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PRACTICAL DECISION TOOLS FOR IMPROVED DECISION-MAKING IN COMPLEX SITUATIONS

Chris Bearman[1,3], Benjamin Brooks[2,3] and Christine Owen[2,3]
[1]Central Queensland University
[2]University of Tasmania
[3]Bushfire and Natural Hazards CRC

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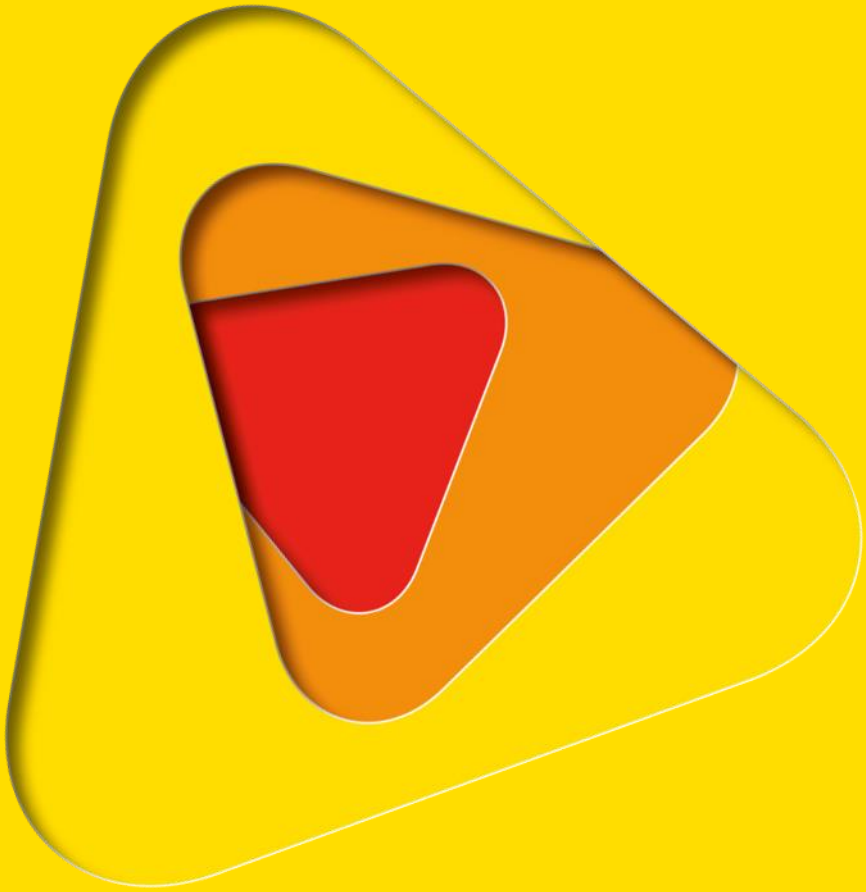

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Practical Decision Tools for Improved Decision-Making in Complex Situations

Chris Bearman[1], Benjamin Brooks[2] & Christine Owen[3]

[1]Central Queensland University, Appleton Institute

[2]University of Tasmania, Australian Maritime College

[3]University of Tasmania, Faculty of Education

What is the Problem?

There is increasing pressure on agencies from larger-scale natural hazards, financial constraints and declining volunteer numbers. As a consequence response and recovery is becoming more complex. These more complex operational situations exert pressure on people that may lead to an increased frequency of degraded situations, breakdowns in team coordination and the occurrence of errors. It is important then to develop ways to help people cope in these more complex situations and to provide strategies to facilitate operational recovery following breakdowns or errors.

Why is it Important?

As the complexity of operational situations increases it is necessary to develop enhanced ways for people to be able to manage in such situations. If people are overwhelmed they are more prone to errors and breakdowns in coordination, which may ultimately impair task performance and degrade the operational response or recovery effort. Increasingly the response to large-scale emergencies is occurring in the context of decreasing tolerance in the community and political spheres to emergency management coordination failure.

How are we going to solve it?

The objectives of the project are to develop practical ways to help people cope in complex situations and to better recover from breakdowns and errors. Thus this project seeks to develop cognitive decision tools and heuristics that can be used to enhance strategic level decision making in complex situations. This will include constructing straightforward ways for strategic level managers to track the performance of teams they are responsible for to ensure the team is not operating at the edges of safety. In addition, we will develop a set of process-based measures for agencies to measure operational performance.

Introduction and Project Outline:

Evidence from inquiries into major disasters, as well as government-based policy research suggests that incidents associated with natural hazards are increasing in complexity, duration, and require involvement of an increasing number of agencies (cf. Owen, Bearman, Brooks, Chapman, Paton, & Hossain, 2013). At the same time financial constraints from government, declining volunteer numbers, an aging workforce and workforce restructuring are presenting agencies with significant challenges. Together these factors have the potential to compromise the effectiveness of an agency's capacity to respond and recover to emergencies. As a consequence during response and recovery efforts, there is likely to be an increased frequency of degraded situations, breakdowns within and between teams and the occurrence of errors. These problems will play out within the context of a decreasing tolerance in the community and their political representatives to emergency management coordination failure.

