Closing the research-practice gap in emergency services organisations

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Abstract

This paper outlines research conducted in Australia and New Zealand into what enables and constrains emergency services agencies to utilise research to support organisational learning and evidence-informed practice. At a time when emergency services agencies are under increasing scrutiny, being able to demonstrate the link between research and theory to practice is ever more critical. This paper reports on a mixed methods approach that includes findings from a survey of 190 participants from 29 emergency services agencies on the degree to which they perceived their agencies engaged in a number of important processes in research utilisation. Agencies had different approaches to keep up to date with research advances. In collaboration with participants from the AFAC KIRUN group, an examination of the activities described by participants identified four developmental levels of what we have called research utilisation maturity (basic, developing, established, and leading). Organisations at high levels of utilisation maturity reported higher levels of perceived effectiveness on disseminating, assessing, and evaluating research as well as monitoring and communicating changes made as a result of the research (e.g., to policy, training, or practice). Practitioners experienced barriers associated with connecting research outcomes to agency business, understanding the meaning and implications for practice, and feeling confident about assessing research findings or addressing implications for practice. Where research utilisation maturity was higher, ratings on learning were higher and barriers experienced lower. Subsequent collaboration with a practitioner group has led to the co-creation of a self-assessment research utilisation tool that agencies can use to diagnose their capability and processes to support utilising research evidence in their practice. It is important to recognise that change and innovation is developmental and requires adjustments to governance processes, job responsibilities, and participation in communities-of-practice. More work is needed to better understand the enablers and constraints to utilising research to support development of evidence-informed practice, particularly in the emergency management sector.

Keywords: *Research-practice, research utilisation, learning organisations, fire and emergency services, emergency management*

Learning in emergency services organisations can come from a range of contexts: after-action reviews, often held at the end of an emergency event in an endeavour to improve practice (Vinnell, Orchiston, Becker, & Johnston, 2019); externally-led inquiries (Royal Commissions of Inquiry in Australia and in New Zealand; the TAG review into how New Zealand responds to disasters and emergencies: MCDEM, 2017); engagement in practice-led research projects (Hatton, Kipp, Brown, & Seville, 2017); and researcher-stakeholder collaborations (Huggins & Johnston, 2015; Kay et al., 2019). Indeed, in the emergency services sector we have seen a growing interest in learning. Participation in forums like the Australasian Fire and Emergency Services Authorities Council (AFAC) Lessons Management Forum continues to increase and similar forums are now occurring in New Zealand.

In many countries, sector innovation is supported by government policies and initiatives that fund research institutions to take a collaborative approach to research and development. These research centres produce ideas and outputs that can be adopted and applied by organisations. However, studies examining how research outcomes lead to learning, including enablers and constraints, appear limited to the medical field in general (Elliott & Popay 2000; Kothari, Birch, &

Charles, 2005) and nursing in particular (Carrion, Woods, & Norman, 2004; Retsas, 2000). As researchers and practitioners, we have a particular interest in understanding what enables and constrains emergency services organisations from learning, and in particular from adopting, research insights and incorporating these into practice.

Although using research to inform practice sounds straightforward, as Kay et al. (2019) point out negotiating this in the "real" world is not as simple as it might seem. This is because research scientists often produce findings in journal papers which are not easily or directly usable for practitioners. Moreover, decision-makers often face barriers to integrating research information into everyday practice. Yet the need to do so has never been greater; over the past decade there has been increasing scrutiny on emergency management organisations to justify actions (Boin & t'Hart, 2010; Eburn & Dovers, 2015). There is an urgent need for these organisations to learn about learning to innovate (Adams, Colebatch, & Walker, 2015). One way to do this is to actively engage in utilising research outcomes from partnerships with researchers and their institutions. The current paper investigates the problem of why insights from research are not better utilised by emergency services organisations. It aims to contribute to a better understanding of what enables and constrains emergency services organisations from learning to improve their capability.

