Report on Research Utilisation Review

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For AFAC and the Bushfire and Natural Hazards CRC

Executive Summary

This report was a joint initiative between the Australasian Fire and Emergency Service Authorities Council (AFAC) and the Bushfire and Natural Hazards CRC (the CRC) research utilisation partners to provide insight into how agencies are engaging in research and capitalising on research outputs.

Context

As a part of the former Bushfire CRC's research utilisation strategy, partner agencies were surveyed in 2010, 2012, and 2014 to assess the utility of the tools and resources being provided by the CRC, to explore how agencies were incorporating research into their business and what they perceived to be the barrier to effective research utilisation. In January 2016 a similar survey was conducted by AFAC and the CRC. The 2016 survey garnered 266 responses from 29 CRC and AFAC end user partners, including response, support, government and not for profit organisations across the spectrum of emergency management.

The respondents were well were well qualified to address the questions posed. An increased response rate from agencies engaged in the earlier surveys suggests that engagement builds engagement and that new partners may need support. Participants had a high level of familiarity with their own agencies strategic plans and a reasonable familiarity with the CRC research outputs.

Findings

The survey findings can be broadly grouped into four themes:

- Dissemination and understanding
- Assessing impact, implementing change and evaluation
- Learning culture
- Capability and research utilisation maturity

Dissemination and understanding

The survey found that established media and information products, such as the CRC website, AFAC website, Fire Australia and Hazard Notes are the most effective information media by which the people in the emergency management sector access research information. It is by using these media that organisations share research information with their personnel. Social media such as BNHCRC Twitter, Linked-in or U-tube were not as well utilised or endorsed as the traditional media. Whilst dissemination is strong, there was a statistically significant difference in this perception between senior management and those personnel in frontline positions, suggesting reach is limited.

Assessing impact, implementing change and evaluation

Active participation and engagement, particularly via project groups and AFAC professional development events, was rated as the best means to help people in the industry make sense and understand the application of research. It is primarily through these mechanisms that individuals (and consequently organisations), incorporate research into their practice. In the survey opportunities for engagement consistently out-performed traditional information tools on items such as enhancing familiarity; as well as in assisting participants to help evaluate what needs to change in their agency's practice and in assisting with skills to help bring about change. This reinforces the need to continue and possibly extend such activities.

Regardless of how well efforts in information dissemination and providing opportunity for active engagement and participation have been received, analysis of the barriers that influence research utilisation capability identified these themes:

- assess, analyse and evaluate what the research means for their business
- interpret and manage change indicated by research
- the ability and confidence to make meaning of the research reports and outputs
- access to the research.

This could mean that there are limitations to agency capacity and capability to benefit from these, and also that there is still room for improvement in the services themselves.

Learning Culture

Participants were asked to rate the degree to which they thought their agency was one that exemplified a learning organisation, where this was defined as one that learns from experience of its members or learns from the experience of others. While this had shown an increase between 2012 and 2014 this item has declined and is now just below that reported in 2010. The lack of confidence reported earlier in relation to research utilisation capability may account for the slight decline in perceptions of being learning organisations.

Given the industry's strategic drive to be able to demonstrate an evidence-base to practice, having a strong learning culture would be advantageous. Little change in these perceptions over time, as well as the findings reported earlier in relation to dissemination and active engagement and participation required to assess impact and evaluate, suggest that existing utilisation strategies may not yield step-change improvements and that the learning culture of the industry may be a limiting factor.

Capability and Research Utilisation Maturity

Just as a strong learning culture is essential to research utilisation, it is important that agencies and the industry build capability to develop robust processes of deliberative review, assessment and evaluation so that evidence-based practice can be demonstrated and advanced.

Individuals and organisations involved with the CRC have highly variable research utilisation capabilities**.** Individual capability includes the ability to actively seek research, to interpret it and to create links with the CRC and other research groups without specific direction from the organisation. Organisational capability is enhanced when there are a number of strategies and processes in place to support research utilisation.

Findings from the survey indicated there is a high degree of variability in the maturity of CRC partners with respect to research utilisation. A thematic analysis of respondent comments suggested that there are four levels of maturity in research utilisation practices:

- relies on individual effort;
- some systems in place, relies mainly on dissemination;
- established processes that include efforts to review and evaluate
- widely embedded and active connections between research and operational activities.

This analysis builds on initial work done through the Knowledge, Innovation and Research Utilisation Network at AFAC. The research, writing and publication of case studies that highlight research

impact and the factors contributing to this success also offer an opportunity to enhance industry confidence and demonstrate capability that is not explicitly recognised.

Conclusion

The key findings from this survey can inform future research utilisation strategy, specifically;

- Continue and strengthen dissemination efforts and focus on those found most useful. Explore opportunities for social media.
- Emphasise participation and deep engagement (especially project teams and professional development) as essential. Explore additional opportunities to embed this into our culture
- Consider the different levels of maturity in our partner organisations and tailor products and activities accordingly
- Support activities that build both individual and organisational capability.
- Further develop a research utilisation capability model and share cases of successful research to impact.

Finally, this survey has served its original purpose well and has informed shifts in direction of the research utilisation program. The evolution of the CRC and the industry means that this particular survey would need considerable overhaul if it were to be conducted again. Within AFAC, the capability to monitor and measure commitment to research and its impact has been incorporated into a national broader industry performance measurement initiative, and the BNHCRC has developed a comprehensive monitoring and evaluation framework suited to its needs. The monitoring, reporting and review of information products and engagement opportunities is now commonplace and should continue within the relevant organisations with a specific emphasis on their utilisation value.

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Introduction

As part of the former Bushfire CRC's research utilisation strategy, stakeholders have been regularly surveyed to assess how they are utilising research in order to gain maximum benefit from their investment. Those surveys were conducted in 2010, 2012, and 2014. In January 2016 a similar survey was conducted by AFAC and the Bushfire and Natural Hazards CRC (BNHCRC). These four time-series data points provide insights into how agencies are engaging the research and capitalising on the utilisation of CRC research outcomes. The surveys have been conducted to:

- assist individual agencies to understand their current situation with regard to research utilisation; and
- collectively inform further research utilisation programs.

The summary of findings presented here can inform research utilisation strategies into the future. Previous reviews of the literature (e.g., Dearing 2009; Owen 2011) suggested that systematic evaluation of research utilisation supports industry effectiveness through developing learning cultures which enable:

- processes to accelerate the pace of adoption;
- increases in the number of adoptions possible from research conducted;
- enhancements in the quality of research implementation;
- sustainability in the use of worthy innovations; and
- demonstration of the research effectiveness at agency and industry levels.

Critical to success in research utilisation is also an understanding of what main barriers might be impeding research outcome and thus need to be overcome. In line with the body of literature associated with barriers to organisational change and adaptation (see for example Funk 1991; Baernholdt and Lang 2007; Elliot and Mihalic 2004; Helmsley-Brown and Oplatka 2005; LaPierre, Ritchey and Newhouse 2004), the surveys have also canvassed selected items identified as potential barriers to research utilisation within agencies.

Method

The structure of items in the survey initially developed from a literature review where the key activities known to be important were identified and sequenced. In this way some of the items follow the sequence of activities found to be important. For example, new knowledge first needs to be disseminated and read, then assessed and evaluated for its possible impact on existing practice, any changes needed based on the new knowledge need to be implemented, tracked and again evaluated.

For the 2016 survey the previous 2014 iteration was reviewed and some minor updates were made. Changes included adding in a number of new opportunities for information dissemination and engagement since the commencement of the Bushfire and Natural Hazards CRC as well as some other qualitative questions on utilisation strategies and indicators of being a learning organisation. The January 2016 survey was distributed to 50 agencies. Agency contacts were requested to distribute the survey to 5-15 people, using the following stratified sample:

- Senior management: the most senior person in the organisation responsible for the following areas:
    - communications
    - training and development
    - operations
    - community safety
    - knowledge management/innovation/research;
- Five persons at middle-management including regional operational and non-operational personnel (e.g. District Managers);
- Five persons in operational or front-line service positions (e.g. volunteers, field operations personnel, community education officers, training instructors).

The purpose of this sampling method was to target personnel who could reasonably be expected to:

- have an understanding of the strategic planning of the agency;
- have some awareness and/or involvement in Bushfire CRC and/or BNHCRC activities; and
- are those persons responsible for implementing any changes needed based on research evidence.

Table 1: Participation rate in the 2010, 2012, 2014 and 2016 surveys

Year	N	Agencies responded	Agencies invited
2010	148	15 (60%)	25
2012	95	18 (64%)	28
2014	180	21 (68%)	31
2016	266	29 (58%)	50

In the 2016 sample, 266 responses were received from 29 agencies (see Table 1). The participation rate is appropriate for online surveys of this type (Baruch & Holtom, 2008).

However, it is also important to acknowledge that the 2016 cohort consisted of two somewhat different groups:

(i) those who have been engaged in the surveys in previous years; and
(ii) a new cohort of agencies who have joined the new Bushfire and Natural Hazards CRC in the past 18 months.

To ascertain if these cohorts were responding differently based on different perceptions or experiences some of the findings are split into these two groups: continuing members and new members. Differences were found in the participation rates of these two cohorts with 15 agencies participating of the 21 who were previously engaged in the 2014 study, yielding a participation rate of 71% for continuing agencies; and 14 agencies participating of the 31 new members (45%). One insight that may be suggested from this difference is that with engagement grows increased

attention to involvement and participation. It may be appropriate to consider particular strategies to induct agencies not yet engaged and to help them to learn from those who are involved.

Sample

The median number of years that survey participants have been in the industry was 22, and the median number of years within the agency was 13, thus demonstrating the level of experience of those responding. Of the participants who answered the question about their position in the agency, 28 (15%) were in senior management positions (e.g., Directors); 126 (66%) were in middle management roles (e.g., District Managers) and 37 (19%) had front line responsibilities (e.g., training instructors).

There was also a reasonable spread of participation from the kinds of agencies included in the sector with the exception of urban agencies where only one agency participated yielding 12 (5%) of responses. Most of the responses came from people participating in agencies that have multiple hazard roles (n= 77 or 35%) indicating the structural shifts occurring within the industry as well as a broadening of the BNHCRC industry stakeholder base. Participation from rural agencies was also well represented (n= 52 or 21%). Land management agencies (n=37 or 15%); State Emergency Services (n = 35 or 14% and agencies with another role (e.g., critical infrastructure, humanitarian, specialist science roles; n= 38 or 15%) comprised the balance.

Survey Analysis

The survey consisted of a number of quantitative Likert-type items where participants were asked to rate their level of agreement on a scale of 1 to7, with an option for “can’t answer”.
Where appropriate, descriptive summaries and statistics are included to highlight trends between the three surveys and within the 2016 sample. Where the statistical assumptions required for advanced analyses have been met then these analyses have also been performed. For ease of reading, whenever statistical analyses have been performed the details of the calculations are included in an endnote rather than in the text.

