ALERTNESS SAFETY AND PRODUCTIVITY

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

2015 Annual Report

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Contents

Executive Summary

In its second year of operation, the Alertness CRC made significant progress towards reducing the financial and human costs of road and workplace accidents through improved alertness and sleep health in the workplace.

Designed to support innovation, our research program is generating a unique combination of data that flows across projects to service multiple research strategies.

Four Platform Projects were set up in our first year. These are now well underway providing large data collection engines for the consortium in the laboratory, in the clinic and in the field. These data feed into a comprehensive and searchable sleep alertness database allowing advanced data analysis and data mining.

With strong engagement from many of our end user and academic participant organisations, the Alertness CRC has been developing additional project concepts that are taking advantage of the large datasets being generated. These new targeted projects will support the delivery of our key outputs.

Executive Summary

Achievements

Research and Collaboration

The overall structure of the Alertness CRC's research underwent changes in 2015 that has seen the programs increase from two to three, with an additional Program Leader position being created.

This has provided a significant boost to the academic supervision of the research activities and has allowed the CRC to more closely monitor the ability of the project activities to generate high-impact outputs in alertness management.

The existing research themes, while unchanged in substance, were redistributed across the new program structure to provide a sharper focus on our strategic objectives.

Revised Program Structure

Program One (Leader: Professor Shantha Rajaratnam) – Alertness Measurement, Prediction and Testing

1.1 Real-time biomarkers and other measures of alertness

1.2 Technologies for detecting and predicting alertness

Program Two (Leader: Associate Professor Steve Lockley) – Safety and Productivity Improvements

2.1 Dynamic scheduling systems

2.2 Smart lighting solutions

Program Three (Leader: Professor Ron Grunstein) – Sleep Health

3.1 Integrated data management

3.2 Personalised sleep health management

The Program Leaders joined the Chief Executive in a newly formed Management Committee and have also taken on specific portfolio responsibilities for end-user engagement, research translation and education and training.

In the context of the research restructure, Professor Mark Wallace was appointed as Theme Leader of Dynamic Scheduling Systems. Professor Wallace works in the Faculty of Information Technology at Monash University and is Director of the CTI-Monash Centre for Optimisation in Travel, Transport and Logistics.

With data collection proceeding at pace and a management committee coordinating data utilisation and output mapping, the Alertness CRC was very pleased to welcome three new participant organisations – CSIRO, Fatigue Management International (FMI) and Neuroscience Research Australia (Neura).

Early in 2015, the Alertness CRC held a research planning event hosted by the Woolcock Institute of Medical Research. Representatives from all our participant organisations joined with Program Leaders, Theme Leaders and Project Leaders, researchers and students for a three-day program. The program included meetings of the Strategic Review and Research Translation Panels, the project working groups and a series of customised training workshops and presentations.

The Alertness CRC was a bronze sponsor of the 9th International Conference on Managing Fatigue held in Fremantle in March 2015. Both Anthony Williams (CEO) and Professor Shantha Rajaratnam (Program Leader) gave keynote presentations. Dr Tracey Sletten (Postdoctoral Fellow and Project Leader) presented a paper on the implementation of novel lighting interventions to improve alertness and performance in shift workers.

A CRC delegation travelled to the US in June 2015 to participate in the annual meeting of the Associated Professional Sleep Societies and to attend a three-day research planning meeting with key CRC partner Philips Respironics.

In December 2014, Professor Shantha Rajaratnam and Dr Mark Howard presented a webinar, 'Towards field-deployable alertness monitoring systems, hosted jointly by the National Transport Commission and the Federal Highways Administration of the US Department of Transportation.

Such webinars are conducted regularly to share knowledge between the two countries on topics of interest.

The Alertness CRC was subsequently invited to join the Heavy Vehicle Fatigue Data Advisory Group coordinated by the National Transport Commission (NTC) to provide advice on appropriate research activities for the collection of real life operational data to better inform fatigue-related policy. The group comprises national regulatory and enforcement agencies and constitutes a well-developed and comprehensive research translation network in the area of heavy vehicle driver safety.

This group was brought together, along with additional transport industry stakeholders, for a National Alertness Summit held at Old Parliament House in Canberra on Tuesday 30 June 2015. The summit, co-hosted by the Alertness CRC and the NTC, focused on improving the evidence base for heavy vehicle driver fatigue regulation.

The Alertness CRC continues to develop relationships with the mining industry through the International Council on Mining and Metals (ICMM), an active Essential Participant. This year, Hannes Struyweg, Director Health and Safety at ICMM, invited Dr Andrew Tucker to present CRC capabilities/research translation opportunities to ICMM members in London as part of their Health and Safety Forum.

The overall level of engagement with Alertness CRC participants remains extremely high and productive. With increasing SME engagement, a number of new and targeted project opportunities are being developed.

Commercialisation and Utilisation

The Alertness CRC has directed considerable effort towards the development of utilisation pathways and relationships in support of its output targets.

The National Alertness Summit hosted by the Alertness CRC and the development of a formal discussion paper through the NTC's Heavy Vehicle Data Management Framework Group established the Alertness CRC as a key research engine for the sector.

The Alertness CRC continues to collaborate with the Sleep Health Foundation (SHF) to raise awareness around the relationship between sleep health and performance with support for Sleep Awareness Week and ongoing involvement in the Business Council to facilitate more integrated advocacy initiatives consistent with CRC objectives.

Alertness CRC personnel also worked with the Transport Accident Commission (Victoria) to develop supporting content for their 2014 drowsy driving awareness campaign.

In addition to the development of formal networks and translation portals, the Alertness CRC is developing utilisation plans for multiple product concepts.

The Alertness CRC has also identified opportunities to incorporate bio mathematical models in more dynamic scheduling and optimisation software. Developing data to support the business case is complex and sector specific. The CRC is continuing to canvass industry requirements such as costs savings, the implications of shift configuration demands and fatigue management risk.

With a number of key outputs in development, the Board of the Alertness CRC resolved to form a specialised commercialisation committee in Year 3. This committee will formally map the output flow, interrelationships and business cases to further refine data collection requirements, project review and commercialisation partners for the consortium.

Executive Summary

Education and Training

Guided by the Education Committee, the Alertness CRC has developed a comprehensive and diverse education and training component.

With a total of 12 postdoctoral fellows active in the research program, these early career researchers have been given prominent roles in project teams with most taking on Project Leader positions. This responsibility and the ability to interact with senior end-user representatives is a key factor in building capacity, aligning their skills and expertise to output-driven research and exposing them to industry practices and pressures.

The PhD program includes 11 students currently enrolled and integrated into the Platform Projects and core activities of the CRC. The Masters program currently includes four students and is particularly vital to the creation of a 'pipeline' of PhD candidates.

The Alertness CRC has also supported the equivalent of 6.5 (FTE) shorter term vacation scholarships. This includes a formal relationship with Swinburne University to collaborate on an Industry Based Learning program with six students working with the Alertness CRC as a formal part of their training program.

The Alertness CRC continues to develop training initiatives for all students and CRC personnel with several formal programs offered during a three-day research planning meeting in early 2015.

Working closely with Monash University, the Alertness CRC is also helping to establish and oversee the development of a Graduate Diploma of Psychology advanced course which will include a focus on the development of industry engagement strategies and initiatives. The course will be available through the Monash Institute of Cognitive and Clinical Neurosciences.

The Alertness CRC sponsored a one-day course held in Perth in October 2014 titled 'Managing Alertness in Industry – Minimising Risk & Optimising Productivity'. The short course was coordinated by the Occupational Health, Safety and Performance Special Interest Group of the Australasian Sleep Association.

Awards

Professor Peter Robinson, Program Leader/Investigator – Awarded an Australian Laureate Fellowship in August 2014.

Professor Peter Robinson works on a range of complex systems topics spanning brain dynamics, imaging, biological physics, computational neuroscience, plasmas and other areas. His core research focus is on interdisciplinary research with an emphasis on translation of results into real-world applications. This involves a range of theoretical, computational and experimental collaborations, including strong commercial and industrial interactions.

Risks and Impediments

This second year of the Alertness CRC has focused heavily on the implementation and 'ramp up' of the four major Platform Projects.

The standardisation of data collection is critical to the Alertness CRC's ability to interpret results as early as possible. A Methodology Standardisation Group has been established to ensure that data collection is standardised across the CRCs multiple sites and highly interrelated project activities.

The Alertness CRC continues to develop internal structures and processes to enhance the collaborative environment. A robust process to carefully map and monitor outputs that can be commercialised is now a major focus of the Board.

With a sophisticated and complex program of research, it is vital to continue to finalise utilisation plans around intellectual property; to scrutinise progress towards the relevant proof of concept; and to continue to identify opportunities to leverage partnerships within and beyond current CRC participant organisations.

End-User Environment

The Alertness CRC participant group continues to align well with its objectives. Additional projects are being developed for Year 3 that will leverage the platform data and create clear pathways to the high-impact outputs the CRC is working towards.

Opportunities to develop sustainable and commercial partnerships are being identified and developed with the support of a targeted stakeholder engagement strategy. Relationships such as those facilitated by the National Transport Commission demonstrate how a consortium approach can spearhead regulatory change as well as lead to the practical translation of new and improved tools and systems in alertness management.

