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Title: **The challenges and benefits of multi-agency response to bushfires**

Author: Greg Hickey

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# **The challenges and benefits of multi-agency response to bushfires**

Greg Hickey  
[Gregory.Hickey@utas.edu.au](mailto:Gregory.Hickey@utas.edu.au)

PhD candidate

University of Tasmania and Bushfire CRC

## Abstract

The diversity and number of organisations involved in bushfire management and mitigation provide both challenges and benefits to the efforts of the organisations involved. This paper is based on research currently being undertaken as part of a PhD research project which explores the issues of interoperability and integration in bushfire management and mitigation in Australia; with the emphasis on Victoria and Tasmania.

This research draws on data gathered from extensive interviews conducted with 45 experienced personnel from the eastern states of Australia with experience in Incident Management Team work and the preliminary findings of a national survey (conducted by the Bushfire CRC and the University of Tasmania) of fire responding personnel including IMT personnel, Division Commanders, Sector Commanders and Crew Leaders.

The intention of this paper is to identify the areas concerning interoperability which are problematic in facilitating an effective approach while highlighting those areas and aspects of the multi-agency approach which will enhance integration and response effectiveness when managing major incidents.

## Introduction

Increasingly, fire and land management agencies are required to share knowledge, information and technological and human resources. This historical process provides challenges to the agencies in terms of harnessing their disparate cultural, historical and organisational practices into a single cause. However, the organisational differences between agencies also provide opportunities for the agencies involved to gain exposure to other discourses, perspectives and approaches and adapt their own activities accordingly.

The multi-national military alliance NATO defines Interoperability as, ‘. . . the ability of systems, units or forces to provide services to and except services from other systems, units or forces and to use the service so exchanged to enable them to operate effectively together. . .’ (Warner 2003 p, 3) (Stewart et al 2004, p, 2) (Report of a French-German-UK-US Working Group 2000 pp 29) ‘. . . without altering or degrading the information exchanged’ (Clark and Jones 1999 p, 4)<sup>1</sup>

In bushfire management and mitigation low levels of interoperability is an issue *within* as well as *between* organisations (see Table 3 in Findings). The AIIMS organisational arrangements in place during a level 2 and/or 3 bushfire response stratifies inter and intra organisational relationships both horizontally and vertically. Effective interoperability requires not only effective transmission but the information being communicated also requires comprehension by those receiving it. Timely and/or concise information incorrectly interpreted and misunderstood in its effect may as well be late and inaccurate.

The purpose of this research is to develop a taxonomic frame work which can assist in the analysing of interoperability in the context described. By adopting a Cultural Historical Activity Theory approach discontinuities in the flow of information from one system to another are considered as developmental epiphenomena and

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<sup>1</sup> These papers are from a series of conferences by the name of the Command and Control Research and Technology Symposium. The papers are available at <http://www.dodccrp.org/>

conceptualised as contradictions, tensions and/ or disturbances. By adopting this theoretical and analytical approach, appropriate interventions can be developed where participants are given the opportunity to develop means with which to mediate the issues identified (Engestrom 2005) (Engestrom 2000).

## **Literature**

A search of national and international journals show that there is not a dearth of peer reviewed papers published that directly addresses the issue of interoperability. Where the issue is canvassed is often in an environment vastly different to that which this paper is concerned. Most papers published, where the issue is addressed directly are concerned with the ability of technological information systems to interoperate and exchange and process received information. These information technology papers do however offer some interesting insights into the nature of interoperability in other contexts. The issues identified in these papers have analogues in the context of organisational interoperability. Interoperability between information systems technology requires both the transmission of information and the ability for that information to subsequently be appropriately processed within the receiving technology. The receiving technology is required to process the information received in the manner that it was intended.

The need to transmit information, by what ever means, indicates the presence of a 'boundary'. Communication is a means by which spatial, temporal and physical boundaries can be traversed. Issues concerning interoperability are located around these delineating boundaries (see Table 3 in Findings).

Obstacles to personnel effectively communicating meaningful information also have implications for their ability to develop shared mental models which are considered critical in a teams ability to operate effectively as a team rather than a collective of individuals (Cannon-Bowers et al. 1993) (Langan-Fox et al. 2004). It is further suggested that having shared mental models also enables teams and team members to continue coordinating their activities when not in communication with each other (Cannon-Bowers et al. 1998).

Literature published on the issue of multi-organisational work in the area of Command and Control organisations, organisational networks, military coalitions and distributed work environments emphasises the importance of efficacious communication, information flow and shared understandings as critical in achieving high levels of interoperability. Interoperability is a two edged sword; it provides a greater range of perspectives, approaches and resources but also adds complexity to the organisational requirements (Warner 2003). In the published research on international emergency and disaster responses, such as terrorist attacks in both New York (Comfort & Kapucu 2005) and London (London Regional Resilience Forum 2006) and natural disasters such as floods (Courtois 2002), mudslides and cyclones and hurricanes, it has been found that multi-organisational forms of responding to such events is increasingly prevalent; as the approach both adopted and required. Consequently the role of information exchange and understanding are critical to an effective multi-organisational approach (Dawes et al. 2004) (Comfort & Kapucu 2005).