Benchmarking Survey Results

As discussed in the previous studies, in considering whether the overall responses have **endorsed** an item, a benchmark of 4 out of 7 on the scale has been notionally set as support for or endorsing the item in terms of perceived levels of effectiveness or satisfaction. This is akin to a “report card” approach often used in Management communities of practice. Doing so enables a discussion of the results as feedback from the industry on perceived levels of endorsement for various practices (e.g., research utilisation strategies). From this point of view then, and where appropriate, rankings between 6 and 7 are regarded as high levels of endorsement for the item; and a ranking of 1, 2 or 3 on an item as a low level of endorsement.

1. Strategic alignment

The first three items assessed participant familiarity with their agency’s strategic plan; familiarity with the research outputs emerging from the Bushfire and Natural Hazards CRC (BNHCRC), and the perceived alignment between agency strategic planning and the research emerging from the BNHCRC.

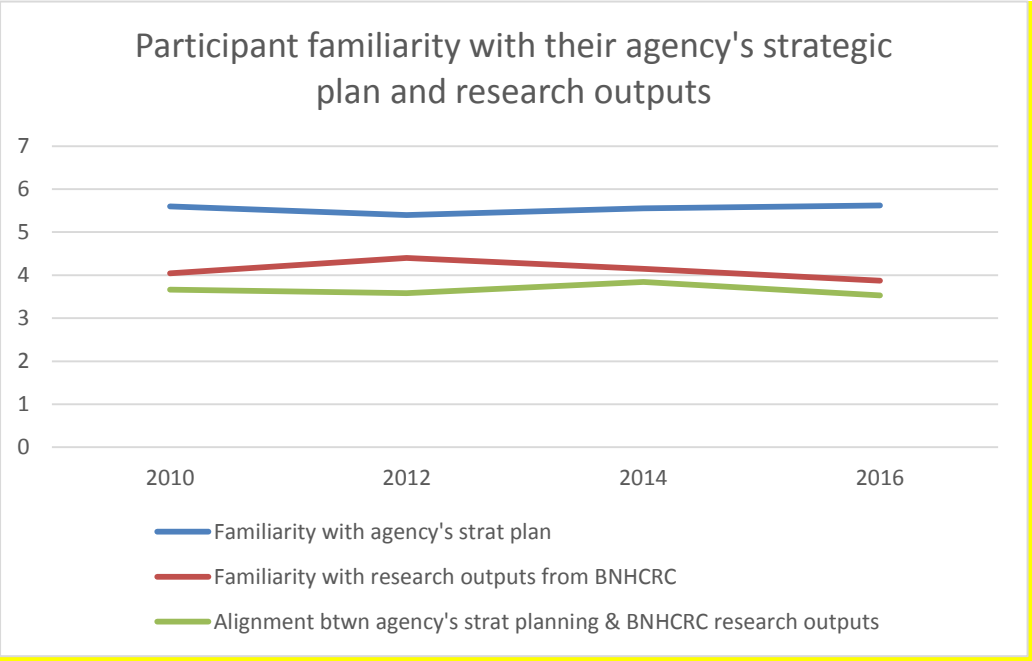

Figure 1: Participant familiarity with the strategic alignment between agency and research

There has been a consistently high level of familiarity with the agency's strategic plan, indicating that the sampling approach taken has reached its intended target and has been stable across the three data points. In the 2016 sample there is a lower level of familiarity with the research outputs[i] as well as with the perception of the alignment between the agency's strategic planning needs and the research outputs emerging from the BNHCRC. Lower levels of familiarity are not surprising given the current life cycle of the existing CRC and the emergent state of the research outputs. Lower levels of alignment may be due to the various specialisations of research which only target particular problems and therefore only represent part of an agency's business. However, it is also interesting to note the findings to an additional question asked for the first time in 2016 which asked participants to report on the level of alignment between their strategic planning and other research outputs. This was, on average, slightly higher than that reported for alignment with BNHCRC outputs[ii]. These findings may indicate a need to assist agencies to better connect their corporate strategy to an evidence base.

Awareness of strategies to keep up to date with research

Participants were also asked to rank their level of awareness of the strategies their agency had in place to keep up to date with research. The level of awareness has remained largely the same over the four data collection years and is at about 4/7. There are significant differences between those staff working on the frontline of their agencies (and likely to be expected to implement any changes in practices), and those who are in middle management or senior management positions- see Figure 2. The figure below shows the mean differences which yielded a statistically significant difference between senior management and middle management as well as between senior management and personnel working on the front line[iii].

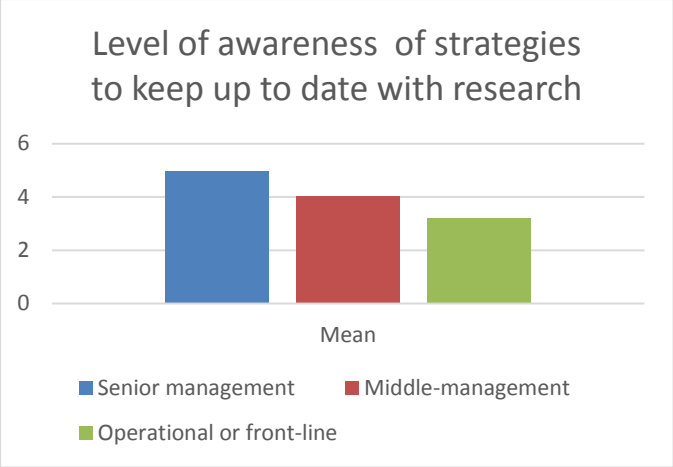

Figure 2: Level of awareness of strategies to keep up to date with research

Strategies used to keep up to date with research

Participants were asked to provide comments on the types of strategies they knew were in place. From the 2016 survey 95 (or 38%) of participants provided responses. These included comments in relation to participating in BNHCRC or AFAC organised events, such as attending the conference or RAF as well as participating in the research project team as an end user. Other strategies included keeping abreast of the research from emails or other forms of dissemination. It appears that within some agencies there are processes in place to discuss and review research and in other agencies the motivation is left up to the individual. The data has been further analysed and is reported below (see section Analysis of utilisation strategies, page 29 below).

Perceived effectiveness of research utilisation processes

Participants were asked to rate the perceived effectiveness of their agency (see Figure 3) in terms of its processes to:

- **disseminate** research within the agency;
- **assess and evaluate** the impact of the research in agency practice;
- **implement** any agency changes that may be needed;
- put in place **monitoring** processes to track changes; and
- **disseminate** the outcomes of any changes made as a result of research.

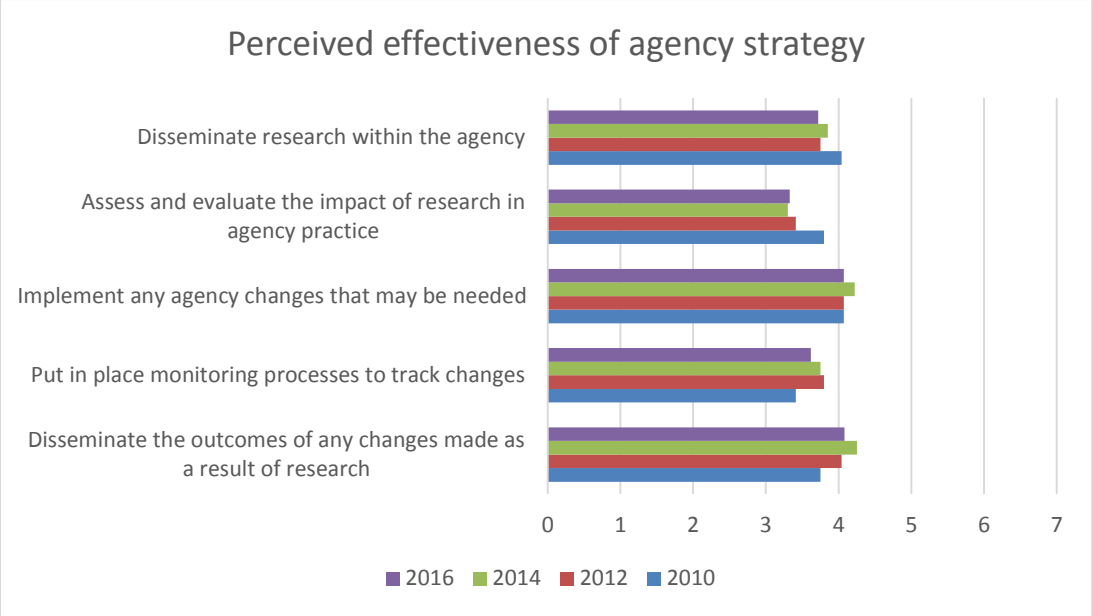

Figure 3: Participants assessment of the effectiveness of their agency's processes to benefit from research

These ratings have either remained the same or declined slightly since the last data collection period, however these shifts are likely to be due to sampling variation since none are statistically significant. In addition, in terms of the 2016 survey there was also no significant difference in how this item was answered between those new or engaged groups in the sample (i.e., whether participants were those engaging for the first time or had continuing engagement). There was a significant difference in the perceptions of effectiveness in terms of disseminating research within the agency between senior management and those personnel in operational or frontline positions with the latter being less satisfied[iv]

What was also significant was the variation within the sample – that is, the way individuals responded to each of the items. On average participants rated their agency's effectiveness in *assessing and evaluating the impact of research in agency practice* significantly lower than they did its effectiveness in disseminating research[v]. In addition *putting in place processes to monitor and track changes* was also significantly lower[vi].

Given the sustained effort that the CRC and AFAC have put into packaging up materials to make dissemination a relatively straight forward and accessible process for agencies, this may indicate that similar resources and tools are needed to help agencies to undertake these other aspects important in the utilisation process.

2. Uptake of research utilisation strategies

Information Products

The next section asked participants to assess the information products tools and resources to communicate the research to agencies. In the 2016[1] survey these resources include the AFAC

[1] The earlier surveys included similar items for CRC Website as well as BCRC fire notes. The findings reported here are similar to the previous survey in terms of levels of endorsement for these items.

Website, Bushfire and Natural Hazards CRC Web Site, as well as BNHCRC Hazard Notes; Hazard News, BNHCRC Facebook page; Twitter, Linked-in U-Tube and finally the Publication Fire Australia. In considering these tools and resources participants were asked to rate their level of satisfaction with using the tool to:

- become **familiar** with the research;
- give them the **information** they want;
- assist them in learning new **knowledge** and **skills**;
- help them **understand** the research;
- help them **evaluate** what needs to **change** in their agency's practice; and
- enables them to develop **skills** to help bring about **change**.