Literature Review

The value of utilising research is well established (e.g., Brown & Frame, 2016; Cutler, 2008; Dearing, 2009). This is particularly so in an emergency services context. A good bond between researchers' findings and practice enables:

- co-creation of new knowledge (Brown et al., 2019);
- the number of strategies to support resilience to be increased (Doyle, Becker, Neely, Johnston, & Pepperell, 2015; Retsas 2000);
- a better understanding of resilience and enhanced capability (Brown et al, 2019; Vahanvati, 2020);
- improved emergency services response and management capability (Brooks, Curnin, Owen, & Boldeman, 2019; Owen, Hayes, Brooks, Scott, & Conway, 2018); and
- research effectiveness at agency and sector levels to be evaluated and demonstrated (Spiekermann,

Kienberger, Norton, Briones, & Weichselgartner, 2015; Taylor, Ryan, & Johnston, 2020).

Studies of utilisation and the barriers that need to be overcome (e.g., Carrion et al., 2004; Kothari et al., 2005) suggest that research is used through a process by which new information or new ideas are communicated through certain channels, over time and among members of a social system. The process includes:

- disseminating new ideas or findings among members of a social system (Brown & Frame, 2016; Hemsley-Brown, 2004);
- assessing and evaluating the ideas in terms of their relevance to members of the social system (Carrion et al., 2004);
- implementing changes that may be needed (Brown et al., 2019; Elliott & Popay, 2000);
- monitoring the effects of the changes put in place (Taylor et al., 2020); and
- reporting outcomes of changes made as a result of the new idea (Doyle et al., 2015; Kay et al., 2019; Standing et al., 2016).

In summary, research is only one of several ingredients for successful improvements in practice and, in many respects, only the start of the process. Utilisation from research does not magically follow from research outputs. What is needed is a systematic follow-through from research insights to consider the implications and to develop processes that support review and, where needed, implementation and change.

Method

In Australia, the Bushfire and Natural Hazards Co-operative Research Centre (BNHCRC) and the AFAC have a continuing interest in enhancing research utilisation. Emergency services organisations have been regularly surveyed as part of a wider longitudinal study to assess how they use research to gain maximum benefit from their investment. Having gained research ethics approval to conduct the investigations (University of Tasmania Social Sciences Ethics Approval H0010741), surveys have been conducted every two years since 2010. The early surveys revealed opportunities to improve communication, engagement, and collaboration. Subsequent research utilisation policy focused on these areas.

The structure of items in the survey included the degree to which the research outcomes link to the organisation's strategic plan and core business; strategies to:

- disseminate the research within the agency;
- **a**ssess 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
- add value to the outcomes of any changes made as a result of the research.

In this way, some of the items follow the sequence of activities found to be important in learning from research utilisation. For example, new information first needs to be disseminated and read, then assessed and evaluated for its possible impact on existing practice, and any changes needed based on the new knowledge need to be implemented, tracked, and evaluated.

The 2018 survey was distributed to 47 emergency services management agencies in Australia. Agency contacts were requested to distribute the survey to five to 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; and knowledge management, innovation, and research;
- Five middle managers including regional operational and non-operational personnel (e.g., district managers); and
- Five people 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 involvement in BNHCRC activities; and
- be responsible for implementing any changes needed based on research evidence.

Participants

The response yielded 190 returns from 29 agencies. The participation rate of 63% is good for online surveys of this type (Barach & Holtom, 2008). The median number of years that survey participants have been in the industry was 19, and the median number of years within the agency was 12, thus demonstrating the level of experience of those responding. Participants were asked a free text question to describe their role and answers from 122 participants were able to be coded.

Of the participants who answered the question about their working role, 11 (6%) were in senior management positions (e.g., Directors), 70 (37%) were in middle management roles (e.g., District Managers), and 41 (22%) had front line responsibilities (e.g., training instructors). There were 38 responses that were not codifiable (e.g., "fire", "operations") and 20 participants (15%) did not answer the question.

