Report 5 -
The RMIT 'Communications Grid': A Formative Knowledge Management Tool

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About this Report

The Effective Communication Pathways project aims to identify effective strategies for raising awareness of the Victorian Bushfire Information Line (VBIL) or similar service. This report describes a set of research activities conducted by CSOW in order to provide the CFA VEIL management team with a Knowledge Management tool documenting bushfire risk communication artefacts (The RMIT Grid). The RMIT Grid is a repository of bushfire risk communication artefacts that have been produced by emergency agencies to promote public bushfire safety, be it via education, raising awareness or facilitating increased levels of preparedness. We document a set of activities designed to extend the Grid from a repository towards an analytic, knowledge management tool. This work is placed in the broader context of Knowledge Management principles and how the Grid is situated in the range of emergency agency Knowledge Management activities.

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List of Abbreviations

AEM-KH	Australian Emergency Management-Knowledge Hub
AFAC	Australasian Fire Authorities Council
BODs	Business Object Documents
CFA	Country Fire Authority
CRC	Cooperative Bushfire Centre
CRM	Customer Relationship Management
CSOW	Centre for Sustainable Organisations and Work
KM	Knowledge Management
RMIT	Royal Melbourne Institute of Technology
SECI	Socialisation, Externalisation, Combination, Internalisation
TRIM	Total Records and Information Management
VBIL	Victorian Bushfire Information Line
VEIL	Victorian Emergency Information Line

Executive Summary

1. The CFA Effective Communication Pathways project aims to identify effective strategies for raising awareness of the Victorian Emergency Information Line (VEIL) or similar service.

2. This report documents the development of a Knowledge Management tool; the RMIT Grid.

3. A brief introduction to the concepts of Knowledge Management (KM), and the importance of effective KM strategies for the information-rich domain of emergency services are discussed.

4. In its existing form the Grid was a relatively 'static' repository of collected bushfire risk communication artefacts produced by Australian emergency agencies to promote bushfire safety.

5. A series of activities were designed to transform the Grid from this repository into a formative knowledge management tool.

6. A brief review of Risk Communication literature informed the selection of coding categories for the analysis of artefacts contained in the Grid.

7. A total of 218 artefacts were coded for five risk communication principles: 1) clarity, 2) conciseness, 3) instructional, 4) motivational, 5) provides further sources of information. A sixth, VEIL-related category was added: 6) VEIL-type service mentioned.

8. The extended grid provides the CFA VEIL management team with a formative KM tool that: a) provides access to examples of 'good practice' in communications material, b) reveals a range of dissemination materials and pathways available for consideration for a VEIL-type service and c) contributes to an evaluation of the adequacy of materials.

9. The potential for the future development of the Grid is discussed (as well as existing limitations). This possibility is presented in the context of existing agency activities around knowledge management.

Chapter One: Background

1.1 The Project

This report has been produced as part of a one-year (2012-2013) research initiative led by the Centre for Sustainable Organisations and Work (CSOW) for the Country Fire Authority of Victoria (CFA). The project aims to identify, develop and evaluate effective communication pathways for increasing awareness of the Victorian Bushfire Information Line (VBIL). The project can be divided into two distinct phases of work.

Phase one of the research had a focus on effective communication pathways for dissemination of the VBIL DVD and raising awareness of the VBIL service. Three locality studies were conducted; Koroit, Euroa and Lakes Entrance, and a number of themes were identified with respect to locality and communication pathways.

Phase two builds on this research in two ways;

1. By conducting end-user focus group activities centering on multiple hazards and information provision during emergencies; and

2. Building knowledge management capacity around risk communication products (and other materials) by extending *The RMIT Grid*.

End-user engagement involves a series of scenario-driven focus group activities that are designed to elicit information about community members' risk perception across multiple hazard types. These activities also demonstrate how a multi-hazard emergency information line could support decision-making and safe behaviour in an emergency. The process of transferring the VBIL to a multi-hazard information line (the Victorian Emergency Information Line - VEIL) is already underway. Thus, in preparation for this shift, one aim is to develop awareness materials and methods of service delivery that lead to acceptance and uptake of the service by community members.

The RMIT Grid comprises a repository that draws together materials from all State-based and Federal Fire Agencies, as well as other institutional sources. It provides a rich source of available data and a foundation for further development.
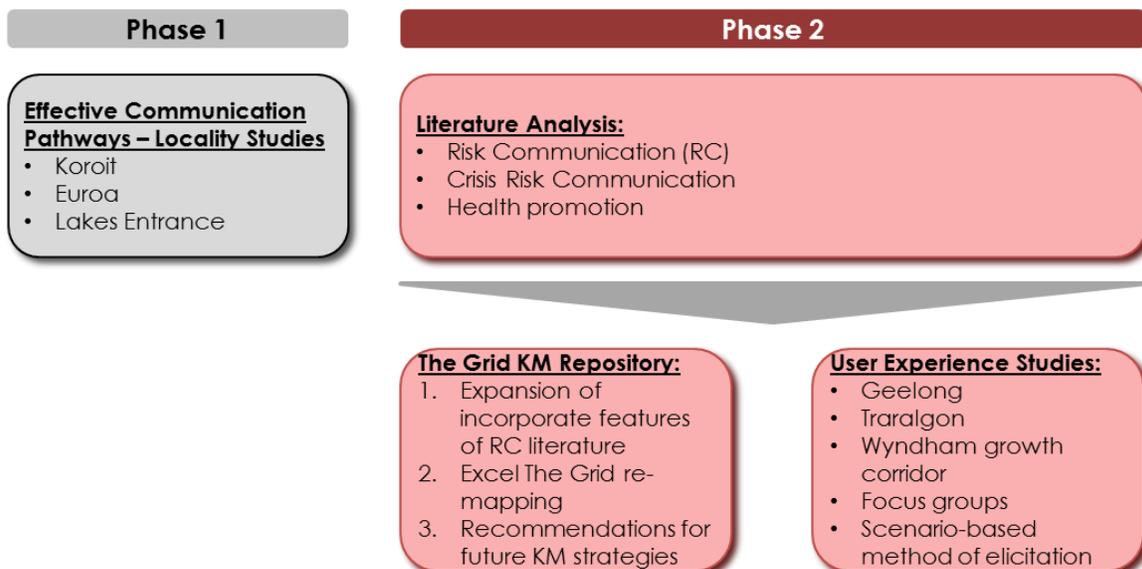
Currently the Grid:

- Stores and organises a variety of informational forms and modes including electronic (e.g. websites, DVDs), hard-copy (e.g. pamphlets and posters) and live (e.g. public speeches, youtube video clips) artefacts.

- Draws together information and communication artefacts from each state and territory in Australia.

- Promotes accessibility, analysis and sorting of these artefacts through the use of a tagging system designed by researchers and end users.

Work around the expansion and enhancement of The Grid will transform it from a relatively 'static' repository of collected materials, to an analytic tool of risk communication activities. The Grid will also assist the VEIL management team to develop an overview of the potential range of dissemination-based activities for a VEIL-type service.

The project overview is depicted in Figure 1, locating this report within the overall project.