Figures comparing the responses on the items are presented in Figure 4 to Figure 9. In summary:

- BNHCRC Hazard Notes are ranked highest in enabling familiarity with the research as well as in satisfaction with getting the information wanted, and other traditional information resources – BNHCRC and AFAC Websites as well as Hazard News also rank highly for these items. These traditional sources were also endorsed for helping to understand the research and to assist in learning new knowledge and skills.
- **Overall these information resources were consistently lower in their endorsement as places to go for *help with evaluating what needs to change* and *helping to bring about change* receive the lowest rankings compared with all other items**. That is, while the other items ranged in average between 4.05 and 5.1, these two items ranged between 2.88 and 3.75.
- While developing expertise in evaluating and in enacting change is not the main focus of AFAC or of the BNHCRC, these skills are however critical to research utilisation. In future research utilisation initiatives it might be profitable to focus on developing agency capability and capacity to interpret and evaluate research findings in relation to organisational development and developing skill sets for addressing changes needed. Some insights in relation to agency concerns here are also discussed below in the barriers section.
- The social media resources (Face-book, Twitter, Linked-in and u-tube received the lowest levels of endorsement for the items, indicating either that they are not being used by this sample cohort and/or are not being used for these purposes (the participants providing a response on these information tools ranged from 32-53 responses, apart from "can't answer" or skipping the item.

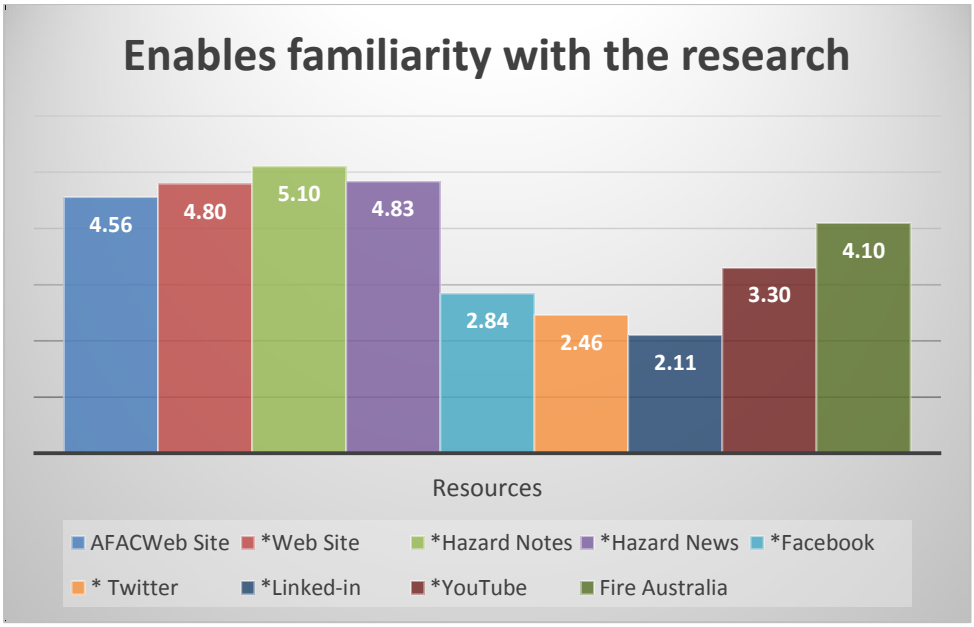

Figure 4: Participants level of familiarity with Research through use of research utilisation tools and resources

(*Resource = Bushfire & Natural Hazards CRC)

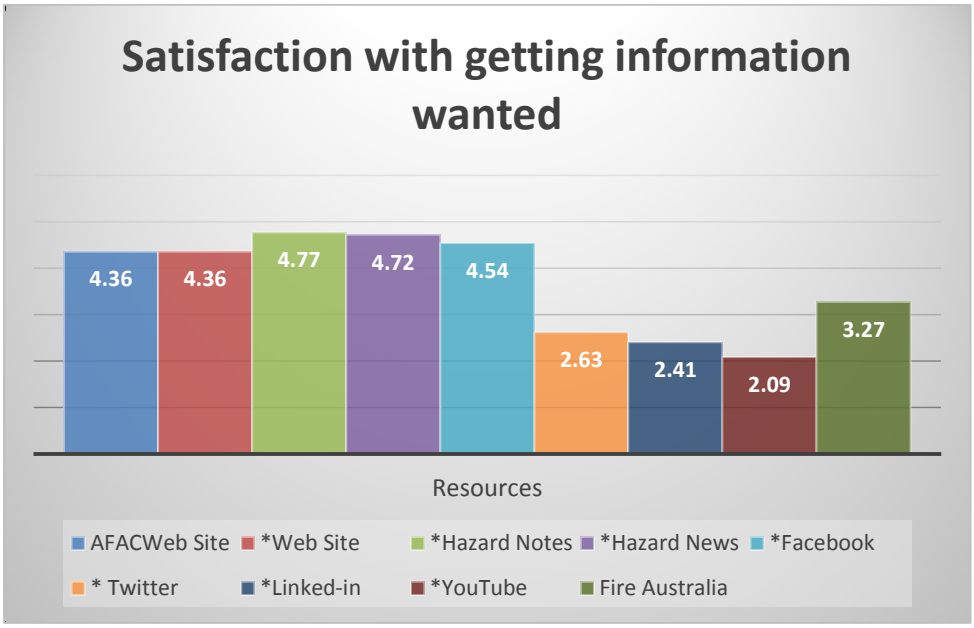

Figure 5: Participants level of satisfaction with getting the information they want from research utilisation tools and resources

(*Resource = Bushfire & Natural Hazards CRC)

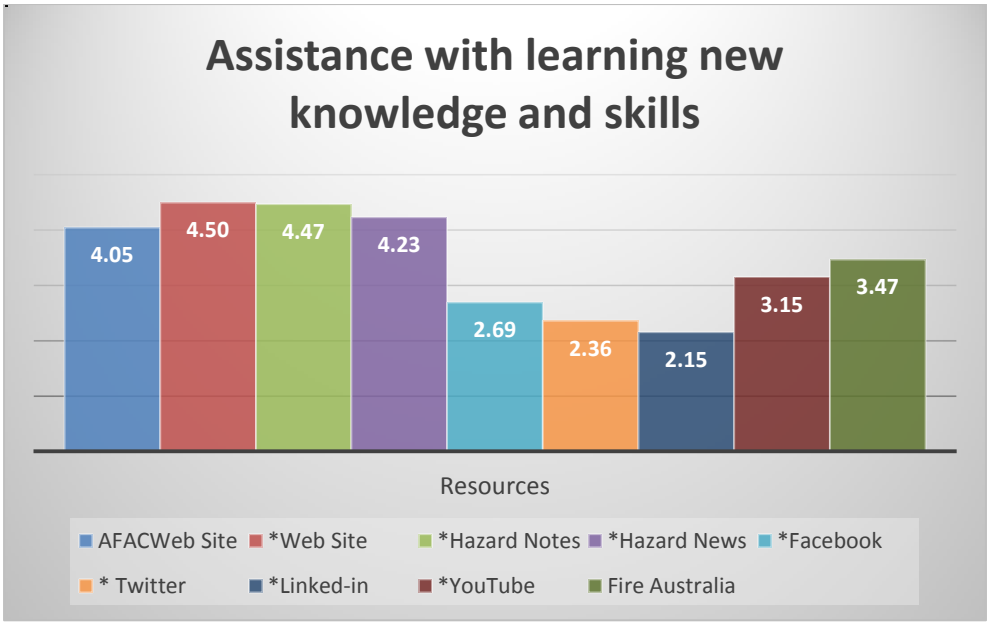

Figure 6: Participants rating of the level of assistance the research utilisation tools and resources provide in helping them acquire new knowledge and skills

(*Resource = Bushfire & Natural Hazards CRC)

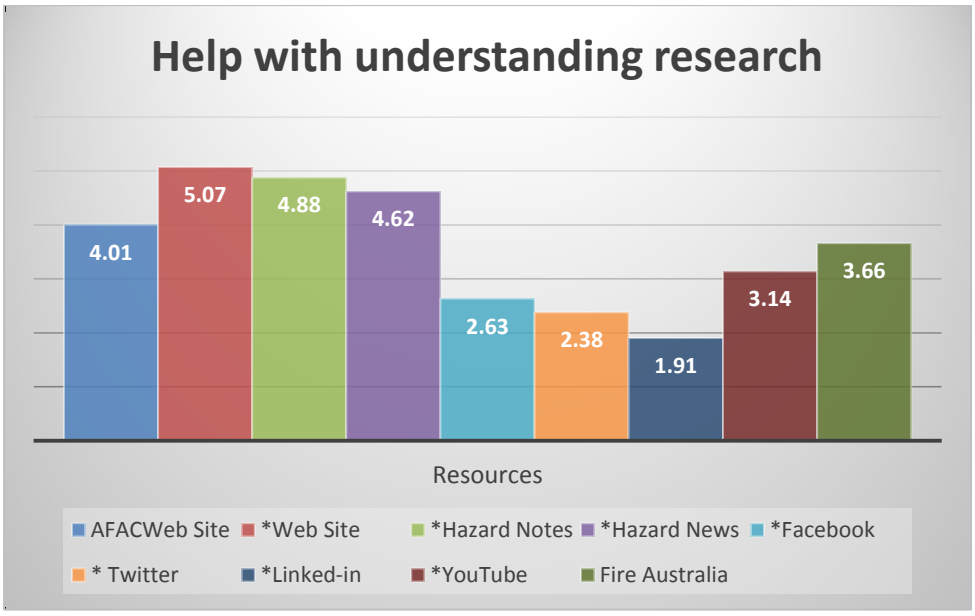

Figure 7: Participants rating of the level of help the research utilisation tools and resources provide for them to understand research

(*Resource = Bushfire & Natural Hazards CRC)

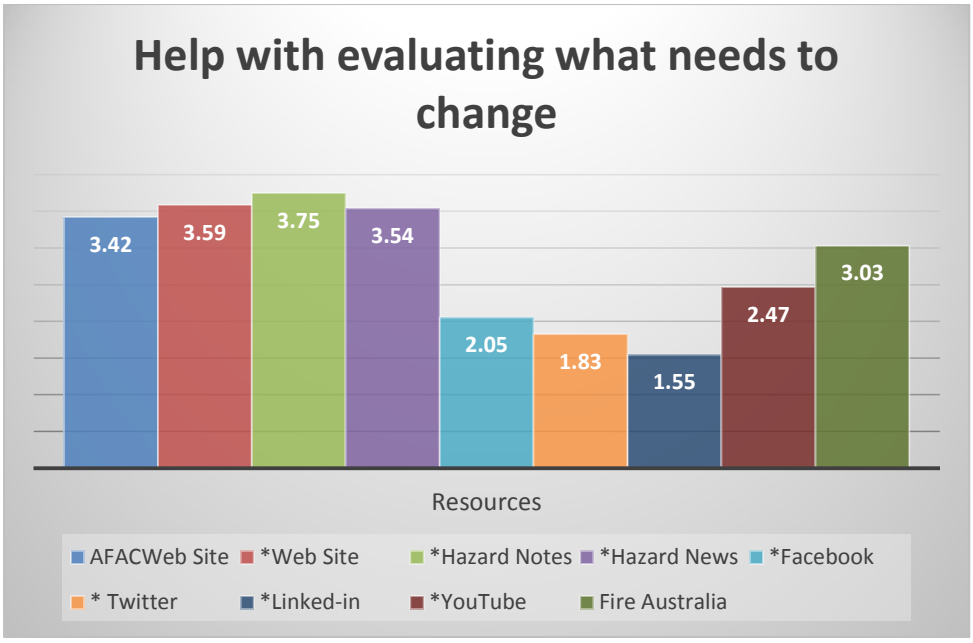

Figure 8: Participants rating of the level of help the research utilisation tools and resources provide for them to evaluate what needs to change in their agency's practice

