

KNOWLEDGE MANAGEMENT OF FLOOD DISASTER IN SOCIAL MEDIA

FAIRUZ AMALINA BINTI MUZAFAR

A dissertation submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Information Technology
Specialization Information Technology Management

Faculty of Computing
Universiti Teknologi Malaysia

MAY 2017

ACKNOWLEDGEMENT

Firstly, I would like to express my sincere gratitude to my supervisor, Dr Nor Hidayati bt Zakaria for the continuous support of my research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis.

I thank my fellow classmates, Gautam, Hajar, Rashidi, Faridah and Amer for the stimulating discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have had in the last two years.

Last but not least, I would like to thank my family to my family for supporting me spiritually throughout my life. Without their encouragement and support, it would have been impossible for me to finish my study.

ABSTRACT

Social media sites are playing a significant role in rapid propagation of information when disasters occur. This effective communication platform is a great useful tool for emergency management agencies during all phases of disaster management life cycle which is prevention, preparedness, response, and recovery. Effective knowledge management is promising to improve organizational and personal performance. It has been widely recognized that information and communication technologies may contribute to knowledge management if they can be suitably utilized. Thus, this study is carried out to identify the utilization of knowledge management processes for flood disaster management in social media. Quantitative method is chosen for collecting data in this research.

ABSTRAK

Media sosial memainkan peranan penting dalam penyebaran maklumat ketika bencana berlaku. Platform komunikasi yang berkesan ini adalah alat yang berguna bagi membantu agensi-agensi pengurusan bencana semasa fasa pengurusan bencana iaitu pencegahan, persediaan, tindak balas, dan pemulihan. Pengurusan pengetahuan yang berkesan menjanjikan untuk meningkatkan prestasi organisasi dan peribadi. Ia telah diiktiraf secara meluas bahawa teknologi maklumat dan komunikasi boleh menyumbang kepada pengurusan pengetahuan jika ianya digunakan dengan sebaiknya. Oleh itu, kajian ini dijalankan untuk mengenal pasti penggunaan proses pengurusan pengetahuan bagi pengurusan bencana banjir di media sosial. Kaedah kuantitatif dipilih untuk mengumpul data dalam kajian ini.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	i
	DEDICATION	ii
	ACKNOWLEDGEMENT	iii
	ABSTRACT	iv
	ABSTRAK	v
	CONTENTS	vi
	LIST OF TABLES	xi
	LIST OF FIGURES	xii
	LIST OF ABBREVIATIONS	xv
	LIST OF APPENDIX	xvi
1	INTRODUCTION	1
	1.1 Introduction	1
	1.2 Problem background	3
	1.3 Problem statement	5
	1.4 Research objectives	5

1.5	Scope of study	5
1.6	Significance of study	6
1.7	Summary	6
2	LITERATURE REVIEW	7
2.1	Introduction	7
2.2	Disaster	7
2.2.1	Flood Disaster in Malaysia	8
2.2.1.1	Challenges in Flood Disaster	13
2.2.2	Disaster Management Cycle	15
2.2.2.1	Role of Information in Disaster Management	16
2.2.2.2	Risk Factors in Collecting Disaster Information	17
2.2.2.3	Organizational Structure for Disaster Management	19
2.3	Knowledge Management	21
2.3.1	Existing Knowledge Management Framework	22
2.3.1.1	Knowledge Management Framework for Humanitarian	23

	Assistance and Disaster Relief	
2.3.1.2	Knowledge Management	25
	Framework for Disaster Management	
2.3.1.3	Knowledge Management Framework	27
	for Disaster Management in Malaysia	
2.3.1.4	Knowledge Management using Social	29
	Media	
2.3.1.5	Comparison of Existing Knowledge	31
	Management Framework	
2.3.2	Knowledge Management Processes	32
2.3.2.1	Knowledge Audit	33
2.3.2.2	Knowledge Transfer	33
2.3.2.3	Knowledge Integration	34
2.3.2.4	Knowledge Dissemination	34
2.4	Social Media/Social Networking Sites	34
2.4.1	Use of Social Media in Natural Disaster	39
2.5	Knowledge Management in Social Media for Flood	40
	Disaster Management in Malaysia.	
2.6	Summary	44