Fig 1: Outline of the twelve month Effective Communications Pathways project

Phase 1	Phase 2
Effective Communication Pathways – Locality Studies • Koroit • Euroa • Lakes Entrance	**Literature Analysis:** • Risk Communication (RC) • Crisis Risk Communication • Health promotion

| **The Grid KM Repository:**
1. Expansion of incorporate features of RC literature
2. Excel The Grid re-mapping
3. Recommendations for future KM strategies | **User Experience Studies:**
• Geelong
• Traralgon
• Wyndham growth corridor
• Focus groups
• Scenario-based method of elicitation |

1.2 This Report

In this report we introduce the RMIT Communications Grid (henceforth referred to as 'The RMIT Grid' or simply 'the Grid') and the background to its development (funded by the Australasian Bushfire Cooperative Research Centre), its current content and capabilities, along with its potential future development. Specifically, the report outlines a series of activities that were undertaken to:

1. Assist the VEIL management team to identify examples of effective safety-related material within The RMIT Grid, and;

2. Explore the need and potential for transforming the Grid into a more sophisticated Knowledge Management (KM) system.

First, we provide a brief introduction to KM and the RMIT Grid. Second, we present a brief literature review focused on risk communication theory. This literature review was used to guide the analysis and coding of the content of the Grid. Third, we outline the activities undertaken to expand the Grid into the version delivered to the CFA VEIL management team. Finally, we present recommendations for future development of the Grid as a potential KM system. These recommendations are based on findings from a series of semi-structured interviews conducted with selected emergency agency personnel, focusing on their KM requirements.

1.3 Knowledge Management

KM includes a set of theories and practices that can assist emergency services agencies to identify requirements for knowledge-based resources. This analysis includes an assessment of challenges around the creation, storage, retrieval, transfer, and application of these resources. KM is a 'conscious strategy of getting the right knowledge to the right people at the right time; it also helps people share and put information into action in ways that strive to improve organisational performance' (O'Dell & Grayson, 1998, p.6). KM is therefore

important for emergency services agencies, where policies, operational procedures and service models change frequently in response to complex political, environmental and societal challenges.

Among the many benefits of KM are:

- An improved focus on core organisational knowledge;

- Identification of gaps in organisational knowledge;

- Enhanced ability to manage key knowledge-based resources;

- Ability to obtain a higher return on human capital;

- Enabling personnel to learn more efficiently and effectively;

- Increased employee and client satisfaction;

- Cost savings;

- Improved organisational efficiencies;
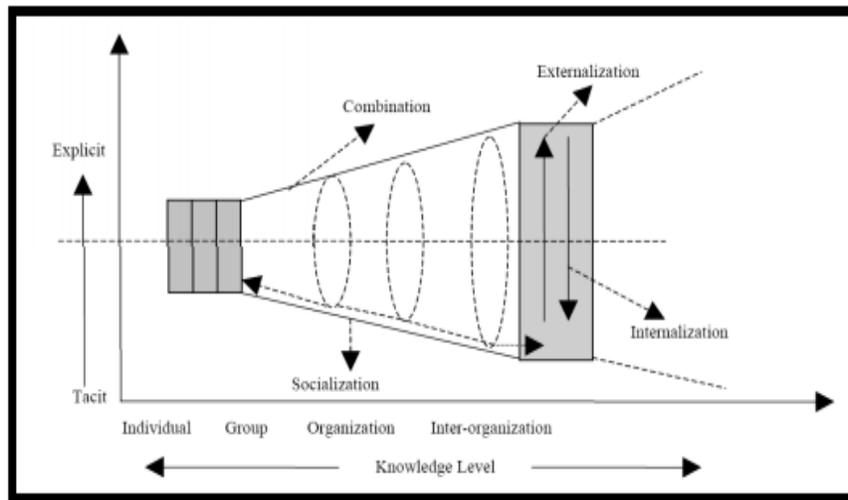
- Improved organisational effectiveness.

Importantly, KM encompasses a broader range of activities and concerns than merely collecting and updating information into repositories (Alavi & Leidner, 2001). It recognises the diverse forms (e.g. tacit, explicit) and sources (people, process, technology) of knowledge-based resources within and across complex organisational and problem contexts, such as emergency services. It considers operational, technological and cultural issues (Bhatt, 2001) and employs top-down and bottom-up approaches. Therefore, while this report focuses on The RMIT Grid as a potential technology-based KM system, it also recognises that such a solution cannot be divorced from the wider problem context, and needs to start with human-based processes (Walsham, 2001).

The SECI (Socialisation, Externalisation, Combination, Internalisation) model of knowledge conversion (Nonaka &Takeuchi, 1995) is useful in understanding human-based knowledge processes and the role that KM systems like the Grid might play within them (Figure 1). Nonaka and Takeuchi identify two dimensions to the knowledge conversion process.

a. Within the ontological dimension, organisations support individuals by providing contexts within which they can create knowledge within communities of interaction. As it develops, the knowledge spirals through the organisation from individual to group to organisation and indeed inter-organisational levels.

b. Within the epistemological dimension, the key is the distinction between tacit knowledge and explicit knowledge and the interactions between them that lead to knowledge conversion. Explicit knowledge can be put down on paper, formulated in sentences or captured in drawings or technology-based systems. Being formal, systematic and identifiable it is easier to capture and transmit (Nonaka & Takeuchi 1995). Tacit knowledge is informal, personal and hard to pin down. It is tied to the senses and to innate personal skills and intuitions, and being subject to individual awareness it cannot always be articulated (Nonaka & Takeuchi 1995). While these distinctions exist, they do so in relative terms. Tacit and explicit knowledge are to be viewed not as diametric opposites, but as different points on a knowledge spectrum.

This model is presented below in Figure 2.

Fig 2: SECI model of knowledge conversion (Nanaka & Takeuchi, 1995)

Source: Holsapple & Joshi

Nonaka and Takeuchi's (1995) approach is therefore anchored in the assumption that human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge.

The SECI model assumes that tacit knowledge can be transferred through a process of socialization into tacit knowledge in others and that tacit knowledge can become explicit knowledge through a process of externalization. It also assumes that explicit knowledge can be transferred into tacit knowledge in others through a process of internalization, and that explicit knowledge can be transferred to explicit knowledge in others through a process of combination. These assumptions are elaborated so as to inform the utility and development of the RMIT Grid. They involve:

a. Socialisation involves personnel sharing their tacit knowledge (e.g. experiences) and creating new tacit knowledge (e.g. shared mental models and new technical capabilities).

b. <u>Externalisation</u> requires personnel to capture their tacit knowledge (e.g. experience) in explicit form (e.g. standard operating procedures), thus potentially making it widely available for use by others.

c. <u>Internalisation</u> often involves 'learning by doing' where personnel access explicit knowledge (e.g. from a content management system), and learn from it, effectively creating new tacit knowledge (e.g. understanding of best practice).

d. <u>Combination</u> involves creating new explicit knowledge through combining bodies of explicit knowledge (e.g. personnel using existing research material to inform and create new research material).

To fully realise the benefits of KM, agencies need to operationalise the four types of knowledge conversion and indeed the wider strategies for KM. This step is achieved by supporting the four knowledge conversion processes within three important infrastructures for KM: operational, technological and cultural. KM as a discipline offers detailed principles and practices to enhance the effectiveness of these infrastructures, and ultimately, the social return on KM efforts. While a detailed treatment of these infrastructures is outside the scope of this report, a brief summary of each is provided below as a means to highlight how they might support the four types of knowledge conversion and thus enhance the success of KM systems like The RMIT Grid:

a. <u>Cultural Infrastructure</u> - Effective KM requires an organisational culture that is 'knowledge-friendly', whereby personnel are encouraged and supported to share what they know, as opposed to an organisational culture with the perception that 'knowledge is power' and is consequently hoarded by personnel.

b. <u>Operational Infrastructure</u> - Considers the structure of the organisation (e.g. physical and logical), and governance of KM (e.g. accountability and responsibility for KM); along with a range of KM 'instruments' that can be used to support knowledge-based processes and behaviors (e.g. Key

Performance Indicators, rewards and recognition, provision of time and resources).

c. <u>Technological Infrastructure</u> - Considers the role of technology to support KM initiatives such as content management, collaboration and knowledge transfer functionality.