(*Resource = Bushfire & Natural Hazards CRC)

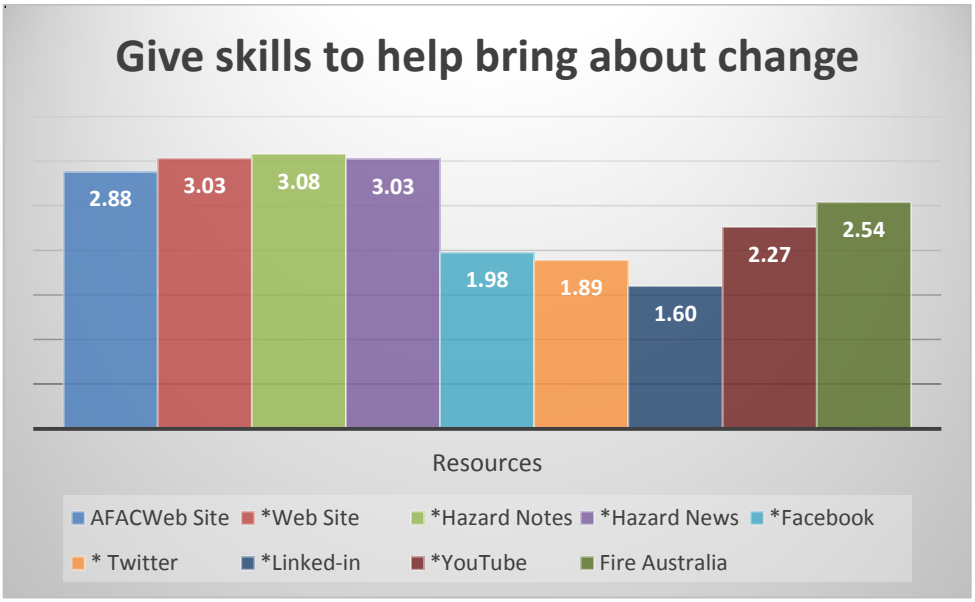

Figure 9: Participants rating of how well the research utilisation tools and resources give them the skills to help bring about change in their agency

(*Resource = Bushfire & Natural Hazards CRC)

Engagement in research utilisation processes

Information was also sought on involvement in engagement in opportunities for collaboration with the BNHCRC and its research. The opportunities canvassed were:

- AFAC/BNHCRC Conference and Research Forum;
- Research Advisory Forum;
- One-off workshops on specific topics;
- Involvement in a project team, and
- AFAC Professional Development workshops

Table 2 summarises the number of participants who are also engaged in these collaborative opportunities and illustrates the highly engaged nature of the sample.

Table 2: Number of participants engaged in collaborative opportunities (2016)

Engagement	N	% of sample
AFAC/BNHCRC Conference and Research Forum	121	56%
Research Advisory Forum	65	30%
One-off workshops on specific topics	103	47%
Involvement in a project team	71	33%
AFAC Professional Development workshops	89	41%

Participants who were engaged in each of these collaborative opportunities were also asked to report their levels of satisfaction with each collaborative activity in terms of the degree that it:

- enables you to become **familiar** with the research;
- gives you the **information** you want;
- assists you in learning **new knowledge** and **skills**;
- helps you to **understand** the CRC research;
- helps you to **evaluate** what needs to **change** in your agency's **practice**; and
- enables you to **develop** the **skills** to help bring about **change**.

The findings are indicated in Figure 10 to Figure 15. In summary the findings indicate that:

- With one exception[2], all opportunities for engagement were more strongly endorsed than were the traditional information resources.
- Providing skills to help in evaluating change as well as skills in being able to bring about change were moderately endorsed (ranges from 3.55- 4.91); with the strongest endorsement across all items being for sustained engagement in a project team.
- This indicates the value participants place on being involved in discussion about the meaning of the research what it might mean for practice. This finding indicates two things. First it suggests that those who are able to participate are also able to improve their understanding of what the research may mean for their agency's practice. Secondly, it suggests that if engagement is distributed to personnel from the agency then this increased understanding should assist in capacity building to facilitate innovation within the agency assuming the people tasked with improving aspects of the agency's practice are the ones who are engaged.

The issue here, however, is also one of reach. Even within our engaged sample of 226, those participants able to report on traditional information products numbered between 115 and 200 (43 – 75%); in contrast, those able to report on direct engagement numbered between 60 and 120 (23-45%). It may be that the 'more engaging' of the information products, such as You Tube, could be employed to both extend reach and to engage people more deeply in considering the practical implications of research findings.

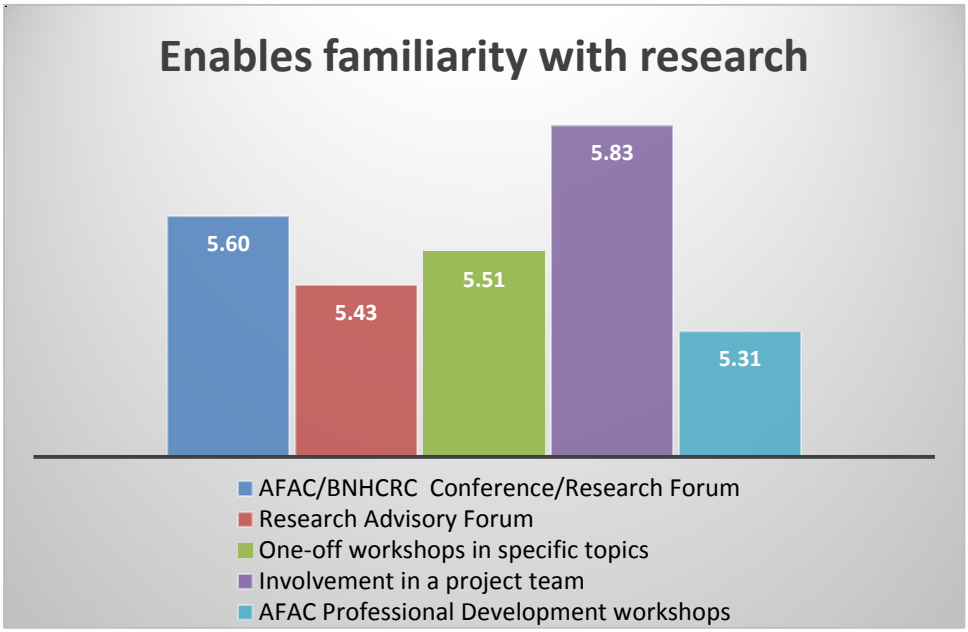

Figure 10: Participants' rating of their familiarity with the research when engaged actively in collaborative opportunities

[2] In terms of looking at the Figures, the items "Gives you the information you want" is higher for BNHCRC Hazard Notes (Ẍ= 5.10) than it was for the Research Advisory Forum (Ẍ =4.89), however this is not statistically significant.

Figure 11: Participants' level of satisfaction with getting the information they want research when engaged actively in collaborative opportunities

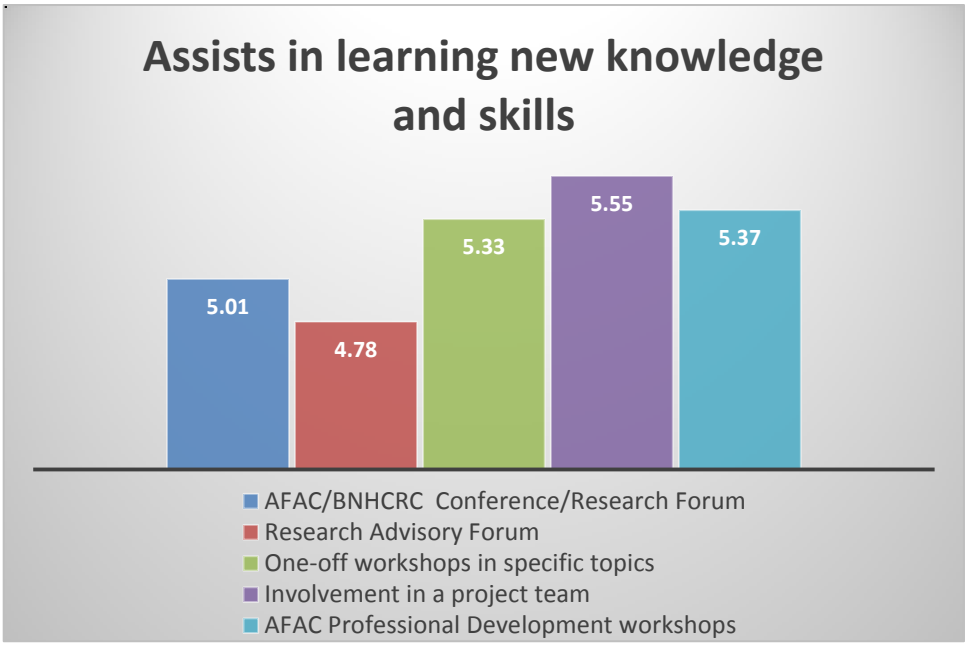

Figure 12: Participants' rating of the level of assistance with learning new knowledge and skills when engaged actively in collaborative opportunities