3	METHODOLOGY	45
3.1	Introduction	45
3.2	Research Strategy	45
3.3	Research Design	46
3.3.1	Literature Review	49
3.3.2	Research Planning	50
3.3.3	Data Collection	50
3.3.3.1	Questionnaire Design	52
3.3.3.2	Questionnaire Distribution	53
3.3.4	Data Analysis	53
3.3.5	Documenting report	54
3.4	Summary	54
4	RESULTS AND FINDINGS	55
4.1	Introduction	55
4.2	Research Model and Hypotheses	55
4.3	Descriptive Analysis	57
4.3.1	Respondent Information	58
4.3.2	Flood Experience	62
4.3.3	Knowledge Management of Flood Disaster in Social Media	63

4.3.4	Effectiveness of Knowledge Management of Flood Disaster in Social Media	75
4.4	Assessment of Measurement Models	77
4.4.1	Discriminant Validity	77
4.4.2	Reliability analysis	78
4.5	Assessment of Structural Model	78
4.5.1	Structure Equation Model	79
4.6	Summary	80
5	DISCUSSION AND CONSLUSION	81
5.1	Introduction	81
5.2	Achievement of Overall Study	81
5.2.1	Objective 1: Knowledge Management in Flood Disaster Management	81
5.2.2	Objective 2: Utilization of Social Media in Knowledge Management Process for Flood	83
5.3	Recommendation of Study	86
5.4	Limitation of Study	86
5.5	Summary	87
	REFERENCES	88
	APPENDIX	96

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.1	Disaster Relevant Information Needs (Yap, N. T., 2011)	17
2.2	Evaluation Checklist (Chua, Balkunje, & Goh, 2016).	26
2.3	Comparison between Existing Framework based on Context and Knowledge Process	32
3.1	Research Design	47
3.2	Sources of each construct	52
4.1	Latent Variable Correlations	77
4.2	Reliability Statistics	78

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
2.1	Flood prone area in peninsular Malaysia ("Flood Management - Programme and Activities", 2016)	10
2.2	Flood prone area in Sabah and Sarawak ("Flood Management - Programme and Activities", 2016).	10
2.3	Penang directly hit by flash floods (Zainooddin, 2016)	13
2.4	Worst floods in Kelantan (Azlee, 2015)	13
2.5	Disaster Management Cycle (Warfield, 2008).	15
2.6	Malaysia Disaster Management Structure (Malaysia Disaster Management Reference Handbook 1-100)	19
2.7	Disaster Management Organization Levels in Malaysia	20
2.8	KM Framework for the support of decision making in HA/DR (Zhang, Zhou, & Nunamaker Jr, 2002).	24
2.9	Knowledge Management Framework (Mohd Rodzi et al, 2014)	28
2.10	Knowledge Management Cycle (Dalkir, 2011)	30
4.1	Research Model	56
4.2	Gender of respondent	58

4.3	Age of respondent	59
4.4	Educational level of respondent	59
4.5	State of respondents	60
4.6	Smartphone owner	60
4.7	Social media application in smartphone	61
4.8	Name of social media in smartphone	62
4.9	Respondent's Flood Experience	62
4.10	Flood Type	63
4.11	Utilization of Social Media during Flood	63
4.12	Type of flood's information	64
4.13	Flood's Information in Social Media	65
4.14	Search flood's information	66
4.15	Source of Flood's Information	66
4.16	Quality of Flood's Information	67
4.17	Action based on Flood's Information	68
4.18	Respondents Opinion on Social Media Features	69
4.19	Respondent Attitude in Knowledge Transfer	70
4.20	Frequency of Transferring Information	71
4.21	Frequency of Transferred Flood's Information	72
4.22	Respondent Attitude in Knowledge Integration	73
4.23	Respondent Attitude in Knowledge Dissemination	74
4.24	Respondent Opinion on Knowledge Dissemination	74

