles.

H6b. Posts that include keywords in the title will be re-used more often than posts without keywords.

Methodology

An emergency management blog used for a variety of contingencies and emergencies rather than a single emergency (Shan *et al*., 2012) was sought to test the hypotheses. This blog would have the advantage of more regular usage instead of a burst of activity (Yang *et al*., 2012). An emergency management blog operated by the US Defense Information Systems Agency stated that the Strategic Knowledge Integration Web, or SKIWEB, was an ideal platform for the study. SKIWEB connects users across the Department of Defense, who share knowledge in real time about ongoing contingencies, disaster response and emergency activity. This knowledge includes a range of posts from transactional details of operations status and news items to insightful analysis of intelligence, world events and anything that might be of interest to others subscribed to the blog. SKIWEB connects users worldwide in tactical (field) units, operations centers and staff agencies alike. Although not specifically focused on any particular emergency or crisis, SKIWEB use is typical of how emergency responders communicate with systems such as WebEOC and Sahana and how Turoff (2002) describes the prototypical emergency management system.

Preliminary interviews with ten SKIWEB users yielded interesting insights concerning their propensity for re-use. As all individuals were busy with their own response activities, they scanned SKIWEB regularly looking for knowledge to re-use, but did not have time to read through each and every post. SKIWEB users interact via the "event log" view, which shows a chronological (most recent on top) list of posts and provides the title of the post; information about the poster; icons which represent if the post includes embedded links, documents, images or Google Earth (KML) files; and certain key words designed to attract interest. They then select specific entries of interest to view the entire post and access embedded information or provide comments or updates. Although subscribers were pre-registered as users and the blog resided on a closed network, the dynamics of user interaction were quite similar to any social media platform. Users came and went at all times during the day and typically logged in to either share knowledge or access others' shared knowledge for re-use, because they were in the midst of a contingency, emergency or disaster situation themselves. They related that they sought information from users in other organizations that might provide clarity on an ongoing emergency response, something that might be "important", "interesting" or "of interest to senior leaders" or something that they might need to be re-used within their own organization. No clear *a priori* classification or pattern existed, which might indicate the value of certain posts for re-use, warranting more in-depth analysis of the posted knowledge itself.

One week (chosen at random from the last year) of posts was coded by the author, simultaneously with another SKIWEB user, yielding 645 posts. A one-week period was judged comprehensive enough to capture a nominal set of operational events, including daily and weekly recurring updates about ongoing emergencies. The average number of posts per week for the 10 weeks surrounding the week chosen was 575 with a minimum of 488 and a maximum of 735, indicating that the week chosen was representative of SKIWEB activity in general. Table I shows the coding scheme used and descriptive statistics. Preliminary interviews with ten SKIWEB users helped identify how each variable would be coded and provided both a system introduction and a subset of each type of post identified in the research model and the characteristics of which each user recognized and agreed

Table I Descriptive statistics of coded measures

Variable N = *645*	*Coding scheme*	*Mean*	*SD*
Re-use	Number of times a post was read (from log)	19.47	32.30[a]
Rank of poster N = 369	1-15; 1 for military E-1 (private or airman basic); 15 for military O-6 (colonel)	7.82	3.75
Title word count	Number of words in post title	12.95	5.85
		N	*Frequency*
Event post	1 if post focus was event; 0 otherwise	301	0.47
Non-event post	1 if post focus was non-event; 0 otherwise	229	0.36
Time-based post	1 if post focus was time-based; 0 otherwise	115	0.18
Information post	1 if post function was information; 0 otherwise	528	0.82
Correlation post	1 if post function was correlation; 0 otherwise	102	0.16
Mobilization post	1 if post function was mobilization; 0 otherwise	7	0.01
Continuity post	1 if post function was continuity; 0 otherwise	8	0.01
Link	1 if post contained a URL (Web link) to additional information; 0 otherwise	187	0.29
Image	1 if post contained an embedded Image file; 0 otherwise	123	0.19
KML	1 if post contained an embedded KML file (Google Earth overlay); 0 otherwise	181	0.28
Document	1 if post embedded a document (e.g. report and PowerPoint presentation); 0 otherwise	175	0.27
Keyword	1 if post title contained a keyword; 0 otherwise (examples: "hostile", "earthquake" and "damage")	224	0.35
Organization poster	1 if posted by an organization account; 0 if an individual	179	0.28
Civilian poster	1 if posted by a civilian (no military rank); 0 otherwise	71	0.11