While the focus is currently on the development of activities that align with the strategic priorities and deployment opportunities identified by Alertness CRC participants, there have been multiple expressions of interest from a broader stakeholder network (including those with high-risk, safety critical operational settings) that requires a more formal mechanism for engagement. The CRC is further developing this network to provide collaboration and deployment opportunities for a range of project outputs.

The major advantage of the Alertness CRC is the availability of unique expertise, state-of-the-art technologies; and a significant pipeline of background IP from end users that is being incorporated into the research and development activities.

The Alertness CRC has established a Research Translation Partnerships Program to guide the development of research that can deliver tangible improvements in safety and productivity. The program is designed to connect the work of the CRC with a broader industry stakeholder network and is being coordinated by Dr Andrew Tucker who moved from industry to join the Alertness CRC team.

Impacts

The interrelated programs and current project activities of the Alertness CRC remain focused on delivering comprehensive and integrated state-of-the-art outputs that are expected to trigger a paradigm shift in the approach to alertness management.

The data generated by the four major Platform Projects along with the integrated database will continue to support the development of additional projects. These will leverage the data collection engines and target product concepts suitable for commercialisation as well as alertness management interventions.

Executive Summary

Figure 1: Alertness CRC Participants

Table 1: Alertness CRC Output Summary

Measurement and Prediction	Scheduling of Work and Sleep	Smart Lighting Solutions	Personalised Sleep Health
Technologies and biomarkers of alertness impairment (biochemical, physiological)	Personalised sleep-wake monitoring/ scheduling device that provides tailored information on wake and sleep promoting interventions (e.g. caffeine, light, melatonin)	Software for portable devices to deliver light alerting countermeasures and 'smart' programmable LED lighting and systems	Measuring individual vulnerability to sleepiness and targeted management of sleep disorders
Optimising and combining technologies and biomarkers for real-time portable alertness monitoring	Organisational rostering software based on state-of-the-art biological alertness models, task demands and operational factors	Light timing and use of different light colour strategies to adapt to shift work and jetlag	Individualised sleep and alertness monitoring devices, scheduling software and applications
		Software to facilitate customised lighting design	Customised lighting integrated with sleep, work and alertness assessment
Integrated platform to deliver systems and tools			
Education and advocacy to drive change			

Research

With the mid-year restructure of the research program and a revised Program Leadership in place, the significant increase in core research activity and the parallel development of additional projects is positioning the Alertness CRC to provide both early stage impact and genuine innovation around alertness management technologies.

The themes of research within each program are highly interdependent, as are the platform project outputs that provide critical data components across the activities. For example, the ability to develop new biomarkers will:

- facilitate more individualised safety and productivity countermeasures
- enhance the biomathematical modelling capability of the consortium, and
- provide more opportunity for individualised management of sleep health and sleep disorders.

Professor Shantha Rajaratnam, Monash University

Program One – Alertness Measurement, Testing and Prediction

The objective of Research Program One is to develop and verify tools to measure current alertness levels accurately. This in turn can support the development of practical alertness tests and tools to predict the risk of future alertness failure. Testing and prediction enables intervention before poor alertness impairs productivity and safety.

This research program incorporates two themes of research activity: Identification of real time biomarkers of alertness and Technologies for predicting and monitoring alertness.

Biomarkers are biological characteristics that can be objectively measured to provide information on changes in alertness. They can provide an early warning of potential alertness failure or impairment. To enable us to examine how alertness biomarkers change according to factors such as time awake, circadian phase and (for some markers) a period of recovery sleep, a highly controlled study has been initiated using start-of-the-art measurements in healthy volunteers. A research team made up of academic and industry researchers from several participating organisations has designed this study in which participants spend six days in a laboratory, including a 40-hour period of sleep deprivation under constant routine conditions. As part of the study, participants complete three weeks of unscheduled and scheduled sleep, including assessment of circadian phase.

Following the commencement of the collection of neurophysiological and biological samples, a project has been developed in collaboration with CSIRO to evaluate nanoparticle-based technology to detect changes in alertness state. Metabolomics Australia (part of Bioplatforms Australia) is facilitating an untargeted discovery program to determine a novel alertness biomarker.

After this initial laboratory testing of alertness outcomes, field based validation will move to operational environments within Alertness CRC participant organisations. The biomarkers and alertness measures identified in these initial projects will then be incorporated into devices for testing fitness for duty and roadside alertness tests as well as personalised alertness and management devices.

Within the Healthcare Platform project, medical personnel from the Austin Hospital Intensive Care Unit are being recruited to a study aimed at developing sensitive measures of alertness impairment during night shift work. This work will facilitate the development of new objective tests of fitness for duty and improved alertness monitoring capabilities. Project team personnel are also monitoring rest-activity cycles and physiological rhythms in these individuals during their periods of shift work. The findings will improve algorithms that monitor and predict circadian and alertness states.

Another exciting new project is aimed at improving the ability to predict the timing of the circadian clock. This project will include phenotyping or characterising the sleep-wake habits and timing of circadian rhythms in a variety of participants.

Case Study 1

40 hours of sleep deprivation helps identify biomarkers of alertness

Project Leader: Dr Suzanne Ftouni, Monash University

One of the Alertness CRC's objectives is to identify alertness measures including biomarkers to assess and predict the risk of alertness failure. Biomarkers are biological characteristics that can be objectively measured to provide information on changes in alertness. They can provide an early warning of potential alertness failure or impairment.

To examine how alertness biomarkers change according to factors such as time awake, circadian phase and (for some markers) a period of recovery sleep, a highly controlled study is being carried out using start-of-the-art measurements in healthy volunteers.

A research team made up of academic and industry researchers from several participating organisations has designed this study in which participants spend six days in a laboratory, including a 40-hour period of sleep deprivation.

This research will contribute to the development of a new alertness testing device.

Research

Professor Steven W Lockley, Monash University

Program Two – Safety and Productivity Improvements

Research Program Two is designed to demonstrate that alertness can be maximised at individual, workplace and community levels to deliver measureable improvements in safety and productivity. This program is developing, testing and validating new tools and approaches to improve alertness.

A main focus of this research program is the development of an evidence based framework for shift scheduling, to be tested initially in the healthcare setting, and then utilised and tested with a variety of occupational groups.

Through the Alertness CRC activities, medical personnel are being monitored under normal conditions during which both group and individual response to shift work is evaluated and the considerations governing work hour scheduling reviewed. Prototype group scheduling software, capable of generating alternative schedules that meet all the logistical and operational requirements, while conforming to Alertness CRC best practice recommendations, will be developed.

The proposed scheduling solutions will use predictions of sleepiness derived from Alertness CRC modelling work with current modelling of sleep-wake cycles improved to account for a number of factors including sleep propensity, melatonin dynamics and the alerting effects of white light. This improved model will be integrated into the sleep-wake and alertness prediction model and combined with scheduling tools for groups of employees.

Further improvements will be made to account for the effects of chronic sleep restriction, sleep inertia, and light spectrum on sleep-wake and alertness dynamics. This will allow for more accurate prediction of alertness in a wider variety of occupational and environmental conditions.

The Alertness CRC is also examining the effectiveness of lighting countermeasures in a range of occupational and other settings. Through work in both the laboratory and healthcare settings, the process of quantifying the benefits of different lighting types in safety critical occupations has commenced. This will allow the integration of these findings into lighting and architectural design tools to promote widespread use of improvement in lighting countermeasures.

The main focus of these activities are to develop 'smart' lighting systems that use combinations of light wavelength, intensity, timing and pattern to optimise the alerting or sleep-promoting or body clock resetting effects of light. Initial reviews of the current lighting in a high-intensity inpatient setting has been completed, and research teams are now developing a dynamic lighting system in partnership with Lighting Science Group Corporation that will optimise the lighting environment.

The aim is to promote better sleep and daytime alertness for patients, and better on-the-job alertness for staff, in conjunction with work schedules, for the entire team and for individuals. The Healthcare Platform project activity is providing the initial information and first round of validation for the development of the integrated lighting hardware and software system and the individual-level data portable lighting devices.

Case Study 2

Helping health workers manage the impacts of shift work

Project Leader: Dr Tracey Sletten, Monash University

The health industry encompasses the largest body of shift workers in Australia and the global economy requires many other industries to employ people to work around the clock.

Because they are working at irregular hours, shift workers are more likely to be sleepy and less alert, which reduces their ability to concentrate or react quickly. This can lead to mistakes, accidents and injury. With the right mix of measures in place, these negative impacts are avoidable.

Research being carried out includes a large-scale applied research project with the voluntary participation of medical and nursing staff from the Austin Hospital, Melbourne.

During the project, a number of evidence-based interventions that aim to improve alertness and performance will be trialled. The outcomes of this project will not only benefit the current participating health workers but will also inform new approaches applicable in a range of shift workplace settings.

Research

Professor Ron Grunstein, Woolcock Institute of Medical Research

Program Three – Sleep Health

The Sleep Health Research Program focuses on two highly prevalent sleep disorders that can impact negatively on alertness, productivity and safety – insomnia and obstructive sleep apnea (OSA). Collectively, these disorders occur in approximately 20% of the adult Australian population and are even more common in specific occupational groups, for example up to 45% of Australian truck drivers have OSA.

We know that untreated sleep disorders lead to a several fold increased risk of occupational accidents and injuries due to changes in alertness and also that sleepiness can greatly reduce work productivity. As such, understanding both how these sleep disorders evolve and which treatments are the most effective is fundamental to improving productivity and safety for these people, especially if they are employed in roles where safety is critical.