4.25	Respondent Opinion on Effectiveness of Knowledge Management of Flood Disaster in Social Media	76
4.26	PLS test of the proposed structural model	79

LIST OF ABBREVIATIONS

BCP	Business Continuity Plan
DRMC	Disaster Management and Relief Committee
ERP	Emergency Response Plan
ESSAWTM	Emergency Situation Awareness – Automated Web Text Mining
GDACS	Global Disaster Alert and Coordination System
HA/DR	Humanitarian Assistance and Disaster Relief
ICT	Information and Communication Technology
KA	Knowledge Audit
KD	Knowledge Dissemination
KI	Knowledge Integration
KT	Knowledge Transfer
KM	Knowledge Management
MNSC	Malaysia National Security Council
UTM	Universiti Teknologi Malaysia
SPSS	Statistical Package for Social Sciences Programme

LIST OF APPENDIX

APPENDIX	TITLE	PAGE
A	Questionnaire	96

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter briefly explained the overview of the study and how the research will be conducted. It is included the research background, problem statement, research objective, scope of study, significance of study and expected contribution. Firstly, the introduction of the topic and explanation about the background study. Problem statement obviously shows the rationale behind leading the research. Objective and scopes are needed as it is a guideline to conduct the research. Lastly, significance of study is for understanding the implication of this research. The purpose of this research is to study about knowledge management of flood disaster in social media.

Flood is an overflow that comes from river or any source of water that covered all over land yet it is not usually submerged. Various countries on the Earth confront flooding events, including Indonesia, Malaysia, China, Australia and Thailand. Flood is one of the natural disasters that frequently occur in Malaysia. Normally, flood happened during the monsoon season due to prolonged heavy rain. It can cause destruction of property and loss of life (Abdul Latif & Arshad, 2014). The rising water caused the road routes were closed. Many daily activities disrupted by flood.

Therefore, information is the most significant item amid emergencies or disaster (Barrantes, Rodríguez, & Pérez, 2009). Information is needed in order to make decisions. Most importantly, it is essential for quick and effective emergency assistance for those affected by disaster. Plus, information is the core components in the damage and needs assessment process. Moreover, it is the basis for coordination and decision making in crisis circumstances. It also important for after-event analysis, assessment and lessons learned. Thus, public and social communication and media relation have ended up as key components in efficient emergency management.

Today, social media had ended up as a worldwide phenomenon. More than 80% of Internet's users are social media users. Social media becomes one of the favored medium to gain and broadcast information regarding natural disaster such as flood. In Indonesia, social media is one of famous information resources when disaster occurred (Oktafiani, Jariyah, Fitri, & Takako, 2012). While in Australia, flood happened between September 2010 and March 2011. During that time, many people used social media as an approach to get and share information about flood (Charlwood, 2012). Social media users were active in sharing the official messages to spread warnings and information. Besides that, social media users were willing to report relevant situational information to emergency management agencies. The Victoria State Emergency Service (VICSES) Facebook page received various direct posts from social media users with detailed information including road closures, images and videos of local flood conditions.

Malaysia still lack of experience in using social media, particularly during disaster events (Wan Hussin, 2016). People does not recognize social media as their first source information. Thus, a few researchers and analyst have begun to propose some techniques and framework for disaster management by evaluating social media data (Sakaki, 2013). The researcher proposed a knowledge management framework in order to enhancing the usage of social media during flood disaster.