In essence, in order for personnel to engage in effective knowledge conversion processes, they require the agency to consider each KM infrastructure. Similarly, in order for a KM system like The RMIT Grid to form a useful component of the KM technological infrastructure, operational and cultural-based issues need to be considered first, as these are central to the successful adoption and use of KM systems. We now turn to situate The RMIT Grid in the context of current CFA knowledge requirements and resources.

1.4 Knowledge Management in Australian Emergency Agencies

The information and knowledge demands placed on emergency services agency personnel are significant. Whilst a complete internal knowledge audit was beyond the scope of this report, it was evident that the knowledge requirements of personnel encompass internal and external policy documents, compliance, standard operating procedures and research findings, to name but a few. Depending on the organisational roles and functions of personnel, these requirements cover a broad range of specialty areas, including: operational effectiveness, land management and planning, fire ecology, compliance, fire fighter and community safety and other specialty fields. Tacit knowledge is difficult to capture, track, and share within and between emergency services agencies and personnel. Explicit knowledge on the other hand, is typically not difficult to acquire in these domains but is more difficult to organise, synthesise

and disseminate effectively. These issues represent challenges across the four key knowledge conversion processes within CFA and VEIL.

With respect to the organisation, synthesis and dissemination of external explicit knowledge, we have identified two key information repositories available to Australasian emergency workers, including those at VEIL and the CFA. These are: the AFAC (Australasian Fire Authorities Council) Web, and the Australian Emergency Management Knowledge Hub (AEM-KH). The AEM-KH adopts a multi-hazards approach to content inclusion, whereas the AFAC Web is more focused on bushfire. Both services offer web-based interfaces, with searchable content that is available to the general public. Both systems also offer membership options for access to other features. For example, membership of the AEM-KH affords access to forum discussion boards for sharing views and ideas.

The importance of a multi-hazard service is highlighted in the AEM Knowledge Hub FAQs:

> *"In 2011 the Australian Emergency Management Institute completed a feasibility study to explore the nature of knowledge hubs and the need for an Australian emergency management knowledge hub. We consulted with stakeholders from all jurisdictions and more than 30 emergency management agencies and organisations, representing practitioners, research, policy, education, and information services.*
>
> *Findings included the need for an 'all hazards' approach, more connectedness in the emergency management (EM) sector and a clearing house for EM research"*

Research findings are also available via other resources such as the Bushfire CRC website, and academic journals available via online resources. Some agencies provide physical libraries to make material readily available to emergency services personnel. Given this array of information sources, the objective of any KM system within the CFA should be to avoid the 'doubling up' of current

resources, and to facilitate access to, and use of, these existing external resources. In addition, it is important that the CFA better leverage its own internal knowledge and expertise.

The approach to KM system development involves a review of current practices and awareness of data sources and related resources. With respect to tacit knowledge, there are a range of forums that encourage sharing research findings, operational doctrine and more formative ideas. These include the annual Australasian Fire Authorities Council conference, AFAC user groups, agency volunteer conferences, workshops and other forums including pre-season briefings and operational exercises. Interviews with key CFA personnel and subject matter experts revealed the importance of the dissemination of learning from these events. Although there were different views regarding the extent to which this was effectively organised or resourced, the practices were generally seen to have improved over the last few years. Again, the challenge for agencies is not necessarily around accessing information, but rather, how to best organise and synthesize information into a format that is maximally useful for informing policy and best practice.

In this knowledge intensive context there was evidence for a diverse set of approaches to knowledge conversion processes; that is, socialization (e.g. team meetings, expert groups, conferences), externalization (e.g. writing down lessons learned), combination (e.g. creating new explicit knowledge-resources based on research material), and internalization (e.g. learning-by-doing, training). While an in-depth analysis of the current state of the KM infrastructures was not commissioned, there was some indication that the operational infrastructure for KM combines both top-down and bottom-up approaches and employs a wide range of KM instruments (e.g. after-action reviews). Further, the cultural infrastructure is one where personnel recognized the CFA as a 'knowledge-based' organisation and that wants to utilize KM principles and practices. However, evidence that this may have happened was not forthcoming.

It is clear that the CFA and VEIL have numerous tacit and explicit knowledge resources at their disposal— thus the key issue is around 'knowing what is known' and making these resources readily available for use, rather than a lack of knowledge per-se. To this end, the work commissioned on The RMIT Grid as presented in this report offers a useful first step to identifying existing effective safety-related material. Chapter 2 provides a brief review of risk communication theory that was used to guide the analysis of the Grid content, but first we provide a more detailed description of the Grid and its initial development.

1.5 The RMIT Bushfire Communications Grid

1.5.1 Introduction and background to the Grid

The RMIT Grid offers the foundation for a KM system, documenting bushfire related information and communication artefacts from across Australia. Communication products are significant assets to an organisation in terms of both the cost of design and production and, most significantly, knowledge content. To our knowledge The RMIT Grid is the only repository that focuses on a collection of risk-communication materials. The Grid is therefore a unique electronic knowledge repository that enables researchers, end users and other relevant parties to compare and contrast the form, shape and underlying principles of bushfire communication strategy from across Australia.

To develop The RMIT Grid a variety of agencies were approached during the data collection process, including both those explicitly and tangentially engaged in bushfire preparedness communication. These agencies included the Country Fire Authority (CFA) in Victoria, the New South Wales Rural Fire Service (NSW-RFS), the Fire and Emergency Services Authority (FESA)[1] in Western

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[1] Now the Department of Fire and Emergency Services

Australia, among others, as well as State governments, local governments and government-run health services.

The collection of data was uneven. When approached, many fire agencies provided examples readily, many offering to send their communication products through the post. This provision, however, was not exhaustive. One Agency, FESA in Western Australia, provided a comprehensive and complete database because an official enquiry into a post-fire situation required a complete record of agency artifacts in relation to bushfire preparedness. Another agency referred the researchers to their website as the source of all their communication material. The result is an indicative spread of the data provided by agencies; it thus provides a pilot for the development of a comprehensive knowledge management system. At a practical level and as a forerunner for the development of such a system, printed material was digitised and electronically stored.

The repository is currently organised within a qualitative data analysis software tool called NVivo (version 10). NVivo enables a collection of materials such as those collected by RMIT, as "projects". It then facilitates the coding of text into significant themes for further analysis. With respect to the RMIT Grid, the use of NVivo has advantages such as: a) the classification and storage of information; b) the tagging of attributes, c) coding and grouping conceptual themes; and c) sophisticated content searches (search queries can be saved for future access). However, there are also limitations to having the Grid in this NVivo format, most notably around content sharing and accessibility. NVivo requires users to purchase a software license and has a steep learning curve for users compared to more common software tools such as MS Excel.

