

FIRE NOTE

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ORGANISING FOR HIGH RELIABILITY IN EMERGENCY MANAGEMENT: AN EMPIRICAL LINK

The 2008 AIIMS questionnaire was, in part, designed to empirically test the extent of any links between the organising principles underpinning so-called high reliability organisations and teamwork practices of those involved in managing fire and emergency incidents. Few if any studies have attempted to do this, despite the fact that in the United States, fire and emergency management agencies are enthusiastically embracing the principles of High Reliability Organising (HRO).

BACKGROUND

To obtain consistently good results in fire and emergency management, there is a clear need to “manage the unexpected”. Even minor lapses or mistakes can lead to untenable losses. For Weick and Sutcliffe (2001), organising for “high reliability” means that organisations need to be more aware of their capabilities and of what “managing the unexpected” might mean for operational personnel. The principles underpinning HRO are being enthusiastically embraced in emergency management across the United States (for an outline of the HRO principles, see Table 1, page 2).

Organising for high reliability is obviously also important in Australia. The intent of AIIMS (and CIMS in New Zealand) is to provide a framework that allows the core unit, the Incident Management Team, to expand as the incident grows in size or complexity.

There has been virtually no research to empirically test (a) how much an AIIMS structured organisation might align with the principles of organising for high reliability, or (b) establish what links may exist between HRO principles and the capacity of personnel to adapt while still attaining high quality performance. To have relevance within Australian agencies it is imperative that the benefits, if any, of HRO within work practices be established. This research is one of the first studies to make this possible.

SUMMARY

Australian emergency agencies aim to be high reliability organisations – that is, to be consistently relatively error-free and make consistently good decisions which result in high quality and reliable operations. To this end, they use an emergency management system known as AIIMS – **Australasian Inter-service Incident Management System**, designed to enable the integration of activities and resources from several agencies – when responding to critical incidents.

This *Fire Note* reports on an investigation into the principles supporting **high reliability organising (HRO)** and adaptive teamwork practices in the management of fire and emergencies in Australia and New Zealand.

Personnel were asked to report on an incident they were involved with and give their assessment of the AIIMS processes at work. They were also asked about the teamwork practices they might have experienced. Respondents included people on the ground at the fire or other emergency, Incident Management Teams, and staff in regional and state coordination centres. The findings demonstrate that AIIMS is necessary but not sufficient on its own for organisations to achieve HRO.

When AIIMS-endorsed practices also include high degrees of **distributed sensemaking (the actions members in different groups and/or locations take to make meaning of a situation)** and **flexibility (in the actions personnel are able to take themselves)**, personnel report better information flow and manifestly fewer problems doing their job. These findings demonstrate an empirical link between certain emergency incident management practices and high reliability organising.



BUSHFIRE CRC RESEARCH

Two questions were asked:

1. How much do incident management personnel follow the principles of high reliability organising when interacting with others involved in emergency incident management?
2. When they do so, does this make a difference to incident management performance?

The researchers used indicators drawn from

ABOUT THIS PROJECT

Project D5, Information Flow and Incident Management Team Effectiveness, is part of Bushfire CRC Program D: Protection of People and Property.

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the literature to develop examples for the questionnaire that demonstrated the HRO concepts (see Table 2, page 3). Successful performance was measured in two ways:

- Whether they had high scores on a scale measuring quality of information available
- Whether people reported they were able to effectively do their job (or conversely whether there were inhibiting factors in this regard which resulted in unsuccessful performance).

The questionnaire was completed by 543 people in different layers within the AIIMS structure – 109 (19%) worked directly on the fire or other incident, 375 (65%) were in Incident Management Teams (IMT), and 59 (10%) were engaged in regional or state-level coordination. Of those in IMT, 112 (19%) were incident controllers or deputy incident controllers, 96 (17%) were in Operations, 107 (18%) were in Planning, and 60 (10%) were in Logistics. The average number of years respondents had acted in their respective roles was nine to 13 years.

Respondents were asked to give their perceptions on a range of indicators of information flow and teamwork within the AIIMS system. They were asked to think about one incident and to identify:

- The characteristics of that incident
- Whether they received a briefing or incident action plan
- Whether particular risk management and assessment tools were in use
- Whether particular teamwork indicators were in use.