This research program is developing new systems for phenotyping patients with insomnia and OSA. The project teams have commenced testing and currently have five sites across Australia studying patients with these disorders. These sites (Adelaide Institute of Sleep Health; Flinders University; Monash University; Institute for Breathing and Sleep, Melbourne; and Woolcock Institute of Medical Research, Sydney) have researchers who are experts in sleep disorders. They have established research teams consisting of end user representatives, research investigators, postdoctoral fellows, research students and research assistants to undertake the phenotype studies in the insomnia and OSA populations.

There are three main areas of research – two projects examining patients with OSA and a third involving insomnia patients:

1. The respiratory phenotyping stream is developing clinical tools to determine whether individual patients with OSA have primarily anatomical or non-anatomical factors leading to their OSA.
2. The other OSA phenotyping stream focuses on early detection of patients with significant impaired neuro-behavioural function leading to alertness failure.
3. The insomnia phenotyping stream is developing a phenotyping toolkit that will consist of objective markers for more accurate diagnosis.

The Alertness CRC continues to develop a comprehensive, scalable and searchable sleep alertness database. The database stores data from all projects as well as incorporating existing sleep research data sources. The database is being supported with sophisticated data mining tools to extract the maximum benefits from the data across the project activities.

Case Study 3

Improving understanding of common sleep disorders

Project Leader: Dr Chris Gordon, University of Sydney/Woolcock Institute for Medical Research

Untreated sleep disorders can lead to a several–fold increased risk of occupational accidents and injuries due to changes in alertness. In addition, sleepiness can greatly reduce work productivity. Understanding how sleep disorders evolve and which treatments are the most effective is fundamental to improving productivity and safety, especially for people employed in roles where safety is critical.

Two highly prevalent sleep disorders that can impact negatively on alertness, productivity and safety are insomnia and obstructive sleep apnea. Collectively, these disorders are experienced by approximately 20% of the adult Australian population, and they are even more common in specific occupational groups. For example, up to 45% of Australian truck drivers have been found to have obstructive sleep apnea.

This study is being conducted by researchers at Flinders University, Adelaide and the Woolcock Institute of Medical Research, Sydney.

The findings of this research program will help guide more personalised treatment programs, rather than the current one-size-fits-all approach.

Research

Education and Training

The Alertness CRC Education Committee is responsible for

- Providing oversight regarding the selection, training and interactions of students and post-doctoral awardees of the Alertness CRC
- Monitoring progress and relevance to Alertness CRC education milestones.

The Committee is made up of

- Professor Ron Grunstein, Woolcock Institute for Medical Research (Chair)
- Dr Clare Anderson, Monash University
- Dr Peter Catcheside, Flinders University
- Dr Chris Gordon, Sydney University.

The aim of the Alertness CRC training program is to provide opportunities for PhD, Masters and postdoctoral researchers to not only develop research, communication, engagement and project management skills but also significantly deepen their understanding of the drivers and imperatives in businesses and industries operating in globally competitive markets. This supplementary training support is critical to building the capacity of our new and early career researchers as the Alertness CRC seeks to create industry-based employment opportunities for graduates.

The Alertness CRC continues to develop customised training initiatives for all students and CRC personnel. During a three-day research planning meeting in early 2015, Project Leaders and PhD students undertook a one-day workshop in project planning and management. The workshop was well received with the following comments from attendees:

"I gained insight into which processes are beneficial when planning a large scale project."

"It was particularly helpful to hear from fellow attendees the strategies they employ to remain on task and meet assigned goals."

During these meetings, a workshop on 'Taking Ideas to Market' was presented to all students and CRC researchers focusing on product development processes utilised by Philips Respironics and the experiences of Australian-based technology development company Grey Innovations. Professor Karen Reynolds from Flinders University also provided an academic's perspective in relation to the development of medical devices.

Industry placement is also a key priority for CRC students. The industry placement program is gathering pace as project specific opportunities are identified. The CRC has several already underway (Cogstate, Philips Respironics, Bioplatforms Australia) and is dedicating significant effort to mapping and scheduling opportunities in the context of project requirements and timing. This will ensure the maximum value from the placements is derived by both the student and the industry partner.

Postdoctoral Training

The eight Project Leader roles are held by postdoctoral fellows. Valuable skills in project planning, reporting, financial management, collaboration and negotiation are developed on the job through their experience of developing and managing a significant project stream. The Project Leader role requires frequent engagement with end-user participants as well as other Project Leaders. Meetings and teleconferences are held on a regular basis, either fortnightly or monthly, in order to develop project agreements, governance arrangements, work plans and collaboration with other Project Leaders and to discuss what IP, technologies and other resources can be contributed by industry partners to support the research activities.

PhD Program

A total of six full time PhD scholarships have been awarded in the past 12 months. Another seven PhD students have been provided with top-up grants. In addition, stipends were provided for three PhD students to work for up to 12 weeks on a program run through the university vacation period to assist with the modelling and data fusion activities.

Other Graduate and Postgraduate Training

The Education Committee approved the establishment of a Masters entry program as a precursor to PhD appointments. Four students completing Masters degrees in a range of disciplines have been offered scholarships for two years each. Six students from Swinburne University have been recruited as Industry Based Learning candidates. They are based at Monash University, engaging with end-user participants and supporting the Laboratory and Healthcare Platforms project activity.

Industry Training

In October 2014, the Alertness CRC was the primary sponsor of a one-day course, Managing Alertness in Industry – Minimising Risk & Optimising Productivity', hosted by the Occupational Health, Safety and Performance Special Interest Group of the Australasian Sleep Association in Perth. The target audience included occupational health and safety professionals, occupational physicians, PhD students and researchers. Course attendees learnt about proven methodology and tools to actively manage the improvement of a robust health and safety management system for fitness for work, while balancing people, production and cost to ensure continuity of business operations safely. Facilitators and presenters included key Alertness CRC personnel. The workshop is expected to be an annual event with significant Alertness CRC involvement.

Small to Medium Enterprises – SME Engagement

The Alertness CRC continues to value and encourage the involvement of SMEs in the consortium as participants (both essential and other). While in some cases the ability of SMEs to contribute significant resources to the research activities is limited, the data collection engines facilitated by the four Platform Projects are providing opportunities for smaller targeted projects to be developed around the specific priorities of these SMEs.

The larger participant organisations remain eager to support the involvement of SMEs in project teams, and the Alertness CRC continues to highlight opportunities for collaboration within the CRC as well as beyond CRC-specific objectives.

At a project level, the SME's remain actively engaged through the provision of vital background IP and in-kind contributions.

Results

Utilisation and Commercialisation

The early stage outputs of the Alertness CRC are critical to its ability to develop high-impact alertness management tools. Data collection through each of the Platform Projects is providing critical data, and the interrelationship between the project activities provides a level of sophistication and linkage that is unprecedented in the field to date. However, considerable effort has been focussed on developing utilisation pathways and relationships across its key output targets.

The ability to engage with key stakeholders in order to inform regulation and policy is a key objective of the Alertness CRC's approach and provides a two-way interaction that continues to drive the research agenda towards the gaps identified by the relevant stakeholders.

The process established within the National Transport Commission's Heavy Vehicle Data Management Framework Group is an example of this interaction. Driver fatigue is a challenging area for policy makers. Driver fatigue data collection is usually based on police enforcement data and collected by jurisdiction. Operational definitions, regulations and methods of recording and reporting fatigue data may differ between jurisdictions and organisations, leading to limitations in comprehensive analyses at a national level.

Consistent and detailed data collection on driver alertness and fatigue risks, including scheduling, is needed to support improved policy-making in the Heavy Vehicle National Law.

A national Alertness Summit was held at Old Parliament House, Canberra, on Tuesday 30 June 2015, co-hosted by the Alertness CRC and the National Transport Commission. The focus of the summit was on improving the evidence base for heavy vehicle driver fatigue regulation. Presentations and discussion at the summit focused on factors contributing to heavy vehicle driver alertness and fatigue issues, including drowsiness associated with poor or disrupted sleep. Other key areas of focus included current evidence gaps and future initiatives to develop and assess the effectiveness of heavy vehicle driver fatigue policy.

The summit featured an interactive program and captured guest feedback during small group discussion streams. Discussion topics included improving crash investigation reporting; evaluating work schedules and regulations; methods for capturing alertness and fatigue trends; and developing guidelines for evaluating and implementing alertness monitoring technologies. Perspectives from industry, academia, technology, regulatory bodies and law enforcement agencies were represented.

With this stakeholder and translation network actively involved, the Alertness CRC is now positioned to provide valuable research input for the heavy vehicle transport sector. It is anticipated that the discussion paper generated through the NTC's consultation process will provide a consensus view of how the current Alertness CRC research activities can service the policy questions and also how it can further mobilise its relationships, technology and expertise in the field.

The Alertness CRC is also working with agencies to continually translate and raise awareness of the current sleep health evidence base and how this links to potential safety and productivity improvements.

For example, the Alertness CRC continues to develop significant initiatives with the Sleep Health Foundation (SHF) to raise awareness of the relationship between sleep health and performance. Whether through initiatives such as Sleep Awareness Week or co-developing new occupational constituencies for the SHF, the ability of the SHF to drive advocacy towards alertness management, safety and productivity provides opportunities to support research translation and utilisation initiatives.