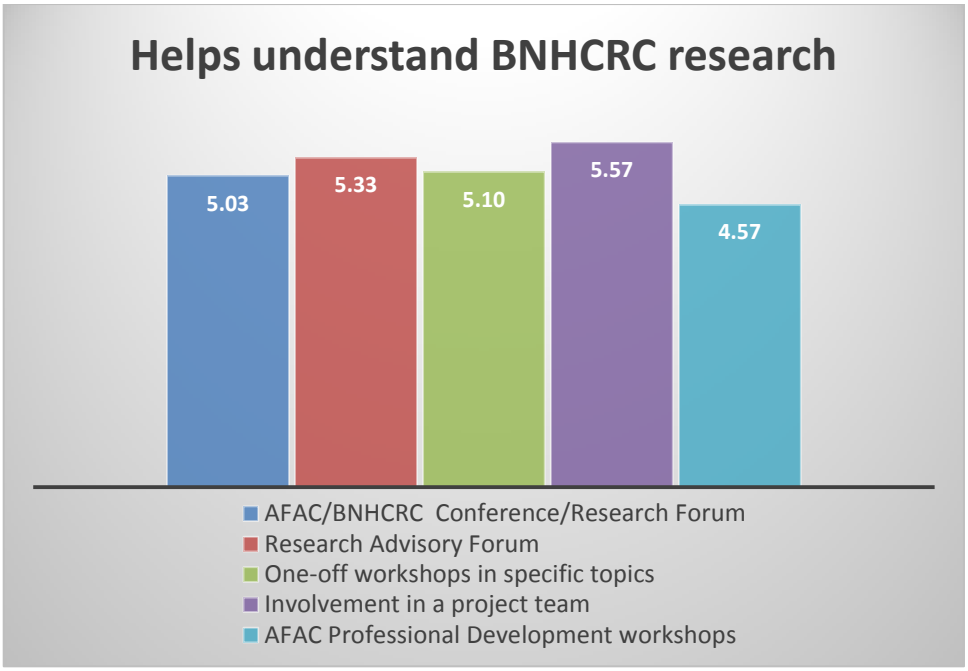

Figure 13: Participants' rating of their understanding of the research when engaged actively in collaborative opportunities

Figure 14: Participants' rating of the level of help to evaluate what needs to change in their agency's practice when engaged actively in collaborative opportunities

Figure 15: Participants' rating of how well they are able to develop the skills to help bring about change in their agency from being engaged actively in collaborative opportunities

Comparison of information products and engagement

In addition, further analysis was conducted to compare the compilation of traditional information products with the opportunities for engagement. Having first checked the internal reliability for the items to be scaled[vii] was robust, the combined responses rating the 5 information products[3] were compared with 5 opportunities for direct engagement[4] in their ability to assist participants to:

- become **familiar** with the research;
- give them the **information** they want;
- assist them in learning new **knowledge** and **skills**;
- help them **understand** the research;
- help them **evaluate** what needs to **change** in their agency's practice; and
- enable them to develop **skills** to help bring about **change**.

The Results presented in Figure 16[5] are entirely consistent with contemporary communication and engagement models such as the IAP2 public participation spectrum (IAP2 International Federation 2014.)

[3] AFAC Website, BNHCRC Website, BNHCRC Hazard Notes; BNHCRC Hazard News as well as the publication Fire Australia

[4] AFAC/BNHCRC Conference and Research Forum; Research Advisory Forum; One-off workshops on specific topics; Involvement in a project team, and AFAC Professional Development workshops

[5] The combined traditional information products/direct engagement scale could yield a maximum of 35 (individual items out of 7 x 5 items)

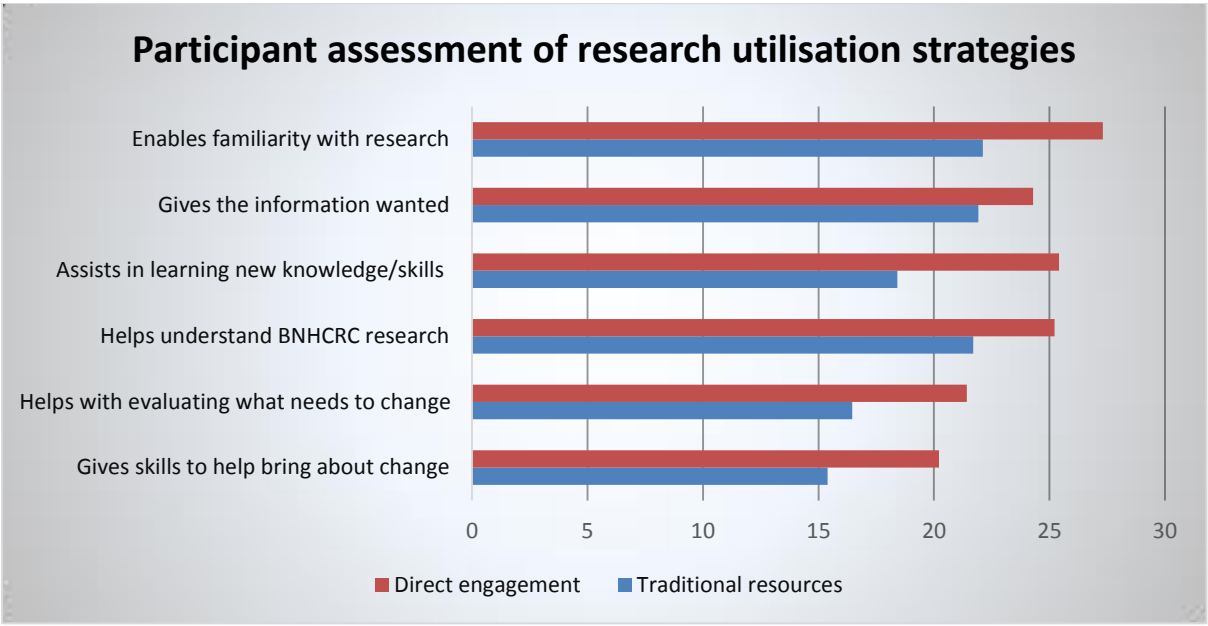

Figure 16: Comparison of traditional information resources and opportunities for direct engagement

Perceptions of learning cultures in agencies and in the industry

The 2016 survey again surveyed perceptions of the degree to which (i) the agency and (ii) the fire and emergency services industry could be characterised as having an emphasis on learning, where a learning culture was defined as an agency (industry) that learns from the experience of its own members or the experience of others. In the 2010 survey participants were also asked to report on where they thought the industry was five years previously. As can be seen from Figure 17 perceptions of learning in agencies, as well as in the industry, following a bump between 2012 and 2014, this assessment has once again declined. The perception of learning in agencies in 2016 is significantly lower than that reported in 2014[viii].

On the one hand, it might be reasonable to conclude that a self-assessed report card equivalent of 67% (4.6/7) might be as good as can be expected for agencies. On the other hand, it might also suggest that existing strategies are not assisting agencies to get the most out of their investment. Given the increased exposure of agencies to public scrutiny not being able to point to a strong evidence-based learning culture would seem to represent vulnerability with associated risk.

Given the importance of a learning culture to support adaptation, innovation and change within the industry, it would be important in the future to continue to identify ways to assess the industry in terms of a learning culture. There may also be value in further examining aspects that enable or constrain a learning culture and in particular to better understand which agencies are better or poorer at developing new knowledge and in innovation. The findings provide some insights but do not explore the attributes that would enable the development of a learning and innovation culture. Indeed while the findings are interesting, the current survey structure does not provide insights as to why these items have changed or whether there are differing patterns in segments within the industry.

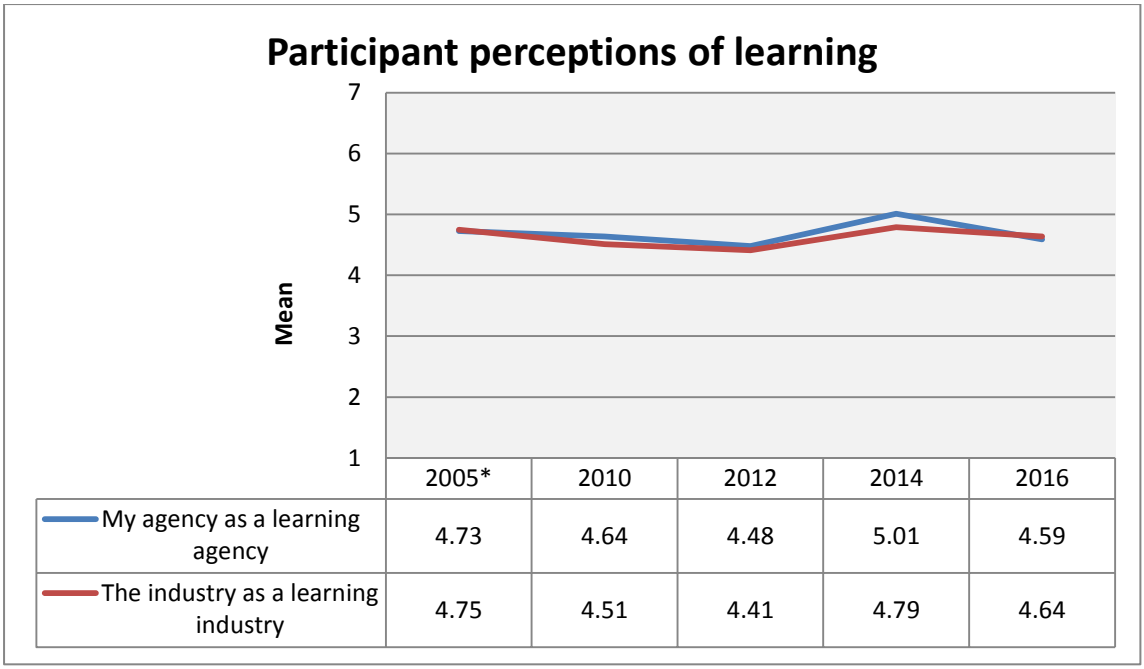

Figure 17: Mean of participants' perception of learning in their agencies and the industry over time. Perceptions rated from 1 to 7 in survey.[6]

Given the importance in the industry (including supporting resilience in the face of litigious scrutiny for agencies) to be able to demonstrate evidence-based practice and to enable responsiveness to change and agility, then a better understanding of learning cultures within the industry would seem critical.

The final section of the survey assessed barriers to research utilisation that have been identified in the research literature.

3. Barriers to research utilisation

Participants were also asked to provide an assessment of the degree to which key barriers might be impeding research utilisation. As discussed in the introduction to this report, the barriers included have been extracted from research in related fields.

The 2010 survey included 28 items adapted from research undertaken in related domains (Baernholdt & Lang 2007; Funk, Champagne, Weise & Tornquist 1991; Retsas 2000; Hemsley-Brown & Oplatka 2005). Following a review of the items in a factor analysis, 15 items were retained and included in 2012 and these repeated in 2014.

Previous survey responses reported above indicated concerns about the capacity to assess and evaluate research impact for agency practice; to monitor changes based on research evidence; and

[6] *2005 – as estimated by participants in 2010.

about skills needed to initiate change. Thus, it was anticipated that a review of potential barriers to research utilisation may yield useful insights on how areas of concern may be overcome.

Factor Analysis

Factor analysis has been employed to examine underlying patterns of response and to reduce data to ascertain if there are particular dimensions (factors) that help explain the way participants are responding. Factor analysis can also measure the relative importance or "weight" given to the factor by responses. This can be helpful in identifying overarching areas to target in strategy. The analysis revealed that in responding to the 14[7] barriers items, four dimensions could be identified. These included:

First factor- Connecting research with agency business

The first and, by far, the factor given the most weighting in the response pattern relates to the internal processes agencies have in place to assess, analyse and evaluate what the research means for their business. Items included in this factor include perceptions that agencies:

- The agency hasn't developed the appropriate assessment strategies to consider the implications of the research
- As an agency we don't have an effective process for translating the research for our personnel
- It is not clear who is dealing with what Bushfire CRC research in our agency

At the heart of this concern seems to be the internal agency processes to untangle what and how the research undertakes interacts with their business goals and functioning. This includes establishing processes of "who" is responsible as well as the "how" in terms of developing processes of analysing and assessment.