1.2 Problem background

Malaysia has experienced various type of natural disaster. Flood disaster becomes synonymous with our country since it happened almost every year. Usually it happens during the monsoon season due to prolonged heavy rain. In December 2014, Malaysia makes a history when three of the state makes a hit with massive flood happened in Kelantan, Terengganu and Pahang. Kelantan was found out the most affected when eight of the territories are severely damage (Wan Ahmad & Abdurahman, 2015). This incident happens for seven days from 26 December 2014 to 2 January 2015. Flood disaster makes local people suffering from loss of their property such as house, cars and schools. Besides that, flood can cause loss of life.

Disaster related agencies, humanitarian assistance associations and the affected citizens require information as data, figures, reports and circumstances analysis or recommendations. The problem is on how the communication and information management lead to more powerful and timely response. With effective information management, lives can be saved and reduce the effect of disaster and crisis. Plus, it can enhance the quality of life of affected citizens. They should be perceived as key components in organizing resources, trigger solidarity and support.

With the rise of social media as broadly utilized information and communication technologies (ICT), it becomes a tool that providing a real – time data about the circumstance at the disaster area from the influenced individuals themselves (Mukkamala & Beck, 2016). Social media draw in consideration for their data sharing abilities, particularly Twitter, which is a trendy social medium utilized during disasters (Sakaki, 2013). Thus, people use their social media during the disaster to get and sharing the information. The information is focused in real- time data which originating from end-users through social media. Malaysia have facing many challenges in order to practice disaster management.

Social media keep people alert with their areas. It is a powerful platform to disseminate information but it also can disseminate false information which will cause problem later (Abedin, Babar, & Abbasi, 2014). Social media provided real time information updated from the user. People looking up for a real-time information during flood disaster. The importance of the disaster related information is it give real time alerts and warnings, agencies can detect the survivors and victims, gather volunteer, and raise fund.

Social media is a pool of public knowledge. It is either in a form of text, pictures or videos. The knowledge are regularly unstructured, inaccurate or redundant. Lack of control in social media lead the knowledge becomes in various forms and unfiltered (Mohd. Rodzi, Ahmad, & Zakaria, 2015). Hence, knowledge management process can transform the knowledge into a knowledge that can benefit the public, agencies and others.

Knowledge management (KM) has been perceived as an important instrument for the procurement of disaster related data (Seneviratne, Baldry, & Pathirage, 2010). It is to understand the basic need to oversee past encounters and information to guarantee noteworthy upgrades in future disaster relief operations. The innovation of technology that link the world in a worldwide system has the potential to advance the trading of information on disaster-related among organizations, areas, states and public. Disaster management highlight the accuracy and speed requires a compilation of information for decision making and forecasting purposes. Research into the significance of organizing, sorting out and speaking to disaster related knowledge has been expanding recently (Othman & Beydoun, 2013).

1.3 Problem statement

Based on the research background that have conducted, there are some problem statement that have been identified and should be highlighted through the study. The problem statement has been identified as below:

- a) How are KM processes currently practiced in flood disaster management?
- b) How are social media used in KM processes of flood disaster management?

1.4 Research objectives

Research objective is to solve the problem statement. So, the objective that been identified are as below:

- a) To identify KM processes currently practiced in flood disaster management.
- b) To examine the usage of social media in KM processes of flood disaster management.

1.5 Scope of study

In order to complete the research, the scope of the research is determined and will be focused on. The scope in this study are:

- a) The area of study is in Malaysia, where usually flood is occurring.
- b) The respondent is the youth of the victims or those who have experience regarding flood.
- c) The social media is focused on Facebook and WhatsApp application.

1.6 Significance of study

The significance of study is to increase the awareness of people towards the usage of social media as a medium of broadcast information during flood disaster. Plus, the industry or agencies can take part in creating or enhancing application for disseminates information of flood. Besides that, the committee can take action by creating a group application in social media. When flood is occurred, the committee can know who still being trapped in flood and needed a help. So, the bond within the community becomes stronger. This research can be a future reference for academic purposes.

