Social architecture considerations in assessing social media for emergency information management applications

Dr Asif Qumer Gill, University of Technology, Sydney, takes a social architecture approach to assessing the viability of social media channels for emergency situations. ®

ABSTRACT

The emergency management industry is showing a significant interest in the adoption of social media for sourcing and disseminating crisis information. The emergency management industry needs to identify social architecture concerns when considering the adoption of a specific social media technology. Social architecture describes the properties and environment of a social system such as the 'emergency management system'. This paper identifies a set of 21 social architecture concerns based on recent qualitative research. This set of social architecture concerns can be used as a criteria list to assess the effectiveness of social media platforms for emergency information management applications.

Introduction

Information and communication technology plays an important role in emergency management (Royal Commission Report 2011). A poor emergency information management system could have an adverse impact on emergency management activities and general welfare of the community. Traditional emergency information management systems come under pressure in the rapidly changing human and technologically dominated landscape (Gill & Bunker 2012). The emergency management industry is showing a significant interest in the adoption of emerging social media technology. The emerging social media technology can be used and integrated with traditional emergency information management systems for disseminating disaster information (American Red Cross 2011, White 2011, Eustace & Alam 2012). Social media can also be used for sourcing real-time crisis information and intelligence (Gupta & Brooks 2013). Despite these potential benefits, the emergency management industry should proceed with great caution when considering the adoption of a specific social media platform for emergency information management.

There are a number of social media tools (e.g. Twitter, Facebook), however the challenge is how best to adopt these tools. Emergency management is an integrated multi-dimensional social system (Foster 2013). A social system can be described by using a social architecture lens (Gill *et al.* 2014, Gill 2013b). The emergency management sector should identify social architecture concerns that need to be addressed by the social media technology. The question is how are social architecture concerns best identified. This paper presents a set of social architecture concerns that can be used as a guide for identifying the context of social media adoption for emergency information management applications.

Social architecture

Social architecture is a part of the overall enterprise architecture. Enterprise architecture is a strategic discipline that describes the overall structure and behaviour of an enterprise in terms of its business, information, social, and IT architectures. A social architecture (based on ISO/IEC 42010) can be defined as the 'fundamental concepts or properties of a social system in its environment embodied in its elements, relationships, and in the principles of its design and evolution' (Gill 2013b). A social architecture lens can be used to describe the structure and behaviour of a human-centred social system (e.g. formal and informal communities of people), which emerges to share information and opinions by using conversational or social media tools (Safko & Brake 2010). There are a number of social media technologies that claim to support the social architecture of a social system. However, before jumping on the bandwagon of social media technology, we need to capture and understand the contemporary social architecture concerns (see Figure 1).

In order to address this important question a social architecture concern template that contains 21 concern categories is presented. The use of such a template ensures the important social architecture concerns are not overlooked when assessing a social media technology for emergency information management.
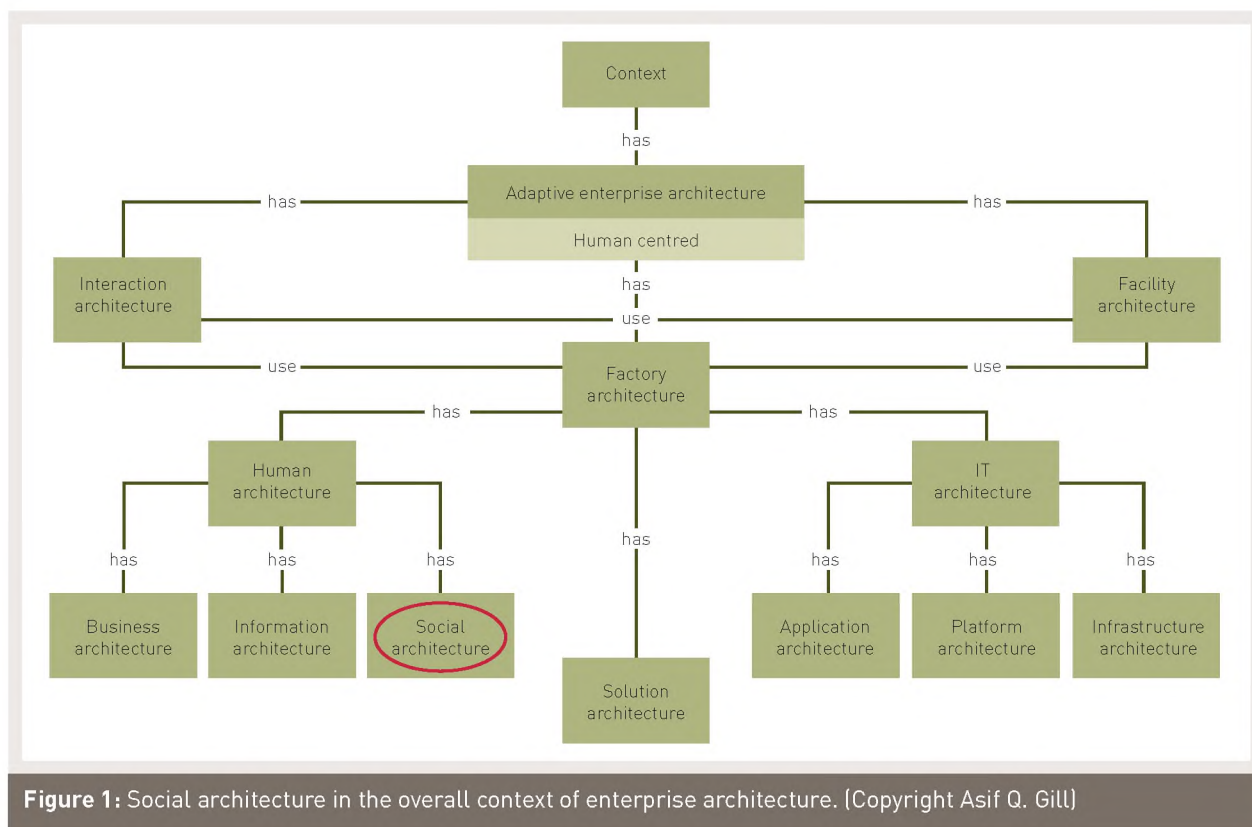
Figure 1: Social architecture in the overall context of enterprise architecture. (Copyright Asif Q. Gill)