Materials and Procedure

This method section and the following results outline four sections of survey findings. Section 1 includes answers to a qualitative question: "What strategies does your agency have in place to keep up to date with research?". In the survey, we defined research as a systematic approach to answering a question or testing an hypothesis using a systematic study; that is, the researcher enquires into a problem, systematically collects data, and analyses these to develop findings to advance knowledge. Participants were advised that doing research in this way is distinguished from gathering general information through reading a book or surfing the internet.

Sections 2 to 4 contained quantitative questions which included: (2) participant perceptions of agreement with a statement about their organisations as learning organisations, (3) their levels of perceived effectiveness of their agencies in processes known to be important in research utilisation, and (4) levels of agreement with statements indicating barriers to research utilisation.

Section 2: Perceptions of learning in organisations. Participants were asked to rate the levels of agreement (on a Likert scale between 1 and 7 with the option of "can't answer") with the statement: "My home agency exemplifies a learning organisation". In the survey, a learning organisation was defined as one where personnel were able to learn from the experience of members of the organisation or emergency services community through processes of reflection, sense-making, and action to develop new ways of acting which can lead to an increased capacity to act differently in the environment (after Kolb, 2014).

Section 3: Research utilisation processes. Participants were asked to rate the perceived effectiveness of their agency (on a Likert-type scale between 1 and 7 with the option of "can't answer") 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
- make the most of the outcomes of any changes made as a result of research.

Section 4: Barriers to research utilisation. Participants were also asked to provide an assessment of the degree to which key barriers might be impeding research utilisation. The barriers section included 15 items adapted from research undertaken in the health sector. Funk and her colleagues (1991) used the "Barriers to research implementation" questionnaire to diagnose areas that can be targeted to enhance change toward evidence-based work practice in the nursing sector. This work has been widely replicated by Baernholdt and Lang (2007), Elliot and Mihalic (2004), Helmsley-Brown and Oplatka (2005), and LaPierre, Ritchey, and Newhouse (2004) and provides a useful template. The question asked participants to consider each of 15 statements adapted for the emergency services sector and to rate (on a scale between 1 to 7 where 1 = "not a barrier" and 7 = "very much so") the degree to which they experienced the barrier in their workplace. The 15 statements are:

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;
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;
8) The impacts of the research for the agency need to be better articulated;
9) We need cooperation from other stakeholders in the industry for successful implementation;
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 research in our agency;
14) As an agency we don't have an effective process for translating the research for our personnel; and

15) The agency hasn't developed the appropriate assessment strategies to consider implications of the research.

Limitations

It should be noted that coding used to develop the levels of research utilisation maturity were empirically derived from the qualitative comments provided by participants. This means that the levels were based on only what the participant had reported in their comments, meaning that the participant's agency may be more active than was articulated in the comment. This may indicate a need to further investigate using other methods what is happening in agencies so others may learn from what actions personnel are taking to gain benefit from research.

Results

Analysis of Qualitative Data

A total of 140 participants provided codable answers to the question "What strategies does your agency have in place to keep up to date with research?". An initial review of the comments indicated that participants were describing qualitatively different types of activities and processes. A subsample of 30 of the comments were coded and discussed between the authors, drawing on research utilisation practice and innovation found in other sectors such as health (Baernholdt & Lang, 2007). Based on this subsample, a series of codes were developed and then reapplied to the 30 comments. Once the coders achieved an inter-rater reliability of 88%, all of the remaining comments were coded and all 140 responses were reviewed and discussed. The codes were then inserted into the survey dataset for further analysis.

These codes were also discussed with members of the AFAC Knowledge Innovation Research Utilisation Network (KIRUN), with whom the following indicators of *research utilisation maturity* were co-constructed. We define research utilisation maturity as including the processes and systems in place within organisations to make the most of their investment in research. Research utilisation maturity, therefore, is about using research in practice to support the agency's decision making, to drive innovation, highlight gaps and opportunities, and deliver the desired or improved results. The four levels of research utilisation maturity were defined as:

Basic: There are pockets of research utilisation however these are not systematically organised. Attempts to keep up to date with research depend on individual effort.