1.7 Summary

This chapter is an overview about the research by introducing the problem statement, objectives, scopes and significance of study. Hence, through this chapter, people can understand and have a rough idea about what will discussed in this research. At the beginning of this report, it discusses about the introduction and problem background. Meanwhile chapter two discusses the literature review of previous studies by other researchers. Afterwards, chapter three shows how this study was conducted. For chapter four, it explains the finding of this study. Lastly, chapter five discuss about conclusion, limitation of study and future work.

REFERENCES

- Abd Rahman, A. (2015). Knowledge Management Process: An Overview. Lecture, Universiti Teknologi Malaysia.
- Abdul Latif, A., & Arshad, N. (2014). A Review of Flood Management Governance Framework in Malaysia and Selected Countries. In *2014 International Conference on Information Technology and Multimedia (ICIMU)*. Putrajaya, Malaysia.
- Abedin, Babak, Babar, Abdul, & Abbasi, Alireza. (2014). Characterization of the Use of Social Media in Natural Disasters: A Systematic Review. 449-454. doi:10.1109/BDCLOUD.2014.17
- Ahmad, M., Zakaria, N., Othman, M., & Mohd Rodzi, M. (2014). *Managing Information and Knowledge in Malaysia's Flood Management: Towards a New Framework* (1st ed., pp. 446-463). IOS Press.
- Ahmad, A. Use of social media in disaster management. in Second international conference on information systems 2011.
- B. Stollberg and T. de Groeve, "The use of social media within the global disaster alert and coordination system (gdacs)," in Proceedings of the WWW 2012 Companion, ser. WWW '12 Companion. New York, NY, USA: ACM, 2012, pp. 703–706.
- Barrantes, S., Rodriguez, M., & Pérez, R. (2009). Information management and communication in emergencies and disasters: manual for disaster response teams. Washington.
- Bharati, P., Zhang, W., & Chaudhury, A. (2015). Better knowledge with social media? Exploring the roles of social capital and organizational knowledge management. *J Of Knowledge Management*, 19(3), 456-475.

- Berita Harian,. (2014). Terkini:Banjir Di Kelantan, Terengganu, Pahang Tambah Buruk. Retrieved from <http://www.bharian.com.my/node/24876>
- Berita Harian,. (2015). Banjir: Pahang terjejas kembali, Perak pulih, mangsa di Kelantan dan Johor kekal. Retrieved from <http://www.bharian.com.my/node/28865>
- Bhagat, R., Kedia, B., Harveston, P., & Triandis, H. (2002). Cultural Variations in the Cross-Border Transfer of Organizational Knowledge: An Integrative Framework. *The Academy Of Management Review*, 27(2), 204.
- Boyd, d. & Ellison, N. (2007). Social Network Sites: Definition, History, and Scholarship. *Journal Of Computer-Mediated Communication*, 13(1), 210-230.
- BOWLEY, R. (2009). A COMPARATIVE CASE STUDY: EXAMINING THE ORGANIZATIONAL USE OF SOCIAL NETWORKING SITES (Master). The University of Waikato.
- Cao, X., Guo, X., Liu, H., & Gu, J. (2013). The role of social media in supporting knowledge integration: A social capital analysis. *Information Systems Frontiers*, 17(2), 351-362.
- Citizen Tech: Social Media in Disaster Response – Amy Sample Ward’s Version of NPTEch.* (2011). *Amysampleward.org*. from <http://amysampleward.org/2011/02/19/citizen-tech-social-media-in-disaster-response/>
- Chan, R., Chu, S., Lee, C., Chan, B., & Leung, C. (2013). Knowledge management using social media: A comparative study between blogs and Facebook. *Proc. Am. Soc. Info. Sci. Tech.*, 50(1), 1-9.
- Charlwood, J., Dennis, A., Gissing, A., Quick, L. and Varma, S. (2012). *Use of Social Media During Flood Events*. Retrieved on 28 February 2015 from <http://floods.org.au/wp-content/uploads/Jilly-Charlwood-Full-Paper1.pdf>
- Chee Wai, L., & Wongsurawat, W. (2012). Crisis management: Western Digital's 46€ • day recovery from the 2011 flood disaster in Thailand. *Strategy & Leadership*,

41(1), 34-38.