The researchers believed that the degree to which AIIMS procedures would use the principles of Weick and Sutcliffe's HRO model would, in part, be most obvious in personal interactions. Since interactions within Incident Management Teams and teams on the ground at critical incidents is frequently identified as a weak link, they were particularly interested in investigating interactions at these levels in the Incident Control System.

RESEARCH OUTCOMES

The AIIMS system contains a number of embedded practices that support the principles of HRO. For example, being systematic in having a briefing that covers key elements identified to be important, having an Incident Action Plan and having charge over arrangements to ensure continuity of knowledge. The results show that these practices are widely used.

However, weaknesses were also reported. Only one third of people reported that the briefing or the incident action plan included

Table 1: HRO principles (source: Wilson, Burke, Priest & Salas, 2005)

HRO value	Organisational level concern
1. Pre-occupation with failure	<ul style="list-style-type: none"> • Encourage error reporting • Accept human error as inevitable • Obsession with avoiding overconfidence
2. Reluctance to simplify	<ul style="list-style-type: none"> • Unwillingness to simplify a situation • Create more complete pictures of situations • Encourage spanning of boundaries, negotiating, scepticism and differences in opinions
3. Sensitivity to operations	<ul style="list-style-type: none"> • Ongoing concern with the unexpected • Attentiveness to those on the front line • Acknowledgement that the cause of an accident is often not the result of a single active error but rather multiple slips and lapses that can be latent (present but inactive) in the system
4. Commitment to resilience	<ul style="list-style-type: none"> • Ability to identify, control, and recover from errors • Errors and failures kept small • Practice worse case scenarios • Develop strategies to expect and react to the unexpected
5. Deference to expertise	<ul style="list-style-type: none"> • Encourages communication of expertise from all levels • Decisions made on the front line • Migrate decision-making to its lowest possible level • Cultivate diversity

END USER STATEMENT

"This project provides an important connection between High Reliability Organising and what we can do to be effective in emergency incident management. It is important that fire managers in particular understand how to enable HRO when involved in a fire. This is a project of national significance. Developing organisational systems and strategies that support high reliability organising is critical. The findings will help agencies to better respond in fire and emergency events."

– **Craige Brown,**
Assistant Chief Officer
Operations Support,
Fire and Emergency Management,
Department of Sustainability and
Environment

any reference to alternative strategies. In Level 3 incidents (i.e. the most complex), only 38% of people reported that the briefing included alternative strategies. This has implications for HRO because in HROs it is important that personnel are sensitive to operations so that they can pick up weak signals of things going wrong. Researchers also noticed in the data that the interaction indicators used to assess "preoccupation with failure" (see Table 1, this page) did not make a difference to reported performance.

The researchers specifically asked questions about the quality of IMT interactions on

the ground at the fire or incident. They then analysed the information using appropriate statistical procedures to establish whether there was an empirical link.

Using the items included in the questionnaire (see Table 2, page 3) the researchers computed an HRO interaction scale between IMT and ground crews – the IMT/Fire-Ground interaction scale – which included the two dimensions of distributed sensemaking (the actions members in different groups and/or locations take to make meaning of a situation) and flexibility (in the actions personnel are able to take themselves), and divided responses evenly into three groups: low, medium and high (i.e. respondents who gave high scores to the interaction items in Table 2 would be high on the HRO scale). The HRO scale was then used to predict other items measured in the questionnaire.

The scale significantly predicted responses on a Quality of Information scale (see Figure 1, page 4). Where respondents reported higher levels on the HRO scale they received higher quality information. There was also a positive association between measures on the HRO scale and answers to the question "Were there any factors that prevented you from effectively doing your job?". For example, more than half the people (52%) who reported low levels on the distributed sensemaking dimension between the IMT and the fire-ground also experienced obstacles to doing their job well. Conversely, people who had the highest scores on the distributed sensemaking dimension of the HRO scale reported that they did not

Table 2: Example of Items included in the AIIMS questionnaire as indicators of the HRO concepts