Figure 3: The Grid in its NVivo environment
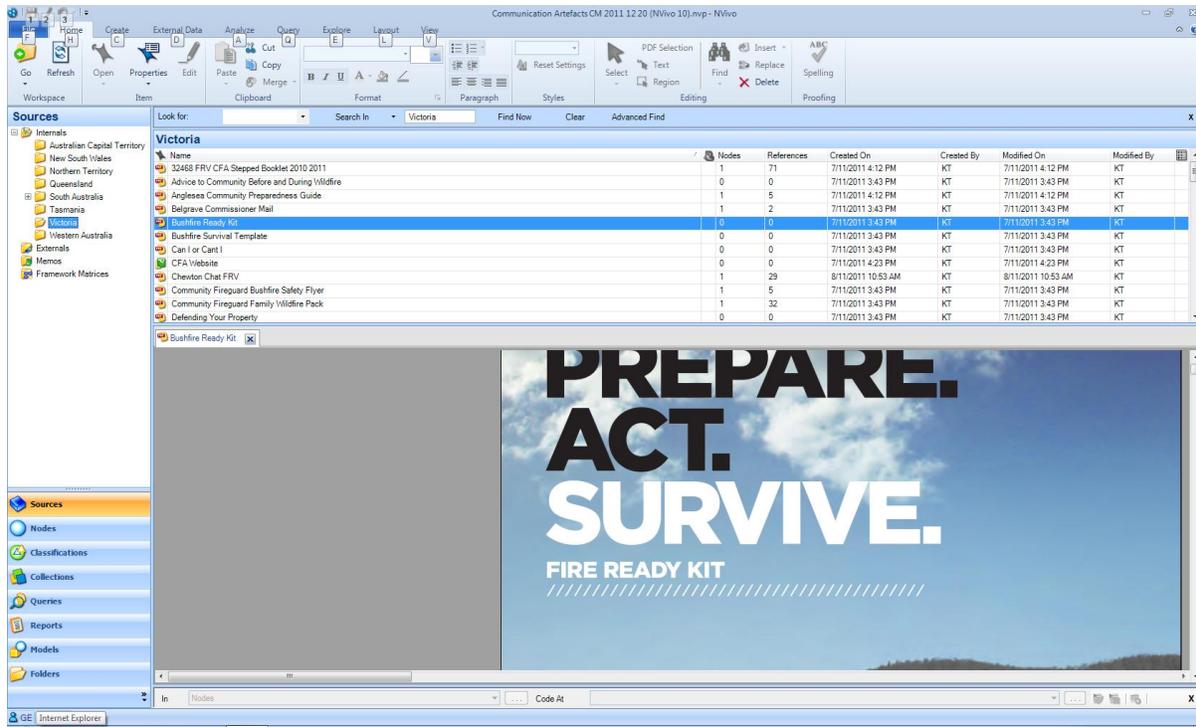
Prior to the current project, the communication products in the Grid were indexed and classified within NVivo using the following categories (meta-headings):

Campaign: Identifies products used in significant communication programs. The most common being "Prepare. Act. Survive."

Scheme: Identifies products deployed for sub-campaigns, under a parent or overarching campaign (e.g. Farm Firewise)

Agency: Identifies the agencies associated with the products in terms of visible branding. Often this would be the lead fire agency in conjunction with the relevant State government.

Audience: Identifies instances where material was developed for specific demographic groups, e.g. Fiery Women program (SA)

Form: Identifies the form or mode of delivery (e.g. print, radio, web-
                    site)

Further background to the development of The RMIT Grid can be found in the Fire Note, 'Making Knowledge Visible'[2]. We now turn our focus on the activities undertaken in this work to identify existing safety-related material and the potential for further development of the Grid.

1.5.2 Further analysis of the Grid artefacts

Although the Grid was developed as a documentation and analytical tool, hitherto it has existed as a documentation resource only. This limits the range of potential applications of the Grid for emergency agencies. Rohrman (2000) argues that for community risk communication, the mere distribution of material is not enough to ensure their effectiveness but rather, critical effectiveness evaluation is required. What is required is further analysis and commentary around the knowledge artefacts contained within the RMIT Grid. Future bushfire risk communication materials can benefit from both the analysis of artefact effectiveness, combined with the applied knowledge from bushfire social research. Two evaluation methods available to emergency agencies are:

1) Evaluation of the effectiveness of risk communication artefacts from investigations with end-users' (e.g. delivery preferences, comprehension, intentions to act).

2) Evaluation of the effectiveness of risk communication artefacts for their adherence to risk communication principles.

The current work focuses on a preliminary analysis of artefacts within the Grid materials for their adherence to effective risk communication principles.

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[2] http://www.bushfirecrc.com/resources/firenote/making-knowledge-visible

With respect to presenting The RMIT Grid to the CFA VEIL management team, Microsoft Excel was chosen as the most suitable and commonly used interface (it was beyond the remit and scope of the current project to develop a new user interface for The Grid). Compared to NVivo, MS Excel provides a more fundamental document management system, but will be familiar to most users. Individual artefacts are contained within rows (organised by State) with spreadhseet columns acting as individual coding categories.

There are other advantages to positioning the Grid in an MS Excel environment, such as facilitating the addition of new knowledge artefacts by the CFA. This is a simple data entry process (as opposed to learning the NVivo program). Extra coding categories can be added as new spreadhseet columns. Links to the electronic versions of documents can be easily added and maintained via hyperlinks to a dedicated folder.

To further develop such understandings, three activities were undertaken:

1) A literature review of risk communication principles was conducted with the goal of providing a number of coding categories to analyse and organise the knowledge artefacts

2) Data around the knowledge artefacts was taken from the NVivo software program and re-organised in a Microsoft Excel database

3) Further content analysis and additional coding of knowledge artefacts was undertaken

The content and further coding of material was guided by a literature review including research articles and policy documents as outlined in the following chapter.

Chapter Two: Risk Communication

Due to climate change, the frequency and intensity of bushfires is predicted to increase (Hennesey *et al.* 2006; IPCC, 2012). Currently fire agencies allocate resources to fires in order to restrict their spread and potential impact upon assets (lives and property). However, it is impractical that fire agencies can provide protection to every residential property and resident under severe fire conditions. Subsequently, community members are encouraged to take responsibility for their safety during wildfires and other natural hazards. In Australia, residents are encouraged to develop action plans (whether for leaving or staying and defending) well before the occurrence of natural hazards. Fire and other emergency agencies currently produce and distribute a range of risk communication materials (flyers, leaflets, brochures, web-sites, DVD's) to assist residents to assist this endeavour. Through this communication, emergency services agencies aim to inform the public about 'the expected type (good or bad) and magnitude (weak or strong) of an outcome from a behaviour or exposure' (Reynolds et al. 2012: 7). In addition to these educational objectives, communicators aim to persuade members of the public to adopt appropriate behaviour in planning and responding to risks.

Both in Australia and worldwide there is a large body of research that has investigated the relative effectiveness of a range of risk communication materials. Risk communication typically focusses on mass persuasion. Social marketing methods are suited to reaching this broad audience and promoting positive behaviour. The behavioural aspect of risk communication is supported by agencies through the availability of emergency information from a number of sources. Examples include radio, agency websites, and phone services such as the Victorian Bushfire Information Line (VBIL). In order for a service to achieve uptake, members of the public must have an awareness of the service, knowledge of what the service provides and when it is appropriate to use it, trust

in the service to provide timely, accurate, and relevant information, and a preference for the source over other, often local and established information networks. Adequate perception of risk is a precursor to these.

Agency awareness campaigns must therefore undertake to 1) increase awareness of risk; 2) promote appropriate behaviour, and; 3) promote information sources that can support appropriate behaviour.

2.1 Risk Communication Principles

Risk communication occurs at several stages in relation to an event. Public awareness is carried out prior to a potential event, public warnings (crisis communication) during or in response to an imminent event, and following an event communicators are tasked with informing and advising members of the public with regard to recovery (Health Protection Scotland 2008: 19). Publications that have reviewed the literature on risk communication have generally focused on crisis communication in health domains; that is, the provision of information and warnings as a health emergency is developing (for example, Glik 2007; Health Protection Scotland 2008).3 These publications can help to guide practices in other risk domains, as they address the same underlying psychological mechanisms.