Developing: Some systems and processes are documented which enables research to be disseminated. There is limited evidence of analysis or impact assessment.

Established: There are systematic processes in place for reviewing and utilising research (e.g., dissemination and review either through job responsibilities or an internal research committee).

Leading: There is evidence of using research proactively. Operational and strategic decisions are informed by assessing research using formal research utilisation processes. These processes and systems are widely understood.

Table 1 details the four codes that emerged from the data as indicators of research utilisation maturity together with examples from the data. The total number of responses coded to the utilisation maturity level is included in the first column.

Once the responses to the qualitative question were coded, the codes were then reinserted into the overall dataset and the utilisation maturity levels were then used to analyse the quantitative responses.

Perceptions of Agencies as Learning Organisations

When considering if their organisations were learning organisations, the mean for the entire data set was 4.3 out of 7. Figure 1 shows the mean differences on perceptions of agencies as learning organisations for agencies at different levels of organisational maturity according to the coding of the qualitative themes. Figure 1 illustrates the link between how the responses to the qualitative question outlining the processes in place to keep up to date with research and coded to different levels of research utilisation maturity are associated with perceptions of organisational learning. In short, those reporting more established and leading indicators of research utilisation maturity were also reporting higher levels of organisational learning. The difference is most apparent between those responses coded to a "basic" level and those reported as developing, established, or leading. This difference was statistically significant, $F(3, 135) = 14.195$, $p <. 001$, $\omega = .47$, indicating that as research utilisation maturity increases so too does organisational learning. At issue then, is what is it that those reporting basic levels of research utilisation maturity might do differently?

Research Utilisation Processes

Responses coded to the utilisation maturity framework also yielded statistically significant results for perceptions of effectiveness in: (1) disseminating research, (2) assessing and evaluating research implementing
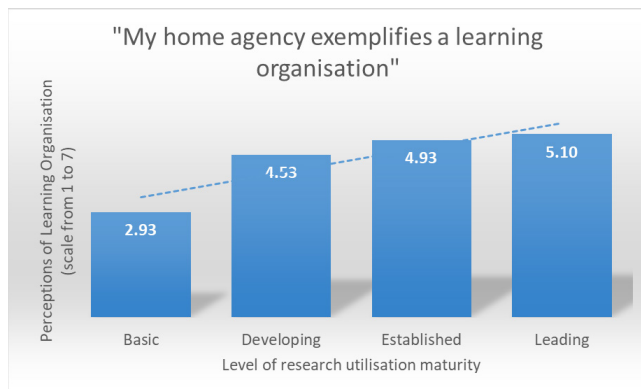
Table 1
Research utilisation maturity codes and examples from the survey.

Level	Description	Examples in data
1: Basic $n = 29$ (21%)	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: Developing $n = 70$ (50%)	Some systems and processes are documented which enables research to be disseminated. There is little or no evidence of analysis or impact assessment. No evidence of how the findings are translated or connected to operational activities.	"We have two people that email CRC updates to staff." "Lots of material is distributed via our portal and email to keep staff and volunteers informed."
3: Established $n = 22$ (22%)	There are established processes in place for reviewing research (e.g., dissemination and review either through job responsibilities or an internal research committee).	"Developed a research committee." "SMEs [subject matter experts] appointed as capability custodians to ensure up to date best practice."
4: Leading $n = 10$ (7%)	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 program design and delivery, are interpreted and analysed for their implications and relevance and then used to inform decision-making and strategy through numerous internal fora." "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 1. Mean comparisons for perceptions of learning organisation across levels of research utilisation maturity.

any changes needed, (3) putting in place monitoring processes to track changes, and (4) making the most of research outcomes (see Figure 2). Figure 2 illustrates the ways in which those coded at a basic level of organisational maturity were consistently reporting statistically significantly lower levels of effectiveness of a range of strategies associated with utilising research. These included differences in perceptions of how effective the agency is in disseminating research[1], in the ability to assess and evaluate its potential impact for practice[2], in being able to implement changes[3], in monitoring and evaluating any changes made[4], or making the most out of the changes introduced[5]. These represent important capabilities in being able to close the research-practice gap.