- Chua, A., Balkunje, R., & Goh, D. (2016). Evaluation of disaster management portals: Applying knowledge management to digital information (pp. 42-47). Queensland, Australia.
- Demerest, M. (1997), "Understanding knowledge management", *Journal of Long Range Planning*, Vol. 30 No. 3, pp. 374-84.
- DID 2009 Department of Irrigation and Drainage Malaysia (2009). Flood management manual vol 1
- DID 2000a, urban storm water management manual for Malaysia, Kuala Lumpur: Department of Irrigation and Drainage Malaysia
- Emergency Preparedness Week Toolkit. (2016). Getprepared.gc.ca. Retrieved 13 May 2016, from <http://www.getprepared.gc.ca/cnt/rsrscs/ep-wk/tlkt-en.aspx>
- F Burgess, T. (2003). *A general introduction to the design of questionnaire for survey research* (1st ed.). University of Leeds.
- G. D/iya, S., BarzaniGasim, M., EkhwanToriman, M., & G. Abdullahi, M. (2014). FLOODS IN MALAYSIA Historical Reviews, Causes, Effects and Mitigations Approach. *International Journal Of Interdisciplinary Research And Innovations*, 2(4), 59-65.
- González-Ramírez, R., Gascón, J., & Llopis Taverner, J. (2015). Facebook in teaching: strengths and weaknesses. *Int Jnl Of Info And Learning Tech*, 32(1), 65-78.
- Gosnell, A. & News-Sentinel, K. (2015). *Social Media's Role in Disaster Response Expands*. *Emergencymgmt.com*. from <http://www.emergencymgmt.com/disaster/Social-Medias-Role-Disaster-Response-Expands.html>
- Gratton, C. & Jones, I. (2010). *Research methods for sports studies*. London: Routledge.
- Heisig, P. (2009). Harmonisation of knowledge management – comparing 160 KM frameworks around the globe. *J Of Knowledge Management*, 13(4), 4-31.
- Iacobucci, Dawn (ed.) (2001), *Journal of Consumer Psychology's Special Issue on*

Methodological and Statistical Concerns of the Experimental Behavioral Researcher, 10 (1&2), Mahwah, NJ: Lawrence Erlbaum Associates.

Imran, M., S. Elbassuoni, and C. Castillo. Practical extraction of disaster-relevant information from social media. in IW3C2. 2013. Rio de Janeiro, Brazil.

Islam, S., & Chik, Z. (2011). Disaster in Bangladesh and management with advanced information system. *Disaster Prevention And Management*, 20(5), 521-530.

J. B. Houston, J. Hawthorne, M. F. Perreault, E. H. Park, M. Goldstein Hode, M. R. Halliwell, S. E. Turner McGowen, R. Davis, S. Vaid, J. A. McElderry and S. A. Griffith, "Social media and disasters: a functional framework for social media use in disaster planning, response, and research", *Disasters*, 39 (2015), pp. 1-22.

Katsirikou, A. & Skiadas, C. (2010). *Qualitative and quantitative methods in libraries*. Singapore: World Scientific.

Krishnamurthy, B., P. Gill, and M. Arlitt. A few chirps about twitter. In WOSN 2008. 2008. Seattle, Washington, USA.

Laframboise, K., Croteau, A., Beaudry, A., & Manovas, M. (2007). Interdepartmental Knowledge Transfer Success During Information Technology Projects. *International Journal of Knowledge Management*, 3(2), 47-67. <http://dx.doi.org/10.4018/jkm.2007040103>

Liyanage, C., Elhag, T., Ballal, T., & Li, Q. (2009). Knowledge communication and translation – a knowledge transfer model. *Journal of Knowledge Management*, 13(3), 118-131. <http://dx.doi.org/10.1108/13673270910962914>

M. A. Cameron, R. Power, B. Robinson, and J. Yin, "Emergency situation awareness from twitter for crisis management," in Proceedings of the WWW 2012 Companion, ser. WWW '12 Companion. New York, NY, USA: ACM, 2012, pp. 695–698.