Research design

The 21 social architecture concerns are based on an extensive literature review and disaster case studies. The social architecture concerns that arose are:

- Agility (Qumer & Henderson-Sellers 2008, Gill 2013a)

- Auditability (Vogel *et al.* 2011)

- Availability (Birmingham 2011)

- Integration (Starbird & Palen 2011)

- Interoperability (Starbird & Stamberger 2010)

- Localization (*The Advertiser* 2011)

- Mailing (Timson 2012)

- Management (Gill & Bunker 2012, Bunz 2010, Royal Commission Report 2011)

- Performance (NSW SES Report 2011)

- Privacy (Gill & Bunker 2012)

- Reliability (Gill & Bunker 2012)

- Resilience (COAG 2011)

- Reporting (Eeles 2005)

- Right Information (Royal Commission Report 2011)

- Right People (*The Advertiser* 2011)

- Right Time (Starbird & Palen 2011)

- Security (Price 2008)

- Scalability (Starbird & Palen 2011)

- Supportability (Eeles 2005)

- Usability (*The Advertiser* 2011)

- Metering (Gill & Bunker 2012)

This review was conducted within the overall context of design research (Hevner *et al.* 2004). Design research is a method that is concerned with the design and development of novel artefacts or templates that aim to solve practical problems. The identified 21 social architecture concerns are configured into a 'Social Architecture Concern Template' (see Table 1). These 21 concerns will be further investigated for developing and evaluating a comprehensive 'Social Reference Architecture' for emergency information management. The Social Reference Architecture will be used to achieve the following outcomes:

- assess and understand the potential impact of new and emerging social technologies for the effective and timely dissemination of risk information communication and warnings

- assess and understand the effectiveness of current warning mechanisms

- develop best practice approaches to guide the design of resilient and agile information architecture for creating and disseminating warnings, and

- develop social technology adoption roadmaps for emergency information management.

Social architecture concern template

Table 1 lists the 21 social architecture concerns and the criteria by which assessment takes place. The template provides a set of concerns and related assessment criteria questions that can be used by agencies for assessing the social media technology capabilities in the context of emergency information management.

Table 1: Social Architecture Concern Template.

Item	Concern	Assessment criteria
1	Agility	Does it support dynamic emergency information communication needs?
2	Auditability	Does it allow accessing and inspecting the communication logs?
3	Availability	Does it support specific system availability needs?
4	Integration	Does it allow integrating with existing emergency management information systems?
5	Interoperability	Does it support information interoperability needs?
6	Localisation	Does it support information localisation needs?
7	Mailing	Does it support email communication?
8	Management	Does it support social media management practices?
9	Performance	Does it support context specific system performance needs?
10	Privacy	Does it allow control of access to crisis information?
11	Reliability	Does it support a reliable information management and sharing environment?
12	Resilience	Does it operate well under stress and adapt and recover from a failure or disaster state?
13	Reporting	Does it allow generation of reports?
14	Right Information	Does it allow assessment of information accuracy?
15	Right People	Does it allow assessment of source and destination accuracy?
16	Right Time	Does it allow assessment of the trustworthiness of the information?
17	Security	Does it offer the capacity to handle security breaches?
18	Scalability	Does it offer the capacity to scale-up and scale-down to meet contextual communication needs?
19	Supportability	Is it testable, adaptable, maintainable, compatible, and configurable to a specific context?
20	Usability	Is it easy to use?
21	Metering	Does it allow the monitoring and measurement of social media use?

Agility

Social media platforms (e.g. Twitter or Facebook) may provide the ability to accommodate diverse and changing emergency management information communication needs in the context of disaster prevention and management.

Auditability

Social media platforms may provide emergency management stakeholders access to inspect communication history logs to resolve any conflicts and to meet information audit and compliance requirements.