Analysing Barriers to Research Utilisation

A factor analysis was conducted of the 15 barriers to research utilisation using Principal Components Analysis and Varimax (orthogonal) rotation, with factor loadings (weightings) above .40 visible (as per Field, 2017) and with items sorted to reflect the relative strength of loadings per factor. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = .781, as "very good", according to Field (2017). Four dimensions were identified and in combination explained 61% of the variance in response patterns, above the standard of 50% (Field, 2017).

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1   Analysis of Variance between groups for "Disseminate the research within the agency", $F(3, 137) = 19.799$, $p < .001$, $\omega = .53$
2   Analysis of Variance between groups for "Assess and evaluate the impact of the research in agency practice", $F(3, 128) = 13.785$, $p < .001$, $\omega = .47$
3   Analysis of Variance between groups for "Implement any agency changes that may be needed", $F(3, 131) = 15.027$, $p < .001$, $\omega = .49$
4   Analysis of Variance between groups for "Put in place monitoring processes to track changes", $F(3, 128) = 10.329$, $p < .001$, $\omega = .42$
5   Analysis of Variance between groups for "Make the most of any changes made as a result of research", $F(3, 128) = 10.662$, $p < .001$, $\omega = .42$

Table 2 shows the factor loadings after rotation for the dimensions and where items with loading less than .40 were not included. The items that cluster together suggest that the first factor represents barriers relating to agencies connecting research outputs to their business, the second factor represents barriers associated with making sense of the implications and its consequences for practice and limits to change, the third factor represents barriers to accessing and understanding the research, and the fourth factor represents research evaluation capability.

First factor: Structural barriers to connecting research with agency business. The first factor (accounting for 34% of the response pattern) includes items that relate to the internal processes that agencies have in place to assess, analyse, and evaluate what the research means for their business (see Table 2). This barrier indicates a need to address internal governance processes for increasing the effectiveness and efficiency of connecting research to agency business. This includes defining the initial problem, transforming research output into meaning for agency practice through systematic assessment processes. This requires clarity and visibility about who is responsible for value-adding to research outputs for the agency. The agency may need to ensure that the personnel engaged in various projects are communicated to a coordination point.

Second factor: Barriers to understanding the meaning and implications for change. The second factor (accounting for 10% of the response pattern) relates to the need to overcome barriers to understanding the implications of research for practice and arrangements to support the changes needed in an agency and for the sector (see Table 2). This suggests a need to support prioritisation of necessary changes and ways to
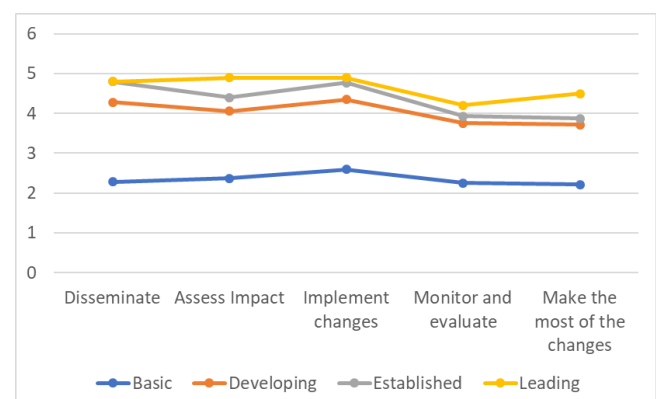

Figure 2. Mean comparisons for utilisation processes across levels of research utilisation maturity.

interconnect potentially disparate research outputs. This factor also connects to the next factor about ensuring research is visible for access and understanding.

Third factor: Barriers to access research and capacity to assess. The third factor (accounting for 9% of the response pattern) relates to the ability and confidence of participants to assess and evaluate the research reports and outputs (see Table 2). It may be that barriers to accessing the research and its meaning connects the first two factors. It indicates a need to build capability to be able to read, assess, and critically evaluate the quality of the research so that the findings can be trusted.