A number of message characteristics have been repeatedly identified in both the risk communication literature and agency guidelines as constituting best practice in this phase of communication: messages need to be consistent, accurate, precise, and tailored (Infanti et al. 2013: 11). Guidelines developed by the U.S. Centres for Disease Control and Prevention (Reynolds 2004), state that messages should accord with the acronym STARCC; they should be Simple, Timely, Accurate, Relevant, Credible, and Consistent.

Natural hazards risk communication literature often focusses on the adoption of protective strategies prior to a disaster (O'Neil 2004: 4). Greater use of social

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3   For a comprehensive discussion of the social psychology of public warnings and crisis risk communication, we refer the reader to a seminal paper by Mileti and Peek (2000).

marketing and public awareness methods have proved useful in improving these outcomes.

> 'Social marketing can be defined as one-way, persuasive communications that use commercial marketing techniques and tools to encourage socially desirable goals. Public awareness campaigns are designed to provide information on the hazard and associated risks' (O'Neil 2004: 42).

These methods target the majority of the population, who may be 'in denial of natural hazard risks - sometimes strongly so' (O'Neil 2004: 42). Mediums for reaching the public include 'advertising, community service announcements, media stories, staged events and print materials' (O'Neil 2004: 42). Guidelines for effective strategies at this public awareness phase of communication have been established in a number of publications.

A 2010 report titled 'Risk Communication and Natural Hazards' both reviews risk communication literature and provides an overview of 60 natural hazard risk communication practices in Europe (Hoppner, Brundi & Buchecker 2010). The authors provide a list of principles in communication to inform and to raise awareness. This list is based on Mileti and colleagues (2004), who identify 'laws' for effective public hazard communication and education that have been repeatedly tested, validated, and confirmed. Key messages from these reports include:

- communicate in simple, non-technical language
- support simple words with attractive graphics
- utilise varied sources including authorities, familiar people, etc.
- utilise multiple channels such as mass media, community groups, direct mail*
- ensure consistency and repetition of messaging
- tailor information to specific audiences, including personal and household characteristics, organisations characteristics, locality characteristics
- ensure messages have a 'call to action', including the stages before, during, and after an event
- support people in their search for more information

- position additional information in appropriate community locations
- use local people to disseminate and champion information*
- provide information in multiple languages

*The findings from the first CSOW-ECP major report suggest that a critical feature for VBIL/VEIL dissemination is the use of varied sources. Further, in smaller communities, a connection between the community and local CFA and authorities has a strong history. Increasing the capacity of local brigades to disseminate safety-related information is therefore likely to be an effective approach (Elliott *et al.* 2012).

Likewise, in an earlier conceptual framework, Rohrmann (1995: 45) listed a range of considerations for effective risk communication for fire preparedness. These are:

- ensure valid understanding of how people process and evaluate hazard information
- focus risk communication on both behaviour change as well as knowledge advancement
- check materials for comprehensibility, credibility, feasibility and their capacity to motivate
- acknowledge apathy/inertia and information overload when designing preparedness requirements
- adapt materials to core characteristics of specified target groups (including ethnicity issues)
- provide interactive communication and pathways for information requests and confirmation
- strengthen personal involvement and responsibility

The tailoring of content to specific audiences is one of the concepts that has been adopted from social marketing for use in risk communication (Glik 2007: 41). O'Neil (2004) discusses a range of characteristics by which audiences can be segmented and targeted by communication programs. These include demographic variables, psychological traits (risk attitude and perception, degree of independence and self-efficacy), and hazard experience (personal

or vicarious, with the latter affected by local norms). Atkin and Rice (2012: 5) identify two key strategic advantages to this audience segmentation.

> 'First, message efficiency can be improved if subsets of the audience are prioritized according to their centrality in attaining the campaign's objectives as well as receptivity to being influenced. Second, effectiveness can be increased if message content, form, style, and channels are tailored to the attributes and abilities of subgroups' (Atkin & Rice 2012: 5).

This dimension of message design emphasises the need for materials and stylistic devices to be 'personally involving and relevant, so receivers regard the behavioural recommendation as applicable to their situations and needs' (Atkin & Rice 2012: 9). Other influential message qualities include: an engaging presentation, validity and coherency, and motivational incentives. The credibility of relevant agencies is also crucial. In order for risk communication to be effective, members of the public must trust the information source; a result of public perceptions of the motives, honesty, and competence of an organisation (Health Protection Scotland 2008: 8).

2.2 Dissemination Materials

Agency dissemination materials primarily fall into the 'pre-crisis' phase (Reynolds et al. 2012: 10). At this stage, 'audiences can be educated about risks and encouraged to prepare' (Reynolds et al. 2012: 60). These constitute two types of informational messages. First, awareness messages 'present relatively simple content that informs people what to do, specifies who should do it, or provides cues about when and where it should be done' (source). Second, instructional messages 'present how-to-do-it information in campaigns that need to produce knowledge gain or skills acquisition, including enhancing personal efficacy in bolstering peer resistance and acquiring media literacy skills' (Atkin & Rice 2012: 8).

Assessment of bushfire information sources has been undertaken by Rohrmann (1995; 2000; 2003). He notes that:

> '[M]ere distribution of material is not enough - it is crucial that communication efforts are effective. This requires socio-psychological expertise and critical effectiveness evaluation. Within pertinent campaigns, various means are used for enhancing disaster preparedness, including leaflets/brochures, picture series (graphs, slides, posters) and videos; altogether printed material is prevailing' (Rohrmann 2000: 14).

Rohrmann (2000) carried out interviews and focus groups with residents to provide insight into the viewpoints of those receiving bushfire preparedness information. In a later article on the utility of the internet for fire preparedness, experts and residents evaluated six (6) agency websites (four in Australia and two overseas) (Rohrmann 2003). The findings of these studies confirm the significance of both substantive material as well as stylistic features in their production. According to these studies, dissemination materials should include:

- information that is:
  - factual, concise, understandable
  - meets the needs of a range of people / specific audiences
  - addresses necessary action for preparedness
  - addresses a range of issues, including personal safety, evacuation, animal issues, local information relevant to the community, and phone numbers for emergency situations

- effective presentation of materials:
  - large, easy-to-read text
  - helpful pictures and illustrations to add visual appeal and to enhance the salience of hazards
  - diagrams and drawings for instructive purposes
  - appealing graphics

Likewise, a manual on crisis and emergency risk communication published by the Centers for Disease Control and Prevention confirmed the following requirements in their guidelines for fliers:

- be clear and concise
- avoid jargon, acronyms, or highly technical language
- include contact information for additional assistance

The literature suggests a finite number of risk communication principles that bushfire awareness and preparedness materials should follow. What is currently lacking is a resource whereby agency personnel can document and evaluate the range and nature of risk communication materials that have been produced. The RMIT Grid represents a first attempt to do so. Earlier in this report we identified a small number of Knowledge Management systems that are currently accessible to emergency agencies. To the best of our knowledge, however, the content does not currently cover risk communication material.

The literature review described in this chapter has informed the subsequent work involving the extension of the Grid to include analysis of this type of material.

Chapter Three: The Extended RMIT Grid

The aim of this work was to transform the Grid from an information repository to an analytical knowledge management tool. The extended Grid provides the CFA with a first step towards reviewing a range of Australia-wide risk communication artefacts, as well as investigating the range of materials that have been used to raise awareness of telephone-base, VEIL type services. The activities undertaken to achieve this are described below.

