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DECISION MAKING, TEAM MONITORING & ORGANISATIONAL LEARNING IN EMERGENCY MANAGEMENT

Annual project report 2018-19

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Cover: South Australian Country Fire Service Region 1 Coordination Centre.
Credit: Chris Bearman.

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ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

This project explores aspects of teamwork, decision making and organisational learning with the aim of better supporting people working in complex strategic operations centres. We have adopted a human-centred design method to produce practical tools that are designed around how people use these tools in their workplace. As part of this process end-users are embedded into the research process. Bringing end-users into the research process creates a partnership where the researchers contribute their knowledge of literature, theory and the research process and the end-users contribute their requirements, operational knowledge and understanding of the barriers to utilisation and adoption. Using the human-centred design method we have created a number of practical tools that are at various stages of development. These tools focus on managing teams, how to make better decisions, and how to better utilise the products of research. For the tools that have reached (or are close to reaching) the end of their evaluation we have also developed training to support their use by end-users. We have seen extensive operational use by end-users of the tools we have developed, with a number of agencies amending their standard operating procedures to facilitate use of the tools. In addition, research from the project has formed the basis of several key publications (e.g. the Resilience Expert Advisory Group's "A practical guide for crisis decision making."). Into the future we will be continuing to develop new tools to support teamwork, decision making and organisational learning and expect to see further utilisation by agencies both in Australia and worldwide.

END-USER PROJECT IMPACT STATEMENT

Heather Stuart, *New South Wales State Emergency Service*

The outputs from this research project have received tremendous support across the emergency sector. The team performance tools are being utilised by multiple agencies, the decision making training has been well received and the component on organisational learning is raising much interest. Individuals and organisations utilising the research outputs are praising the products as well as the individual researchers. The value of a collaborative approach to research which includes end users throughout the process is certainly evidenced by this project.

PRODUCT USER TESTIMONIALS

Jeremy Smith, *Tasmanian Fire Service*

"These types of tools that support incident management and fire operations, or indeed any other hazard, are invaluable."

Mark Thomason *South Australian Country Fire Service*

"The straightforward, practical tools developed through this research are of great benefit to emergency managers to ensure their teams are functioning to the best of their ability."

Rob McNeil, *Fire and Rescue New South Wales*

"The outputs from this project will greatly assist the industry in preparing our future leadership for disasters and the decisions they will be expected to make."

Neil Cooper *ACT Parks and Wildlife*

"Those tools are bloody fantastic."

INTRODUCTION

The focus of this project is on providing simple practical tools that can help people to better manage teams, make more effective decisions and enhance utilisation of research. The project therefore has three streams: team monitoring, decision making and organisational learning.

In the team monitoring stream we have developed five key products that help people to better manage teams at strategic levels of emergency management. The products are: the team process checklist (TPC), the emergency management breakdown aide memoire (EMBAM), the state coordination centre key tasks cognitive aide (SCC KTCA), the regional coordination centre key tasks cognitive aide (RCC KTCA) and the non-technical skills checklist (NTSC). The TPC is fairly well advanced now with an extensive set of development and evaluation activities having been conducted. This tool is showing excellent levels of utilisation (as described in the sction on utilisation). The tool was officially launched by the Bushfire & Natural Hazards CRC in 2018. EMBAM has proved to be rather harder to test but has seen some utilisation in the field. Like the TPC it was officially launched by the Bushfire & Natural Hazards CRC in 2018. The state and regional key tasks cognitive aides (SCC KTCA and RCC KTCA) are currently being developed. Development and testing activites are being conducted (as described in the section on key milestones for 2019) and will continue into next year. These tools have already seen some utilisation in the field. NTSC has been constructed based on an extensive literature review and will undergo development and testing with our industry partners in 2019/20.

The decision making stream has also developed five key products to support decision-making for any emergency management decision that is both complex and of high consequence. These products include Aide Memoirs for Psychological Safety and Swift Trust; Cognitive Bias, and Situational Awareness. We also developed the Individual and Team Coping Tool (ITCT) – a heuristic driven tool for tracking individual and team intent and performance. Our recent work has focused on the challenge of incorporating creativity into key aspects of emergency and crisis management using process we've tentatively titled the Divergent-Convergent Options Process or DCOP. Over 220 senior emergency managers have participated in a training course designed to provide participants with the underpinning knowledge associated with the tools and then provided opportunities through discussion exercises to use these tools in a safe environment.