Fourth factor: Barriers to capability and capacity to address implications. The fourth factor (accounting for 7% of the response pattern) relates to the ability and confidence of participants to evaluate the research and to find the space to think about what it means for the future (see Table 2). However, as has already been discussed, assessing the implications of research for practice is not easy to address as the implications will change for different agencies and even different functional units within 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.

Comparing factor scores and research utilisation maturity. The results from the potential barriers to research utilisation are interesting in that they provide insights into the challenges facing the 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. The findings also point to the need for research providers to have a greater understanding of the fire and emergency industry and a willingness to engage with practitioners in co-constructing meaning from findings for research investment to have greater impact.

An analysis was also made of the barriers reported as the combined factor scores for each of the four dimensions. Standardised scores were computed for each of the factors, where factors are normalised with a mean of 50 and a standard deviation of 10 and then mean differences are computed for those coded to each level of research utilisation maturity. This analysis indicated that those with higher levels of utilisation maturity

Table 2
Barrier items grouped into factors.

|	1	2	3	4
The agency hasn't developed the appropriate assessment strategies to consider the implications of the research	0.812			
As an agency we don't have an effective process for translating the research for our personnel	0.808			
It is not clear who is dealing with what research in our agency	0.776			
The impacts of the research for the agency need to be better articulated		0.753		
We need cooperation from other stakeholders in the industry for successful implementation		0.696		
We need a change advocate within the agency to take the research implications forward	0.458	0.643		
The amount of research information is overwhelming		0.551		
There is too much change happening in this agency already, we don't need more to be considered		0.478		
Implications for practice are not made clear			0.758	
The reports are hard to read			0.741	
Most people in this agency don't know about the research			0.678	
Personnel don't feel capable of evaluating the quality of the research				0.814
Agency personnel don't have the capacity to think strategically about what the research may mean for our business				0.750
It is not clear what change is needed				0.460
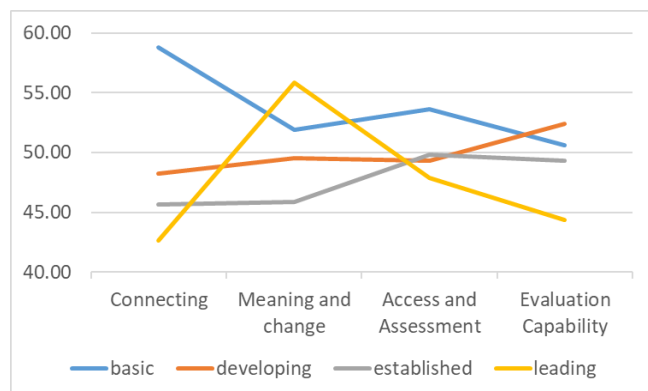
Figure 3. Levels of organisational maturity and barrier factors standardised scores.

reported lower levels of concern with the barriers (see Figure 3). It should be noted however that only one of the factors (Factor 1) is statistically significant[6], so the findings are indicative only of a descriptive trend but one which is worthy of further investigation.

We also speculate a relationship between the factors. Figure 3 suggests the biggest barrier for those personnel reflecting a basic level of maturity is "connecting research to agency business", which is reported lowest by those reflecting a higher "leading" level of research maturity. For those personnel reporting practices indicative of leading in research maturity the highest barrier experienced is in the factor relating to making meaning from the findings and their implications for change. This fits with personnel who are directly engaged in exploring the implications and what they mean for their practice. While these personnel are able to connect research outcomes to agency business, they still need help with consideration of the implications for change. For those reporting at a basic level of maturity, if it is not possible to connect research to the business, then considering implications is moot. We speculate that overcoming the barriers reflected in the third and fourth factors (access to the research and evaluation capability to assess its credibility) are intermediate steps between connecting and considering meaning and implications.

