

The use of Social Media in Knowledge Integration for Improving Disaster Emergency Management Task Performance: Review of Flood Disasters

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Abstract

Objectives: The main purpose of this study is to investigate the use of social media in knowledge integration for effective disaster emergency management in context of flood disaster. **Methods/Statistical Analysis:** The study used literature review methodology which involves a thorough literature search into three databases including Emerald, Science Direct and AISEL. Search keywords used were social media, social networking and disaster management or emergency management. Full text research articles published between 2010 and 2015 were included. Quality assessment criteria were set to determine what to include and exclude for this study. 22 papers were identified as potential units for analysis. **Findings:** The findings have shown that only a limited study had been undertaken in the use of social media for knowledge integration. Also, there is lack of knowledge towards investigating empirically the intricate and dynamic nature of crisis management operations and to determine how knowledge coordination can assist managers in enhancing emergency management task performance. The review of 22 final selected papers has indicated that there is scope for more significant research within three major areas. Firstly, there is an urgent need for Information System researchers to conduct more research regarding the application of social media in disaster situations. Secondly, only one paper has clearly outlined the use of social media within knowledge integration, despite the success of social media within disaster management. Finally, more research is required in order to better understand the determinants of knowledge integration within the context of emergency/disaster management. **Application/Improvements:** An innovative aspect of the research was a comprehensive look at the relationship between knowledge integration and social media as a new technology in context of emergency management performance.

Keywords: Coordination and Flood Disaster, Emergency Management Performance, Knowledge Integration, Social Media

1. Introduction

A 'Disaster' has lately become a familiar expression used to describe socially-difficult situations¹, a 'harmful' occurrence² or generally sudden and unforeseen events which can lead to human hardship³. Throughout history, tremendous losses have been caused by natural disasters, such as floods, which have destroyed economies and resulted in the loss of human lives. As a result of these devastating results, flood disasters have been identified as a critically destructive form of natural hazard, the impacts of which can include direct loss of human

lives following the flooding or resulting diseases. About a third of all disaster-related destruction and fatalities are caused by flooding⁴. Additionally, frequent flooding occurrences can present a risk and a barrier to sustainable development. Flood disasters have been related to natural occurrences such as heavy rain or the negative influence of humans on their environments and their activities that harm nature⁴. Influences such as drainage blockages can be the result of inappropriate land use and deforestation⁵.

According to Australian government propositions for a standard definition of flooding (2011), a flood event has been defined as the covering of ordinarily dry land with

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water, beyond the conventional limits of lakes, streams and natural water paths, regardless of whether or not altered they have been altered or any reservoir, canal or dam. In¹⁵ has defined flooding as “the event of a body of water, rising, swelling and running over land not commonly thus covered”. A wide range of studies have focused on the event of a body of water rising and spilling over land not usually inundated.

Flooding is considered to be a major threat which causes grievous devastation, especially in developing countries. Its immense impact can result in millions of dislodged inhabitants, a loss of human lives, crops, disease break-outs and the breakdown of social infrastructure and economies. Its repeated, annual occurrence results in great mortality rate and property loss and it is considered globally to be a destructive disaster⁶.

For instance, within the Sudan context of this research, the recurrence of floods caused a substantial loss of human life, in addition to infrastructural damage to public facilities such as schools, hospitals and governmental offices. This results in a need for enhanced flood emergency management as a main tool for providing safety to civilians in such situations⁷. Although the occurrence of disasters cannot be avoided, proactive measures undertaken with the right approaches and with the right information available, may make disaster mitigation feasible. While it is not feasible to prevent disasters like flooding, it is possible to be prepared for such situations by the means of collecting the right information. Although crisis situations cannot be prevented, as they are natural disasters, their impacts can be better managed. To achieve a reasonably high level of disaster management, adequate planning, well-prepared response measures and guided efforts all need to be in place⁸. Definitions of emergency management are broad and extensive. Different to fields that are more organized, emergency management has expanded and contracted through different cases of events, leadership styles and congressional enthusiasm. A more appropriate definition for this term is a discipline that deals with risk and risk prevention.