3.1 Selection of Coding Categories

3.1.1 Risk communication categories

The risk communication literature review presented in Chapter 2 informed the selection of new coding categories for 'The Grid'. In making this selection we were mindful of the wide range and nature of risk communication materials collected. Educational artefacts, for example, may require more detailed content than artefacts developed to raise awareness of a service. Further, there is a need for agencies to produce and disseminate a range of materials, detailed or brief, that address the needs of a range of users, reflect community diversity, cater for differing levels of engagement, and so on. Therefore, the context of the knowledge artefacts was carefully considered when coding the artefacts. Alternatively, a number of risk communication principles can be applied broadly to risk communication materials, irrespective of their purpose. For example, the use of clear, non-jargonistic language is preferable for all forms of public communication. Given the complex nature of the task, coding was undertaken by two researchers with a high level of domain knowledge and expertise in qualitative analysis.

From the literature review, a total of five risk communication principles emerged as particularly strong themes and were included for subsequent coding of The Grid. These are as follows:

Clarity: *Documents should use short sentences and simple, non-technical words. Key messages should be easy to find and not hidden in large quantities of text.*

Conciseness: *Documents that are overly wordy or technical are more likely to be rejected and discarded. This may lead to community members missing key 'take-home' messages.*

Instructional: *The material should provide clear, plain language instructions on what people should do in order to help minimise their risk.*

Motivational: *The documents should outline the advantages of adopting the recommended actions, potentially including messages relating to 'self-efficacy'*

Additional Sources of Information: *The material should clearly detail where people can access more detailed information if they wish to do so.*

With respect to providing further sources of information, we anticipated that the CFA VBIL management team might wish to search for examples of literature that specifically include reference to the VBIL or VBIL-type service. A sixth coding category was therefore added:

VBIL type service mentioned: *The reference material promotes the VBIL or VBIL type service as a further source of information.*

3.1.2 General coding categories

In addition to the above categories, a small number of coding categories were added to assist in sorting and classifying the source material. For example, users may want to search for all documents that raise awareness of a product or service that are limited in size to one A4 page. These categories are as follows:

IDtag: *Grid artefacts were not given a unique identification code. Therefore each artefact has been provided with a unique identifier. These also enable the materials to be easily linked to the corresponding electronic copy in the folder structure.*

Goal: *Identifies the intended purpose of the communication material and is divided into 4 sub-categories: 1) Educational, 2) Awareness, 3) Motivational, 4) Community*

Length: *This relates to the document length in terms of A4 pages. Note: It is not an assessment of the suitability of the length for the document purpose*

Appearance: *This relates to the general appearance of the artefact in terms of text, graphics or a combination of text and graphics. It is not intended as a judgement of the aesthetic appeal of the document as this line of inquiry would be more suitable to end-user testing.*

Special Interest: *This is where materials contained something of note that was unique or distinctive to that particular artefact.*

Notes: *This is dedicated to notes about how the material may be improved, or conversely where it is an example of good risk communication practice.*

We note that the current activities around extending The RMIT Grid are indicative rather than exhaustive of the types of analyses that the Grid enables. (A full list of coding categories can be found in Appendix 1).

3.2 Coding Method

In the NVivo environment, The RMIT Grid contains information on approximately 500 artefacts across emergency agencies from every state and territory of Australia (It should be noted that material collection ceased since 2011). These artefacts were initially reviewed to assess their suitability for further coding. Criteria for further coding (risk communication categories) were as follows:

1. All printed materials dedicated to risk communication for the public were included

2. Web-sites or online media were excluded due to the frequent updating of online content

3. Materials developed for agency personnel, technical reports, etc… were excluded from coding

4. Artefacts such as children's games, mobile stands at fetes/markets, and policy documents or training materials were excluded from coding

Using the above criteria, a total of **218** artefacts were included for subsequent coding. The breakdown of artefacts by state and inclusion are summarised in the table below:

Table 1: Artefacts included or excluded for coding by state

State	# Artefacts	Included for coding	Excluded for coding
Vic	46	31	15
NSW	50	50	-
Qld	25	7	18
Tas	42	14	28
SA	45	41	4
WA	76	67	9
ACT	25	7	18
NT	31	11	20
Total	340	218	122

Where possible the physical documents were collected and assessed. Where this was not possible the electronic version of documents were assessed. The assessment was carried out by two researchers. Prior to individual coding, the two researchers co-coded a number of documents in order to develop a consistent approach. Both researchers have a high degree of domain knowledge and experience with qualitative data analysis.

The analysis can be sorted by coding columns using the MS Excel 'Sort' function. A basic colour coding scheme identifies artefacts as coded for risk communication categories (light olive green), not coded for risk communication categories (tan) and web-pages (light blue). It is important to note that in a more fully developed Grid, steps should be taken to cross check coding references by artefact – target audience, purpose and so forth.

3.3 Artefact Type by State

In order to provide an overview of the types of materials contained within The Grid, frequency counts for material type were conducted by state. The results can be seen in Table 2, below. The table is presented to provide an overview of the types and frequency of documents that are found within the Grid. They are not reflective of the overall frequency of artefact types distributed by each state agency. The distribution is influenced by the different methods of artefact collection across states and territories (future work would require weighting procedures). Notwithstanding, it can be seen from the table that fact sheets/information notes are the most frequently occurring artefact type. Fact sheets provide a means of presenting clear, short educational messages that do not present a cognitive burden on the public. However, they do usually require people to be proactive in seeking the information. The Grid also contains a large number of booklets and flyers, which is typically instructional material around planning a property for bushfire defense, or planning to leave early under bushfire threat.

Table 2: Artefact type by state

STATE	Booklet	Pamphlet /Flyer	Fact Sheet	Web-page	Multi-media	Letter	Reports, policy docs	Newsletter	Newspaper article/advert	Other	Total
Vic	14	6	4	9	-	4	2	-	1	6	**46**
SA	5	4	32	4	-	-	-	-	-	-	**45**
NSW	8	9	30	Note	-	-	-	-	2	1	**50**
TAS	9	1	-	24		4	1	-	-	3	**42**
QLD	3	4	-	16		-	1	-	-	1	**25**
WA	6	24	31	Note		3		2	3	7	**76**
ACT	6	-	-	14	-	-	4	-	-	1	**25**
NT	2	8	-	16	-	-	2	2	-	1	**31**
Total	53	56	97	83	-	11	10	4	6	20	340

Note: Due to the large number of NSW-RFS and WA-FESA web pages (94), these were not listed in The current Grid

3.4 Artefact Overview

A preliminary analysis of the quality of all materials in the Grid was carried out. This analysis reveals that most material meets most of the criteria set out by the risk communication literature review. Australian fire agencies produce a range of education and awareness materials that are targeted towards different populations (e.g. general public, vulnerable groups, school children), and different levels of engagement. Generally, they do this in a manner that is consistent with most risk communication principles, including clarity (using plain, easy to understand language), highlighting key messages, providing practical instruction on how to mitigate risk and providing further sources of information.

Notwithstanding, we highlight two potential issues:

1. Motivations for action are not well detailed, other than vague references to personal safety and protection of property. We suggest this may be in large part due to the paucity of available research in this area. Recent Bushfire CRC research is addressing these shortcomings. Future risk communication materials can benefit from the application of this knowledge. We direct interested readers to: Beatson & McLennan (2011), McLennan et al. (in press), and McNeill et al. (2013).

