

IBES

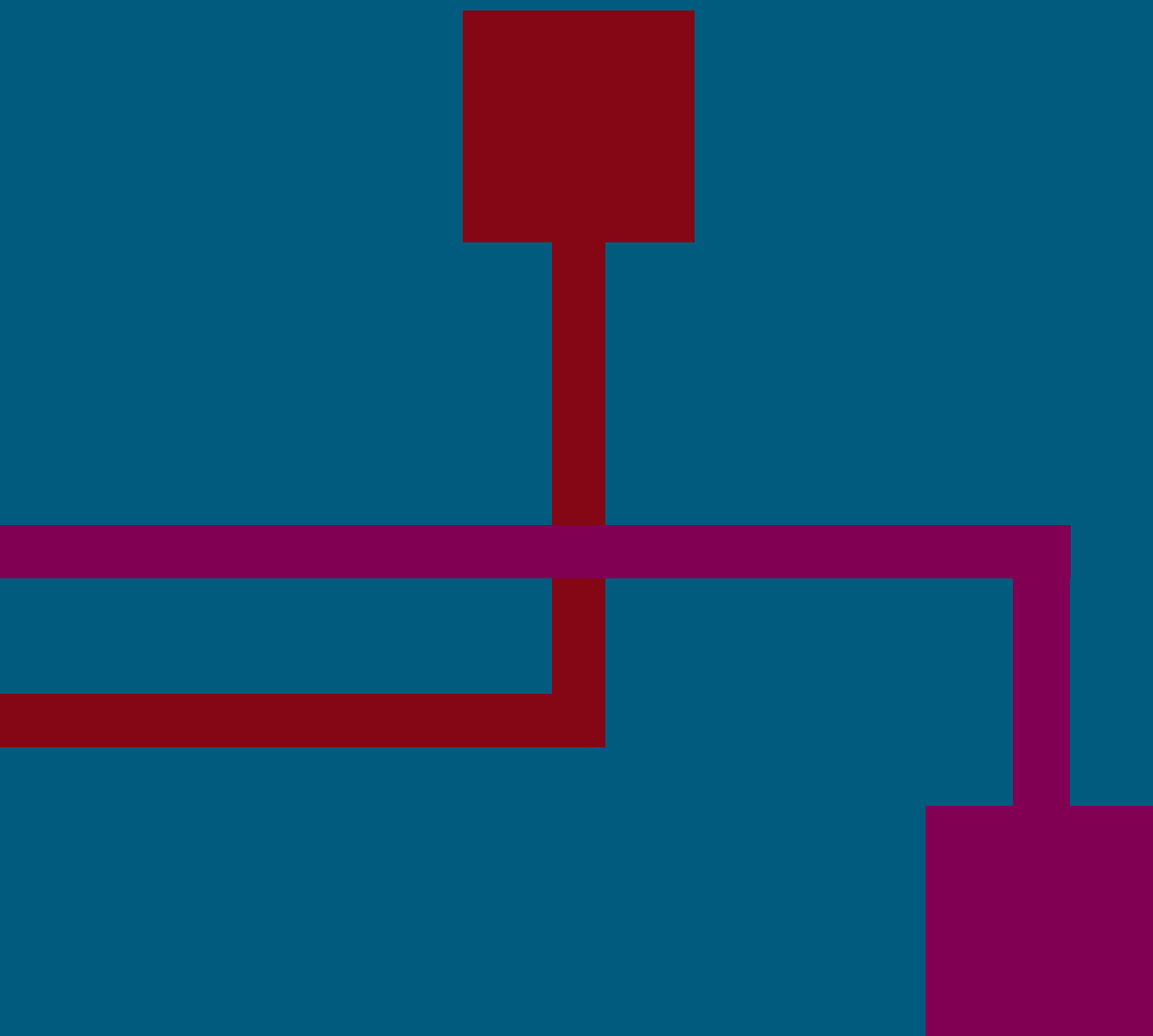
Institute for a Broadband-Enabled Society

Annual Report 2013-4



IBES

Institute for a
Broadband-Enabled Society



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Director's Welcome

Welcome to the IBES 2013–14 Annual Report. The past year has been one of change and transition. Having recently been appointed Director, I would like to first thank the hard work and commitment of Rod Tucker and his work laying the foundation and building IBES. Rod's dedication and commitment to broadband research and the need to develop meaningful engagement with industry was essential to the Institute's success.

However, the Institute is more than one person and I would like to acknowledge the IBES team, 109 researchers from 31 departments and schools across the University and the 62 external collaborators who were the integral components for delivering the 32 research projects featured in this Annual Report. This report is a showcase of the Institute's collective endeavours and those people who are turning ideas into reality.

A highlight from the past year was the launch of the Microsoft Research Centre for Social Natural User Interfaces (SocialNUI). The Centre is an \$8 million partnership between Microsoft, the Victorian Government and the University of Melbourne, and will undertake pioneering research creating and understanding interfaces that facilitate human communication, collaboration and social interaction.

Another success has been to equip students with the tools they need to thrive within the ICT sector through the IBES Lab internship program. The program has seen seven Masters of Information Technology students complete an internship at the IBES Lab providing students with new skills and supporting IBES research projects.

Finally, I am excited by the challenges and opportunities arising from broadband connectivity and delighted to be able to continue the growth and development of the Institute. As the Institute enters its next chapter it does so built upon the solid foundation of research excellence.