However the definition of emergency management can be extended and expanded. In contrast to other research areas, it expands and contracts, aligning to the different circumstances that occur around the world and to different governmental interventions and styles of administration. The simplest definition of emergency and disaster management is the handling and prevention of risk. Risk can lead to a diverse range of issues and may

involve a range of different parties⁹. Within all of phases of an emergency response, collaborative teamwork is crucial. In such cases, different teams can carry out unique but related tasks and actions that require cooperation, as a means of reducing or possibly eliminating the impacts of disasters. Usually there are established procedures within emergency plans that teams should follow in order to effectively handle emergency situations. When things go wrong in these situations, this mostly happens due to reasons related to failures in communication or coordination. Within all emergency management phases, a core and essential part of the procedure involves the knowledge embedded in it and the understanding of that information and knowledge by the people in charge. The quick gathering and circulation of information plays a crucial role in the success of crisis teams¹⁰.

Therefore this study's aim is to contribute to the existing body of knowledge, targeting research gaps related to the utilization of knowledge-driven social media in improving crisis management, specifically in studies published after 2010. The expected outcome of this review paper is to showcase articles that analyze the application of social media within knowledge integration, within the years of review. This study intends to clarify research gaps in applied-social media in knowledge integration, as an important component of emergency management information.

2. Literature Review

In recent years, floods initiated by massive rain downpours have been the cause of most disasters around the globe, particularly in developing countries. Such floods are considered to be one of the most destructive natural crises that can cause destruction of property and life¹¹. A lack of appropriate evaluation of flood management approaches worldwide has resulted in greater resulting damage to environments. Events of heavy rainfall are predicted to continue to increase, as a result of climate change and in future areas that have only recently been affected may be facing even heavier downpours and consequential floods¹². Flooding is a global affliction that has caused significant destruction, loss of life and economic issues. It was estimated that in 2010, 178 million people were rendered homeless by flood disasters¹³. Flood disasters have affected both developing and developed countries. For instance, in Western Europe during a particular season, significant flooding can occur. In 2010, a flood covered

Belgium, Germany and France, resulting in 30 fatalities and an estimated 1.8 billion USD loss¹³.

In some developing countries such as Malaysia, floods are one of the most costly natural hazards within the context of human and economic losses. Average annual flood damage has been estimated to be as high as 100 million USD. In Malaysia, floods are caused by a combination of natural and human factors¹⁴. According to¹¹ as highlighted by the Department of Irrigation and Drainage (DID), around 29,800 km² of Malaysian territory is susceptible to flood. 4.82 million people have been affected by such disasters and it has been reported that Malaysia's average annual flood devastation cost has been set at about 30 million USD. According to¹⁵, annual losses resulting from flooding in Malaysia, which affects around 21% of the entire population, is estimated to be at about 1 billion MYR¹⁵. Besides, the State of Johor in Malaysia has experienced major floods in the past decades which were more intense between December 2006 and January 2007. The estimated total cost in terms of property loss, resulting from the disaster, has been estimated to be at 50 million USD. It was regarded to be one of the costliest flood crises faced in Malaysia's entire history¹⁵.

Similarly, Sudan faces yearly flooding that hits large parts of the country and its regions and this has been attributed to Sudan's geographic position, with its low-lying terrain, while another reason has been the passage of rain water from neighboring countries. The Blue Nile is a seasonal river, subjected to flooding events that cause destructive damage along its course. During exceptionally rainy seasons, overflow from the Blue Nile can result in extensive flooding disasters, especially in the flood prone areas between Ethiopia and Sudan. The country experienced large-scale flooding in 1988, which has appeared to be the first of a series of high floods that have struck Sudan. The most recent flooding events have occurred in 2007, 2012 and 2013¹⁶.

In August 2013, massive downpours were recorded in some states in Sudan such as the River Nile, the Blue Nile, South Darfur, Khartoum, West Kurd fan and North Darfur, with varying degrees of magnitude and impact caused by flash flooding. The Sudanese Red Crescent Society (SRCS) has estimated the costs of these floods to be almost 7,384,813 USD (6,258,316 USD). According to the Federal Ministry of Health, as outlined in the World Health Organization's report (2013), 38 localities in 13 states were affected. 49, 664 families and about a quarter million citizens were forced to leave their homes.