Notes: [a]Because re-use was positively skewed, alternative models were run by excluding outliers and with transformed variables. No differences in significance were found; thus, the analysis continued with the complete, untransformed data

upon. Coding of each post was then conducted in concert between the researcher and one of the expert SKIWEB users. The two coders worked together, rather than coding the posts independently of each other and then comparing results afterwards. When disagreements arose (very rarely), the coders would stop, discuss the post and resolve their disagreement before moving on to the next post. Posts were first coded based on the event log view, which shows users a single line with title, keywords and icons indicating attached elaborating information. Then, each individual post was accessed and coded for focus and function. A table of bivariate correlations among the model variables is shown in Appendix. Post activity was robust and fairly steady: the average time between posts was 15.5 min; the ratio of military posters to non-military posters (civilian or contractor) was 8:1 and the ratio of individual to organizational posters was 2.6:1.

Log data showing how often each post was read by another user (not the author) were used as a proxy for re-use, as it was impossible to contact users directly to assess how shared knowledge impacted their thinking or how they applied it in other circumstances to create new knowledge resources. Users were presented through the blog interface with a chronological list of updated posts and their titles. In many cases, users might glean all the information they need to know about each post from the title, and not read further. But by clicking through to the post itself to read the shared knowledge and access elaborating information, they made a conscious decision to evaluate that knowledge for re-use. The log recorded only the click-throughs as reads. Thus, although reads is not a perfect measure of re-use, at worst, it measures intent to re-use and at best identifies those posts judged by users as potentially offering new and useful knowledge.

Hypothesis testing was conducted in SPSS using multiple regression, with re-use as the dependent variable, following procedures in Hair *et al.* (2009). As the three types of focuses and four types of functions were dummy coded and, thus, perfectly correlated, event and information were not coded and were instead included as the baseline model (Stockburger, 1996). A Bonferroni adjustment (Abdi, 2007; Mundfrom *et al.*, 2006) was used because of the simultaneous inclusion of eight different types of variables (focus, function, embedded information, keyword, title word count, organizational poster, civilian poster and rank), resulting

in a target alpha of 0.006. Although the purpose of the regression was hypothesis testing and not model fit, the regression was also run as a stepwise model to verify that no non-significant factors were inflating the explanatory power of the overall result. The stepwise model excluded two non-significant predictors but did not result in a significantly different adjusted R^2 value; also, no regression coefficients or their significance levels were materially different.

Results

Table II shows the results of the multiple regression. Overall, the predictors explained 30.7 per cent of the variance in re-use ($F = 22.915$, $p < 0.001$). We found significant results for non-event ($\beta = 0.275$, $p < 0.001$), image file ($\beta = -0.119$, $p = 0.002$), organizational poster ($\beta = -0.307$, $p < 0.001$) title word count ($\beta = -0.16$, $p < 0.001$), keywords ($\beta = 0.372$, $p < 0.001$) and title length ($\beta = -0.128$, $p = 0.001$). Additionally, mobilization ($\beta = 0.078$, $p < 0.02$) and KML file ($\beta = -0.085$, $p = 0.04$) were significant at the 0.05 level; however, these were not considered significant results after the Bonferroni adjustment. Re-running the model with event and information included and non-event and correlation excluded yields a significant impact for event ($\beta = -0.287$, $p < 0.001$) but not information.

For *H1*, we predicted that knowledge in events posts would be re-used more often than non-event and time-based posts. Results show that in fact non-events are re-used significantly more than events, contrary to expectations. Time-based posts were not significant; that is, not re-used more or less than others. For *H2*, we predicted that information posts (*H2a*) and correlation posts (*H2b*) would be re-used most often; yet, information, correlation, continuity and mobilization posts did not have a significant association with re-use. Thus, *H2* was not supported. *H3* stated that indications of elaborating information – a link, image, KML file or document – would positively influence re-use. Of the four types of elaborating information tested, only image had a significant impact on re-use, but it was in the negative direction. Thus, *H3* was not supported, and, surprisingly, posts with image files were re-used less often than those without image files. *H4* and *H5* were that posts made by higher ranking individuals and posts from individual

Table II Regression results

Model summary

Model	*R*	R^2	*Adjusted* R^2	*Standard error of the estimate*
1	0.566	0.321	0.307	26.895