In the organisational learning stream we have continued to develop, test and refine the research utilisation maturity matrix. This is a self-assessment tool that can be used by personnel in agencies to self-assess how the agency or unit are getting the most from research outputs in general and to guide discussion on how utilisation of research outputs may be enhanced. The value of this tool is that it can be used by personnel to review utilisation of any research output, not just those associated with this project. Discussion is also occurring in a number of fora (e.g., the Lessons Management Forum held in August 2019) about how the tool may also be extended to support a broader lessons management approach to further support organisational learning.

RESEARCH APPROACH

As described in previous annual reports, the research approach that has been adopted in the project centres around Human Centred Design. See Bearman et al. (2018a) for more information. The basic premise of human centred design is that products are designed to suit the characteristics of intended users and the tasks they perform, rather than requiring users to adapt to the product. A key component of human centred design is usability testing, where end users are at the centre of a cycle of development and testing activities. This allows the end users to play a central role in the creation of the products, helping to shape them so that they better meet their needs and requirements. The process can be simply described as an iteration around four key stages and is described below in Figure 1.

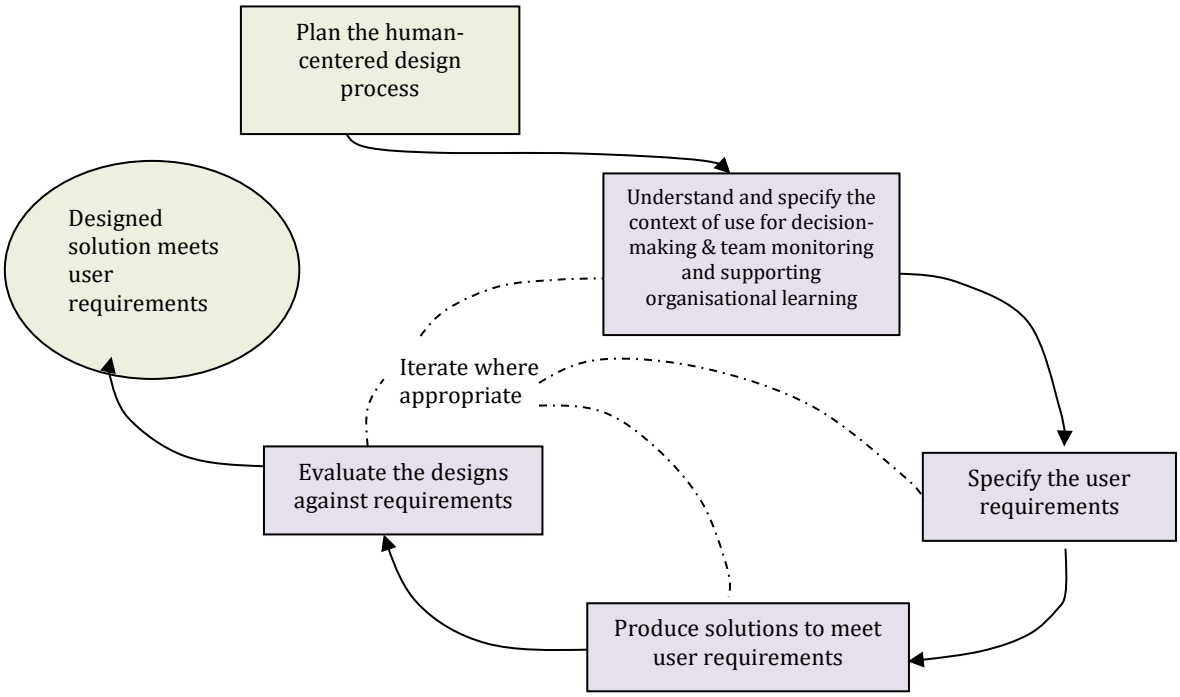


Figure 1 – Interdependence of human centred design activities (adapted from ISO 9241-210:2010(E) p.11)

Our approach in this project then has been to develop and evaluate the tools in real life emergency responses and exercises, or, where this was not possible, in dedicated workshops that focused directly on evaluating usability using an expert group of likely users. Where possible we have also sought to embed end-users into the research process so that they become a central part of the creation of the tools. Bringing end-users into the research process creates a partnership where the researchers contribute their knowledge of literature, theory and the research process and the end-users contribute their requirements, operational knowledge and understanding of the barriers to utilisation and adoption.

