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DISASTER MANAGEMENT: BUILDING RESILIENT SYSTEMS TO AID RECOVERY

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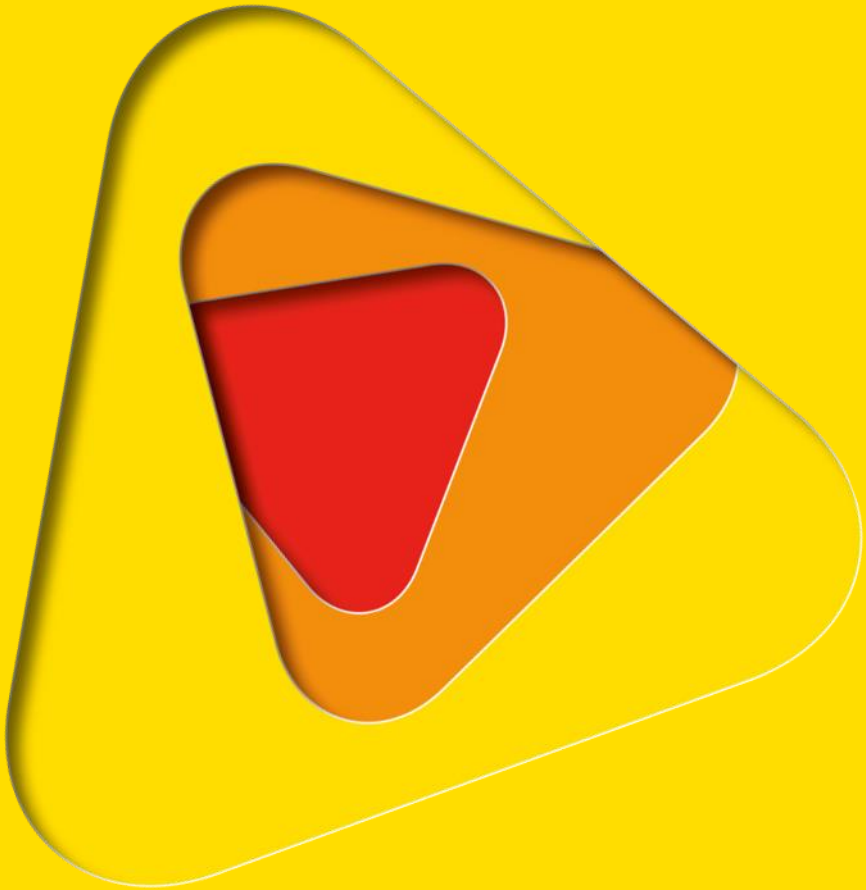

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INTRODUCTION

Developments in open innovation platforms, mobile phones and portable computers have enhanced communication, collaboration and location of people, places and resources, while facilitating societal transformation and self-organising capability on an unprecedented scale. Communities have been able to "self organise" like never before and have become major participants in, and facilitators of disaster recovery operations in the Haiti Earthquake (2010), Christchurch Earthquake (2010/11), Japanese Tsunami (2011) and the Queensland, NSW and Victorian Floods of (2011/12). Case studies of these incidents provide numerous examples where self-organizing groups of citizens supported and supplemented government efforts. While genuinely attempting to render assistance in the recovery process, these self-organising groups and the systems they have created, have sometimes been misguided, inappropriate and dangerous due to their lack of integration with coordinated government, NGO and community view of recovery activities and systems.

We examine how to best harness the principles of self-organising systems to augment traditional "command and control" pictures of disaster recovery in order to more effectively develop an integrated approach to: situational awareness, resource utilization and recovery outcome optimization. This is a very important, costly and complex problem for government and one that is currently significantly under-researched. In order for this problem to be effectively tackled in the current context of social transformation, the best of command and control approaches and structures must be considered and blended with the potential that is arising from emerging self-organising systems.

This study outlines the results of a 1-day Resilient Disaster Systems Symposium that was held with an experienced academic, agency and NGO audience where key issues in disaster recovery and suggested areas of focus were generated. These key issues were then examined utilising the theory of evolving organisations and systems archetypes, so as to better understand guiding principles for developing effective and resilient systems solutions.