The flooding destroyed many examples of social infrastructure, including hospitals, schools, worship centers, community facilities and government offices¹⁷.

As a result of this disaster, a large quantity of livestock was washed away and killed. In addition, many wells and latrines were flooded, causing the pollution of water sources that resulted in increased health issues and water-related diseases including malaria, diarrhea and fevers. The displaced inhabitants lost their personal possessions and lived under extremely terrible conditions, without any safe drinkable water or appropriate hygiene. There was an urgent need for the disbursement of emergency relief, including temporary shelter, food in aid form, safe drinkable water and sanitary/hygiene products.

According to the estimated assessments provided by the Sudanese Red Crescent Society (SRCS) and other risk management parties in the country, 17 states were affected. 28,621 households, including 177,724 individuals, were displaced. Meanwhile 16,225 houses were completely destroyed and 18,616 others were partially damaged, causing the deaths of 49 people. In 1988 the floods came earlier than anticipated and were regarded to be the worst in 20 years. They resulted in the displacement of 7,000 families and the destruction of schools and mosques, with the cost set at CHF 1,293,933. It was reported that the northern capital of Khartoum, which is situated in the River Nile State, was the most badly hit city in the country. The impact of this flood was so devastating that 36,000 people lost their homes. Aside from this, according to SRCS, government authorities, UN Agencies and NGOs, 70,000 acres of fertile land situated within the Nile State were destroyed as result of the floods¹⁸.

2.1 The Complexity of Crisis Management

By their nature, crisis management activities are implicitly complicated and dynamic. This is due to the critical time constraints related to generating appropriate information and sharing it with organizations that need it, in addition to locating and delivering required assets and evacuating affected people. Data relevancy is very important for making decisions regarding how attention should be focused and how to manage limited available resources. In this case, obtaining accurate and reliable data can be particularly difficult, especially for NGOs who need to send necessary quantities of volunteers and teams to areas where they are needed. In addition, the facilitation of coordination in emergency situations requires effective communication and information sharing¹⁹. Information

should not only be reliably collected, but it should also be speedily and effectively shared among relevant stakeholders at appropriate times and places¹⁹.

Therefore, effective communication is necessary for providing proper knowledge and information to emergency managers. This allows decision-makers to execute evacuation plans and for volunteers to help each other within affected areas¹⁹. In addition to this, there is a need for updated and speedy knowledge dissemination and decision coordination between multiple agencies, across different positions. Nevertheless, common pitfalls are faced when analyzing, describing and assessing the complicated and changing nature of disaster management processes and the way that knowledge integration can assist stakeholders in improving emergency management task performance²⁰.

2.2 A Need for Knowledge Co-Ordination

The collaboration between multiple agencies involved in emergency interventions, despite being a key issue, remains a sidelined research area²¹. Multi-agency management is needed in such a situation, which is a major challenge due to the complicated condition in which it occurs²¹. For instance, in²² offered a perspective that in a situation like that, where there is significant destruction, the interruption of the infrastructural support need for coordination is bound to occur. All of these facts can be worsened through factors including personal involvement, multi-authorities and clashes of interest²². Within the field of emergency management, most research has reinforced that multi-agency collaborations should be insolvent during the occurrence of natural hazards^{21,23}.

Disaster preparedness, intervention, reduction and recovery are all impacted by complicated political and administrative communication and consequently the outcomes are unpredictable and cannot be controlled. It is very important to analyze suitable approaches to this communication, since improved activities within crisis management depend largely on the abilities of public officials, volunteers and managers to coordinate knowledge and information. This coordination of knowledge and information allows the stakeholders to fully understand the complexities of operating within areas affected by flooding. Access to this knowledge allows for greater, strategic planning²⁴. The prevalence of social media has resulted in its extensive application, with increasing numbers of companies incorporating social media into their organizations in order to support communication and

collaboration. According to a survey undertaken regarding the way organizations use social media, as conducted by the McKinsey Global Institute (2011), companies are enhancing their mastery of social media as a means of improving their operations and exploiting new market opportunities. Meanwhile, academic studies have provided some exploratory perspectives into social media's influence on knowledge management²⁵.