With a number of key outputs in development, the Board of the Alertness CRC has subsequently resolved to form a specialised commercialisation committee in Year 3. This committee will formally map the output flow, interrelationships and business cases to further refine data collection requirements, project review opportunities and commercialisation partners for the consortium.

Intellectual Property Management

The Alertness CRC continues to maintain its robust process to secure intellectual property (IP) developed through its activities and to ensure that maximum benefits accrue to end users, research providers and Australia.

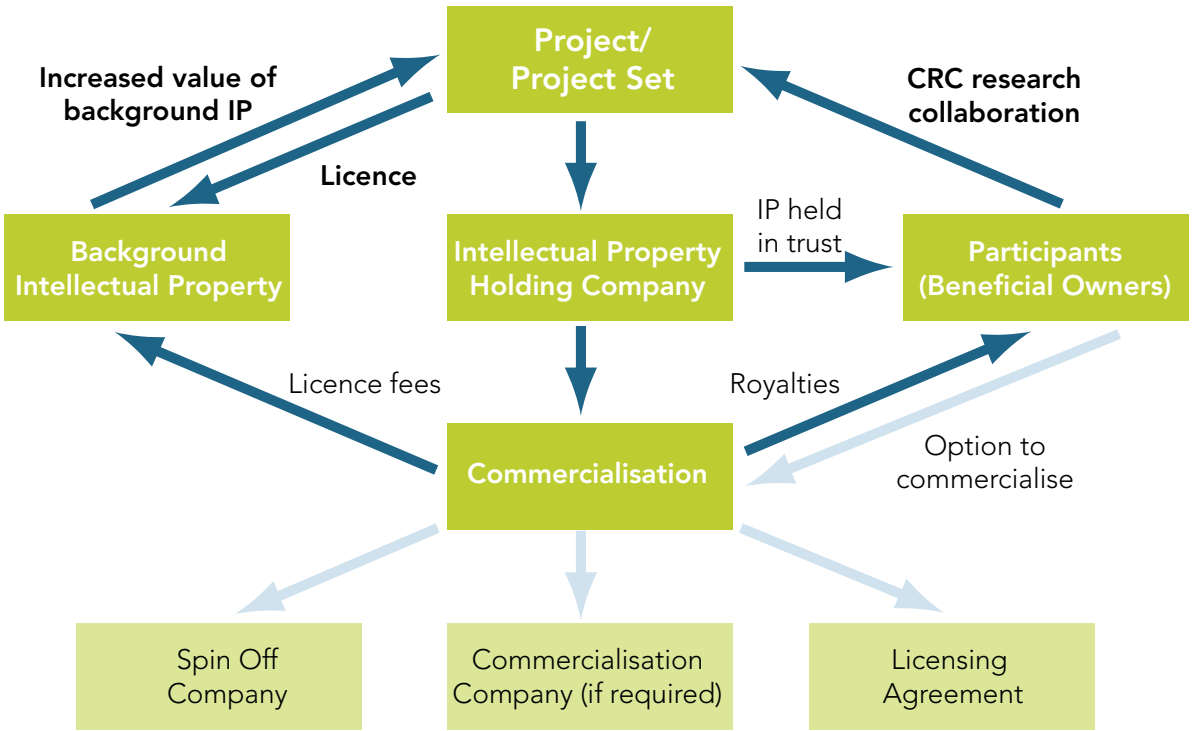
Background IP made available by participants is registered and managed via the project agreements and utilisation plans with an emphasis on predicting the value of IP and the appropriate licensing fee thresholds as early as possible.

Alertness CRC IP is to be legally held by an IP holding company (Alertness CRC Holdings Pty Ltd) on behalf of the beneficial owners (see Figure 1). The beneficial owners will be the Essential Participants of the Alertness CRC, and ownership will be based on their proportional contributions to the projects or activities that generate the IP. Other participant project parties will be contractually entitled to an interest in the returns arising from the Utilisation of Project IP, proportionate to its contributions to the project.

With extensive student involvement in CRC activities and the need to ensure adherence to the National Principles of IP Management for Publicly Funded Research, the Alertness CRC has developed clear contractual terms around student ownership of IP, the rights to publish, the right to be examined, and the right for participant organisations to utilise IP for non-commercial purposes.

The IP management structure of the Alertness CRC ensures that every effort is made to provide benefit for Australia and that the ownership is vested appropriately (including academic participant organisations). Board oversight and detailed utilisation plans ensure IP is protected and made available through licensing and appropriate accessibility arrangements.

Figure 2: Alertness CRC Intellectual Property Management Structure



Results

Communication

Communication and stakeholder relations strategies tailored to the expectations and requirements of key Alertness CRC stakeholder groups is critical to the success of this collaborative approach and the ability to effectively translate the research outputs.

Key communication priorities for the reporting period have been

- Building awareness of the Alertness CRC and its potential to drive new gains in road and workplace safety and productivity.
- Enhancing the quality of the collaboration between researchers and industry partners within the consortium.
- Promoting the latest research about healthy sleep and the relationship between performance, productivity and safety to a broader research translation network across multiple occupational sectors.
- Working with the Sleep Health Foundation to focus advocacy initiatives on the benefits of improved alertness.
- Supporting the Heavy Vehicle Fatigue Data Management Framework stakeholder group and hosting the National Alertness Summit (Driving Heavy Vehicle Safety).

The Alertness CRC website underwent a major upgrade to be more informative and easy to navigate. New information about research translation opportunities, the revised Research Programs and additional CRC personnel were included. The home page now incorporates @AlertnessCRC Twitter feed which refreshes the page regularly. There is also a 'Latest news' section, including invitations for volunteers for research studies in Adelaide, Melbourne and Sydney.

A Twitter strategy has been implemented to disseminate information about sleep and its importance for optimised alertness to a broader stakeholder network.

A corporate Linked In page has also been established with the aim of promoting the work of the Alertness CRC to occupational health and safety professionals in safety critical industries.

To date, social media has also proven to be a strong platform for encouraging volunteers to register for sleep research studies.

Internal Communication

Internal communication between industry partners and research teams continues to be a high priority for the Alertness CRC.

At the highest level, the CRC has extensive participant involvement in the research and translation plans via the Strategic Review and Research Translation Panels. This process was activated during the reporting period with extensive face-to-face research planning meetings held in Sydney in February 2015. All participant organisations were represented at these meetings and provided the Program Leadership with a mandate to proceed with implementing a consensus strategy in line with the overall priorities and output expectations of the Commonwealth and the IP holding company Alertness CRC Pty. Ltd.

Internal communications is closely linked to the management committee and the ability of the Program Leadership to coordinate the efficient and effective flow of information through the Theme Leaders and project teams. Program Leaders also have separate portfolio responsibilities around end-user engagement, research translation partnerships and education and training to ensure we have high-level coordination and information control regarding key issues and end-user involvement in CRC activities.

External Communication

External communication has been led through the Alertness CRC website, which is regularly reviewed and updated. According to online analytics, the current 38% of web traffic for the Alertness CRC is linked to new users. The highest number of page views occurred in June 2015 and is linked to the success and profile of the National Alertness Summit hosted in Canberra.

The Alertness CRC newsletter is distributed to more than 200 organisations and provides regular exposure to the non-confidential activities of the consortium. The distribution of the newsletter typically triggers a marked rise in website page views and has an open rate of 54% compared to industry average open rates below 20%.

The Alertness CRC sponsorship of the 9th International Conference on Managing Fatigue, held in Perth in March 2015, facilitated reach to a new audience with information included in the conference booklet and conference satchel.

The Alertness CRC is represented on the Business Council of the Sleep Health Foundation and participated in an audit of council representatives regarding their strategies for involvement with the Sleep Health Foundation and the synergies with the broader objectives of the Alertness CRC.

The Alertness CRC participated in the Parliamentary Showcase, which was part of Australian 2040, the CRC Association conference held in Canberra in May 2015. The Alertness CRC display promoted the potential of a new device currently in development that will objectively measure circadian rhythm disorders and a Transport Accident Commission (Victoria) road safety campaign which highlights the risks of driving when sleepy. The campaign was developed on the basis of advice from Alertness CRC research leaders.

Resources

As a Cooperative Research Centre, the Alertness CRC has a well-defined mission to promote the prevention and control of sleep loss and sleep disorders and to develop new tools and products for individuals and organisations to improve alertness, productivity and safety.

The CRC management company (Alertness CRC Ltd) continues to build a research and development facility that is efficient and effective, providing a unique opportunity for organisations in the field to add value to each other and produce deployable outputs.

Alertness, safety and productivity are negatively influenced by sleep loss, sleep disruption and shift work (circadian or body clock disruption), due to widespread effects on core brain functions such as reaction time, decision making, information processing and the ability to maintain attention.

The Alertness CRC is addressing the following five key challenges:

- The available tools to measure, monitor and manage the public safety risks posed by reduced alertness are currently inadequate.
- Sleep loss affects different people in different ways.
- There has been a failure to account for the variation between individuals when managing fatigue.
- Effective strategies to improve alertness in the workplace and help shift workers reduce the health and safety risks inherent in their work schedule are lacking or poorly integrated with other aspects of their lives.
- There has been no evidence-based program to determine the best way of informing the public, professions and regulatory groups about how to manage work schedules to optimise alertness.