Embedding end-users into the research and design process therefore has two goals, 1) to produce tools that can help people to make better decisions and

manage their teams more effectively, and 2) to create the right context for the adoption of the tools by emergency management agencies. In this way we have brought utilisation to the centre of the project, embedding it within the research process so that utilisation informs and is informed by the research from the beginning of the project. For us utilisation is not a separate activity but an integral part of the research process.

RESEARCH AND TOOL DEVELOPMENT*

The project is concerned with creating knowledge and tools to help people to better manage teams, make decisions and utilise the products of research. We have conducted reseach that has idenitifed the need for such tools and have constructed the tools in close conjunction with our end-user partners. A description of work we have conducted in project is provided in this section.

TEAM MONITORING

The team monitoring stream started in 2014 and over the course of the project has developed a number of practical tools that help people to better manage teams. We started the team monitoring stream by identifying the different practices, needs and requirements of a wide range of emergency management agencies in Australia and New Zealand. We observed several large-scale response operations (both real and simulated) and interviewed people from 18 different agencies that were responsible for urban fire, rural fire, land management, storm and flood response, urban search and rescue, and human recovery. We had extensive discussions of our findings with numerous end-users, including: chief officers, deputy chief officers, principle rural fire officers (NZ), state coordination personnel, regional coordination personnel, and incident management team personnel. From these observations, interviews and discussions we found that team monitoring was often not done very effectively and that there was little or no guidance in most agencies about how to do it.

To identify potential tools that could be used for real-time team monitoring in emergency management we conducted a comprehensive literature review (see Bearman et al., 2018b for more details). This review considered literature from both emergency management and other related high reliability industries. From this literature review two methods of monitoring teams were identified: The Emergency Management Breakdown Aide Memoire (EMBAM) and the Teamwork Process Checklist (TPC).

EMBAM (Grunwald and Bearman, 2017) is a checklist that focuses on the output of teams and the networks that people have in order to identify team breakdowns at a high level. EMBAM is essentially a set of prompts that focus on: missing information, conflicting expectations, inconsistent information, intuition, familiarity and the available networks. EMBAM also includes suggestions for resolving breakdowns, such as: delegation, resourcing, mentoring, asserting authority and finally replacing people.

The TPC provides a more detailed examination of a team's performance based on the literature on high performing teams (Bearman et al., 2015, Wilson et al., 2007). It focuses on three aspects of team functioning: communication, coordination and cooperation. Checklist items identify behaviours that would be expected to be observed. If these behaviours are not observed then this initiates a discussion with the team about what is occurring and why.

The two tools that were identified were subject to extensive development and testing in close conjunction with end-users using the human-centred design

* Much of this section has been reported in previous annual reports

approach (Bearman et al., 2018a) (see above for more information). The tools were initially evaluated by observers who were evaluating the performance of teams during a multi-agency response to a simulated aircraft accident at a small rural airfield. The observers used the tools to inform their evaluation and provided feedback to the research team (see Bearman et al. (2017) for more information).

Based on this feedback from the simulated aircraft accident the tools were modified and re-evaluated in a set of four regional coordination centre exercises. These exercises consisted of a full activation of the regional coordination centre who were required to manage one or more large incidents. Actors simulated radio traffic from teams managing the incident and played the part of stakeholders who would normally visit the regional coordination centre. External observers used the tools to evaluate the performance of the regional coorindation team and provided feedback to the researchers. The tools were adjusted after each of the exercises.

A third development and testing activity was conducted with regional coordinators who were managing large storm and flood events. During the events one of the research team called each of the participants and discussed how the teams were performing according to items in the tool. As part of the discussion about teamwork feedback about the tools was provided by participants.