Second Factor- Interpreting research and managing the changes needed

The second factor relates to a concern to have better ways to make the implications clearer as well as what to do once the meaning of the research is known. This factor appears to be expressing agency concern about not knowing how to make the changes needed. Items included in this factor include perceptions that:

- Personnel don't feel capable of evaluating the quality of the research
- Agency personnel don't have the capacity to think strategically about what the research may mean for our business
- The impacts of the research for the agency need to be better articulated
- We need a change advocate within the agency to take the research implications forward
- There is too much change happening in this agency already, we don't need more to be considered
- We need cooperation from other stakeholders in the industry for successful implementation

This factor also connects to the next one which is about research understanding and capability to be able to read, assess and critically evaluate the quality of the research so that it can be trusted.

[7] The item "the amount of research is overwhelming was removed because it was not correlating with any other item.

Third factor – Evaluating the research –developing research literacy

The third dimension relates to the ability and confidence of participants to make meaning of the research reports and outputs. Of consideration here is how the BNHCRC and AFAC might support end users in their ability to assess the quality of the research findings.

This indicates what agencies, peak bodies such as AFAC and the CRC can do to support sense making about the implications for research utilisation. These items include reference to:

- The reports are hard to read
- It is not clear what change is needed
- Implications for practice are not made clear

Clearly information products such as Hazard News and Hazard notes assist in distilling the main ideas emerging from the research. Perhaps these or other resources from the website could include some assistance aimed at interpretation of research terms and how such research might be evaluated as well as articulating what the findings imply for changes to practice.

However, it should also be noted that assessing the implications of research for practice is not an easy fix, as the implications will change for different agencies and even different parts of the agency. It is thus critical to acknowledge that developing a capacity to better understand the implications for practice will require significant effort and a targeted strategic approach.

Fourth factor – Research access

The final factor includes one item which is that *the research is hard to find.* This is likely to be more of an issue for newcomers to the BNHCRC and those AFAC agencies who might not have engaged previously.

Table 3: Barriers items grouped into dimensions

Rotated Factor Matrix[a]				
	Factor			
	1	2	3	4
Q11.15. The agency hasn't developed the appropriate assessment strategies to consider the implications of the research	.848			
Q11.14. As an agency we don't have an effective process for translating the research for our personnel	.805		.306	
Q11.13. It is not clear who is dealing with what Bushfire CRC research in our agency	.694			
Q11.7. We need a change advocate within the agency to take the research implications forward	.446	.582		
Q11.4. Agency personnel don't have the capacity to think strategically about what the research may mean for our business		.569		
Q11.11. Personnel don't feel capable of evaluating the quality of the research		.515		
Q11.8. The impacts of the research for the agency need to be better articulated	.363	.500		
Q11.5. There is too much change happening in this agency already, we don't need more to be considered		.326		
Q11.9. We need cooperation from other stakeholders in the industry for successful implementation		.310		
Q11.2. The reports are hard to read			.617	
Q11.1. Implications for practice are not made clear			.569	
Q11.6. It is not clear what change is needed			.490	
Q11.3. Most people in this agency don't know about the research	.383		.448	
Q11.12. The research is hard to find				.940
Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization.[a]				
a. Rotation converged in 6 iterations.				

Table 4: Summary of barriers items and ranking for 2010-2016.

List of Statements	2010	2012	2014	2016
1. Implications for practice are not made clear				
2. The reports are hard to read				
3. Most people in this agency don't know about the research	4th	3rd		1st
4. Agency personnel don't have the capacity to think strategically about what the research may mean for our business				
5. There is too much change happening in this agency already, we don't need more to be considered				
6. It is not clear what change is needed				
7. We need a change advocate within the agency to take the implications forward		2nd	4th	
8. The impacts of the research for the agency need to be better articulated	1st	1st	1st	2nd
9. We need cooperation from other stakeholders in the industry for successful implementation			2nd	3rd
10. The amount of research information is overwhelming				
11. Personnel don't feel capable of evaluating the quality of the research				
12. The research is hard to find				
13. It is not clear who is dealing with what Bushfire CRC research in our agency				5th
14. As an agency we don't have an effective process for translating the research for our personnel	3rd	5th	3rd	4th
15. The agency hasn't developed the appropriate assessment strategies to consider implications of the research	5th	3rd	5th	
Total number of responses	148	94	180	207

The results from the potential barriers to research utilisation section are interesting in that they provide insights into the challenges facing the fire and emergency services industry. The analysis suggests that for significant leverage from utilisation to occur there is a need to build agency and industry capability in assessment and evaluation of potential impacts, as well as in processes of sense-making and assessment and evaluation.

Barriers overall rankings

The highest scoring barriers are presented in Table 4 in rank order, across all three data points[8]. The Table shows that there are consistent barriers identified across all three data points. The items that were included in the top five rankings in 2016 are:

- Most people in this agency don't know about the research
- The impacts of the research for the agency need to be better articulated
- We need cooperation from other stakeholders in the industry for successful implementation.
- As an agency we don't have an effective process for translating the research for our personnel
- It is not clear who is dealing with what Bushfire CRC research in our agency.

Analysis of utilisation strategies

As discussed earlier, the qualitative responses to the question "*What strategies does your agency have in place (to keep up to date with research?*") indicated that there may be some underlying patterns in the qualitative responses useful to further examine.

At the December meeting of the Knowledge Innovation and Research Utilisation Network (KIRUN) a workshop was held to explore how and the network could assist in delivering value from research and to better understand existing agency practice. One of the models put forward at the meeting was about organisational maturity (see Table 5).

Given the findings presented this far, the survey question inviting comments on what research utilisation strategies the participant's agency currently employed was reviewed in relation to the concept of organisational maturity. Responses to the qualitative question were extracted and reviewed. Coders were thus blind to agency representation and responses to other questions included in the survey.

A sample of the comments provided from 168 participants who answered the question were initially coded and discussed between two of the authors[9]. Of the comments 8 were discarded as not answering the question. Having ascertained that the comments could be mapped against a

[8] One item included in the 2010 survey that was second overall *" there needs to be better linkages between researchers and practitioners"* was dropped

[9] N Krusel & C. Owen

framework of maturity the authors again worked through a sample of 30 responses and developed a modified framework of *maturity in research utilisation*. The modified codes and some examples are presented in the Table below. Once the coders achieved an inter-rater reliability of 88% the rest of the comments were coded and then all responses were reviewed and discussed. The total number of responses coded to the utilisation maturity level is also included in the first column of Table 6.

Once the responses to the qualitative question were coded, the codes were then reinserted into the overall data base and the utilisation maturity levels was used to analyse the rest of the responses. When comparing means on utilisation maturity, the figure below shows the mean differences which yielded statistically significant differences on perceptions of agencies as learning organisations[ix] as well as perceptions of the industry being engaged in learning[x]. In addition responses on the utilisation maturity framework also yielded statistically significant results for perceptions of effectiveness in (i) disseminating research[xi]; assessing and evaluating research[xii] implementing any changes needed[xiii]; putting in place monitoring processes to track changes[xiv] as well as disseminating outcomes of changes made as a result of research[xv] (see Figure 19). Finally an assessment was also made of the barriers reported on the combined factor scores. This indicated that those with higher levels of reported utilisation maturity reported significantly less concern regarding barriers to connecting the research to agency business[xvi] (see Figure 20).

Agencies reporting higher levels of utilisation maturity are also reporting fewer problems with barriers to both connect the research to operational activities and to evaluate that research in terms of what it may mean for agency practice.

A thematic evaluation of the aggregated comments within each of the research utilisation maturity codes suggests the following profiles for a potential framework. (See Table 6). It should be noted that codes were based on only what the participant had recorded, meaning that the participants agency may be more active but this was not articulated in the comment. This may indicate a need for a network such as KIRUN to assist agencies to better articulate what they are doing to add value to research.

This framework has potential given that it identifies practices that agencies are engaging in that may be useful for others not yet able to connect research findings to agency practice. More work is needed by the KIRUN Network to take this further.

Table 5: Concepts of maturity and capability maturity models (AFAC KIRUN workshop November 2015)

Level	Description
1	Systems are ad hoc and unsystematic. Success depends on individual effort, skills and experience
2	Some systems and processes are documented which enables successful activities to be repeated, as long as they are similar to past activities as success is very much based on previous experience
3	There are standard processes in place for documenting procedures and risk management systems and processes are widely integrated into the decision making processes of the organisation
4	Decisions are made using formal risk management processes. This includes decision planning, setting context, risk identification, assessment of risk, risk mitigation strategies, monitoring of risk and reviewing decisions. Business processes and systems are widely understood and controlled
5	Continuous improvement is possible because of the capture of quantitative information and feedback. New ideas and technologies can be systematically trialled and associated risks managed. Decision reviews provide information used immediately to improve current systems and processes

Table 6: Research utilisation maturity codes and examples

Level	Description	Examples in data
1 **N=39; (24%)**	Systems are ad hoc and unsystematic. Attempts to keep up to date with research depend on individual effort	*"Undefined, not clearly communicated within communications. Nil business unit assigned to research and development. "* *"the onus for keeping up to date is largely upon individuals maintaining an interest, or subscribing to emails".*
2 **N=63; (39%)**	Some systems and processes are documented which enables research to be disseminated. There is little or no evidence of analysis or impact assessment.	"*We have 2 people that email CRC updates to staff."* *"Lots of material is distributed via our portal and email to keep staff and volunteers informed."*
3 **N=35; (22%)**	There are established processes in place for reviewing research (e.g., dissemination and review either through job responsibilities or an internal research committee). No evidence of how the findings are translated or connected to operational activities	"*Developed a Research Committee*" "*SME's appointed as capability custodians to ensure up to date best practice*."
4 **N=23; (14%)**	There is evidence of active connections between research and operational activities. Operational and strategic decisions are informed by assessing research using formal research utilisation processes. These processes and systems are widely understood and embedded in multiple areas of practice	"*… a process of ensuring results are read by key specialist staff involved in programme design and delivery, are interpreted and analysed for their implications and relevance and then used to inform decision making and strategy through numerous internal for a*" "*Alignment of evidence based decision making in the planning phases of annual planning and the development of indicators around causal factors that inform emergent risk*"