Governance – Board, Committees, Staff

The CRC for Alertness, Safety and Productivity (Alertness CRC) was incorporated on 24 April 2013. The Company is a public company limited by guarantee. The Company is registered as a health promotion charity with the Australia Charities and Not-for-profits Commission (ACNC) since its inception. The Australia Tax Office (ATO) has provided its endorsement to Alertness CRC Ltd as a charitable institution to enjoy the following tax concessions from 24 April 2013:

1. Income Tax Exemption.

2. GST Concessions.

3. FBT Exemption.

In addition, the Alertness CRC is endorsed by the ATO as a deductible gift recipient effective from 12 September 2014.

The governance structure is represented in Figure 3 below:

The Board of Alertness CRC Ltd comprises five independent Directors led by Chair, Patricia Faulkner AO. A representative of Philips Respironics has been invited to attend Board meetings as an observer and as Chair of the Strategic Review Panel.

The Board has also empanelled an Audit, Finance and Risk (AFR) Committee as a subcommittee of the Alertness CRC Board that meets biannually. This committee is chaired by Peter Maloney, and its primary functions are to review the appropriateness of the Alertness CRC's:

a. financial reporting

b. performance reporting

c. system of risk oversight and management, and

d. system of internal control.

In addition, the AFR Committee is responsible for:

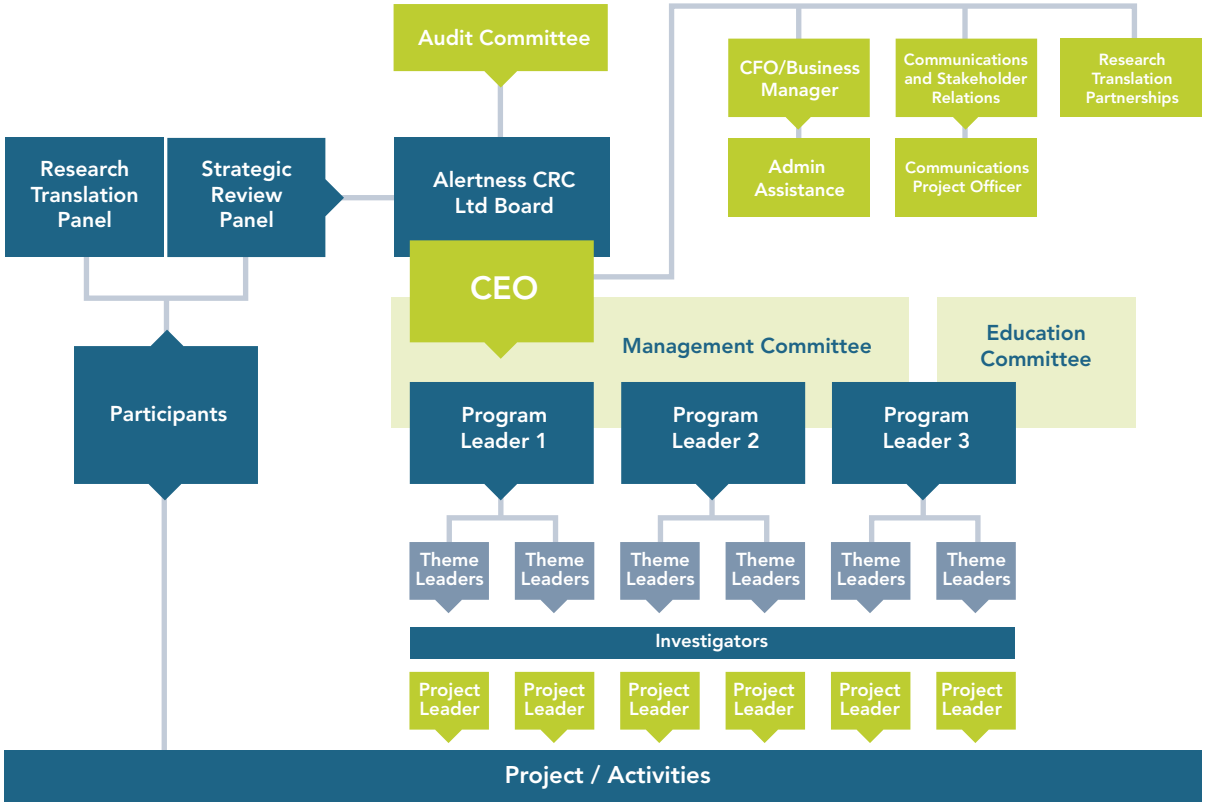
e. monitoring the risk management framework, and making recommendations to the Board on changes to the framework

f. making recommendations to the Board on the appointment, assessment and removal of external auditors, and overseeing their independence

g. annually reviewing and approving the external audit fees, plans and their scope

Board Members Standing L – R: Deena Schiff, Anthony Williams (CEO), Ian Farrar, Seated L – R, Peter Maloney, Patricia Faulkner AO (Chair).

Figure 3: Alertness CRC Organisational Chart



Resources

Table 2: Alertness CRC Board of Directors

Name	Role	Key skills	Independent/ Organisation
Patricia Faulkner, AO	Chair	Patricia Faulkner, BA (Econ & Psych) DipEd MAdmin, has been CEO of large and complex government departments and a partner in a major advisory firm (KPMG). Her career has spanned the most senior levels of the public, private and the not-for-profit sectors. She now has an extensive portfolio of Board and advisory roles, both as Chairman and member.	Independent
Ian Farrar	Board Member	Ian Farrar, BComm, is an experienced company director who has chaired public, private and government organisations and is well versed in contemporary corporate governance issues. He is a skilled commercial manager with a strong track record of achievement in areas such as large scale asset utilisation, funds management and strategic asset allocation, financial management, insurance, information systems, statistical analyses, occupational health and rehabilitation, research management and organisational change.	Independent
Peter Maloney	Board Member	Peter Maloney, BComm MBA, has wide experience as a business executive and company director, both in Australia and internationally, across a range of industries. He has been a director of various public and private companies since 2000. Peter was Chairman of Southern Health, the largest healthcare provider in Victoria 2003–2006.	Independent
Deena Shiff	Board Member	Deena Shiff, BSc (Econ) Hons BA(Law) Hons, has 15 years' experience as a non-executive director on both public and private sector Boards and experience in fostering emerging businesses. Deena served as a Group Managing Director at Telstra Corporation and was the founding CEO of Telstra's corporate venture capital arm. Prior to that, Deena was a partner at King & Wood Mallesons, in-house corporate counsel at Telstra and a senior executive and adviser on legal and social policy reforms for the Australian Government.	Independent
Anthony Williams	CEO and Board Member	Anthony Williams, B App. Sci MPH has extensive experience and a proven track record in clinical research and business development. As a team leader with international, national and regional roles, Anthony has expertise in research management, financial modelling, corporate governance, intellectual property management and contract development.	Independent

Table 3: Board of Director Meetings, 2015

Name	Number eligible to attend	Number attended
Patricia Faulkner, Chair	4	4
Ian Farrar	4	4
Peter Maloney	4	4
Deena Shiff	4	4
Anthony Williams	4	4

h. monitoring the internal control environment and procedures designed to achieve compliance with laws, regulations, internal standards and policies, and

i. overseeing compliance with statutory and other legal requirements.

The operations of the Alertness CRC are managed by the CEO and Business Manager. See Table 5 for details of all key staff for the reporting period. The CEO also chairs a Management Committee which consists of the Program Leaders and the CEO.

Two participant panels have been established via the participants' agreements to provide them with a mechanism to advise the Board and monitor performance in the context of the Essential Participants' agreement.

Strategic Review Panel

- Advises the Board on the project activities and research direction of the CRC.
- Meets bi-annually in person or via telephone or video link.
- Is chaired in any one financial year by a representative of the end-user Essential Participant that has the largest cumulative annual cash contribution budgeted for the financial year in which the meeting is held and who will report directly to the Board as required.
- Includes one representative from each participant which chooses to make an appointment.
- Includes the CEO, Research Program Leaders and the Education and Training Unit Leader as ex-officio members.

Research Translation Panel

- Advises the Board on the research translation activities of the CRC
- Meets bi-annually in person or via telephone or video link.
- Is co-chaired by representatives of the SHF and BUPA, until either party ceases to be an Essential Participant or the Board decides to replace either or both co-chairs at its discretion.
- Is comprised of up to one representative from each participant who chooses to make an appointment.
- Includes the CEO, Research Program Leaders and the Education and Training Unit Leader as ex-officio members.

Participants

The Alertness CRC participant organisations are listed in Table 6.

In 2014, Fatigue Management International (FMI) joined the CRC as an Other Participant. FMI are specialist workplace fatigue consultants to the mining, oil, gas and transportation industries. They are developing systems to continuously measure driver alertness with a focus on steering dynamics combined with mathematical models. FMI join the other three participant organisations developing alertness monitoring devices in this sector.

In 2015, both CSIRO and Neuroscience Research Australia joined as Other Participants to facilitate their involvement in the key activities of the consortium.

CSIRO's gold nanoparticle technology has been adapted to provide a new chemical measurement technique that could significantly increase the opportunities for portable (roadside) alertness testing.

Resources

This device is being tested for feasibility in the laboratory with a view to a much broader application across CRC activities upon proof of concept.