ANOVA

Model	*Sum of squares*	*df*	*Mean square*	*F*	*Significance*
1					
Regression	215,478.472	13	16,575.267	22.915	0.000
Residual	456,426.127	631	723.338		
Total	671,904.598	644			

Coefficients

	Unstandardized coefficients		*Standardized coefficients*		
Model	*B*	*Standard error*	*β*	*t*	*Significance*
1					
(Constant)	27.530	3.587		7.675	0.000
NonEvent	18.569	3.338	0.275	5.563	0.000
TimeBased	−5.808	3.789	−0.069	−1.533	0.126
Correlation	−4.094	3.588	−0.046	−1.141	0.254
Mobilization	24.336	10.611	0.078	2.293	0.022
Continuity	−16.910	10.348	−0.058	−1.634	0.103
OrgSender	−22.103	3.714	−0.307	−5.951	0.000
Civilian	7.031	3.950	0.068	1.780	0.076
Link	−1.423	2.881	−0.020	−0.494	0.622
Image	−9.799	3.083	−0.119	−3.178	0.002
KML	−6.076	2.993	−0.085	−2.030	0.043
Document	−2.310	3.559	−0.032	−0.649	0.516
Keyword	24.084	2.746	0.355	8.770	0.000
Title WC	−0.882	0.224	−0.160	−3.937	0.000

accounts (not organizational accounts) would be associated with greater re-use. Results indicate that rank has no impact, as well as military vs civilian status, on re-use; however, organizational accounts were significant in the negative direction ($\beta = -0.278$, $p < 0.001$), indicating that posts from organizational accounts are re-used significantly less than posts from individuals, as expected. Thus, *H5* was supported. Finally, I hypothesized that title characteristics (presence of key words and concise titles) would be associated with greater re-use, which did in fact turn out to be the case. Table III summarizes these results.

Discussion

The results offer interesting insights of how knowledge is shared and re-used during contingencies, emergencies and disasters via social media. The mass communication theory offers a way to classify posts based on how users might re-use knowledge but does not offer explanations for which different types of focus, function or features might be more or less valuable, particularly during emergencies. This paper extends the mass communication theory by identifying how and why focus, function and features impact re-use. Results show that contrary to expectations, non-event posts are re-used more often than event posts or time-based posts. Why are non-event posts seen as more valuable? It may be that the unpredictable circumstances of emergencies invoke environmental scanning behavior in users (Frishammar, 2002), who "don't know what they don't know". Users are less clear on how non-events (which report news and intelligence) will be impactful; thus, paradoxically, users are more interested in them. Events may be more actionable but ironically be seen to have less potential for re-use. Conversely, an alternate explanation is that users are better able to evaluate events from the information contained in the post title; thus, there is little incentive to click through to view the full post. Consistent with what Ajith and Chakrabarti (2011) refer to as "bounded awareness", in a crisis, users may be less interested in looking for new knowledge if it disconfirms their own understanding. If this is the case, it suggests that:

- Including elaborating information in event posts is wasted effort, as most users will only view the title.
- Events may be better represented in a different format than discrete blog posts, such as graphically or on a map, so that the up-front effort of accessing that knowledge is less costly.

Time-based posts, which typically contain summaries of events, were also not highly re-used, despite the fact that they often represent significant effort on the part of the poster. It may be that in the fluid and fast-moving context of emergencies, summaries of past activities are less useful for re-use; they might be best identified as "archive" files and considered as reference information only, not re-usable knowledge.

Table III Results of hypothesis testing

Hypothesis	*Result*
Event posts associated with greater re-use	Contrary result: non-event posts associated with greater re-use
Information posts associated with greater re-use	Not supported. no significant associations for any function
Correlation posts associated with greater re-use	
Elaborating information associated with greater re-use	Contrary result: images associated with lesser reuse; others not significant
Rank and individual accounts associated with greater re-use	Not supported: no significant impact of rank or military status
Individual accounts associated with greater reuse	Supported: individual accounts have more re-use than organizational accounts
Concise titles associated with greater re-use	Supported: both keywords and shorter titles associated with greater re-use
Keywords associated with greater re-use	

None of the four types of function (information, correlation, mobilization and continuity) were associated with more or less re-use than the other types, although a great many more of the posts were of the information function than any other. Only a few posts were of the mobilization and continuity functions (numbering seven and eight, respectively). These results suggest function may be a useful way to characterize posts from a contributor perspective, but from the perspective of re-use, it is not a useful distinction. Possibly, users were not able to evaluate function merely from the post titles as effectively as they evaluated focus; if that is the case, more explicit notification in the title that a post concerns an interpretation (e.g. "opinion:" or "evaluation:"), a call for action (e.g. "help needed:") or an expression of shared values (e.g. "Conserve fuel:") might aid users in evaluating function more appropriately.