Discussion

Research Utilisation Maturity in Practice

What are organisations which are engaging in research utilisation doing that is different from those which are operating at a basic research utilisation maturity? The authors have continued to work with a national

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6   Analysis of Variance between groups for "Barriers in assessing and connecting research to agency business", $F(3, 126) = 9.059$, $p < .001$, $\omega = .48$

practitioner group, the AFAC (KIRUN), and in 2019 developed and trialled a self-assessment tool that practitioners can use to diagnose and self-assess their organisation's research utilisation maturity. Part of the validation of this tool included a review conducted by one of the authors (Krusel) who undertook an analysis of case studies published by AFAC during the period 2015-2017. This review triangulated the key indicators listed below as important critical success factors where research has led to clear, usable industry impact.

The tool has five sub-sections (see Figure 4) and guidelines for its use have also been developed (AFAC, n.d.). Participants reporting higher research utilisation maturity indicate that their agencies had:

Established governance processes: They have established governance processes in place. In this way, their business goals include research review (e.g., such as having a research review committee and a research framework as part of their business strategy). They also ensure that there are active connections between research engagement and operations.

Utilisation embedded into job roles: People have responsibilities for learning and review built into their job roles and into their group work. There is a widespread expectation that all personnel are responsible for learning and innovation will adopt evidence-informed processes. This is supported by resourcing for professional development opportunities.

Active testing of outputs: They are also actively engaged in testing of outputs, rather than accepting off-the-shelf products. In this way they transform the outputs so they are fit for purpose. They consult widely and know where to go for help and can access networks of expertise (internal or external to the agency) if needed.

Communities of practice: They are actively engaged in agency and industry communities of practice (including other industries such as health) to learn from and innovate. They recognise that there are no magic solutions and they are able to articulate what is not known, problematic, or uncertain which needs further investigation. They also recognise that learning is a process of continuous improvement.

For personnel within agencies experiencing a basic level of organisational maturity there are some actions available. The first step is to make research activity visible so that it can be employed in discussions about operational or strategic planning and capability and in

Research Utilisation (RU) Maturity Matrix

Maturity / Element of research utilisation		Basic *Pockets of research utilisation; not systematically organised*	Developing *Some systematic recognition and commitment to using research*	Established *Using research systematically*	Leading *Using research proactively to add value to our business and community*
Structure and Governance	Structure	Individual focus Not core job	Reactive Limited follow up	Strategic, planned, & systematic "Problem solving"	Risk taking Agile "'Problem seeking"
	Governance	No systematic quality assurance	Project based Spasmodic & unconnected	Programmatic Active management Alignment to strategy	Organisational transformational change
People		Individuals bring skills Limited research literacy	Person designated Some research literacy Some interest in building skills	In job roles Opportunity to develop skills	Questioning and innovation expected Continual improvement, change, & anticipation
Culture		Small pockets Value contested	Limited in reach & resourcing Little challenge of status quo	Value widely acknowledged Limited to "safe" questioning	Everyone values
Support systems and processes	Financial, physical, and resources for people	Individual influence	Stand-alone unit Limited connection to business Limited implementation	Capacity to make change Business as Usual (BAU)	Core business People mobile, diverse, & inclusive Borders are permeable within & external
	Policies, procedures, and doctrine (PPD)	Tacit Locally organised	Limited reach across business	Codified & clearly accessible Cross referenced	Fully embedded & regularly updated with feedback loops
	Communication, engagement, participation & collaboration	Through passionate individuals Not resourced	Dissemination one-way "End users" not linked to organisational processes Knowledge held as "power"	Widespread engagement Internal and some external to organisation	Collaboration between researchers & practitioners Widespread integration Internal and external collaboration
Products		Sit on the shelf Not used when individuals leave	One – off, tied to specific project Short-lived	Products are user friendly, fit for purpose, easily accessible, widely known, & actively incorporated into BAU. Widely disseminated & resourced & may have a cost/benefit assessment (link to systems). They are likely to be used in multiple applications	Testing & prototyping Transformed & applied beyond organisation / sector

Figure 4. Levels of Research Utilisation Maturity.

this way be linked to agency business. This may involve, for example, placing research as an agenda item on meetings so that it can be reported and recorded and thus contribute to corporate memory of the organisation. Another step is reviewing agency policy and doctrine for where the link to having an evidence-based practice is articulated. Inviting researchers to meetings to discuss their findings is also helpful as part of the problem is that, when faced with the findings from a complex research project, the implications for practice can be overwhelming. Researchers have a role to play here in assisting in meaning-making so that research outcomes can be considered in a staged way. It is important, therefore, that researchers step up and make findings both tangible and relevant for practitioners.