The involvement of Neuroscience Research Australia (Neura) in the respiratory sleep phenotyping stream of the sleep disorders platform project is designed to fast track subject throughput and utilise the specific expertise of Associate Professor Danny Eckert, who has worked closely with key end-user participant Philips Respironics in this area.

Collaboration

During the second year of operation, our focus has been on the four Platform Projects that form the data collection engines of the Alertness CRC. Table 7 shows the collaboration mix in this context as most of the end-user participants actively engaged through these activities. This highlights the utility of the Platform Projects and that the end-user group recognises the importance of our interrelated research plan.

Grey Innovation, while highly engaged with CRC activities, is currently assisting the Board with utilisation planning and will provide inputs around the output mapping process before joining subsequent projects with clear commercialisation deliverables.

Notwithstanding the significant commitment of the current participants to the four major Platform Projects, the Alertness CRC has, during the reporting period, developed an additional five projects that are commencing in Year 3 with specific end-user interest and well-developed utilisation plans.

Table 4: Platform Projects and Participant Collaboration

Project Name	End-User Participants	Research Participants
Laboratory-based development of systems and biomarkers to assess circadian, sleep and alertness states.	10	3
Modelling and software development for prediction of alertness and optimisation of scheduling and a data fusion system for the estimation, prediction and control of individual alertness dynamics.	5	4
Assessing individual vulnerability to shift work and integrated interventions for alertness management in the healthcare setting.	18	5
Sleep disorder phenotyping.	7	6

Table 5: Alertness CRC Key Staff as at 30 June 2015

Name	Organisation	Position/Role
Anthony Williams	Alertness CRC Ltd	CEO
Wee Mong Wong	Alertness CRC Ltd	CFO
Andrew Tucker	Alertness CRC Ltd	GM, Research Translation
Margaret Miller	Alertness CRC Ltd	Communication and Stakeholder Engagement
Carissa Hanes	Alertness CRC Ltd	Communication Support
Ron Grunstein	Woolcock Institute of Medical Research	Program Leader
Steven Lockley	Monash University	Program Leader
Shantha Rajaratnam	Monash University	Program Leader
Clare Anderson	Monash University	Theme Leader
Karen Reynolds	Flinders University	Theme Leader
Sanjay Chawla	University of Sydney	Theme Leader
Mark Howard	Institute for Breathing and Sleep	Theme Leader
Doug McEvoy	Southern Adelaide Local Health Network	Theme Leader
Suzanne Ftouni	Monash University	Project Leader
Tracey Sletten	Monash University	Project Leader
Svetlana Postnova	University of Sydney	Project Leader
Jong Won Kim	University of Sydney	Project Leader
Bryn Jeffries	University of Sydney	Project Leader
Chris Gordon	University of Sydney/Woolcock Institute of Medical Research	Project Leader
Peter Catcheside	Flinders University	Project Leader
Andrew Vakulin	Flinders University/Australasian Sleep Trials Network	Project Leader
Sherry Randhawa	Flinders University	Co-investigator
Stuart Marshall	Monash University	Co-investigator
Sean Cain	Monash University	Co-investigator
Ian Smith	Monash University	Co-investigator
Joshua Gooley	Monash University	Co-investigator
David Wang	Woolcock Institute of Medical Research	Co-investigator
Keith Wong	Woolcock Institute of Medical Research	Co-investigator
Brendon Yee	Woolcock Institute of Medical Research	Co-investigator
Dev Bannerjee	Woolcock Institute of Medical Research	Co-investigator

Resources

Table 5: Alertness CRC Key Staff as at 30 June 2015 (continued)

Name	Organisation	Position/Role
Darren O'Brien	Woolcock Institute of Medical Research	Co-investigator
Gunnar Unger	Woolcock Institute of Medical Research	Co-investigator
Nathaniel Marshall	University of Sydney/ Woolcock Institute of Medical Research	Co-investigator
Chris Miller	Woolcock Institute of Medical Research	Co-investigator
Somwrita Sarkar	University of Sydney	Co-investigator
Fabio Ramos	University of Sydney	Co-investigator
Peter Robinson	University of Sydney	Co-investigator
Jussi Parkkinen	Monash University	Co-investigator
Garun Hamilton	Monash University	Co-Investigator
Philip Berger	Monash University	Co-Investigator
Bei Bei	Monash University	Co-Investigator
David Berlowitz	Institute for Breathing and Sleep	Co-investigator
Brad Edwards	Monash University	Site Investigator
Amy Jordan	Institute for Breathing and Sleep	Co-Investigator
Peter Rochford	Institute for Breathing and Sleep	Co-Investigator
Fergal O'Donoghue	Institute for Breathing and Sleep	Co-Investigator
Maree Barnes	Institute for Breathing and Sleep/Austin Health	Co-Investigator
Ching Li Chai-Coetzer	Adelaide Institute for Sleep Health	Co-Investigator
Leon Lack	Adelaide Institute for Sleep Health	Co-Investigator
David Hillman	Sleep Health Foundation	Chair, Research Translation Panel
Helen Burdette	Sleep Health Foundation	Communications Support
Paul Maruff	Cogstate	Co-Theme Leader
James Williams	National Transport Commission	Manager, Policy
Bill Gaussa	Philips Respironics	Chair, Strategic Review Panel
Stephen Pittman	Philips Respironics	Co-Theme Leader
David White	Philips Respironics	Co-Theme Leader
Mike Lenne	Seeing Machines	Research Manager
Ian Evans	Constraint Technologies International	Co-Theme Leader

Table 6: Alertness CRC Participants

Participant Name	Participant Type	ABN/ACN	Organisation Type
Austin Health	Essential	96 237 388 063	State Government
Australian Sleep Trials Network	Other	88 002 198 905	Other
Australian Salaried Medical Officers Federation	Essential	56 536 563 722	Other
Bioplatforms Australia Limited	Essential	40 125 905 599	Other
Brain Resource Limited	Essential	24 094 069 682	Industry/Private Sector
BUPA Foundation (Australia) Pty Ltd	Essential	67 113 817 637	Industry/Private Sector
Cogstate Pty Ltd	Other	80 090 975 723	Industry/ Private Sector
Constraint Technologies International Pty Ltd	Essential	13 054 631 462	Industry/Private Sector
Commonwealth Scientific and Industrial Research Organisation	Other	41 687 119 230	Australian Government
EdanSafe Pty Ltd	Other	61 094 352 959	Industry/Private Sector
Electrolight Pty Ltd	Other	93 288 579 088	Industry/Private Sector
Fatigue Management International	Other	UK company registration 06431894	Industry/Private Sector
Grey Innovation	Other	14 083 304 214	Industry/Private Sector
Institute for Breathing and Sleep	Essential	39 093 685 879	Other
International Council of Mining and Metals	Essential	UK based	Industry/Private Sector
Lighting Sciences Group Cooperation	Essential	US based	Industry/Private Sector
Monash University	Essential	12 337 614 012	University
National Transport Commission	Essential	67 890 861 578	Australian Government
Neuroscience Research Australia	Other	94 050 110 346	Other
Optalert	Other	79 121 747 591	Industry/Private Sector
Respironics Inc – A Phillips Healthcare Company	Essential	24 008 445 743	Industry/Private Sector
Seeing Machines Limited	Other	34 093 877 331	Industry/Private Sector
Southern Adelaide Local Health Network	Essential	14 227 133 467	State Government
Flinders University	Essential	65 542 596 200	University
The Sleep Health Foundation	Essential	91 138 737 854	Other
Transport Accident Commission	Essential	22 033 947 623	State Government
The University of Sydney	Essential	15 211 513 464	University
Woolcock Institute of Medical Research Limited	Essential	88 002 198 905	Other
Worksafe Victoria	Essential	90 296 467 627	State Government

Financial Management

The Alertness CRC depends on the continued support from participant organisations and the Commonwealth Government to fund its ongoing operations.

During the 2014/15 financial year, 50% of the Alertness CRC's cash contributions were received from participant organisations with 47% provided by the Commonwealth through the CRC funding agreement. The remaining 3% was made up of interest income and other revenue.

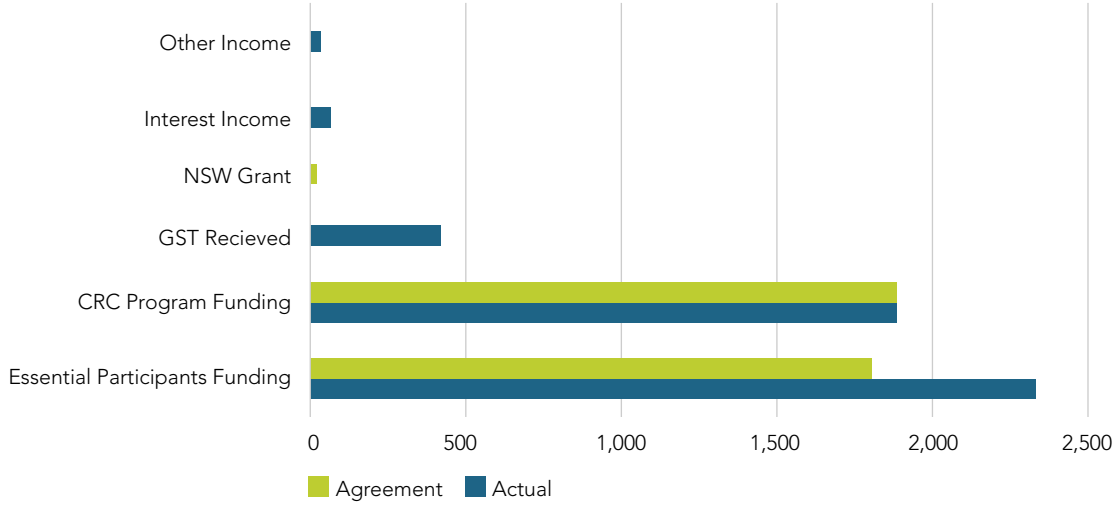
Cash contributions received from Essential Participants have shown an increase of approximately $0.53 million in 2014–2015 as compared to the Agreement, following catch-up payments and additional contributions. Other cash received ($0.52 million) during the year was mainly made up of GST, interest income and other income (see Figure 4).