2.3 Difficulties Faced by Humanitarian Organizations during Disasters

A challenge faced by humanitarian relief agencies is to identify the agencies with whom they can efficiently collaborate. To achieve this outcome, logisticians within these agencies have been divided into two offices. The first is the front media outer office of organizations which handle gifts to the agency. Meanwhile the other office handles logistical operations that need to strategically consider the needs of prospective beneficiaries. These two offices view other humanitarian organizations as competitors, with are vying for funding or the attention of the media, but also consider the other organizations to be collaborators with whom dialogue is needed in order to effectively carry out relief operations. In addition coordination mechanisms are already in position, such as the UN's cluster method and agencies have been established that serve the purpose of coordinating relief efforts²⁶.

Nevertheless, it is difficult for humanitarian logisticians to obtain knowledge about other humanitarian agencies operating in a particular region²⁷. According to the Fritz Institute (2004), as cited by²² these difficulties can be considered to consist of inefficient indicators, training, either a low amount or a lack of collaboration, poor recognition of logistics and insufficient social infrastructure. As a consequence, insufficient coordination between humanitarian agencies has been perceived as a huge challenge. NGOs are further obstructed by inadequate knowledge concerning one another²⁷. There is obviously a significant amount of communication between these disparate organizations^{27,28}.

2.4 Challenges Faced by Humanitarian Organizations during Flooding Disasters in Sudan

Many previous studies have highlighted that the biggest barrier faced by agencies during disasters in developing countries has related to communication and

coordination^{27,29,30}. From another perspective, the SRCS has complained that communication with remote SRCS units has been the most difficult, especially during the first phases of emergencies when road blockages and bridges damaged by flooding can lead to malfunctioning radio equipment³¹. Furthermore, the SRCS organization in Sudan has suffered from communication problems, the coordination of which is essential for building relationships with state authorities, especially with Civil Defense.

There is also a need to advocate for more efficient coordination between various organizations, in order to systematize information collection and documentation. This is particularly important when standardizing disaster reporting formats and training staff on effective report writing proficiency and when updating and upgrading SRCS communication systems at all levels. Furthermore, this coordination is important when identifying and objectively pursuing new partnership opportunities³¹.

2.5 Social Media

The development and widespread of online social media have made available a new world of communication. Over a billion people all around the world share ideas and knowledge using this concept³². Social media is a new technology with the flexibility and resilience needed by response organizations for their information systems. Sutton, in³³ have described the capabilities of social media technologies not only in coordinating information dissemination and flow, but also in adapting to the changing needs of responders. Social media technologies are not a new factor within disaster management, but despite this few studies have been carried out in order to examine their impact on knowledge management utilized during emergency management organizational responses³⁴. Social media like face book goes more than linking and commenting of face book profiles and posts. It also has an effect on the organizations for knowledge management and organizational business improvements³⁵.

In³⁶ have defined social media as web-based services that allow individuals to formulate public or private profiles within confined systems and to establish expressive lists of other users with whom they share connections³⁷. The difference between these technologies and other standard forms of Information and Communications Technology (ICT), are that they allow parties to make their contributions, opinions and knowledge public via the available systems. This encourages stronger connec-

tions with other parties who may have similar interests. While integration may not be an initial objective of the technologies' use, knowledge sharing has been made consequently possible through the establishment of knowledge integration.

Nevertheless, the notion of collaborative knowledge dissemination refers to the ability of parties to interactively establish content and knowledge. By so doing, users are able to create standards and classifications for organizations and can store this information for future retrieval³⁸. These technologies can assist users in acting speedily in reaction to changes to information and the environment, while providing flexibility, adaptability, usability and customizability in regards to both the system and the information. Social media ensures the establishment of informal networks of users, facilitating the flow of ideas and knowledge by allowing for the efficient generation, dissemination, sharing and editing/refinement of informational content^{34,39}. Meanwhile, academic research has provided some exploratory insights into social media's influence on knowledge management²⁵. Knowledge management is a phenomenon whereby an individual or team gained knowledge in systematic manner such that it can easily be retrieved by other teams looking for the same information⁴⁰.