2. With respect to awareness of the VEIL, the current suite of risk communication artefacts may not facilitate the easy storage of, and access to a VEIL number. Leaflets and flyers are transitory in nature. Many are thrown out if they are not seen as relevant to the recipient. Provision of further sources of information are useful if the content is viewed as incomplete, but are unlikely to be recalled and used for emergency events

From the findings in the current and other project reports, we identify four challenges around risk communication;

1. To target campaigns to those most at risk.

2. To develop artefacts maximally suitable for locality types. This does not necessarily require detailed community profiling, but can focus on one or two key components of locality types (e.g. rural, peri-urban, tourist). For

example, residents in peri-urban communities are less likely to attend to lengthy materials if they see them as irrelevant to their situation.

3. To increase likelihood of behaviour adoption by carefully targeting community members' motivations for developing various behavioural intentions and plans around hazard events.

4. To educate community members about what can go wrong with plans and potentially hinder their access to emergency information. Continue to emphasise the need to be aware of, and have access to a number of sources of information.

3.5 Delivery of the Grid

The extended Grid will be delivered to the CFA VEIL Management team both in an electronic version, and on a USB stick as a Microsoft Word 2007 Excel file (.xls). Links to the knowledge object files will be provided on the USB stick. Electronic files containing the knowledge artefacts need to be stored in the same pathway that is specified by the hyperlinks contained in the IDtag column of the excel file (e.g. vic01).

The linking of electronic files to Grid artefacts should help facilitate any further coding undertaken by the CFA. New columns can be created for data entry. This is not necessarily limited to risk communication principles, but could also encompass information such as end-user attitudes towards artefacts.

Chapter Four: Future Directions of Knowledge Management and the Grid

The following section summarises key requirements of a KM system that were highlighted in interviews with VEIL and CFA personnel, and offers recommendations for future work.

4.1 Current Technology-based Systems to Support KM

Currently CFA, and VEIL specifically, have numerous IT-based systems that facilitate personnel managed knowledge-based resources. These include (but are not limited to) the Business Object Documents (BODS) project/document management system; Sharepoint; Total Records and Information Management (TRIM) for archival material; an intranet for access to material such as policies, procedures and templates; and a Customer Relationship Management (CRM) system. CFA also has a social media presence.

An in-depth investigation of the effectiveness of these systems was beyond the scope of the work commissioned for this project. Nonetheless, it was the view of one interview participant that current internal technology systems are focused on storage, and to be better able to support KM, there needs to be more focus on knowledge capture, access and utilization.

> *"I don't know if that's necessarily about technology. It's about being able to draw together the narrative and the learning, and tell us what we need to know. I don't know that I'd go into much - better organisation of information, and then some resource to synthesize and tell leaders what they need to know, to answer the big questions. Keep it simple, I think".*

The above quote also suggests that not all issues are technology-based. For example, it was reported that:

- Personnel currently capture knowledge-based resources on an ad hoc nature on the basis of what they think is important, but they do not always know what might be useful to others and indeed others may not necessarily have access to the same systems.

- There was evidence of repetition in work being completed to create, capture, store and disseminate knowledge-based resources.

Such issues could be addressed through wider KM initiatives within the KM operational and cultural infrastructures rather than requiring investment in new technology-based systems (e.g. training and awareness).

Nonetheless, a number of desirable features for technology-based systems to support KM were identified by participants. These include:

- Provision of a central location for knowledge resources that provides everyone access to 'a single source of truth' so as to avoid the need to access multiple systems, saving time and frustration

- Systems are organised using a logical knowledge-based taxonomy to improve the identification and access of knowledge-based resources

- Improved search capability founded on sophisticated search engine technology

- A Web-based interface to enable access from anywhere anytime.

4.2 KM and the VEIL

Although this body of work focused on analysing existing content within The Grid and its future expansion, our investigation highlighted a number of benefits that KM principles and practices might provide the CFA via the VEIL call centre. This could encompass a two-fold strategy.

1. KM has the potential to improve the internal operations of the call centre. For example:

- Staff scheduling around peak call times might be achieved through analyzing call patterns and/or sophisticated modeling of weather patterns to predict call centre demand.

- Low-peak call times might see the VEIL become an out-bound call centre rather than in-bound.

2. KM has the potential to utilize the VEIL as an information hub. For example:

- Rather than just seeing the VEIL as a way to disseminate information to the community, it should be used to improve practices throughout the CFA.

- Effective analysis of the nature of calls might identify 'FAQs' that are not currently captured on current communications material and this could be used to update the material.

There are a range of KM-based systems available that could support the provision of such data. Importantly, as argued in this report, any investments in the technology infrastructure should be supported equally with investment in the operational and cultural infrastructures.

4.3 Future Directions of the Grid

The current potential of the Grid for the VEIL management team comprises its ability to: a) provide access to examples of 'good practice' in communications material, and b) reveal a range of dissemination materials and pathways available for consideration for a VEIL-type service. This could then be used to inform future campaigns.

However, given the requirements for KM systems identified by these same personnel outlined earlier, we believe The Grid has a number of limitations surrounding its functionality and content including:

- The lack of a functional graphical user interface (GUI) with a shallow learning curve

- The Grid is presently a single-user platform. Any future GUI should allow for collaboration amongst users. This could also include potential collaboration around future artefact design (this would also expand functionality of the Grid beyond an archival resource)

- Analysis did not consider the context in which the material has been developed and disseminated. Previous research has highlighted the limitations of treating residents as passive receivers of information. Two-way community engagement has been proposed to be the more effective means of delivery for emergency agencies. Although The Grid can assist with evaluation of printed and other materials, it does not provide information about the context (i.e. pathways) in which information and products are disseminated, including accompanying information via face-to-face communication.

- Analysis did not consider the political and operational landscape (for example, materials post February 2009 will need to reflect the revised AFAC policy that leaving early is the only safe option for ensuring survival).

Therefore currently The Grid is in a process of development as a more sophisticated KM tool. As captured by one interview participant, if the preconditions for people (in the community) have not been set to ensure they want to access the material, then having such systems will have limited impact on disaster management.

Further, a codification approach to KM is only one side of the equation. A more social (tacit)-based approach to knowledge sharing in a community context may be more appropriate. Communication material offers economies of scale in that it is 'one-to-many', however if the reader is detached from the message then such material may not be effective in changing behavior. Similar insights have been provided in a previous report from RMIT University researchers (Elliott, et. al, 2012).

Therefore, before extending the RMIT Grid or embarking on the development and/or implementation of any new KM system(s), further work would need to be undertaken to understand existing KM practices, and the current (vs. desired state) of each of the three KM infrastructures within the CFA. Such work would:

i) Improve these practices in the first instance and thus enable knowledge-resources to be better leveraged;

ii) Avoid duplication of effort; and

iii) Support evidence-based decision-making in regards to KM system requirements within the organization.

Similarly, further work to better understand the approaches to KM and KM systems employed at other emergency services agencies would be useful.

Notwithstanding the need for greater understanding of existing approaches and systems used to support KM within the CFA, our initial investigation suggests that future enhancements to the RMIT Grid and KM systems more generally might usefully provide for:

1 Content Management

- A wider repository of internal knowledge resources and lessons-learned, founded areas of expertise in the CFA and populated from the 'bottom-up' (this would need to take place in the context of the AFAC Web and AEM-KH to avoid replication)

- Links to other relevant local, national, and international sources undertaking risk management planning and mitigation works and thereby assisting the agency to maximise learning

- Improvements to the clarity, consistency, organisation and accessibility of data, information and knowledge through provision of a common web-based platform

- Utilisation of taxonomies and protocols to organize content in a logical way and to ensure it is kept up-to-date

2   Collaboration

- Enabling collaboration within the CFA and between the CFA and other agencies that need to share, coordinate and access risk-based information to assess and monitor hazards and risks common across jurisdictional boundaries more effectively through application of sound KM principles and practices. This might involve exploration of (existing or potential) extranet technology

- Including a 'social' dimension to let others 'know what is known'. This might involve use of social media (e.g. Yammer) or discussion boards and news items/announcements.