Figures 5 and 6 highlight the breakdown by category relative to original participant commitments for the year ended 30 June 2015 (Year 2) and its comparative status for the period ended 30 June 2014 (Year 1).

Total resources made available to the Alertness CRC to carry out its activities during Year 2 have increased as compared to Year 1, in terms of overall participant commitments. Total resources made available to the Alertness CRC during 2014–2015 were only short by 8% on aggregate, as compared to 60% in Year 1. This is primarily due to the significant increase in Platform Project activity and the increased opportunity for direct engagement by all participant organisations.

The Alertness CRC has concluded 2014–2015 with a healthy financial position and a higher level of research throughput activities.

Figure 4: Composition of Cash Received During FY15 vs Agreement



Some notable highlights of audited financial results for 2014-2015 are:

- Net assets (accumulated surplus) of $3.53 million.
- Total Revenue recorded during financial period FY15 of $3.98 million (FY14: $3.69 million).
- Total operating expenses during financial period of $2.87 million (FY14: $1.25 million).

Apart from an increase in the cash resources for the Alertness CRC, there has been a significant increase in staff and non-staff in-kind resources contributed by participant organisations.

The independent auditor's report to the members of the Alertness CRC for the financial year 2014–2015 has expressed the opinion that the financial report of the Alertness CRC has been prepared in accordance with the Australian Accounting Standards – Reduced Disclosure Requirements and complies with the Australian Charities and Not-for-profits Commission Regulation 2013. Their opinion further states that the financial report of Alertness CRC Ltd presents fairly, in all material respects, the financial position as at 30 June 2015 and its performance and its cash flows for the year ended on that date.

Figure 5: FY15 Allocation of Resource Category - Actual vs Agreement

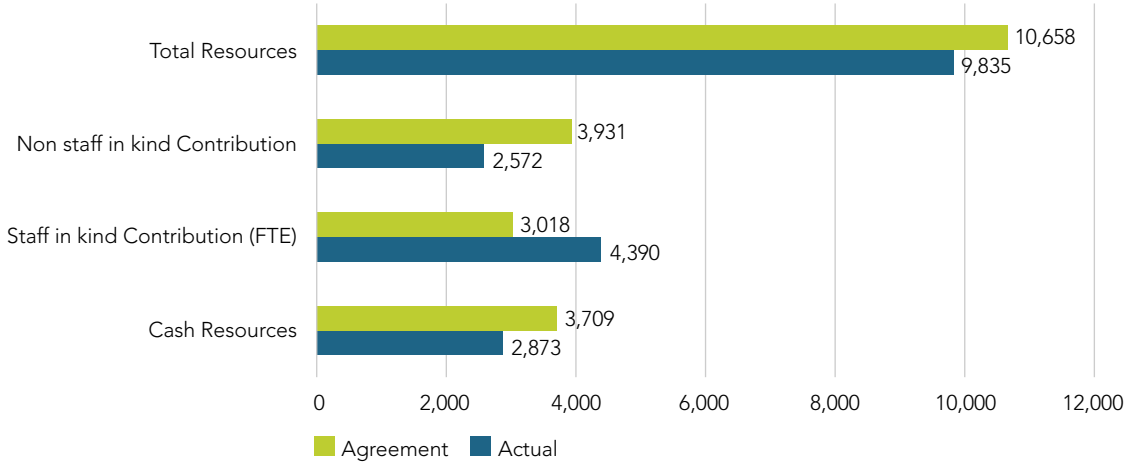
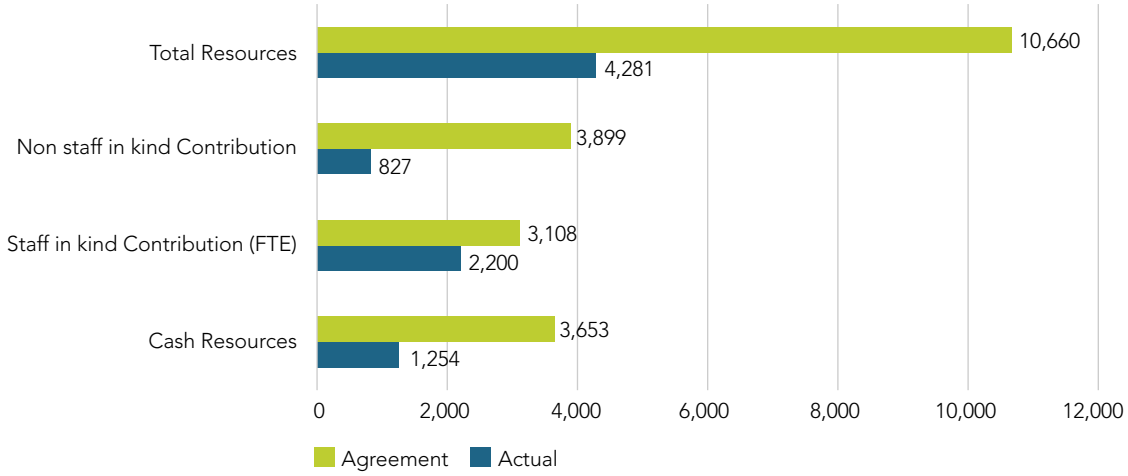


Figure 6: FY14 Allocation of Resource Category - Actual vs Agreement



Appendix 1 **Publications**

Rajaratnam SM, Landrigan CP, Wang W, Kaprielian R, Moore RT, Czeisler CA. Teen crashes declined after Massachusetts raised penalties for graduated licensing law restricting night driving. Health Affairs (Millwood) 2015 Jun;34(6):963–70.

Howard ME, Jackson ML, Stevenson M. Who needs sleep apnea treatment for safety critical tasks – are we there yet? Sleep 2015 Mar 1 38(3):331–2.

Postnova S, Postnov DD, Seneviratne M, Robinson PA. Effects of rotation interval on sleepiness and circadian dynamics on forward rotating 3-shift systems. J Biological Rhythms 2014 29:60–70.

Murray JM, Sletten TL, Magee M, Gordon C, Lovato N, Bartlett DJ, Kennaway DJ, Lack LC, Grunstein RR, Lockley SW, Rajaratnam SM. Prevalence of circadian misalignment and its association with depressive symptoms in delayed sleep phase disorder. Manuscript submitted for publication. Science Translational Medicine.

Research-based conference presentations

Howard ME and Rajaratnam SM. Towards field-deployable alertness monitoring systems, 2014, National Transport Commission & Federal Highways Administration, US Department of Transportation.

Howard ME. Sleep disorders and safety critical work, Australasian Faculty of Occupational and Environmental Medicine, 2014.

Howard ME. Individual management of sleep: sleep disorders and napping, Work Hours, Shift and Fatigue Conference, Australian Nursing and Midwifery Federation, April 2015.

Sletten TL, Raman B, Magee M, Ferguson S, Kennaway DJ, Grunstein RR, Lockley SW, Rajaratnam SM. Implementing a novel lighting intervention to improve alertness and performance in night shift workers. 9th International Conference on Managing Fatigue, 2015, March 23–26, Fremantle, Australia.

Sletten TL, Segal AY, Flynn-Evans E, Lockley SW, Rajaratnam SM. The association between circadian rhythm phase and inter-individual differences in neurobehavioural impairment following sleep loss. 29th Annual Meeting of the Associated Professional Sleep Societies, 2015, June 6–10, Seattle, USA.

Other invited presentations

Ftouni, S. Definitions of alertness: research and industry perspectives. Invited Plenary Presentation. Alertness Summit 2015: A New Framework Driving Heavy Vehicle Safety, June 30 2015, Canberra, Australia.

Howard, ME. Managing alertness in industry: minimising risk and optimising productivity – short course. Convenor and speaker. Sleep Down Under 2014, 26th Annual Scientific Meeting of the Australasian Sleep Association, Perth, Australia.

Sletten TL. Scheduling and sleep: technology to support development, monitoring and adherence with schedules and manage risk. Short course – Managing alertness in industry: minimising risk and optimising productivity. Sleep Down Under 2014, 26th Annual Scientific Meeting of the Australasian Sleep Association, Perth, Australia.

Sletten TL, Rajaratnam SM. Year in review: alertness and fatigue management. Sleep Down Under 2014, 26th Annual Scientific Meeting of the Australasian Sleep Association, Perth, Australia.