In each study participants were asked whether the checklist as a whole provided useful information, whether it captured all of the information that was deemed to be important, whether each question on the checklist was clear and whether any of the questions needed to be amended or removed.

After the development and testing phase a second phase of evaluation was conducted. In this phase groups of participants used the tools to evaluate the performance of a team or teams and provided a quantitative rating of how useful it was, how clear the questions were, and the extent to which it detected all of the important issues (comprehensiveness). In Study 1, 2 & 3 participants watched a video of a team performing a set of actions and used the checklist to rate that team's performance. In Study 4 participant used the checklist to conduct an after-action review in a workshop format. Across the 4 studies, 76 emergency managers rated the checklist (out of 5) on usefulness as 4.17, clarity as 4.31 and comprehensiveness as 4.1.

In August 2018 the teamwork tools were officially launched by the Bushfire & Natural Hazards CRC. They are freely available from the Bushfire & Natural Hazards CRC website or from the authors.

We have also recently developed a number of further tools that support people working at the strategic level of emergency management. These tools consist of two cognitive aides that focus on key tasks that need to be done in state and regional coordination centres and a checklist that provides an integrated method for managing non-technical skills. These tools are discussed further in the section on deliverables below.

DECISION MAKING

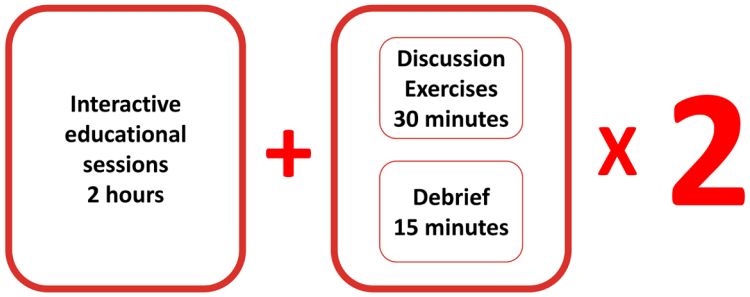
In the past year the decision-making stream has focused on the design, testing and improvement of a process for incorporating creativity into the options generation and analysis phase of emergency response.

We have been focusing on creativity because the 'new normal' includes larger, more complex emergencies. This suggests that leaders will need to think outside the box and use of higher cognitive skills such as creativity and divergent thinking to respond and recover from these incidents. Processes in creativity include thinking skills that are conducive to taking new perspectives on problems, pivoting among different ideas, thinking broadly, and making unusual associations. This approach also aligns with our research focus on harnessing and supporting brain plasticity, as indicated in the table below:

Possible training approach	Aspect of Brain Plasticity	Associated Cognitive Effect	Application in EM
Teaching creative thinking and divergent thinking skills.	Greater cerebral blood flow, functional connections and structural plasticity associated with regions of the brain that deal with reasoning and memory.	Divergent thinking facilitated; various types of reasoning (associated with causes, effects, elaboration and novel use of objects/assets). Improved capacity for meta-cognitive awareness.	Being more creative in novel EM situations; improved ability to reason in difficult contexts.

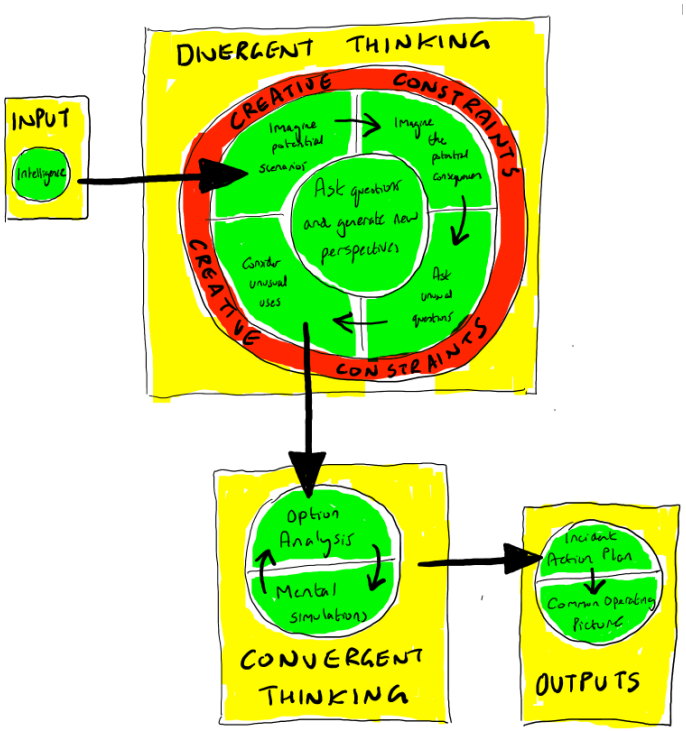
In order to examine this issue empirically we designed a training intervention. The aim of the training intervention was to identify whether it was possible to increase the level of creative output in an options analysis by teaching participants to use a method that promotes creativity. The structure of the day included:

- An introductory presentation on decision-making,
- A 2 hour educational session that explored key decision-making concepts including cognitive bias, situational awareness, psychological safety and the use of the Individual and Team Coping Concept (The Coping Ugly Framework).
- A 30-minute discussion exercise (DISCEX #1) and 15-minute debrief.
- A 2 hour educational session that explored the nature of creativity and the links between divergent and convergent thinking in emergency management, using the concepts identified above.
- A subsequent 30-minute discussion exercise (DISCEX #2) and 15-minute debrief.



40 participants from NSW State Emergency Service, NSW Police and Fire Rescue NSW participated in two one-day workshops using a pre-post experimental approach to test the process. Results indicate that teams scored significantly higher on a creativity scale after being taught the method.

The improvement can be traced to improvements in the criteria of fluency (the number of options) and elaboration (embellishment of the information provided). Teams did not demonstrate evidence of the other two criteria (flexibility in the use of the intelligence provided and originality). Consideration of how to build flexibility and originality into the method will drive the next iteration of the method, which will be translated into research utilisation products over the remaining project time. The process is described pictorially below:



Divergent-Convergent Options Process (DCOP)

ORGANISATIONAL LEARNING

Over the past twelve months the organisational learning component has continued to advance understanding in how agencies are utilising research outputs and has continued to refine the research utilisation maturity matrix.

The work commenced in 2014-5 with a focus on better understanding what enables and constrains fire and emergency services agencies from learning. This was identified as important because the need for emergency services agencies to demonstrate learning is an increasing concern. The first phase (2014-2015) included interviews and survey work and found that many agencies were actively working to identify learning opportunities. These included after-action reviews, externally led inquiries, and practice-led research projects. The agencies also reported how they were attempting to evaluate research insights to identify their implications for reinforcing or changing current practices. However, the research showed that while agencies were developing 'lessons learned' frameworks, these frameworks were not always effective in translating research outcomes into practice. This was found to be the case because, too often, the structures for managing lessons were disconnected from the structures for reviewing and evaluating research. That is, there was no channel between research outcomes and lessons management.

Since then the project has drawn in the literature review and interviews with 18 end-user agency personnel from South Australia, New South Wales, Victoria and Tasmania to ascertain their strategies for learning from incidents and developed an experiential learning model that helped explain how contextual elements enable or constrain opportunities for learning.

A literature review showed how many of the 'lessons learned' publications fell into three themes we called 'the creation myth'; "build it and they will come" and finally "ground-hog day" (for more information see Owen 2018). In the "creation myth", researchers reported reviewing a crisis event, publishing their insights, and then appeared to assume that the act of publication itself signified that 'lessons' had been learned. Other literature themes included how emergency services organisations are establishing processes for managing and learning from lessons ("build it and they will come"), and finally much literature discussed why learning in emergency services contexts is so hard and, some argue, almost impossible ("ground-hog day").

During 2016-2017 an experiential learning model was then developed as part of an *evaluation framework for organisational self-assessment*. This was then reviewed and discussed by the KIRUN (Knowledge, Innovation & Research Utilisation Network) of AFAC as the core stakeholder group to inform the project. Based on the feedback the framework was then adjusted and a pilot of the framework conducted with one of the end user agencies (CFA). Part of the feedback included a request that the tool be called the research utilisation maturity matrix. The work informed a number of items included in a national 2016 survey of agencies which examined the strategies agencies have in place to keep up to date with research. Analysis and discussion with members of the KIRUN then further developed the indicators that could be identified as part of the research utilisation maturity matrix. The theory development work (completed during 2017) then informed a further testing of the indicators as part of the longitudinal investigation of utilisation practices across fire and emergency services agencies in Australia.