In response to the challenges presented by complex, time-constrained and multi-team environments, related industries (such as the aviation industry, the rail industry and the military) have responded by developing practical cognitive decision tools and heuristics to support decision making. Examples of practical cognitive decision tools are: checklists, strategies that can be used to enhance reframing (changing perspective), visual maps of mental-model information flows that can be used in training and in orientation, heuristics (simple decision-rules), and mental simulations that can be used in training and in practice. The use of checklists, for example, has led to significant improvements in risk management in clinical handovers in hospitals (Raduma-Tomas et al., 2011) and mental simulation has led to improvements in the recognition of cues leading to imminent building collapse in urban fire fighting (Klein, 1997). There has also been cross-industry learning transfer. Catchpole et.al. (2007) adapted strategies from Formula 1 pit-stop teams and aviation training captains to patient handovers. This reduced technical errors by 40% without any associated increase in the duration of the handover. These cognitive decision tools provide ways for individuals and teams to manage complexity, help reduce workload, improve situation awareness, and to identify, cope and recover from degraded situations (such as those caused by breakdowns and errors).

Agencies continue to grapple with the challenges of complex, time-pressured, multi-team environments and some have developed strategies to help manage some of the problems. However, there has typically been limited evaluation of such interventions and some agencies are further ahead on the "journey" than others. There is still much work to do in this area. The research in this project is developing a suite of practical cognitive decision tools that can help people at strategic levels of emergency management deal with the increasingly complex, time-pressured and multi-team situations.

An important set of tools and heuristics that need to be developed are those that allow strategic level supervisors to track the performance of individuals and teams they are supervising. This kind of performance tracking allows managers to determine how individuals and teams are performing in real time and to identify any problems they are experiencing. If a problem is detected, changes can be made to the operational response to better support those individuals and teams (such as providing assistance, providing more resources or reallocating workload). Like the use of cognitive decision tools, real-time performance monitoring can be inconsistently applied and sometimes neglected in large-scale emergencies, where it may be needed most (Brooks et al., 2013). Examples of performance measures that have been developed in other high-risk industries are: self-reported measures of workload, simple metrics for team cohesion or quick assessments of the state of the incident management system. For example, battlefield indicators of team coordination breakdowns in a military setting (Wilson et al., 2007) have led to significant improvements in dynamic risk management and quick self-reported measures of fatigue risk in rail industry employees have been

demonstrated as effective predictors of actual fatigue, which can then be mitigated (Dorrian et.al. 2011). These performance indicators therefore have the potential to detect cues that may indicate a developing issue and serve to enhance real-time organizational flexibility, safety and resilience.

The development of such tools can also be further refined to objectively measure operational performance by, for example independent assessors. Such measures (known as LOSA in aviation and CORRS in rail) have been used as an important way of ensuring that drift away from effective safety procedures does not occur (Helmreich et al., 1999). These kinds of measures provide a process measure of performance, rather than the more common outcome measures. Outcome measures in the context of emergency management (e.g. number of houses lost, area of land burnt) are problematic in evaluating performance because they can be subject to uncontrollable events and are thus not necessarily indicative of operational performance. The development of process measures is an important way for agencies to evaluate their performance during and after an event so that they are better able to control their evaluation by external bodies (such as the media and Royal Commissions) and to manage community expectations.

What's been happening

This project has only recently started. We have recruited all of the project participants and have secured ethics approval for the first stage of data collection.

The initial phases of the project are designed to allow us to engage with our industry partners to determine their needs, requirements and current practice (if any) in the three key project areas. Towards this aim we have had initial discussions with all thirteen of our end user participants. Initial fieldwork with NSW SES has been completed and fieldwork with QFES is in progress. We have also begun to have face-to-face meetings with these industry partners, have had a well attended end-user workshop at the research forum and have begun collecting data that will contribute to a report on the current practice, needs and requirements around cognitive decision tools, team monitoring tools and process based performance metrics. We have also had the opportunity to make field trips to observe simulated emergencies in Tasmania and Queensland and a planned burn in South Australia.

We have also been examining the data collected through our previous Bushfire CRC sponsored research project (entitled Organizing for Effective Incident Management) to determine relevant information that can be used in the current project. The analysis of this data has formed the basis of a successful presentation submission to the AFAC 2014 conference to be held in Wellington, New Zealand. We are also currently working on a manuscript, which we expect to submit to a peer-review journal towards the end of 2014.

Publication list:

Owen, C., Bearman, C., & Brooks, B. (2014). Challenges of measuring emergency management performance under adversity: The good the bad the ugly. Presentation at AFAC. Wellington, NZ. Sept 2nd-5th.

Owen, C., Bearman, C., & Brooks, B. (2014). Practical decision tools for improved decision-making in complex time-constrained and multi-team environments. Poster at AFAC. Wellington, NZ. Sept 2nd-5th.

List of current integrated project team members:

Dr Chris Bearman (Central Queensland University) – Lead Researcher
Dr Benjamin Brooks (University of Tasmania) - Researcher
Dr Christine Owen (Central Queensland University) – Researcher
Mr Steve Curnin (University of Tasmania), Research Assistant
Keith Fitzgerald (NSW SES) – Lead End User
Jeremy Smith (TFS) – End User
John Santiago (Red Cross) – End User
Alen Slijepcevic (CFA) – End User
Mike Grant (NZ SRFA) – End User
Andrew Lawson (CFS) – End User
Mike Wouters (DEWNR) – End User
Phil Robeson (NSW FRS) – End User
Bruce Budge (QFRS) – End User
Matt Harper (AG) – End User
Chris Irvine (TAS SES) – End User
Mark Swiney (Metropolitan Fire Brigade Vic) – End User
David Launders (SA MFS) – End User

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