2.6 The Role of Social Media in Knowledge Integration

Knowledge integration was defined as "the fusion of individuals' special knowledge into circumstance-concentrated systemic knowledge"⁴¹. Lastly, knowledge integration has also been described as the "combination of individual team members' information and skills through social collaborations"⁴². Furthermore, KI is considered to be an overall collective process, through which different units of specialized knowledge from different parties or groups are merged together⁴³. However, combating disaster such as earthquakes and other forms of artificial or natural disasters resulted in complicated and dynamic environments. The barriers of inadequate coordination and communication between organizations involved in emergency response are another important matter. Weaknesses in an organization's internal communication can lead to objectionable outcomes. The most important loophole within such a circumstance is the loss of vital knowledge necessary for decision-making¹⁰. This issue has been echoed in previous and later studies⁴⁴ and

reflects the core objective of the current research which aims to solve this problem through knowledge integration.

Social media, with the help of online discussion and exchange, can assist users to exchange timely and invaluable information, in conducting the timely sharing of information and knowledge and in obtaining feedback from knowledge users. Social media has been identified as a rapid, informative and flexible means of satisfying the demands of knowledge management systems within disaster response situations⁴⁵. Information Technology (IT) based systems have been developed in order to support organizational knowledge management processes⁴⁶. When sharing and transferring underlying knowledge, people use personal social networks rather than electronic systems, are both the conveyers and paths through which knowledge is delivered⁴⁷. Furthermore, IT alone is not the main driver of knowledge management initiatives. The way people use it is what allows IT to play such a significant role in supporting knowledge management⁴⁸. Within simulated environments, encouraging people to systematize their knowledge is often complicated. However when people socialize they are more likely to share their experiences and expertise, even in their places of work⁴⁹. Evidence exists that knowledge management is primarily a social process⁵⁰. Therefore, this research regards social media as a platform of knowledge integration and this study's aim is to investigate its influence on knowledge integration within emergency management.

2.7 The Importance of Knowledge Integration in Emergency Management

Within any crisis intervention management situation, issues such as managing different stakeholders' requirements and priorities and providing the various skills needed within a real emergency response situation, are very complex and dynamic. This can lead to complexities in making concrete decisions, under intense situations, while responding to particular disaster situations⁸. Knowledge management involves four different interdependent processes, including knowledge creation, knowledge storage/retrieval, knowledge transfer and knowledge application⁴⁶. Knowledge itself cannot result in competitive advantages. Rather it is the effective utilization of existing knowledge that brings about values. Similarly the processes of knowledge creation, storage/retrieval and transfer do not ultimately result in improved

organizational performance through effective knowledge application⁴⁶. Although knowledge utilization has had a direct influence on organizational performance and value, it has received limited attention in literature⁵¹. Knowledge integration is a key aspect of knowledge application that refers to the combination of individuals' specialized knowledge into situation-specific systemic knowledge⁵¹.

In⁴¹ have argued that knowledge integration considers one process of knowledge management, specifically knowledge recycling, to be a key part of knowledge application. Knowledge integration requires individually-held knowledge to be shared or transferred to other people, often creating new knowledge grounded on the synthesis of existing knowledge and thereby indicating that knowledge integration not only involves but also moves beyond knowledge sharing and creation. The dynamic nature of social media allows participants to freely produce, organize, find and share content. Social media's open and participatory nature can be best demonstrated through its platforms, including Facebook and Twitter, through which people can work collaboratively in order to create, compile and update knowledge. In this sense, knowledge within online communities, established through the collective knowledge of social media, has resulted in the integration of knowledge among community members⁵¹.

Knowledge, especially in the form of expertise and understanding, ensures that knowledge regarding how to carry out operations can remain in one's mind. This inherent knowledge is relevant during action only, which relates originally to its application. This knowledge needs to be collected, stored and recombined, in order to create higher group-level knowledge following integration⁴¹. Similarly in recent perspectives regarding knowledge integration, knowledge has been described to include information, technology, know-how and skills^{52,53}. Information refers to the structured part of knowledge that is already compiled within documents or in an electronic format. Know-how refers to the implied or subjective knowledge of individuals, which is developed through experience and can be embedded into technologies, products and tools. Lastly, skills refer to the inherent personal knowledge of individuals, which has evolved through practice and learning-by-doing⁵³.