3   Knowledge Transfer

- Offering relevant electronic training modules

- Focusing on the capability to transfer lessons learned (e.g. through case studies) and white papers and videos.

While there is certainly room to expand the content and capability of the Grid as outlined above, we reiterate that such an undertaking requires consideration of a cost-benefit analysis within the wider KM context of VEIL and the CFA. Technically, any extension would likely require the underpinning technology to be changed from NVivo to an alternative (web-based) platform. Further, despite the 'wish list' for a single KM system, it is unlikely that a single-system solution is likely to support KM in an organization as complex as the CFA. Indeed, the Grid is not that system. Rather, it is likely there will always be a range of systems in use and thus the focus might be more usefully placed on creating a front-end 'portal' to make access to the back-end systems more streamlined.

Importantly, to extend the analysis it is important to undertake a full analysis of existing technologies in use by the CFA. In this respect the RMIT Grid as a

knowledge management system would be properly located within the agency approach and resource base. A similar approach could also be carried out for a multi-hazard resource.

4.4 Closing Statement

This report has focused on outlining the current capabilities of The RMIT Grid and provided preliminary analysis of safety-related material with respect to effective risk communication principles. The potential to transform the Grid into a more sophisticated KM system has been explored in light of the requirements for KM systems identified in a series of interviews with emergency services personnel, with reference to wider KM principles and practices.

RMIT University would be happy to discuss the contents of this report further and to consult on further efforts in regards to the insights provided in this report.

REFERENCES

Alavi, M. & Leidner, D.E (2001). Review: knowledge management and knowledge management Systems: conceptual foundations and research issues, MIS Quarterly (25) pp. 107–136.

Atkin, C. K. & Rice, R. E. (2012) 'Theory and Principles of Public Communications Campaigns', pp.3-19 in C. K. Atkin & R. E. Rice (Eds) Public Communications Campaigns: Fourth Edition, Thousand Oaks, CA: Sage.

Beatson, R., & McLennan, J. (2011) What Applied Social Psychology Theories Might Contribute to Community Bushfire Safety Research After Victoria's "Black Saturday". Australian Psychologist, 46(3), 171-182.

Bhatt, G.D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques and people, Journal of Knowledge Management, 5(1) 68-75.

Elliott, G.C., Walker, M., Toh, K., Fairbrother, P. (2012) Localities and bushfire infromation: Findings and recommendations. CFA-ECP:Technical report 4, RMIT University

Glik, D. C. (2007) Risk Communication for Public Health Emergencies, Annual Review of Public Health, 28: 33-54.

Health Protection Scotland (2008) Communicating with the Public About Health Risks, Glasgow: Health Protection Network.

Hennessy K, Lucas C, Nicholls N, Bathols J, Suppiah R, Ricketts J (2006) Climate change impacts on fire-weather in south-east Australia (CSIRO; Melbourne). Available at: http://laptop.deh.gov.au/soe/2006/publications/drs/pubs/334/lnd/ld_24_climate_change_impacts_on_fire_weather.pdf

Höppner, C., Bründl, M. & Buchecker, M. (2010) Risk Communication and Natural Hazards, CapHaz-Net WP5 Report, Birmernsdoft: Swiss Federal Research Institute for Forest, Snow and Landscape Research.

Infanti J., Sixsmith J., Barry M.M., Núñez-Córdoba J., Oroviogoicoechea-Ortega C. & Guillén-Grima, F. (2013) A literature review on effective risk communication for the prevention and control of communicable diseases in Europe, Stockholm: European Centre for Disease Prevention and Control.

IPCC, 2012: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation.* A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp.

McLennan, J., Colishaw, S., Paton, D., Beatson, R., & Elliott, G. (in press). Predictors of Australian householders' intentions to self-evacuate if a wildfire threatens: A tale of two theoretical models. International Journal of Wildland Fire.

Mileti, D. S., & Peek, L. (2000) The social psychology of public response to warnings of a nuclear power plant accident, Journal of Hazardous Materials, 75 (2): 181-194.

Mileti, D., S. Nathe and P. Gori (2004). Public Hazards Communication and Education: The State of the Art. Natural Hazards Center.

Nonaka I, Takeuchi H (1995).The knowledge-creating Company. Oxford University Press. New York. NY

O'Dell, C. & Grayson, C. J., Jr. (1998). If only we knew what we know: The transfer of internal knowledge and best practice. New York: The Free Press.

O'Neil, P. (2004) Developing a Risk Communication Model to Encourage Community Safety form Natural Hazards, Wollongong: NSW State Emergency Service.

Reynolds, B. (2004) Crisis and Emergency Risk Communication: by Leaders for Leaders, Atlanta, GA: Centers for Disease Control and Prevention.

Reynolds , B., Seeger, M., Palenchar, M., et al. (2012) Crisis and Emergency Risk Communication: 2012 edition, Atlanta, GA: Centers for Disease Control and Prevention.

Rohrmann, B. (1995) Effective Risk Communication for Fire Preparedness: A Conceptual Framework, Australian Journal of Emergency Management, 10 (3): 42-46.

Rohrmann, B. (2000) Critical assessment of information on bushfire preparedness for residents, Australian Journal of Emergency Management, 15 (1), 14-19.

Rohrmann, B. (2003) The utility of the World-Wide-Web for fire preparedness of residents, Australian Journal of Emergency Management, 18 (3): 20-28.

Toh, K., & Tyler, M. (2013). Making Knowledge Visible, Collecting and collating bushfire communication products, Bushfire CRC, available at: http://www.bushfirecrc.com/sites/default/files/managed/resource/fire_note_102_final.pdf.

Walsham, G. (2001) Knowledge Management: The Benefits and Limitations of Computer Systems, European Management Journal, 19(6), 599-608.

Appendix 1. List of extended Grid coding categories

General categories:

<u>Category</u>	<u>Description</u>
IDtag	Unique artefact identifier
Campaign	Significant initiative
Scheme	Sub or local campaigns
Agency	Lead organisation responsible for material/campaign
Target Population	General public, agency staff, or other (for targeted campaigns)
Function	Purpose of the material (raise awareness, education/information)
Format	Media format (e.g. pamphlet, flyer, DVD)
Length	Length of material (A4 pages)
Appearance	Text, graphical, check-list or text and graphics
Special Interest	This is where materials contained something of note that was unique or distinctive to that particular artefact.
Notes	how the material may be improved, or conversely where it is an example of good risk communication practice

Risk Communication Categories:

<u>Category</u>	<u>Description</u>
Clear	Simple, non-technical, language, avoids jargon and acronyms
Concise	Brief statements, explanations, or instructions
Instructional	Tells people what to do before, during and after an event
Motivational	Demonstrates relevance of issue to recipient and gives incentives to action
Tailored	Personalised to household or locality characteristics
Additional sources of information	Contains sources of additional information and assistance
VEIL type service mentioned?	The material contains reference to an information hotline

Developing
and Evaluating
Effective 'Bushfire'
Communication
Pathways, Procedures
and Products

The RMIT
'Communications Grid':
Towards a Knowledge
Management Tool

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