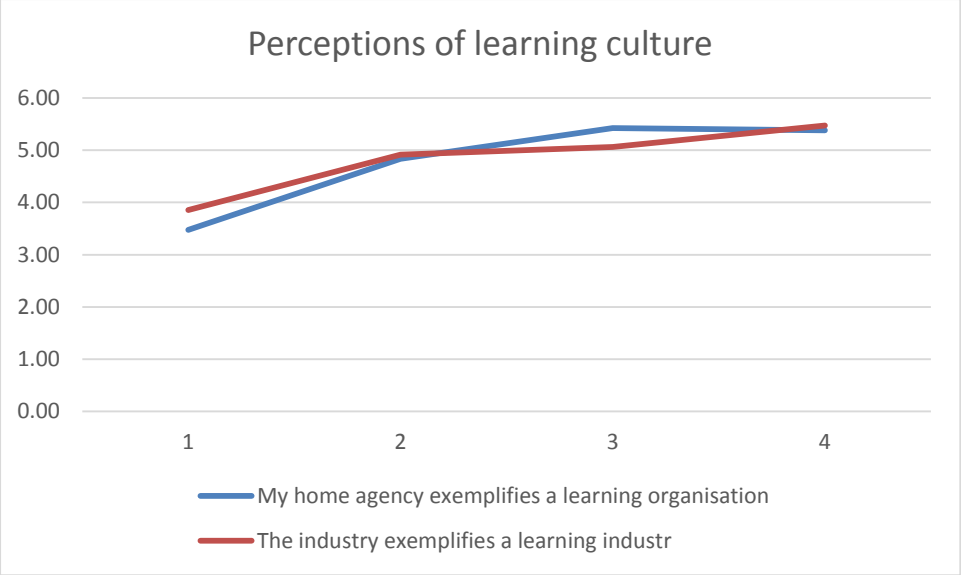

Figure 18 : Mean comparisons for perceptions of learning culture for utilisation maturity

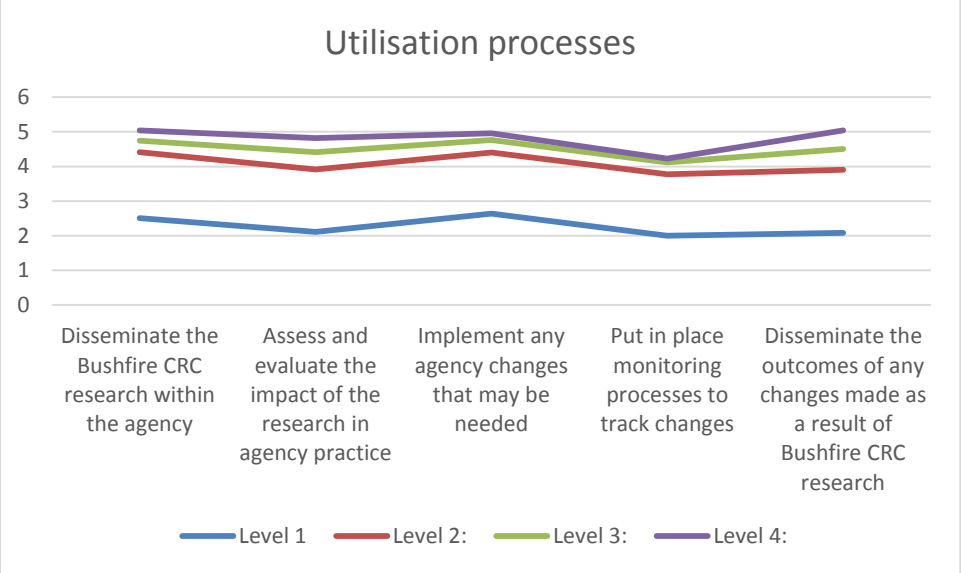

Figure 19 : Mean comparisons for utilisation processes for utilisation maturity

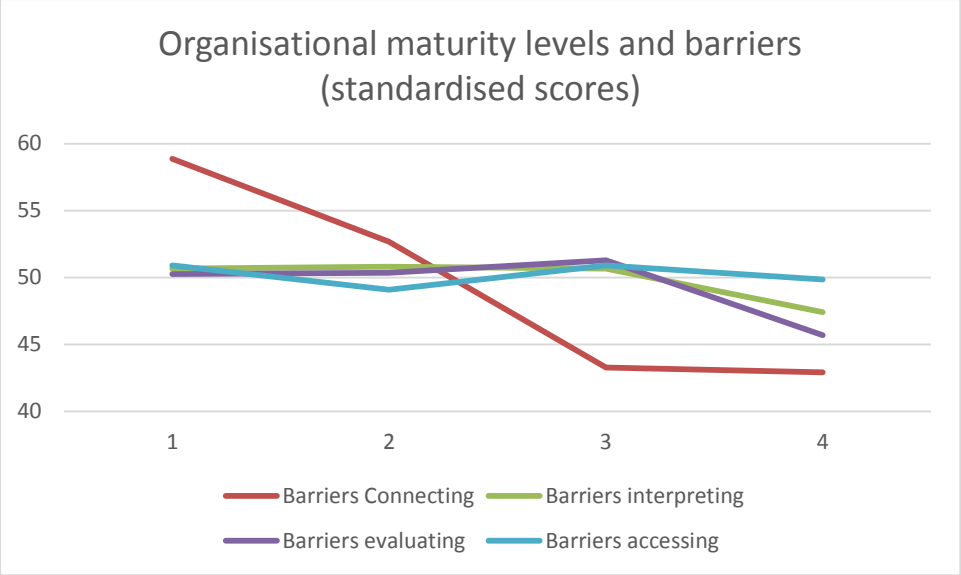

Figure 20 : Levels of research utilisation maturity and barriers factor standardised scores[10]

[10] Mean of 50 and a standard deviation of 10

Table 7: Qualitative themes in strategies to keep up to date with research

Level 1 –agencies rely on individual effort to keep up to date with research. Research may be disseminated, through email for example, but insights or discussions or review is separated from daily activities. Little or no systematic organisational processes are in evidence – organisational engagement is either absent or passive Strategies may exist but these are unconnected to daily business processes. There is a tacit expectation that a "solution" to an agency's problem will be presented that is capable of being fully operationalised without organisational effort.
Level 2 agencies have processes in place to disseminate findings to a wide audience within the agency but are unlikely to go much further. Some individuals and even organisational units might be highly involved and motivated, but this is not yet fully embedded across the whole of agency. Those engaged in research utilisation within the organisation are likely to be at the top of the organisation's hierarchy with limited information flows to the front line. There is likely to be involvement in organised partnerships. There is readership of information that is disseminated. There is little or no analysis or impact assessment. The agency is interested in what other agencies are doing and is likely to adopt other agency policies rather than to bespeak their own. Research utilisation strategy is partially but not fully articulated. The approach, however is rather aspirational and is largely reactive. Less discernment or processing of "what does this mean for us". Learning and problem-solving are likely to happen "on the fly".
Level 3 agencies have active engagement is research activities and are members of project teams; they attend RAF and individuals are tasked with research assessment tasks that are part of their job role responsibilities. They have good process to disseminate research and hold discussions regarding the implications. These may be centred at the top of the hierarchy though there are specific processes of review. They understand the problems they face for which research might have some insights but they may also be constrained by a political context that limits their ability to openly discuss the complexity or uncertainty of their problems. They are willing but not yet fully able to articulate what is unknown to them and may need to maintain a façade of control and certainty.
Level 4 agencies have active connections between research engagement and operations. They are comfortable with an expectation of an evidence base and understand the problems that they face. The have established organisational processes for implementation and change management. They have organisational norms that encourage challenge to established practices or alternatives. They consult widely and know where to go for help and can access networks of expertise (internal or external to the agency) if needed. Opportunities from new knowledge are grabbed and fully processed. People have responsibilities for learning and review build into their job roles and into their group work. There is a widespread expectation that all personnel are responsible for learning and to adopt evidence-based processed. They have a high comfort level with managing, reviewing and evaluating research. They create time within their organisation to think, understand and review new knowledge so that it may be embedded into organisational processes. They have systematic business strategies that are aligned with research review. They recognise that there are no magic solutions and they are able to articulate what is not known, problematic or uncertain. They also recognise that this is a process of continuous improvement.

Conclusion

This report has discussed participant perceptions from fire and emergency services agencies on their use of research utilisation tools and practices as well as their opinions related issues. The survey has been undertaken three times previously allowing for a time-series evaluation. In addition, since the survey was conducted in 2014 the Bushfire and Natural Hazards CRC has been established continuing on from earlier CRC work, bringing with it a new suite of stakeholders and new tranches of research work. The impetus for the 2016 survey is now driven from AFAC, as a key stakeholder to ensure that the industry maximises the value of its evidence base.

The structure of items included the survey follow the sequence of activities found to be important in utilising research. The report illustrates that in self-reporting on perceived agency effectiveness to disseminate research, assess and evaluate its impact on practice, implement any changes needed, or monitor processes to track changes as a result of research, there has either been no change or slight declines on previous survey reporting. In addition there are also reported declines in perceptions of learning. There are also differences reported by organisational roles with those in senior management having a more positive view than those personnel working at middle management or in operational/frontline positions.

As in previous surveys, participants continue to report less confidence in the effectiveness with which their agencies assess and evaluate the impact of research on agency practice and monitor and track changes to practice. Participants feel more confident about their agency effectiveness in disseminating research as well as in implementing any changes needed.

There is good endorsement for AFAC and BNHCRC information products such as the respective websites as well as Hazard News and Notes in enabling participants to gain familiarity with the research. They also indicate satisfaction with getting the information wanted. Consistent with previous surveys there is less endorsement for using these information products to develop the skills to *identify what needs to change* or to *help bring about change*. These findings indicate that while the traditional information products play an important role, they are nevertheless limited in their capacity to support agencies to engage in research utilisation practices and need to be supplemented with more active engagement strategies.

In addition, the survey sought to assess the effectiveness of engagement in Bushfire research review opportunities (e.g., involvement in the AFAC conference Science Day, Research Advisory Forum, one-off workshops as well as involvement in the AFAC Professional Development series. Once again the findings are positive and direct engagement is more strongly endorsed than information products on all indicators.

The 2016 survey again sought perceptions of the degree to which (i) the agency and (ii) the fire and emergency services industry could be characterised as having an emphasis on learning, where a learning culture was defined as an agency (industry) that learns from the experience of its own members or the experience of others. The lack of confidence discussed earlier in being able to carry out utilisation activities associated with assessment, evaluation, implementation of change and monitoring, might also account for the 2016 decline in participant perceptions about the degree to

which their agencies represent learning organisations. While this had shown an increase between 2012 and 2014 this item has declined and is now just below that reported in 2010.

Given the significant scrutiny placed on agencies and the industry as well as the pressure to be able to demonstrate an evidence-base to practice, having a strong learning culture would seem essential. Moreover, this finding suggests that agencies may not be getting the most out of their investment and in turn represents a risk in a context of increased exposure of agencies to public inquiry. Given the lack of improvement in these perceptions over time, as well as the findings reported earlier this may also suggest that existing strategies may not yield the hoped for improvements in assessing impact or maximising utilisation. A more proactive strategy may be needed.