BACKGROUND

Most emergency agencies use their own currently proven processes, technologies and information systems to optimize outcomes and get value for money. These processes, technologies and systems are utilized with varying degrees of success and effectiveness (Bunker & Smith, 1999, Betts, 2003, Levine & Woody, 2010) in the various phases of a disaster. For example, Bunker et al. (2013a) highlight lessons learned from the 9/11 Terrorist Attacks (2001), Hurricane Katrina (2005) and the Black Saturday Bushfires (2009) which show that all phases of disaster management suffer from: 1) incompatibility of local responses together with a lack of central global management; 2) a lack of centralized oversight and sense of common purpose at a local level resulting in poor resource management; 3) "paralysis" of government agencies not wanting to be seen as complicating and over-reacting to the disaster or wasting resources; and 4) little coordinated oversight of individual agency "command and control" structures, processes and systems which prohibited the effective sharing of situational awareness at a central or local level.

COMMAND AND CONTROL PICTURES IN DISASTER MANAGEMENT

During crises and disasters, traditional command and control processes and systems are used to develop situational awareness during a disaster. The Prevent, Prepare, Respond and Recover (PPRR)[1]

[1] As outlined in EMERGENCY MANAGEMENT IN AUSTRALIA CONCEPTS AND PRINCIPLES MANUAL NUMBER 1 © Commonwealth of Australia 2004 ISBN 0-9750474-6-9

protocol provides a common strategy and a backdrop for the development of this situational awareness.

We argue that in most disasters or crises, agencies need to supplement their command and control pictures with dynamic, local situational awareness as a command and control view of a disaster does not easily accommodate a range of representations of the disaster scenario or its dynamic nature. It also does not account for multiple stakeholders needing adequate information to collaborate at a central and/or local levels.

SELF ORGANISATION, OPEN INNOVATION AND THE RISE OF THE "SPONTANEOUS" VOLUNTEERS

We are seeing an emerging trend for individuals and groups (spontaneous volunteers) to "take matters into their own hands" to self-organize and assist in recovery efforts. Open innovation tools and social media platforms (Facebook and Twitter), mapping (Ushahidi and Google) and wiki and mash-up technologies; have enabled many-to-many communication for self-organisation, coordination and collaboration (Mingers 2002, 2004). For example we have seen the:

- Adoption of cloud-based, freely-available collaborative technologies by ENGOs, for ecocollaboration activities of ENGOs (Aoun et al., 2011). These collaboration technologies were used in a structurally dynamic manner depending on the NGO national context (Thai, Lebanese and Australian); and
- Adoption and use of open social media platforms for dynamic communication, co-ordination and collaboration activities during the civil uprising of the "Arab Spring" i.e. Iran 2009/10, Tunisia 2010/11 and Egypt 2011 (Bunker 2011) and the current uprising in the Ukraine and Crimea 2014.

As a general rule, emergency agencies have direct control, governance and assurance over the information within their internal operational "command and control" systems, throughout all phases of a disaster. They must now deal with the proliferation of information generated by individuals and groups using open innovation tools and platforms. Indeed, in order to ensure successful outcomes during disaster recovery, it is imperative that citizens are providing information to, and receiving information from, government agencies (Sydney Alliance, September 14, 2011). For example, during the 2011 Queensland Floods, there were reports of the difficulties engaging with local communities to incorporate local knowledge on floods, into the COP of government agency decision makers. This may have contributed to the loss of life and property for some communities (Campbell, 2011).

A CASE IN DISASTER RECOVERY

The SVA and their self-organised disaster recovery role in the wake of the Christchurch earthquakes, is one of many cases which motivate us to examine how to best augment the command and control picture of disaster recovery in order to more effectively: develop situational awareness, utilize resources and optimize recovery outcomes. The SVA was formed through the use of social media in the wake of the Christchurch earthquakes (September 2010 to June 2011). Bunker et al. (2013b) studied and analysed the first few weeks of Facebook and Twitter activity by the SVA after the February 2011 Christchurch Earthquake (the major disaster event in the earthquake series throughout 2010/2011). This analysis highlighted the power of harnessing community ethos, goodwill, motivation and momentum through the establishment of concepts, descriptions, rules and communications as the prime focus of interactions between the SVA and disaster management agencies. As is indicated by the findings of this case analysis, we argue that the best of command and control approaches must

be supplemented with the potential that is arising from such emerging self-organising systems. A command and control picture enables a centralized view and the integration of agency and organisational systems, whilst individuals and groups (local and remote) are enabled by open innovation platforms to self-organize, coordinate and collaborate as never before.