KEY MILESTONES FOR 2018/19

This section describes key milestones that have been achieved by the project in 2019.

REPORT ON TASK ANALYSES SUBMITTED TO THE CRC

The report outlines the development and initial testing of two checklist-based cognitive aides for state and regional incident coordination. These cognitive aides are based on hierarchical task analyses and are designed to help teams remain focused on key tasks that need to be completed. The cognitive aides can be used in several ways. The first is as a prompt to help incident managers ensure they are continuing to address the key tasks they have oversight for. The second is as a training and development resource. The third is as a diagnostic and monitoring tool to assess how well a control centre is operating, which can be assessed both in real time and through the after-action review process. While further validation is required the cognitive aides presented in the report provide a flexible tool that have the potential to help people better manage strategic-level emergency response. The report has also been submitted as a paper to the AFAC conference.

PRELIMINARY INTEGRATED OBSERVATION METHOD CONSTRUCTED

A checklist-based tool has been developed that provides an integrated observation method for examining non-technical skills in incident management and coordination teams. The checklist draws together some of the research conducted in the project so far and the wider literature on non-technical skills. The tool will now progress through a development and testing phases similar to that conducted for other products developed by the project using the human-centred design approach.

FRAMEWORK SYNTHESISING EXISTING AGENCY PRACTICE IN ASSESSING AND EVALUATING EVIDENCE THAT MAY REQUIRE ORGANISATIONAL LEARNING AND CHANGE

This deliverable outlined a refined framework developed through further analysis of the data collected through the 2018 Research Utilisation Review. This review was a collaboration between AFAC, the BNHCRC and the Decision tools project – organisational learning stream. These refinements have been further discussed with the Director, Dr Noreen Krusel of Knowledge and Research Implementation, AFAC and with members of the Research Utilisation Network (KIRUN).

EVIDENCE-BASED UTILISATION MATURITY MODEL TRIALLED IN AGENCIES WITH END-USER STAKEHOLDERS AND ADJUSTED

The trialling of an evidence-based maturity model is currently underway and reaching completion. The maturity model has been reviewed by members of the KIRUN as well as participants attending a workshiop at the Lessons Management Forum in July 2019.

INTERVENTION ON BRAIN PLASTICITY AND DIVERGENT THINKING DESIGNED

This deliverable developed the testing regime and the training module associated with divergent thinking. This included receiving approval to officially

use the Abbrieviated Torrence Test for Adults (ATTA), the most well-known measure for assessing creativity. This deliverable included developing the necessary amendments to our University human ethics approval.

STAGE 1 INTERVENTION ON BRAIN PLASTICITY AND DIVERGENT THINKING IMPLEMENTED FOR AT LEAST 1 AGENCY

This deliverable was met by implementing the intervention designed in the previous deliverable for the Tasmanian Fire Service. Members of the Tasmanian Police and Tasmanian SES also attended this one-day workshop at the Police Academy in Hobart.

STAGE 1 INTERVENTION ON BRAIN PLASTICITY AND DIVERGENT THINKING IMPLEMENTED FOR REMAINING AGENCIES

This deliverable was met by implementing the intervention for the Red Cross, NSW SES, Fire and Rescue NSW and NSW Police. Members of these agencies attended one of three one-day workshop in Melbourne or Sydney. We also tested the intervention with critical infrastructure organisations in our own time at no cost to the CRC.

EVALUATION OF PRE-INTERVENTION DATA BRAIN PLASTICITY AND DIVERGENT THINKING COMPLETED

This evaluation established whether the Divergent-Convergent Options Process (DCOP) results in improvements in the options produced by teams in a 30 minute discussion exercise. Using a pre and post experiement design we established that the process leads to a significant increase in the number of options generated and how elaborate or detailed those options are.