The knowledge integration processes request that knowledge be practical in its nature and applicable, to ensure its usefulness by organizations⁵². Knowledge integration is defined as the phenomenon through which individuals can coordinate their use of respective knowl-

edge within organizations. In addition it is a core concept behind the knowledge-based perspectives of organizations^{52,54}, the proposed people's knowledge and expertise as precious assets for organizations and key optimization factors for using knowledge to establish powerful concepts. To integrate knowledge, parties must follow integration mechanisms, along with related rules, follow directives and obey formal protocols that integrate the work of employees. Therefore the process mainly focuses on how effectively individuals can utilize their unique and complementary knowledge, in order to carry out assigned tasks with better coordination⁵⁴. As outlined by⁵² there are four mechanisms utilized in coordinating knowledge with integration⁵². The first is sequencing, while the second is the rules and directives that include communications, manuals, directives, policies and procedures. The third is communication independent routines, used to develop sequential patterns of interaction that allow for the integration of the knowledge bases without the need for communicating knowledge. The fourth and final mechanism is unit-based problem-solving and decision-making⁵². Despite the fact that disasters are impossible to avoid, it is possible to be prepared for them and to have proper access to the knowledge and information needed to handle and recover from disasters⁸. The tasks required for handling emergencies are not simple to define, but rather they are inherently mesh-linked and ever-demanding⁵⁵. Also the events happenings are very unique in regards to their associated attributes. All past decisions and experiences need to be recorded as accessible, though they won't match all existing issues. The frequency of anticipation will be low and emergency events will require unique handling by experienced persons⁵⁶. Collecting and recording experiences is also not a simple task and it involves some challenges as many sets of associated information may not be available. These sets of information can include the types of decisions, who took the decisions, where they were executed, who were the associated data members, what was the generated information, which resources were utilized and where the combined knowledge is. Additionally, emergency handling requires coordinating and working with different organizations, operating with different aims and geographic locations⁵⁶.

Although the complexities involved in managing crisis situations have been widely recognized, there is lack of frameworks that can help in describing and assessing the complex, dynamic and inter-organizational nature

of crisis management complexities. Furthermore the issue of misunderstanding is quite significant, especially in regards to assessing and rating emergencies, breaking them down into individual disaster management tasks and relating those to existing knowledge. Prerequisites for emergency management include proper conceptualization, the assessment and quantification of emergency management activities for formulating organizational action plans and activating procedures that will help in performing them. Considering the amount of information and knowledge required for quick assessment and decision-making, crisis management involves intense knowledge identification and sharing across diverse organizations and locations⁵⁶.

Decision makers have usually found the pictorial representation of information to be the most effective format for knowledge application through social media, since a visual medium can be constructed by layering different knowledge sources successively in a common context or orientation. An example of how this has been achieved, specifically during the Haiti earthquake, was the World Food Programmer's decision to organize aid distribution in Port-au-Prince through 16 strategically-placed distribution points. The need for this approach is particularly indicative of the complexity of disaster response. Firstly, the decision of where to place distribution points depended heavily on where aid was actually needed. Supplies were piling up at the airport and also at Cap-Haitian in the north where ships offloaded and additionally in the nearby Dominican Republic. However the transportation of these supplies to the distribution locations was a major problem due to bad roads.

3. Methodology

The aim of this paper has been to address an existing research gap regarding the use of social media as a means for knowledge integration, primarily as a tool for improving flood emergency management performance. It served to support and build on other papers that have tried to address the impact of social media on knowledge integration. A systematic literature review was conducted, using concepts gathered from existing works⁵⁷⁻⁵⁹, in order to establish a summary of existing evidence and works through a systematic literature review. These works have focused on information systems relating to knowledge management and knowledge integration, with respect to disaster management and timely coordination activities

required by various agencies as a means to alleviate and provide relief during the event of natural disasters.

When deciding on an approach to a thorough review of Information System literature, two main issues needs to be considered. These include the sources⁵⁹ and search strategy involved^{58,59}. The sources are the areas that need to be targeted, while the search strategy refers to the search terms used during the article extraction process. Gaps within current research also need to be identified and background also needs to be offered in order to position new research activities.