Availability

Agency personnel and community members may not be able to access and post information if social media channels are shut down due to the loss of internet connection or some other reason. Emergency management stakeholders should be able to access social media platforms and related crisis information (e.g. posted via social media websites) without interruptions.

Integration

Social media platforms should integrate with existing emergency information management systems. Integration between social media platforms and emergency information management systems can be achieved via API or Web Service calls.

Interoperability

Interoperability refers to the need for information sharing between the social media platforms and existing, traditional emergency information management systems. Social media platforms and emergency information management systems should be able to exchange information.

Localisation

Australia is a multicultural nation where people have diverse backgrounds and speak different languages. Therefore, emergency information management systems should support different community groups and provide multi-language support. Use of social media platforms should allow agencies to source, translate and distribute emergency information in multiple languages.

Mailing

Social media platform channels should enable users to send and receive emails in addition to real-time posting of crisis information via tweets or Facebook messages.

Management

We need to clearly define strategies, policies and processes for monitoring, managing, and governing emergency information. For instance, attention should be given to the location and terms of the social media providers who may be subject to different regulations (e.g. USA Patriot Act).

Performance

Performance refers to the scalability of the social media platform to increase its capacity to operate effectively during an emergency situation. The social media platform response can be measured in terms of time units (e.g. usually in seconds), which is critical for timely crisis information communication.

Privacy

Social media platforms should allow emergency management stakeholders to manage access and control to crisis information (e.g. posted via social media websites). This refers to the need to understand critical questions such as: Who owns the information posted on social media (emergency management stakeholders or social media providers)? Who has the right to grant permission and share information via social media platforms?

Reliability

Social media provides a public cloud-based shared information management platform, which can be used by different agencies and individuals around the world. Reliability refers to the capacity of the social media host to assure that the information related to one situation is not mixed with the information related to an entirely different one.

Resilience

Social media platforms may stop working. Resilience is the ability of social media platform to operate well under stress, and to adapt and recover quickly from a failure or disaster state.

Reporting

Social media platforms should allow agencies to run reports on their information. Agencies should be able to use the reporting capability of the social media platform to gather emergency intelligence.

Right information

Community members can publish incorrect information and spread rumors via social media platforms. Social media platforms should provide the capability to detect maliciously generated information. Additional resources for monitoring, updating, correcting and preventing the posting of incorrect information on social media platforms must be considered.

Right people

It is critical that information is coming *from* the right people and that it is being communicated *to* the right people via social media platforms. Maintaining trustworthy communication channels is particularly important during times of emergency.

Right time

The sourcing, translation, and distribution of large volumes of unstructured social media data may delay communication. The value of social media information is to get the right information from the right people and then quickly communicate it to the right people (with access to or using social media) at the right time to support effective decision-making during an emergency.

Security

Security refers to the capability of social media platforms to handle security breaches. Security threats include malware (e.g. a malicious software), group attacks (e.g. manipulating the social media accounts of agencies), and distributed denial-of-service attacks (e.g. flooding a social media channel with repeated postings). Security-related concerns must be identified and addressed when using social media platforms for emergency information management.

Scalability

Social media platforms should have the ability to scale-up and scale-down in response to changing contextual information communication needs. For instance, Twitter is a social media platform that allows sending a message of only (maximum) 140 characters. This means that any message more than 140 characters cannot be sent via Twitter. Short messages can be posted on the social media platforms, and detailed information linked to the short Twitter message can be posted on the emergency information websites. It is important to note here that social media platforms and emergency information websites are subject to problems or crashes.

Supportability

Supportability refers to the extent to which a social media platform can be tested, adapted, maintained, is compatible, and is configurable. These characteristics can be used to assess social media platforms for use in emergency situations.

Usability

Usability refers to the user interface of the social media platform. Social media use is generally associated with young people, however its effective use, particularly in times of emergency response, has extended its penetration to other age groups. It is important to understand the adoption of social media platforms in the broader context of the population.

Metering

Metering refers to the capability to track and measure the use of social media platforms during emergency management activities. This would highlight the use of

social media platforms for informing communities and sourcing intelligence during emergencies.

Discussion

The assessment criteria questions listed in the social architecture concern template can be used to guide the assessment of social media tools for emergency management applications. Emergency managers and communicators, based on their own experience and knowledge, may add additional social media assessment criteria questions to better address the individual situation. The social architecture concern template does not provide an exhaustive list of concerns. What is does provide is a baseline from which the value of the use of social media channels can be assessed.

Conclusion

This paper presented a social architecture concern template. This template provides insights into the important socio-technical information needs of agencies and individuals that must be addressed when considering adopting social media platforms. The social architecture concern template aims to reduce uncertainties and can be used as a guide by agencies and communities in systematically assessing a specific social media channel for emergency information management. In summary, social media platforms are just another system that can be integrated with existing emergency information management systems for sourcing and sharing emergency information.

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About the author

Dr. Asif Qumer Gill is a Lecturer in the Faculty of Engineering and Information Technology at the University of Technology, Sydney. He specialises in agile methods, enterprise architecture, modelling and transformation. He is also an independent ICT industry research analyst and consultant. He can be reached at asif.gill@uts.edu.au.