	HRO Principle (refer Table 1)	Research Outcome Dimensions
1. IMT and Fire/Incident Ground personnel exchanged information clearly and accurately.	2 Reluctance to simply interpretations, 3 Sensitivity to operations	1: Distributed Situation Awareness
2. IMT and Fire/Incident Ground personnel provided helpful advice to each other.	5 Deference to expertise	1: Distributed Situation Awareness
3. IMT and Fire/Incident Ground personnel provided constructive feedback to each other.	3 Sensitivity to operations, 5 Deference to expertise	1: Distributed Situation Awareness
4. IMT and Fire/Incident Ground personnel effectively monitored each other's performance.	3 Sensitivity to operations	1: Distributed Situation Awareness
6. IMT and Fire/Incident Ground personnel interacted in an open and honest manner.	3 Sensitivity to operations, 5 Deference to expertise	1: Distributed Situation Awareness
7. IMT and Fire/Incident Ground personnel kept each other well informed about work-related issues.	2 Reluctance to simply interpretations 3 Sensitivity to operations	1: Distributed Situation Awareness
8. IMT and Fire/Incident Ground personnel made genuine attempts to share information with each other	3 Sensitivity to operations, 5 Deference to expertise	1: Distributed Situation Awareness
9. In discussion between the IMT and the Fire/Incident Ground, potential weaknesses in what was being undertaken were critically appraised.	1 Pre-occupation with failure; 2 Reluctance to simply interpretations 3 Sensitivity to operations	1: Distributed Situation Awareness
10. IMT and Fire/Incident Ground personnel shared their individual knowledge with each other	3 Sensitivity to operations 5 Deference to expertise	1: Distributed Situation Awareness
11. IMT and Fire/Incident Ground personnel were able to state and maintain opinions openly with each other.	2 Reluctance to simply interpretations	1: Distributed Situation Awareness
13. Strategies were adjusted in a timely manner as the incident unfolded.	4 Commitment to resilience	2 Flexibility
14. IMT and Fire/Incident Ground personnel anticipated the needs of others.	3 Sensitivity to operations	2 Flexibility
15. Roles were effectively re-allocated as the situation changed.	4 Commitment to resilience	2 Flexibility
16. IMT and Fire/Incident Ground personnel interacted effectively with external stakeholders beyond the Fire/Incident Ground.	2 Reluctance to simply interpretations	2 Flexibility
18. IMT and Fire/Incident Ground personnel trusted each other.	2 Reluctance to simply interpretations 4 Commitment to resilience	2 Flexibility
20. When problems arose, IMT and Fire/Incident Ground personnel were able to recover quickly and get on with the job.	4 Commitment to resilience	2 Flexibility
21. IMT and Fire/Incident Ground personnel felt that they contributed to the decision making.	5 Deference to expertise	2 Flexibility

experience factors that prevented them from effectively doing their job.

The flexibility dimension showed similar results. People reporting higher levels of flexibility reported that they did not experience obstacles to doing their job.

The findings clearly demonstrate that when interactions between the IMT and those on the ground at the emergency have stronger elements of distributed sensemaking and flexibility then emergency personnel have better quality of information and manifestly fewer problems in doing their job. The results

also indicate that the flexibility and resilience required to respond to changing and unpredictable events is in part based on practices between the IMT and those at the coalface.

In conclusion, AIIMS provides a set of organisational processes that are necessary but not sufficient to provide high reliability organising. When personnel use the information flow tools (e.g. briefings, incident action plans, risk-assessment tools) and engage in high quality interaction that includes attention to distributed sensemaking and flexibility, then they begin to achieve HRO.

HOW COULD THE RESEARCH BE USED?

These insights can be used in three ways. First, the survey items can be used as baseline indicators with which agencies can identify a need for improvements and monitor their own performance. The data, including the baseline indicators and other scales, are being sent to agencies for their consideration. In this respect agencies will have measures they can use to assess the impact of any future change in organisational practice.

Second, agencies can also use the indicators to review their practices and evaluate how their policies and procedures support IMT Fire or

REFERENCES/ FURTHER READING

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Incident Ground interaction. For example, to what degree are personnel currently able to reallocate roles within their respective teams (item #15 Table 2, page 3)?