While the barriers included in the survey discussed here were focussed on considering research findings for practice it is important that agency personnel also consider the infrastructure their agency has in place for processing any research insights. This is where the self-assessment tool based on the research utilisation maturity levels discussed here and guidelines for its use become useful[7]. The guidelines provide a number of options practitioners can use to facilitate discussions about the level of infrastructure in place for the organisation to be ready to utilise research. Fire and Emergency New Zealand, for example, has used the self-assessment tool to contribute to framing research infrastructure needs to support future strategic planning (Z. Mounsey, personal communication, March 29, 2020).

Conclusion

This paper has discussed participant perceptions from 29 emergency services agencies on their use of research utilisation activities and practices. Participants reported that their agencies had different approaches to keep up to date with research advances. An examination of the activities described by respondents identified

7   www.afac.com.au/docs/default-source/ru/afac-rumm-guidelines. pdf?sfvrsn=2

four developmental levels of what, in collaboration with the AFAC KIRUN group, we have called *research utilisation maturity* (basic, developing, established, and leading). Those reporting that their agencies were low in research utilisation maturity reported less satisfaction with their agency's effectiveness in disseminating research, assessing and evaluating the implications of the findings, implementing any changes needed to monitor and track changes as a result of the research, and embedding the outcomes into practice. These participants also reported the most experience of the barrier to connecting research outputs to business. Those reporting activities associated with higher levels of research utilisation maturity reported higher levels of perceived effectiveness on disseminating, assessing, and evaluating research as well as monitoring and communicating changes. The results from the potential barriers to research utilisation section are interesting in that they provide insights into the challenges facing the emergency services sector. The analysis suggests that for significant leverage from utilisation to occur there is a need to build agency and sector-wide capability in assessment and evaluation of potential impacts, as well as in processes of sense-making and assessment and evaluation.

The findings align with research (e.g., Baumbusch et al., 2008; Paramonczyk, 2005) that suggests that to maximise the possibility of overcoming barriers to change for innovation what is needed are, in part, incremental adjustments to workplace practice brought about through an ongoing dialogue between researchers and practitioners. The findings also suggest it is no longer appropriate for researchers to remain isolated from the "real" practitioner world where their publicly funded research projects are intended to make a difference. Researchers have a responsibility to work at demonstrating relevance, facilitating meaning and implications for practitioners, and making their research accessible and transparent.

From this point of view, it will also be important to build bridges between different researcher and practitioner worlds. Understanding something of the different perceptions of researchers and practitioners would be important in order to better understand how the process of translating research findings into practice may be supported (Donaldson, Rutledge, & Ashley, 2004). Given the importance of a learning culture to support adaptation, innovation, and change within the industry, it would be useful in the future to continue to identify ways agencies can build cultures of learning. The existing findings provide some insights but do not explore the attributes that would enable the development of a learning and innovation culture.

In some circumstances it can take decades for research outcomes to translate into changes in practice (Chesla, 2008; Donaldson, et al., 2004). In the current context and for the emergency services sector in particular, these types of time lags between research and subsequent improvements are not acceptable. It is also imperative to develop the capacity to systematically understand what enables and constrains research uptake and end-user adoption. It has been argued that in industries based on evidence-based practice, the research process is in fact not complete until the impact and extent of innovation use are examined and understood (Donaldson et al., 2004; Lundblad, 2003). 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 agility and responsiveness to change, then a better understanding of learning cultures within the industry would seem critical.

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