3.1 Source Search Process

When selecting sources there is a need to identify the disciplinary area(s) in which the search is to be carried out⁵⁹. Within this study's particular research, the area includes knowledge management, knowledge integration, disaster management and emergency management.

3.2 Study Selection Process (Online Databases)

The initial strategy adopted was to search through online databases. Three databases including AISEL, Emerald and Science Direct were accessed (see Table 1), cutting across a wide range of IS research, while disaster management related articles were also sourced from the Association of Information Systems Electronic Library (AISEL). The researchers' decision to choose AISEL related to the fact that it is a repository of the majority of IS journals, including the Journal of the Associations of Information Systems (JAIS), MIS Quarterly (MISQ), the Information Systems Journal (ISJ), the Journal of Information, Communications of the Association of Information Systems (CAIS), the Pacific Asia Journal of the Association of Information Systems (PAJAIS) and conference proceedings related to field of focus including the Americas Conference on Information Systems (AMCIS) and the Pacific-Asia Conference on Information Systems (PACIS), to mention but a few. The retrieved full-text studies were appraised, in order to identify those to be included in the review. Full publications that were subsequently found to not meet the inclusion criteria were excluded. The first group of searched key words included 'knowledge management' or 'knowledge integration', while the second included 'social media' or 'social networking' and 'disaster management' or 'emergency management'.

Table 1. Sources used in SLR

Source
Emerald
Science Direct
Aisel

3.2 Search Strategy

A search strategy has significantly contributed to the methodical extraction of papers within the study's literature review. This is pertinent for establishing what terms need to be looked for while extracting relevant papers⁵⁹. The search strategy is exhibited in Table 2.

Table 2. Summary of the search strategy with descriptions

S/N	Search Process	Description
11	Search Strategy	Journals published in Emerald, AISEL and Science direct.
22	Search Keyword	'Knowledge management' or 'knowledge integration'. 'Social media' or 'social networking', and 'disaster management' or 'emergency management'.
33	Description	Studies were included if their keywords included social media or social networking, emergency management, disaster management, emergency response, knowledge management, knowledge integration, knowledge sharing, post and pre-disaster recovery measure and crisis management.
44	Date of Publication	Literature considered eligible for inclusion and critical appraisal was restricted to studies published from January 2010 to 2015, but in order to meet the study's needs, two papers were also provided from 2008 and 2009.
55	Language of Publication	Only studies published in English were included.

3.3 Inclusion and Exclusion Criteria

The papers chosen for this study were published between 2010 and 2015 and pertained to knowledge management or knowledge integration and disaster management or

emergency management. The included studies were available as full-text research, were published between 2010 and 2015 and were written in English. Studies that were not duplicated were excluded. Studies not related to this paper's research questions and objectives and whose titles and abstracts were not available in a full-text format, were also omitted. Based on the inclusion conditions and the extraction process detailed above, 22 papers were identified as potential units for analysis.

3.4 Data Analysis

Based on the data collected from the study, this study classified papers into categories through the use of data analysis. Figure 1 indicates that literature regarding the use of social media within the field of disaster management increased till 2013 and then decreased until 2015.

Shown in Figure 1 the gathered literature indicated that there was increased academic interest in the use of social media within disaster situations and disaster management in 2013, which then decreased in 2015.

The research context of this publication refers to the topics addressed within the reviewed papers. From an analysis perspective, as shown in Figure 2 these papers were key to the above diagram. It is obvious that there has been limited research regarding the application of social media within knowledge integration, while there is also scarcity of existing research focusing on disaster management. From Figure 2, it can be determined that only two papers discussed the application of social media within knowledge management during disaster events. Five papers discussed other issues pertaining to the development of social media. Meanwhile a total of 13 papers discussed the importance and usefulness of social media during disaster events and issues that relate to social media's influence on knowledge management during disaster events. Only one paper discusses the application of empirical social media within knowledge integration. Only one paper discusses the fundamental influences and components of knowledge integration for disaster management.