Third, the findings can be translated into indicators for training and performance assessment that support development of the needed teamwork skills to enable HRO.

FUTURE DIRECTIONS

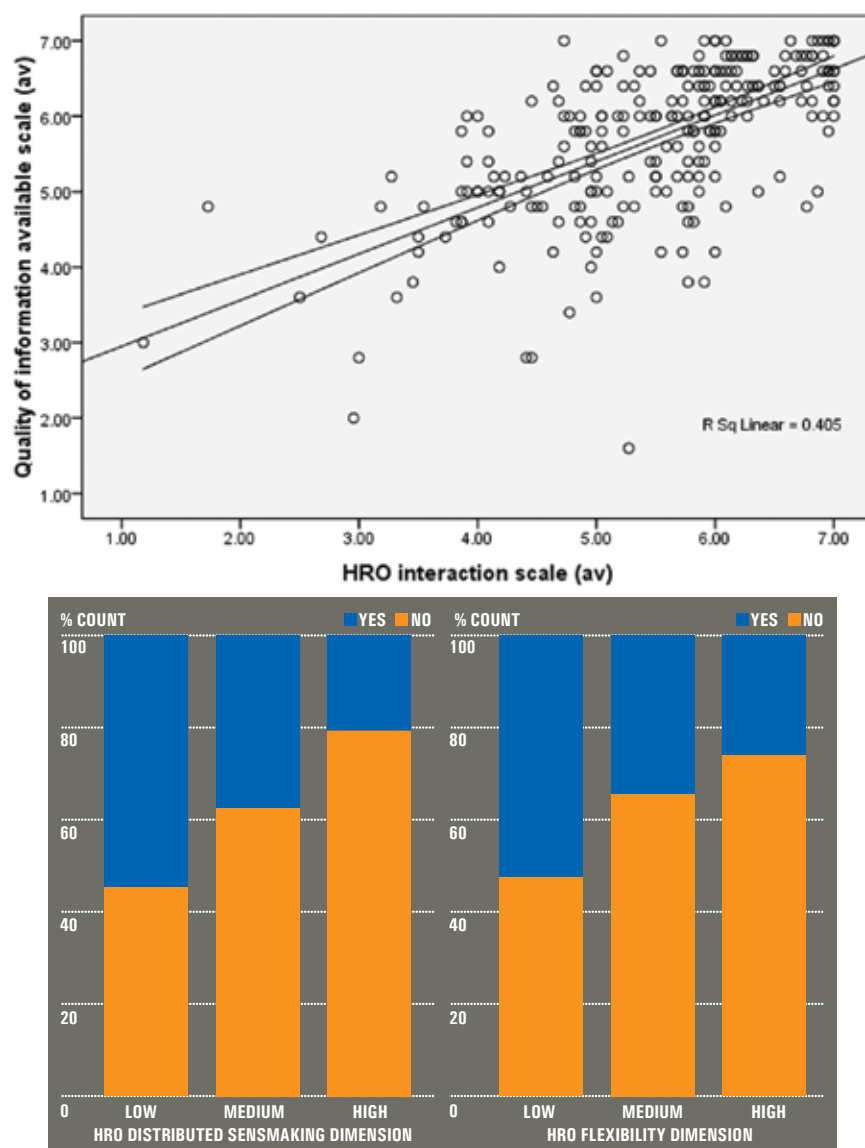
There is a need to better understand how to support the development of adaptive expertise in people, organisational systems and technologies. For example, how might adaptation and improvisation be enabled during an escalating event? In what ways might the incident management system need

to "flex" to support the people managing the incident? And conversely, what skills and attributes are needed in those personnel to be able to adapt and make the most of the resources available in these conditions? What inhibits personnel and

systems from successfully doing so?

Given current predictions of the increased likelihood of more extreme weather events, a better understanding in the future of these sorts of communication and coordination issues is critical.

Figure 1: Link between HRO indicators and indicators of incident management performance



▲ Distribution of low, moderate and high scores on HRO dimensions by whether or not respondents experienced blockages to effectively being able to do their work.

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AFAC is the peak representative body for fire, emergency services and land management agencies in the Australasia region. It was established in 1993 and has 26 full and 10 affiliate members.