Some insights are indicated in the analysis of the qualitative data included in the study. The survey included opportunity for participants to provide comments on the strategies they have in place to keep up to date with research. Thematic analyses on the data suggest that participants were reporting qualitatively different types of strategies within some agencies. These preliminary findings indicate that it may be possible to develop an adapted scale of organisational maturity pertaining to research utilisation. Further work may identify agency profiles of maturity in research utilisation that can then be used to identify strategies to support other agencies. However more systematic analysis is needed as this development is outside the current scope.

Participants were also asked to provide an assessment of the degree to which key barriers might be impeding research utilisation. Given the findings reported earlier indicating lower levels of confidence in agency capacity to assess and evaluate research impact for agency practice and to monitor changes based on research evidence it was anticipated that a review of potential barriers to research utilisation may yield useful insights. A Factor Analysis revealed that barriers to research utilisation were underpinned by four factors. The first and, by far, the factor given the most weighting relates to agency capacity to *connect what the research means with their business*. This focussed on the lack of capability agencies have in place to assess, analyse and evaluate what the research means for their business. The second factor "*Interpreting and managing the changes needed*" relates to a concern to have better ways to make the implications clearer as well as what to do once the meaning of the research is known. This factor appears *capability to decode research*, to be expressing agency concern about not knowing how to make the changes needed. The third factor relates to the ability and confidence of participants to make meaning of the research reports and outputs. Of consideration here is how the BNHCRC and AFAC might support end users in their ability to assess the quality of the research findings. The final factor related to *research access* and includes one item which is that the research is hard to find.

Some insights are indicated in the analysis of the qualitative data included in the study. The survey included opportunity for participants to provide comments on the strategies they have in place to keep up to date with research. Thematic analyses on the data suggest that participants were reporting qualitatively different types of strategies. These preliminary findings indicate that it may be possible to develop an adapted scale of organisational maturity pertaining to research utilisation. Further work may identify agency profiles of maturity in research utilisation that can then be used to identify strategies to support other agencies. The preliminary findings suggest four levels of maturity in research utilisation practices to keep up to date with research: (1) relies on individual effort; (2) some systems in place, relies mainly on dissemination; (3) established processes that include efforts

to review and evaluate and (4) widely embedded and active connections between research and operational activities. However more systematic analysis is needed as this development is outside the current scope.

Finally it would be useful is this survey is to be carried out again in the future to review the questions against other frameworks for innovation and knowledge development. The current questions were originally designed to assess levels of usage and satisfaction with tools such as the website and other information products. As some of the findings indicate, the industry and its approach to knowledge utilisation is continuing to grow and develop and it is time to review the types of questions that might provide better insights into the state of research review and the connection to evidence-based practice to support cultures of learning.

There is a clear role for peak bodies such as AFAC in developing capacity to be able to asses and evaluate new knowledge, to consider what it means for practice and to bring about change where needed. It is vital that agencies – and the industry – build capability in developing robust processes of deliberative review, assessment and evaluation so that evidence-based practice can be demonstrated.

Implications for future research from these findings suggest there is a need to tease out the elements that comprise learning and innovation cultures and what skills, processes and structures are needed. Further work is needed to better understand how perceived barriers can be overcome in order to increase and strengthen cultures of learning within agencies and the industry. Doing so will thus support goals of agility and innovation within the industry through utilisation, which include the acceleration of the pace of adoption, maximise the value of the research to the industry, and increase the worthiness of innovation.

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Attachment 1: Statistical analyses

Factor Analysis

A factor analysis was conducted using Maximum Likelihood estimation and Varimax (orthogonal) rotation, with factor loadings (weightings) above 0.30 visible, and with items sorted to reflect the relative strength of loadings per factor.

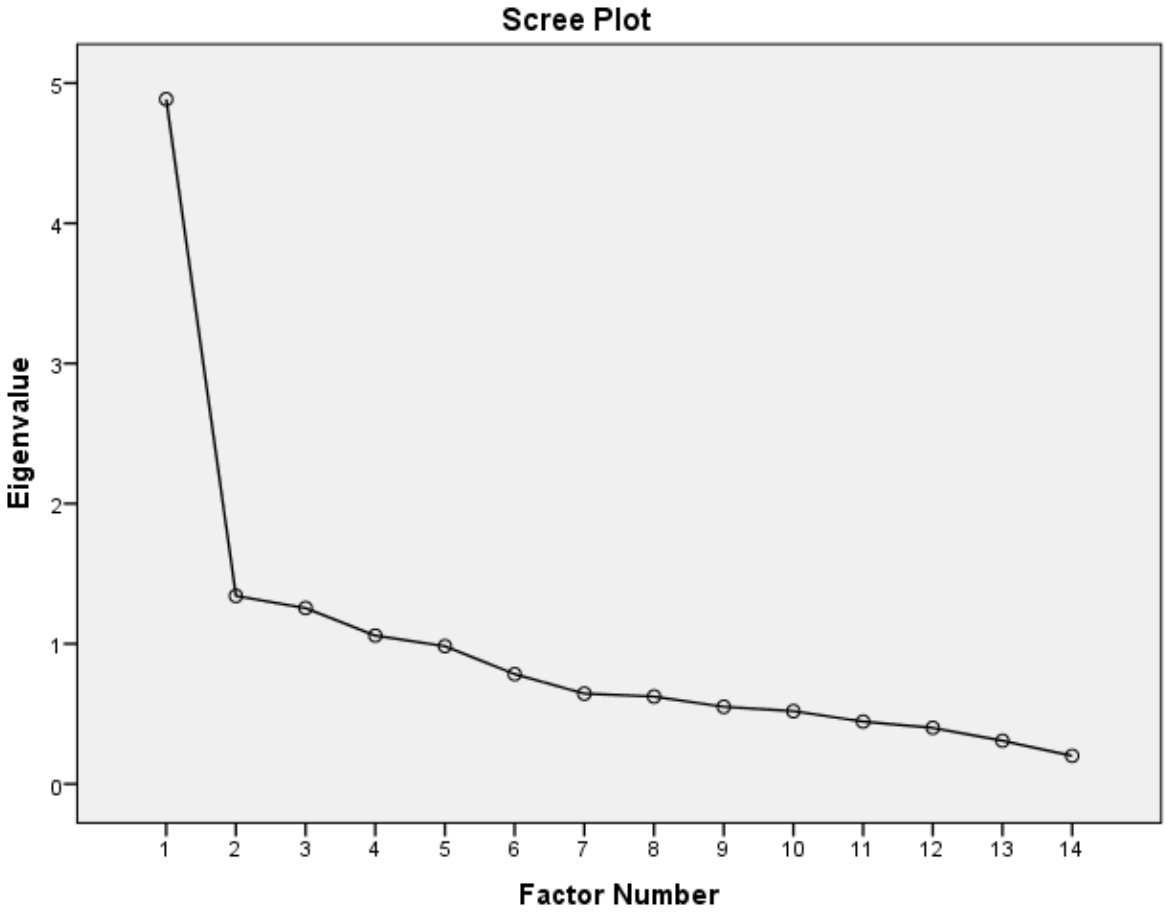
As a rule of thumb, a factor analysis is regarded as robust if it explains more than 50% of the variation of the correlations. Another measure of the robustness of the factors is the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO). Values less than 0.5 are regarded as unacceptable, values between 0.5 and 0.8 are acceptable and values of 0.8 and above are regarded as optimal.

The factor analysis conducted on the 14 *Barriers* items had a KMO measure of sampling adequacy of 0.849 and revealed four (4) factors accounting for 61% of the pattern variation in the responses thus providing a good explanation of the response patterns.

Table 8: Factor Analysis Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.885	34.896	34.896	1.979	14.138	14.138
2	1.342	9.585	44.481	3.162	22.583	36.721
3	1.255	8.963	53.444	0.954	6.816	43.537
4	1.059	7.561	61.005	0.687	4.907	48.444
5	0.983	7.022	68.028			

Table 9: Factor Analysis Scree plot



Notes

[i] Strat plan familiarity (M= 5.66, SE = .095); familiarity BCRC res outputs (M =3.87, SE = .100), (*t* (259) = 15.709, p < .0005, r = .32)

[ii] Paired t-test: T*he alignment between the strategic planning of your agency and the research outputs emerging from the Bushfire CRC* (M = 3.54, SE = 0.103) and T*he alignment between the strategic planning of your agency and other research outputs (*M = 3.75; SE = 0.105), *t* (231) = -2.632, p = 009, r = .69

[iii] Analysis of Variance between groups (F(2, 182) = 5.992, p < .003, ω = *.062*

[iv] Analysis of Variance between groups (F(2, 186) = 4.356, p < .014, ω = *.045*

[v] Paired t-test: *Disseminate the Bushfire CRC research within the agency* (M = 3.97, SE = 0.109) and *Assess and evaluate the impact of the research in agency practice (*M = 3.57; SE = 0.104), *t* (239) = 5.955, p = 0005, r = .81

[vi] Paired t-test: *Disseminate the Bushfire CRC research within the agency* (M = 3.99, SE = 0.108) and *Put in place monitoring processes to track changes (*M = 3.44; SE = 0.106), *t* (233) = 6.208, p = 0005, r = .66

[vii] Cronbach alphas for *familiarity* – 5 traditional information products α = .809, 5 engagement opportunities α = .759; *gives information wanted*– 5 traditional information products α = .813, 5 engagement opportunities α = .845; *assists with learning new knowledge* –5 traditional information products α = .889, 5 engagement opportunities α = .895; *helps understand research* –5 traditional information products α = .776, 5 engagement opportunities α = .897; *helps evaluate what needs to change* – 5 traditional information products α = .917, 5 engagement opportunities α = .582; helps with skills to change – 5 traditional information products α = .950, 5 engagement opportunities α = .919.

[viii] Analysis of Variance between groups (F(2, 503) = 4.915, p < .008, ω = *.019*

[ix] Analysis of Variance between groups (F(3, 147) = 14.5072, p < .0005, ω = *.228*

[x] Analysis of Variance between groups (F(3, 143) = 7.171, p < .0005, ω = *.131*

[xi] Analysis of Variance between groups (F(3, 155) = 24.987, p < .0005, ω = *.326*

[xii] Analysis of Variance between groups (F(3, 147) = 28.614, p < .0005, ω = *.369*

[xiii] Analysis of Variance between groups (F(3, 146) = 25.762, p < .0005, ω = *.346*

[xiv] Analysis of Variance between groups (F(3, 143) = 20.360, p < .0005, ω = *.299*

[xv] Analysis of Variance between groups (F(3, 151) = 31.516, p < .0005, ω = *.385*

[xvi] Analysis of Variance between groups (F(3, 99) = 25.422, p < .0005, ω = *.443*