4. Results and Discussion

From this study findings, it has been determined that there is a general lack of research regarding knowledge integration in disaster events, especially in regards to emergency management and there are also limitations to

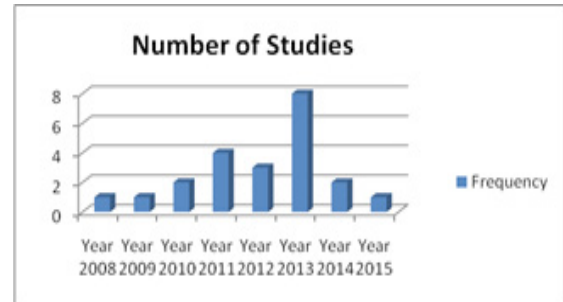


Figure 1. Numbers of studies by year of publication.

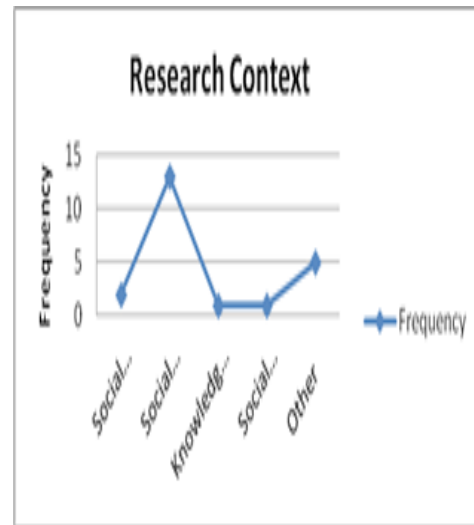


Figure 2. Research context of publications.

studies on social media that allow for the integration of knowledge. This study's thorough review of the final 22 selected papers has indicated that there is scope for more significant research within three major areas. Firstly, there is an urgent need for researchers to investigate methods of streamlining the use of terminologies regarding the emergency/disaster management field. Secondly, only one paper has clearly outlined the use of social media within knowledge integration, despite the success of social media within disaster management. There is also a need for Information System researchers to conduct more research regarding the application of social media in disaster situations.

Finally, more research is required in order to better understand the determinants of knowledge integration within the context of emergency/disaster management. Based on this study's extensive and systematic review of literature pertaining to knowledge management/knowledge integration and to disaster management, there are two major gaps that require urgent attention from within

the body of knowledge. These gaps specifically include the general lack of understanding of how to empirically describe and assess the complex and dynamic nature of emergency management tasks and also there is a gap in regards to how knowledge integration can help managers to improve emergency management task performance, which has resulted in the influences of social media on knowledge integration being overlooked. From this study's analysis and the resulting figures, it can be determined that social media has important influence on knowledge integration, especially within the field of emergency management. This is due to 'knowledge integration' being described as a "combination of individual team members' information and expertise through social interactions"⁴². 'Knowledge integration' can likewise be defined as the "collective process through which different units of specialized knowledge from different individuals are recombined"⁴³.

The barrier of inadequate coordination and communication between those organizations involved in emergency response is an important matter. Weaknesses in communication within an organization can lead to objectionable outcomes. The most crucial flaw in such cases involves the loss of essential knowledge in an organization, specifically knowledge necessary for decision making¹⁰. This issue has been echoed in previous and more recent studies⁴⁴ and serves as the core reason for this study's attempt to address the issue through knowledge integration. Social media, with its function of online chatting and message exchange, allows users to exchange timely information and knowledge with others and to obtain feedback. It is an informative, two way, flexible form of information exchange, that can satisfy the demand of knowledge management systems within disaster response⁴⁵.

5. Conclusion

This paper presents the results of a literature review and a discussion of the influence of social media on knowledge integration, as a means of improving flood disaster management. Based on the Figure 2, one paper has investigated social media in knowledge integration, while another has focused on knowledge integration in disaster events. Otherwise a significant number of studies have focused on social media within a disaster context, although there is a lack of papers that investigate the influence of social media on knowledge integration. These results have con-

firmed that more research is needed, in order to determine the benefits of social media on knowledge integration.

The limitations of this study include that too few papers were accessed and utilized and this needs consideration for further expansion in future studies. Secondly there is a need to determine the effect of combining social media and knowledge integration as a means of improving emergency management task performances.

6. References

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