SKIWEB posters made a considerable effort to include elaborating information in their posts. A majority of the posts (481) had some form of elaborating information and some had multiple types. Yet, none of the four types had a positive impact on re-use, and, in fact, there was a negative association between image files and re-use. Prior research has indicated that evaluating many images at once can significantly increase cognitive load (Yates and Paquette, 2011), which may explain why they are not valued highly. *Post hoc* analysis shows that images are found in all three types of focuses and in information and correlation posts; thus, they are not associated with any specific type of post that is otherwise not highly re-used. Images are correlated only with KML files (they often are included together in the same posts); thus, their negative association with re-use remains a mystery. In general, the lack of re-use of elaborating information offers interesting insights on how the blog is used by others; it appears to offer more exploratory rather than confirmatory knowledge (i.e. knowledge I might want to know more about in the future rather than about events that have occurred). This surprising result bears further exploration as emergency and disaster management systems such as Sahana (http://sahanafoundation.org) and Web EOC (www.intermedix.com/product/product-webeoc) move toward more robust and refined file management options.

Users did not seem to evaluate characteristics of the poster as important to their re-use. Rank was not a significant predictor of re-use. Although explicit rank is most closely associated with military organizations, rank by position or experience is common among first responders. Civilian status in the US Department of Defense typically is associated with longevity and experience, suggesting that posts from civilians might be highly regarded, particularly if associated with non-events, which were re-used more often. Yet, neither rank nor civilian status was significant, suggesting that users focus on the knowledge itself rather than the source. However, when evaluating posts made by an individual vs an organizational account, users more highly valued posts from the individuals. It may be that users felt a greater sense of trust (Majchrzak *et al.*, 2007) when they saw that the information came from a specific individual, or, conversely, that knowledge from a specific organization may be less widely applicable to users from other organizations.

Finally, users did evaluate characteristics of the post title itself when deciding whether to re-use a post. Keywords were a significant predictor of re-use, which makes sense, as the purpose of the keyword is to focus attention and to help users evaluate the relevance (hence, the value) of the knowledge. Keywords appeared in the titles of about one-third of the posts studied; it may be that if they were used more frequently, their impact might be diluted. Title length was significant and, as predicted, was in the negative direction. Users likely find more concise titles easier to scan and perhaps indicative of more focused and impactful knowledge.

Conclusion

This study attempted to dig deeper into the type of knowledge shared and re-used via social media in the context of emergencies, providing a categorization scheme and hypothesizing factors which lead to re-use. Although some of the results were contrary to

expectations, the study has succeeded in its aims. Social media has proven its worth as an enabler of knowledge sharing and re-use for several contingencies, disasters and emergencies of late. Improving our understanding of the effectiveness of this sharing and re-use, qualified by features of the shared knowledge, offers insights for greater research in this area, as well as improvements for both emergency management social media design, and its employment.

This research offers several contributions, both for researchers and for practitioners. For researchers, it evaluates organizational social media in the context of emergencies, offering new ways to think about knowledge re-use when time and cognitive resources are scarce. Xia *et al.* (2011) theorized that for high-complexity tasks, users would avoid written documentation and seek knowledge directly from other users. The present research indicates that through social media, users may re-use knowledge indirectly from others, based on the focus of the knowledge and its features. Additionally, this research helps qualify prior work on elaborating information, such as maps (Majchrzak and More, 2011). Although useful in some circumstances, elaborating information shared via social media may overload users and discourage re-use. Finally, this research extends the mass communication theory in the context of organizational knowledge users, recognizing that with social media, multiple end-users may evaluate shared knowledge differently based on their particular needs – needs which are particularly poignant during emergencies.

For practitioners, this research helps identify strategies for sharing knowledge between organizations and offers insights on how users evaluate posted knowledge. Alberghini *et al.* (2014) offered a set of indicators for evaluating effectiveness of social media use in organizations. This research presents new guidelines based on the focus and function of the shared knowledge, related to the effectiveness of that knowledge as shown by re-use. This research also offers design insights for how to build more useful emergency management tools. Emergency management social media must capture the dynamics not only of sharing itself (Turoff, 2002; Yang *et al.*, 2012) but of the changes in focus and function of the shared knowledge. New tools should make focus more explicit so that users can identify non-event posts quickly and, at the same time, provide posters a way to easily show how event posts are relevant.