CURRENT RESEARCH PROJECTS

We are aware that government agencies have been incorporating social media tools and platforms into general operations and the management of disasters and crises as diverse as floods, bushfires, earthquakes and terrorist bombings (Bunker, 2011, Ehnis & Bunker, 2012, 2013, Bunker et al. 2013b). This use of social media by government occurs across many portfolios: engineering, communications, agriculture, animal management, health, transport and defence at local, state and federal levels as well as internationally. Current examples include: NSW Police EyeWatch[2]; Australian National Security Website and Monitor Centre[3] and international cooperation in local disasters by Sahana Software Foundation and the IBM Disaster team[4], as well as within volunteer organisations attended by the UN and Red Cross.

In recent years Sahana has been somewhat effective in China, Pakistan, Philippines, Peru, NZ (Christchurch Earthquake 2010/11), and New York (Hurricane Sandy 2013) in collaborating efforts of volunteers, NGOs and government organisations. Within the open innovation platform and tool development space, there have also been many development activities, for example Ushahidi[5].

SETTING AN AGENDA

From our initial analysis we can see that command and control pictures and self-organising systems are at work in disaster recovery situations and as discussed, both can help and hinder recovery efforts, but both are still essential if we are to build resilient systems to aid in any recovery effort.

RESILIENT DISASTER SYSTEMS SYMPOSIUM

The symposium was conducted over one day and involved representatives of all of the major metropolitan Sydney universities as well as a cross section of government agencies and NGOs. The aim of the symposium was for agency and NGO representatives to present some major aspect of their disaster management operations and engage with the academic audience on identifying key issues in disaster recovery that required focus and problem solving. There were 35 participants in total as well as a facilitator who kept symposium presenters to time as well as managing the day's proceedings.

OUR RESEARCH METHODOLOGY AND APPROACH

Output from the Symposium was generated collaboratively by speakers and the audience and was documented and presented at the end of the day's activities. The data gathering followed 3 steps:

1. Presentation by each speaker followed by a general discussion (notes were taken by 3 of our research team while this occurred);

[2]www.police.nsw.gov.au/about_us/structure/specialist_operations/operational_communications_and_information_group/project_eyewatch
[3] www.nationalsecurity.gov.au/
[4] http://sahanafoundation.org/
[5] http://www.ushahidi.com/

2. Generation of a list of discussion points identified by each presenter and the audience in the general discussion; and
3. Presentation of these discussion points to the presenters and audience for further comment.

In order to effectively interpret this output we have employed a traditional problem solving approach which includes: 1) a critical review of the practical body of knowledge and how this links to our current understanding of theory; 2) data gathering from primary sources (in this case the symposium participants); and 3) data analysis using thematic and pattern analysis.

THE RESULTS

Our analysis indicates that there are 5 major areas of concern for practitioners and academics that if better understood through joint research and development activities, would assist in the building of more resilient disaster recovery systems for use by agencies, NGO's and communities. As researchers and practitioners we should focus on the further development and integration of our knowledge about:

- The "system of systems" i.e what is available in formal command and control systems but also what is "at hand" in general consumer technologies and self-organizing systems and how can both of these be better integrated?
- How communities and societies behave in relation to resilient disaster recovery?
- Current government approaches and policy on disaster recovery and how this facilitates or impedes the integration of command and control and self-organizing systems to produce resilient disaster recovery systems?
- The impact of self-organizing systems (operations) on agency operations and what practical steps can be taken to integrate the two?
- What knowledge sharing and situational awareness mechanisms do both command and control and self-organizing systems have and how can we learn from these mechanisms to improve and optimise disaster recovery?

Our full paper examines these 5 areas in detail through the research focus of evolving organisations (Star and Levine, 2006) utilising the mechanism of systems archetypes (Novak and Levine 2010).

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