Appendix 2 **Education**

Table 7: Postdoctoral Fellows 2014/2015

Name	Research Project (Program No.#)	Research Organisation	Country
Ben Fulcher	Laboratory (RP1)	Monash University	Australia
Suzanne Ftouni	Laboratory (RP1)	Monash University	Australia
Romesh Abeysuriya	Modelling and Data Fusion (RP1)	The University of Sydney	Australia
Jong Won Kim	Modelling and Data Fusion (RP1)	The University of Sydney/ Woolcock Institute of Medical Research	Australia
Michelle Magee	Healthcare (RP2)	Monash University	Australia
Pasquale Alvaro	Healthcare (RP2)	Institute for Breathing and Sleep	Australia
Tracey Sletten	Healthcare (RP2)	Monash University	Australia
Svetlana Postnova	Modelling and Data Fusion (RP2)	The University of Sydney	Australia
Andrew Vakulin	Sleep disorder phenotyping (RP3)	Flinders University	Australia
Angela D'Rozario	Sleep disorder phenotyping (RP3)	Woolcock Institute Of Medical Research	Australia
Bryn Jeffries	Database Development (RP3)	The University of Sydney	Australia
Christopher Gordon	Sleep disorder phenotyping (RP3)	The University of Sydney/ Woolcock Institute of Medical Research	Australia
Christopher Miller	Sleep disorder phenotyping (RP3)	Woolcock Institute Of Medical Research	Australia
Nicole Lovato	Sleep disorder phenotyping (RP3)	Flinders University	Australia
Peter Catcheside	Sleep disorder phenotyping (RP3)	Flinders University	Australia

denotes:

Research Program 1 (RP1) – Alertness Measurement, Prediction and Testing

Research Program 2 (RP2) – Safety and Productivity Improvements

Research Program 3 (RP3) – Sleep Health

Appendix 2 Education

Table 8: PhD Scholarships 2014/15

Name	Date Commenced	Research Project (Program No.#)	Project Title	Research Organisation	Country	Expected Completion Date
Jade Murray	1 Feb 14	Healthcare Platform (RP2)	Investigating circadian misalignment in a population of patients with symptoms of delayed sleep phase disorder	Monash University	Australia	31 Jan 17
Leilah Grant	1 Feb 14	Laboratory Platform (RP1)	Identification and validation of biological and physiological biomarkers of the alertness State	Monash University	Australia	9 Feb 17
Sachin-kumar Nilkantha Wasnik	1 Sep 14	Sleep Disorder Phenotyping Platform (RP2)	Modelling/data fusion and phenotyping projects with potential value in biomarkers and healthcare	The University of Sydney	Australia	31 Aug 17
Simon Joosten	1 Sep 14	Sleep Disorder Phenotyping Platform (RP3)	Test a simplified method for sub-classifying OSA patients into their underlying causal phenotype	Monash University	Australia	31 Aug 15
Haider Naqvi	1 Sep 14	Sleep Disorder Phenotyping Platform (RP3)	Neuro-behavioural effects of sleep loss in patients with obstructive sleep apnoea	Woolcock Institute of Medical Research	Australia	31 Aug 17
Rohit Philip	1 Feb 15	Sleep Disorder Phenotyping Platform (RP3)	Vulnerability to alertness failure phenotyping	Flinders University	Australia	31 Jan 18
Kelsey Bickley	1-Feb-15	Sleep Disorder Phenotyping Platform (RP3)	To perform a comprehensive investigation of daytime functioning in individuals with insomnia across a range of insomnia subtypes	Flinders University	Australia	31 Jan 18
Julia Stone	2 Mar 15	Healthcare Platform (RP2)	Assessing Individual vulnerability to shift Work and integrated interventions for alertness management in the healthcare setting	Monash University	Australia	1 Mar 18

Name	Date Commenced	Research Project (Program No.#)	Project Title	Research Organisation	Country	Expected Completion Date
Saranea G	22 Jan 15	Healthcare Platform (RP2)	Cognitive markers of shift work vulnerability	Monash University	Australia	21 Jan 18
Devaang Kevat	22 Jan 15	Healthcare Platform (RP2)	Examining worker safety and productivity in the healthcare setting	Monash University	Australia	21 Jan 16
MS Zobaer	1 May 15	Modelling and Data Fusion (RP1)	Proposal on evoked potentials and K complexes in sleep: underpinning of potential biomarkers	The University of Sydney	Australia	30 Apr 18

denotes:

Research Program 1 (RP1) – Alertness Measurement, Prediction and Testing

Research Program 2 (RP2) – Safety and Productivity Improvements

Research Program 3 (RP3) – Sleep Health

Table 9: Masters Degree Scholarships 2014/15

Name	Date Commenced	Research Project (Program No.#)	Project Title	Research Organisation	Country	Expected Completion Date
Helen Mary McMeekan	22 Jan 15	Healthcare Platform (RP2)	Individual-level toolkit for sleep health management in occupational settings	Flinders University	Australia	21 Jan 16
Kirsty Dodds	22 Jan 15	Sleep Disorder Phenotyping Platform (RP3)	Cardiovascular markers of autonomic dysregulation in Insomnia Disorder	The University of Sydney	Australia	21 Jan 17
Anna Mullins	22 Jan 15	Sleep Disorder Phenotyping Platform (RP3)	Quantitative EEG biomarkers for sleep disorder phenotyping and personalised sleep health	The University of Sydney	Australia	21 Jan 17
William McMahon	1 Mar 15	Laboratory Platform (RP1)	Predicting individual vulnerability to alertness challenges following sleep deprivation	Monash University	Australia	28 Feb 17

denotes:

Research Program 1 (RP1) – Alertness Measurement, Prediction and Testing

Research Program 2 (RP2) – Safety and Productivity Improvements

Research Program 3 (RP3) – Sleep Health

Appendix 2 Education

Table 10: Industry Placement Funding 2014/15

Name	Date Commenced	Research Project (Program No.#)	Research Organisation	Country	Expected Completion Date
Adrienne Bell	27 Jan 2015	Laboratory (RP1)	Swinburne University	Australia	26 Jan 2016
Todd Pickering	27 Jan 2015	Laboratory (RP1)	Swinburne University	Australia	26 Jan 2016
Michelle Bravo	27 Jan 2015	Laboratory (RP1)	Swinburne University	Australia	26 Jan 2016
Matthew McLaren	27 Jan 2015	Healthcare (RP2)	Swinburne University	Australia	26 Jan 2016
Jessica Papleo	27 Jan 2015	Healthcare (RP2)	Swinburne University	Australia	26 Jan 2016
Aaron Johnson	27 Jan 2015	Healthcare (RP2)	Swinburne University	Australia	26 Jan 2016

denotes:-

Research Program 1 (RP1) – Alertness Measurement, Prediction and Testing

Research Program 2 (RP2) – Safety and Productivity Improvements

Research Program 3 (RP3) – Sleep Health

Table 11: Short Term Project Officer Approved Funding 2014/2015

Name	Date Commenced	Research Project (Program No.#)	Project Title	Research Organisation	Country	Expected Completion Date
Stephen McCloskey	13 Jan 15	Modelling and Data Fusion (RP2)	Incorporation of the direct alerting effects of white light in the physiologically based model of sleep-wake cycle developed at the University of Sydney	The University of Sydney	Australia	24 Feb 15
Thibaut Lacroix	11 May 15	Modelling and Data Fusion (RP2)	Modelling the effects of prophylactic naps on alertness and sleep	The University of Sydney	Australia	10 Aug 15
Baptiste Jolivet	18 May 15	Modelling and Data Fusion (RP2)	Stretched exponential functions in modelling the effects of chronic sleep restriction on alertness	The University of Sydney	Australia	17 Aug 15

denotes:

Research Program 1 (RP1) – Alertness Measurement, Prediction and Testing

Research Program 2 (RP2) – Safety and Productivity Improvements

Research Program 3 (RP3) – Sleep Health

Glossary

Actigraphy
Provides measurement of the motion associated with rest and activity. In the case of sleep studies, a watch-like device is attached to the wrist.

Antibody
A protein produced by the body's immune system when it detects harmful substances, called antigens.

Biomarker
Short for biological marker, it is a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, disease or the effect of an intervention.

Chemiresistor
A material that changes its electrical resistance in response to changes in the nearby chemical environment.

Circadian rhythms
Physical, mental and behavioural changes that follow a roughly 24-hour cycle, responding primarily to light and darkness in an organism's environment. They are found in most living things including animals and plants.

Co-morbid
A medical condition present at the same time as another one.

CPAP
Continuous Positive Airways Pressure Treatment for sleep apnea to keep the airways open.

Electrophysiological
The production of electrical phenomena, particularly in the nervous system, and their consequences in the living organism.

Homeostatic drive
The mechanisms of an organism or cell that maintain internal balance by adjusting its physiological processes.

Hyper arousal
The state or condition of muscular and emotional tension produced by hormones released during the fight-or-flight reaction.

Melatonin
A hormone naturally secreted with the onset of fading natural light which helps tune the circadian rhythm as it moves in to a sleep cycle.

Metabolomics
The non-targeted detection and quantification of small molecules (metabolites) in biological materials (e.g. plasma, urine, tissue, plant and microbial extracts).

Nanoparticle
A particle between 1 and 100 nanometres in size.

Obstructive sleep apnea
When the airway at the back of the mouth is repeatedly partly or completely blocked during sleep reducing or stopping breathing altogether. When oxygen levels fall, the sleeper wakes up briefly and starts breathing again.

Phenotype
The observable characteristics of a person in the context of specific trait, behaviour or susceptibility to a certain condition.

Proteomics
The study of proteins.

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