UTILISATION AND IMPACT

SUMMARY

The research that we have conducted in the project has been undertaken in conjunction with end-users, with the end-users having considerable input into the development and testing processes. This has allowed us to create practical tools that are tailored to the enviornments in which emergency managers work. The high level of engagement by end-users in the project has allowed us to produce outputs that are being well utilised by emergency management agencies.

The team process checklist (TPC) has now seen considerable use in operational environments and some agencies are changing their policies and doctrine to support it's use. We have supported the use of the TPC by running training workshops for agencies and TPC has been incorporated into AFAC documents, such as the Coaching and Mentoring Resource. The RCC KTCA and the SCC KTCA are still in the development phase but they are already seeing some use in the field.

Over 220 senior emergency management personnel have been trained to use the products developed in the decision-making stream of the research. This work has also been translated into a guide by the Commonwealth Attorney General's department via the Resilience Expert Advisory Group (REAG). The outputs of this work are currently being included in agendas to build guidance document for an Australian Standard. At the next ballot for ISO/TC 292 Security and resilience a further proposal will be placed for a guidance document on decision-making based on our research.

The utilisation of key outputs from the organisational learning stream is developing a self-assessment maturity model for agenies to assess their utilisation maturity. Over the coming year findings from use of the self-assessment tool will inform guidelines to support angeices in their research utilisation journey to support agencies and the CRC to ensure best value from the research conducted.

THE TEAM PROCESS CHECKLIST

Extent of Use

- Over 150 copies of TPC have now been provided to emergency managers in Australia and New Zealand.
- TPC was used to evaluate teamwork in 5 Regional Exercises conducted by the SA CFS in 2017.
- TFS used the TPC throughout one of their worst fire seasons (2017) on record and continue to do so.
- TPC has been used to conduct debriefs during real life storm and flood events with NSW SES.
- TPC has been used to conduct an after action review workshop following NSW SES response to Tropical Cyclone Debbie
- TPC was used as part of an after action review conducted after QFES response to Tropical Cyclone Debbie[1]
- TPC was used to evaluate the Northern Territories Emergency Management Arrangements in 2017.
- TPC was used to evaluate teams at the AMSA Oil Spill Exercise in Cairns in October 2018.
- TPC has been included as a resource in the AFAC publication on Coaching and Mentoring[2]
- TPC is being taught to postgraduate students at Macquarie University in the unit "Team Factors in the Workplace" coordinated by Dr Melanie Taylor
- TPC is being taught to students at York University in Canada in "The Psychology of Disasters" unit coordinated by Dr Eric Kennedy
- Training on TPC has been provided to members of the Youth Advisory Council in South Australia.
- Training on TPC has been provided to EMV Real Time Monitoring and Evaluation personnel
- Training on TPC has been provided to the SACFS.

Utilisation Potential

- The utilisation potential of TPC is high.
- Further utilisation of TPC is currently being discussed with Fire & Rescue NSW.

Utilisation Impact

- In our evaluation studies emergency managers rated the TPC (out of 5) on usefulness as 4.17, clarity as 4.31 and comprehensiveness as 4.1.
- EMV have amended their operational doctrine and have provided TPC to all of their Real Time Monitoring and Evaluation personnel.
- SACFS amended their policy to include use of TPC for real time performance evaluation[3]
- TPC was selected by the Bushfire & Natural Hazards CRC as one of their Utilisation Case Studies[4].
- TPC has also been the subject of a lessons management update by Emergency Management Victoria[5] and an article in Fire Australia[6].

Utilisation and Impact Evidence

1 Queensland Fire & Emergency Services (2018). QFES Post-Incident Review. Final Report for Tropical Cyclone Debbie and the South East Queensland and Rockhampton Flooding Events, March/April 2017. Brisbane: Queensland Fire & Emergency Services.
2 Australasian Fire and Emergency Service Authorities Council. 2018. Coaching and Mentoring – Research Insights into Good Practice. AFAC Ltd. East Melbourne, Victoria, Australia.
3 South Australian Country Fire Service (2019). *12.4 Conducting and Managing Real Time Evaluations* Command, Control, Coordination and Emergency Management Standard Operating Procedures. Adelaide: South Australian Country Fire Service.
4 BNHCRC [2018] Highlights and Achievements 2013-2017. Melbourne: Bushfire and Natural Hazards Cooperative Research Centre
5 Emergency Management Victoria Lessons Management Update, May Edition, 2018.
6 Haritos. C. [2018]. Teamwork when the heat is on. *Fire Australia, 2,* 24-25.