Interoperability has also become a major issue for multi-national military coalitions and as a consequence has received a lot of attention in terms of research. Research into military coalitions conceives of interoperability as consisting of two qualitatively different dimensions; technical and non-technical. Technical interoperability relates to the ability, or otherwise for information systems to interact with each other. Non-

technical interoperability relates to the human and organisational factors which concerns issues such as different cultures, organisational forms, levels of proficiency, variety of skills and nomenclatures. To distinguish between the two types of interoperability various writers describe non-technical interoperability as ‘cooperability’ (Clark & Jones 1999) (Report of a French-German-UK-US Working Group 2000) Stewart, K. Clarke,, Goillau, Verrall & Widdowson, 2004)<sup>2</sup>.

## The Sample

The findings in this paper are based on extensive semi-structured interviews (45-55 minutes duration) conducted with 40 personnel with experience in Incident Management Team work in the area of bushfire mitigation and management in Victoria and Tasmania.

Table 1 (below) provides an overview of the interview data used in this paper. Approximately two thirds of the respondents were from Victoria (CFA,DSE and MFB) and the remaining third from Tasmania (TFS and Parks and Wildlife).

**Table 1: The characteristics of the interview sample.**

State	Agency	Number of Interviewees
Victoria	Country Fire Authority (CFA)	8
	Department of Sustainability and Environment (DSE)	7
	Metropolitan Fire Board (MFB)	11
Tasmania	Parks and Wildlife (Tas Parks)	4
	Tasmanian Fire Service (TFS)	10

## The Method

The interviews were recorded and transcribed. The transcribed interviews were then ‘uploaded’ into the qualitative research software Nvivo™ for analysis. The interviews conducted were extensive and covered a number of issues in addition to that of interoperability. Table 2 (below) provides an overview of the ‘codes’ used in the analysis of the interview data. The codes used for this paper are ‘boundaries’ and ‘interagency aspects’.

## Findings

### *Challenges*

Table 2 (below) shows the distribution of interoperability themes which were reported by the interviewees. The numbers in the cells show the frequency with which the particular issue was mentioned. The numbers do not represent the number of individuals that mentioned the issue. The numbers represent the number of occasions that a specific theme was raised by the interviewee. If the same interviewee mentioned or referred to the same event on more than one occasion that

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issue is only represented once thematically. Because interviews were extensive and canvassed a wide range of issues interviewees were invited to return to many of the issues raised through out the interviews.

**Table 2: The distribution of interoperability issues referred to in the interviews.**

Challenges and Benefits	Technical/ Non-Technical	Issue	Victoria			Tasmania		
			CFA	DSE	MFB	TFS	Parks	Total
Challenges	Technical Interoperability	Incompatible information systems	4	2		2	2	10
	Cooperability	Information management	4	3	2	2		11
		Cultural differences	6	2	5	4	3	20
		Organisational forms	4		3	3		10
		Levels of proficiency and/or experience	4	3	4	2		13
		Shared understanding	8	5	5	3	4	25
		Different nomenclatures	3	1		2		6
		Broader perspectives	4	1		3	1	9
		Alternative approaches	2	3		4	2	11
		Greater level and variety of resources	3	2	1	1	1	8
Greater variety of skills	2	1		1		4		
Benefits								

### *Boundaries*

Table 3 (below) gives an indication of the boundaries identified in by the interviewees as significant in their effect on interoperability. The numbers represent the number of times the boundary was identified and the agency which the interviewee represented. The boundaries identified have, cultural, spatial and temporal dimensions.

**Table 3: Boundaries identified in the interviews**

Boundary	CFA	DSE	MFB	TFS	Parks	Total
Urban and Rural	5	3	2	2	1	13
Local and Non-local	3	2		2	1	8
Old IMT and New IMT	3	2		2	1	8
Day shift and Night shift	4	2		2		8
Uniform and Uniform	3	1	1			5
Ministry and Ministry	2	1		1	1	5
Agency and Agency	3	2	4	1	1	11
State and State	2	1		1		4
Jurisdiction and Jurisdiction	4	4	3	2	1	14
Section and Section	2	3		1	1	7
Fire Ground and IMT	5	1		2	2	10
Professional and Volunteer	2	2	1	1		6

The issue of incompatible information systems (technical interoperability) by comparison to issues of cooperability (non-technical interoperability) was only raised as an issue by two of the interviewees. Furthermore, both of those expressed the view that issues relating to the interoperability of information technologies could be overcome with a shift in organisational culture. From this perspective even the issue of technical interoperability were also seen through the lense of low cooperability. The interviewees were of the opinion that while many of the technological incompatibilities in information systems were historical in origin, in that they evolved independently, the approach taken by agencies to discover and remedy incompatibilities, pro actively or otherwise, was culturally determined.