M. Mendoza, B. Poblete, and C. Castillo, "Twitter under crisis: can we trust what we RT?" in Proceedings of the First Workshop on SOMA 2010. New York, New York, USA: ACM Press, 2010, pp. 71–79.

- Maier, R. (2007). *Knowledge management systems*. Berlin: Springer.
- Mahmood, J., Mohamed Dahlan, H., & Che Hussin, A. (2014). Enhancing Knowledge Sharing in e-learning by Incorporating Social Network Features. *JOURNAL OF INFORMATION SYSTEMS RESEARCH AND INNOVATION*, 47-56.
- Maron, D. (2013). *How Social Media Is Changing Disaster Response*. *Scientific American*. From <http://www.scientificamerican.com/article/how-social-media-is-changing-disaster-response/>
- Mathioudakis, M. and N. Koudas. TwitterMonitor: Trend detection over the Twitter stream. in In Proceedings of the International ACM Conference on Management of Data. 2010. Indianapolis, Indiana.
- Mayfield, A. (2008). What is social media. Ebook. www.icrossing.co.uk/.../eBooks/What_is_Social_Media_iCrossing_ebook.pdf.
- Mekhilef, M., Kelleher, D., & Olesen, A. (2003). *European Guide to good Practice in Knowledge Management*.
- Mohd Drus, S. & Shariff, S. (2011). Analysis of Knowledge Audit Models via Life Cycle Approach. In International Conference on Information Communication and Management (pp. 176-180). Singapore: IACSIT Press.
- Mohd Rodzi, M., Zakaria, N., Ahmad, M., & Yahya, H. (2014). *Towards a Knowledge Management Framework for Disaster Management in Malaysia* (1st ed., pp. 417-431). IOS Press.
- Mohd. Rodzi, M., Ahmad, M., & Zakaria, N. (2015). Using essential processes in knowledge integration for knowledge enhancement. *VINE*, 45(1), 89-106.
- More Americans Using Mobile Apps in Emergencies*. (2012). *American Red Cross*. from <http://www.redcross.org/news/press-release/More-Americans-Using-Mobile-Apps-in-Emergencies>
- Mukkamala, Alivelu, & Beck, Roman. (2016). Disaster Management and Social Media Use for Decision Making by Humanitarian Organizations. 1379-1385.

- Mentzas, G., Kafentzis, K. and Georgolios, P. (2007) Knowledge services on the Semantic Web, *Communications of the ACM*, vol. 50, pp. 53-58.
- National Security Council of Malaysia, Directive No. 20: Policy mechanism of national disaster management and relief. National Security Division, Prime Minister's Department, Malaysia
- Noorazuan M.H. 2006. Urban hydrological changes in the Sankey Brook catchment. Unpublished PhD thesis. Manchester: University of Manchester.
- Othman, S. & Beydoun, G. (2013). Model-driven disaster management. *Information & Management*, 50(5), 218-228
- Pawlowski, J. & Bick, M. (2012). The Global Knowledge Management Framework: Towards a Theory for Knowledge Management in Globally Distributed Settings. *The Electronic Journal Of Knowledge Management*, 10(1).
- Queensland Police Service Disaster Management and Social Media - a case study (1st ed.).
- R. Goolsby, "Social media as crisis platform: The future of community maps/crisis maps," *ACM Transaction on Intelligent System Technology*, vol. 1, no. 1, pp. 7:1–7:11, oct 2010.
- Roosli, R., & O'Brien, G. (2011). Social learning in managing disasters in Malaysia. *Disaster Prevention And Management*, 20(4), 386-397.
- Roosli, R., & O'Keefe, P. (2013). Post-disaster housing and management in Malaysia: a literature review. *Int J Of Dis Res In The Bu Env*, 4(2), 168-181.
- S. Kumar, G. Barbier, M. A. Abbasi, and H. Liu, "Tweettracker: An analysis tool for humanitarian and disaster relief," in *Proceedings of the ICWSM 2011*. The AAAI Press, 2011.
- Sharma, R. & Chowdhury, N. (2007). On The Use Of A Diagnostic Tool For Knowledge Audits. *Journal Of Knowledge Management Practice*, 8(4).