REGIONAL & STATE COORDINATION CENTRE KEY TASKS COGNITIVE AIDES

Extent of Use

- The Regional Coordination Centre KTCA was used to evaluate operational performance in 5 Regional Exercises conducted by the SA CFS in 2017
- The Regional Coordination Centre KTCA was used by the SACFS to construct response plans for Kangaroo Island.

Utilisation Potential

- The utilisation potential of the key tasks cognitive aides is high.
- Further utilisation of the cognitive aides is being discussed with Emergency Management Victoria, the Country Fire Authority and the Metroplitan Fire Brigade.

Utilisation Impact

- SACFS used the Regional Coordination Centre KTCA to inform the Standard Operating Procedure on regional command centres[1]
- SACFS used the State Coordination Centre KTCA to inform the Standard Operating Procedure on the state command centre[2]
- SACFS amended their policy to include use of RCC KTCA and SCC KTCA for real time evaluations[3]

Utilisation and Impact Evidence

1 South Australian Country Fire Service (2019). *1.6 Regional Command Centres.* Command, Control, Coordination and Emergency Management Standard Operating Procedures. Adelaide: South Australian Country Fire Service.

2 South Australian Country Fire Service (2019). *1.5 State Command Centre.* Command, Control, Coordination and Emergency Management Standard Operating Procedures. Adelaide: South Australian Country Fire Service.

3 South Australian Country Fire Service (2019). *12.4 Conducting and Managing Real Time Evaluations* Command, Control, Coordination and Emergency Management Standard Operating Procedures. Adelaide: South Australian Country Fire Service.

DECISION MAKING STREAM TOOLS & TRAINING COURSES

- Over 220 copies of the tools have now been provided to emergency managers in Australia and New Zealand.
- The tools have been used to evaluate exercises for a range of BNHCRC end-user agencies.
- Non-end user agencies such as AMSA, The Australia Antartic Division, Department of Trasnport, Water Authorities, Mining and Energy companies have also been provided the tools, used them in exercising and incorporated them into operational use.

Utilisation Potential

- The utilisation potential of the tools and training is high.
- Further utilisation is occurring with South Australian Department of Premier and Cabinet adapting the tools and traning to support long term recovery operations.
- Further utilisation is occurring via an AWARE grant through DFES, Western Australia where UTAS researchers are working with WALGA (Western Australia Local Government Association) to adapt the tools to suit local government.

NEXT STEPS

The project is scheduled to be completed in June 2020. Over the next year In the team monitoring stream work will focus on further evaluation of the SCC KTCA and RCC KTCA and further development and testing of the NTSC. We are also continuing to promote and support the use of the TPC and EMBAM in agencies: meeting with key decision makers, providing information and running training workshops. In the decision making stream the focus for the upcoming year will be to process the vast amount of data we have collected to produce the high-ranking peer reviewed journal publications for the project. We will also be conducting follow-up evaluations of the end-user agencies to investigate how they have used the tools following the training by applying the model developed in the organisational learning stream. Finally, we will continue to iterate on the Divergent and Convergent Options Process (DCOP) as we continue to evaluate and test it with different organisations. In the organisational learning stream, findings from use of the self-assessment tool will inform guidelines to support angeices in their research utilisation journey and to support agencies and the CRC to ensure best value from the research conducted.

PUBLICATIONS LIST

BOOKS

1 Adams, R. Owen, C. Scott, C. Parsons, D. (2017) Beyond Command and Control: Leadership, Culture and Risk, Taylor and Francis, CRC Press. New York.

PEER REVIEWED JOURNAL ARTICLES

1 Brooks, B., Curnin, S., Owen, C., & Bearman, C. (2019). "Managing cognitive biases during disaster response: the development of an aide memoire." *Cognition, Technology & Work.* https://doi.org/10.1007/s10111-019-00564-5

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