This research suffers from a number of limitations. SKIWEB is used primarily by Department of Defense users who may have different norms of knowledge sharing during emergencies than other types of organizations. Further, the knowledge shared on SKIWEB which operates 24/7 may be different than social media used during a one-time event or for a surge activity such as the crisis management systems used during the Beijing Olympics (Yang *et al.*, 2012). The knowledge shared was not balanced evenly between the different focus and function categories, and the inconsistencies may have skewed results and inflated errors, potentially impacting results. Finally, the posts were coded jointly by the researcher and an expert user, which offered advantages and precluded inter-rater reliability tests, which demonstrate consistency and lack of bias. All of these concerns threaten generalizability of this study, and readers should be cautious while interpreting the results in other contexts.

Future research should evaluate the characterization scheme identified in this research in the context of different situations similar to but different than emergencies (e.g. new product development and cross-cultural learning) and with different enabling social media technologies. It is possible that social networks, microblogs or wikis present the focus and function of shared knowledge slightly differently than blogs, potentially altering how re-users evaluate it. Future research may also look for additional factors associated with users, organizations and the knowledge shared that might better predict re-use. For example, are there better ways to embed elaborating information that would encourage re-use? Finally, more research is needed on knowledge re-use "in the moment" of the emergency response itself (Turoff, 2002). Although this research focused largely on sharing knowledge from responders to decision makers, we still know very little about first

responders' knowledge needs. Would they rely on a robust network of shared knowledge, or would they too quickly become overloaded and ignore shared knowledge?

In conclusion, this study furthers the understanding of how knowledge sharing and re-use happens during contingencies, disasters and emergencies so that decision makers may act swiftly, assuredly and properly to apply resources and potentially save lives. As organizations (government, non-government and commercial) become more engaged and connected through social media, information sharing will increase and, with it, the responsibility of reusing knowledge effectively. Emergencies are unpredictable, but knowledge management systems and social media can help manage the uncertainty and confusion and aid organizations as they respond.

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Table AI Bivariate correlations

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
1. Reuse	–															
2. Event	−0.205**	–														
3. Non-event	0.293**	−0.694**	–													
4. Time-based	−0.100*	−0.436**	−0.346**	–												
5. Information	−0.112**	0.344**	−0.492**	0.167**	–											
6. Correlation	0.079*	−0.312**	0.460**	−0.169**	−0.921**	–										
7. Mobilization	0.116*	−0.068	0.047	0.029	−0.223**	−0.045	–									
8. Continuity	0.019	−0.105**	0.151*	−0.052	−0.238**	−0.049	−0.012	–								
9. Rank	−0.083	0.200**	−0.91	−0.148**	−0.024	−0.026	0.053	0.062	–							
10. Org Poster	−0.094*	−0.302**	0.524**	−0.262**	−0.346**	0.396**	−0.032	−0.069	N/A	–						
11. Civilian	0.052	0.009	−0.23	0.017	−0.053	0.024	0.059	0.050	N/A	−0.218**	–					
12. Link	−0.188**	0.032	−0.31	−0.003	0.079*	−0.09*	0.032	−0.01	−0.181**	0.245**	0.092*	–				
13. Image	−0.124**	0.108**	−0.63	−0.61	0.075	−0.048	−0.051	−0.054	−0.213**	−0.177**	0.258**	0.064	–			
14. KML	−0.193**	0.370**	−0.391**	0.007	0.276**	−0.252**	−0.65	−0.07	0.187**	−0.356**	0.133**	0.103**	0.400**	–		
15. Document	0.066	−0.515**	0.378**	0.199**	−0.464**	0.443**	0.138**	0.026	−0.13	0.401**	0.075	−0.236**	−0.145**	−0.358**	–	
16. Keyword	0.426**	−0.245**	0.486**	−0.289**	−0.248**	0.291**	−0.14	−0.082*	0.086	0.202**	0.014	−0.236**	−0.64	−0.173**	0.221	–
17 Title words	−0.077*	0.229**	0.120**	−0.449**	−0.005	0.063	−0.53	−0.143**	0.430**	0.151**	0.220**	0.031	0.071	0.183**	−0.34	0.203**

Notes: *$p < 0.05$; **$p < 0.01$

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