- Sakaki, T., Toriumi, F., Uchiyama, K., Matsuo, Y., Shinoda, K., & Kazama, K. et al. (2013). The Possibility of Social Media Analysis for Disaster Management (pp. 238-243). Japan.
- Seneviratne, K., Baldry, D., & Pathirage, C. (2010). Disaster knowledge factors in managing disasters successfully. *International Journal Of Strategic Property Management*, 14(4), 376-390.
- Shaluf, I., & Ahmadun, F. (2006). Disaster types in Malaysia: an overview. *Disaster Prevention And Management*, 15(2), 286-298.
- Starbird, K. and L. Palen. Voluntweeters: Self organizing by digital volunteers in times of crisis. in CHI. 2011.
- Storey, M. A., Treude, C., Deursen, A. and Cheng, L.T. (2010) The Impact of Social Media on Software Engineering Practices and Tools, FoSER '10 Proceedings of the FSE/SDP workshop on Future of software engineering research New York: ACM, pp 359-364.
- Surowiecki, J. (Ed.) (2005) *The Wisdom of the Crowds*, Anchor Books, New York
- T. Sakaki, M. Okazaki, and Y. Matsuo, "Earthquake shakes Twitter users: real-time event detection by social sensors," Proceedings of the 19th WWW 2010, pp. 851–860, 2010.
- T. Heverin and L. Zach, "Microblogging for Crisis Communication: Examination of Twitter Use in Response to a 2009 Violent Crisis in Seattle-Tacoma, Washington Area," in Proceedings of the 7th ISCRAM 2010, Seattle, Washington, 2010.
- S. Vieweg, A. L. Hughes, K. Starbird, and L. Palen, "Microblogging during two natural hazards events: what twitter may contribute to situational awareness," in Proceedings of the SIGCHI 2010, ser. CHI'10. New York, NY, USA: ACM, 2010, pp. 1079–1088.
- Sharma, R. & Chowdhury, N. (2007). On The Use Of A Diagnostic Tool For Knowledge Audits. *Journal Of Knowledge Management Practice*, 8(4).

- Vieweg, S., et al., Microblogging during two natural hazards events: What twitter may contribute to the situational awareness, in CHI 2010. 2010: Atlanta Georgia, USA.
- Wan Ahmad, W., & Abdurahman, S. (2015). Kelantan Flood 2014: Reflections from Relief Aid Mission to Kampung Kemubu, Kelantan. *MJSS*.
- Wan Hussin, W., Zakaria, N., & Ahmad, M. (2015). Knowledge Sharing and Lesson Learned From Flood Disaster: A Case In Kelantan. *Journal Of Information System Research And Innovation*, 9(2), 1-10.
- Wan Hussin, W. (2016). Knowledge Sharing Via Social Media in Flood Disaster Event (Master). Universiti Teknologi Malaysia.
- Zhang, D., Zhou, L., & Nunamaker Jr, J. (2002). A Knowledge Management Framework for the Support of Decision Making in Humanitarian Assistance/Disaster Relief. *Knowledge And Information Systems*, 4(3), 370-385.
- Zheng, Y., Li, L., & Zheng, F. (2010). Social Media Support for Knowledge Management. In *Management and Service Science (MASS), 2010 International Conference*.