Table 2 also shows that issues relating to technical interoperability was seen by none of the interviewees has having any benefits. A diversity of information system technologies was considered as only providing challenges.

In contrast to technical interoperability, issues of cooperability were seen as very significant by the interviewees. Cultural differences between agencies were seen as the most prevalent of cooperability issues in a multi-agency environment. Interviewees detailed experiences where resentment against non-local personnel that were used to relieve the existing personnel. It was the view of these interviewees that the resentment was a consequence of a number of cultural dynamics; primarily the local/non-local, urban/rural, insider/outsider identification of the personnel involved and a relative lack of familiarity between the personnel. These issues were particularly prevalent in Victoria and may be a consequence of the prevalence of long duration fires and the geo-politics specific to Victoria. The issue of cultural differences is also interconnected with the concept of 'shared understanding'.

Interviewees expressed the view that organisational and broader socio-cultural factors were determinates of the conceptual schema through which individuals viewed the work of themselves and others. This has, in their view, strong implications for the way in which information is understood and given meaning

### *Benefits*

Consistent with the adage that 'the squeaky wheel gets the oil' the benefits derived from taking a multi-agency approach were addressed by the interviewees only a

small number of times. The various agencies involved in bushfire mitigation and management in Victoria and Tasmania already operate with historically high levels of interoperability and the projected trajectories of these agencies indicates that there will be even higher levels in the future. When asked to comment on the multi-agency approach currently in use none of the interviewees expressed any criticism in any form. Many did give examples of cooperability deficiencies but considered them as developmental issues that would be resolved through time and effort.

Two of the Tasmanian interviewee's gave examples of where having an agency based diversity of perspectives, in their opinion, enhanced the outcome. Due to the different knowledge sets the different values of the assets under threat were made apparent and plans were developed accordingly.

## Solutions

Table 4 (below) summarises some of the suggestions that the interviewees expressed that in their opinion would enhance the levels of cooperability attainable. Many of the suggestions were for more of what was often already being done; such as, more multi-agency training and with a focus specifically on cooperability issues. Some of the suggestions were based on the experiences strategies that the interviewers had witnessed and undertaken themselves; for example, increased and proactive liaison and socialising with personnel from agencies other than their own.

**Table 4: Solutions described and suggested in the interviews.**

Agency	Suggested Solutions
CFA	<ul style="list-style-type: none"> <li>• Liaison – increased levels</li> <li>• Joint debriefings with cross cultural sensitivity</li> <li>• Make sure that there is a mix of local and non-locals on every shift</li> <li>• Increased socialising with personnel from other agencies during and after incident</li> <li>• More multi-agency training</li> </ul>
DSE	<ul style="list-style-type: none"> <li>• Full integration of personnel in IMTs – not different roles for different agencies</li> <li>• More training targeted at interoperability</li> <li>• Joint deployments (e.g. US)</li> <li>• Proactive selling of your organisations capabilities and function</li> </ul>
MFB	<ul style="list-style-type: none"> <li>• Single integrated information distribution point</li> <li>• More training targeted at interoperability</li> <li>• Integrated information systems</li> <li>• Single ICS</li> </ul>
TFS	<ul style="list-style-type: none"> <li>• More deliberation</li> <li>• Agency v Agency (industrial award conditions)</li> <li>• Prof v Vol (shifts, meals, availability etc)</li> </ul>

## **Discussion**

The findings presented in this paper are based on some preliminary findings of a PhD research project. The interviews analysed represent approximately fifty percent of the total number of interviews conducted and transcribed, and in addition are only representative of Victoria and Tasmania. The remaining interviews to be analysed are from similarly experienced personnel from Victoria (SES), Tasmania (Forestry), New South Wales (NSWRFS) and Queensland (QRFS). The conceptual frame work is being developed both deductively (from the theory and literature) and inductively (from the data itself) and is consequentially a work in progress. There is further data to be included and the data requires a deeper level of analysis. However, despite these caveats there are a number of conclusions which can be drawn at this relatively early stage in the analytical process.

The interview data shows that non-technical interoperability, cooperability, is considered by the participants in the interviews (all highly experienced IMT personnel) as of greater importance than technical interoperability. The factor identified by the interviewees as having the most significance was that of cultural differences. The manner in which this manifest itself was not limited to the cultural interoperability of fire response agencies but also in the broader sense of 'outsider' and the 'other'. The themes of 'culture' and 'shared understanding' represent approximately fifty percent of the occasions where the interviewee identified an issue concerning cooperability.

The participants in the interviews also indicated that where there were issues of low cooperability the effects were experienced at the inter-personal level.

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