I invite you to find out more about the work and activities of IBES in this Annual Report.



Thas Nirmalathas | Director IBES

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Overview

The 2013–14 year has been one of change for the Institute. IBES witnessed the departure of foundation Director Rod Tucker in August 2013. Following Prof Tucker's departure, IBES was led by two Interim Associate Directors, Prof Thas Niramalathas and Prof Fernando Martin-Sanchez, with Thas Niramalathas taking up the position as Director in June 2014.

IBES has continued to invest in innovative interdisciplinary research projects with eleven new seed funded projects commencing this year. Details of these projects are contained within this report. In addition, IBES has continued to build awareness about broadband and the benefits arising from connectivity to society through events, publications and engagement with the media. This information is outlined in this report.

The IBES team welcomed Dr Chamil Jayasundara, who joined the IBES team as a Software Engineer in January 2014. Chamil received his PhD from the University of Melbourne's Department of Electrical and Electronic Engineering for researching technologies to facilitate scalable and energy-efficient deployment of IPTV and Video-on-Demand systems. Chamil's expertise provides additional resources in IBES to support the technical development of research projects.



Jason Bosland

There was also change on the IBES Executive Committee with Prof Andrew Kenyon from the Melbourne Law School standing down in March 2014. Andrew was replaced with Jason Bosland from the Melbourne Law School.

Changes on the IBES Advisory Board saw Jamie Chard from NBN Co standing down in September 2013, while Kevin Bloch from Cisco resigned from the board in June 2014.



Dr Chamil Jayasundara

Farewell to Rod Tucker

Rod Tucker, Director retired from IBES on Friday 30 August 2013 bringing to an end 24 years of service as a professor at the University of Melbourne. Rod realised the importance of broadband to transform swathes of human activity and as the foundation Director of IBES worked closely with the Victorian Government, industry and the University to establish a world leading research institute.

Rod's leadership at IBES brought together researchers from the University, industry and the community to develop an innovative interdisciplinary research program focusing on broadband applications, services and their impact upon society.

Industry engagement has been essential to IBES' success and Rod has attracted a diverse body of partners who have provided support to the Institute and been active collaborators on a number of research projects.

Rod has received personal recognition for his contributions to ICT, engineering and the community. In August Rod was inducted into the Pearcey Hall of Fame recognising his lifetime commitment to ICT research and industry in Australia.

For his service to the electrical and electronics industry and in recognition of his outstanding work as a leading figure in Australia, Rod was awarded the Medal of the Order of Australia in January 2012. He has previously received the 1997 Australia Prize for his contributions to telecommunications and in 2007 he received the IEEE LEOS Aron Kressel Award.

Rod was farewelled by IBES, industry partners and the University community at a ceremony at the University of Melbourne on Wednesday 28 August 2013.



Rod Tucker (C) is inducted into the Pearcey Hall of Fame by the Hon Kate Lundy, Minister for Information Technology (L) and Wayne Fitzsimmonds (R), Chairman Pearcey Foundation

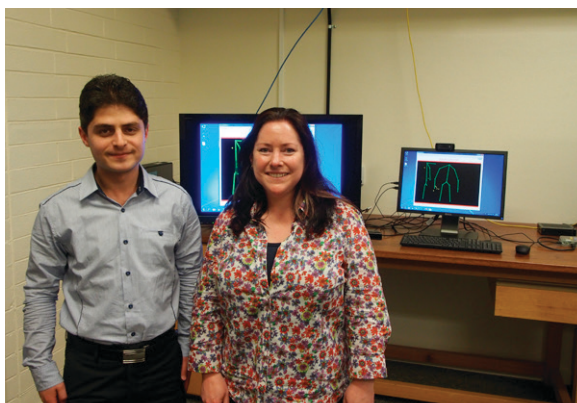
Engagement

Over the past year IBES has conducted a number of activities to keep partners, the university community and the public informed about our research. Engagement is the core of the activities of the Institute and comprises a comprehensive suite of communications and events to disseminate the Institute's research throughout the community. Detailed coverage of the Institute's events, media and meetings is contained in the appendix of this report.

Events

Annual Symposium

The IBES Annual Symposium was held on Monday 30 September 2013 and provided a showcase for IBES research. Over 80 people from industry, academia and the community attended the Symposium providing them with an opportunity to witness first hand how IBES research is shaping society. Key events at the symposium included the announcement of IBES seed funding projects, and tours of the IBES Lab where twelve technology demonstrations were displayed.



Zaher Joukhadar and Robyn Garnett



Demonstrating WADEYE IPTV in the IBES Lab

Public Lectures

The Institute hosted three public lectures and a panel discussion. In July 2013, IBES hosted Mia Conslavo from Corcordia University in Montreal for a public lecture entitled *Being Social in Online Games* examined how types of players, player networks, a game's design and platform, as well as player motivations all matter to how sociality is performed in online videogames.

IBES hosted Peter Fleming from the National eHealth Transition Authority in September 2013, who provided an overview of the Australian Government's National E-Health Initiative and in December 2013, as part of the launch of the Microsoft Research Centre into Social Natural User Interfaces (Social NUI), Tony Hey from Microsoft Research.

Additionally, in August 2013, IBES hosted a panel discussion involving researchers from the University of Melbourne along with representatives from the City of Darebin and Federation Square to launch the research publication *Free Wi-Fi and Public Space: The State of Australian Initiatives*.

Telework Congress



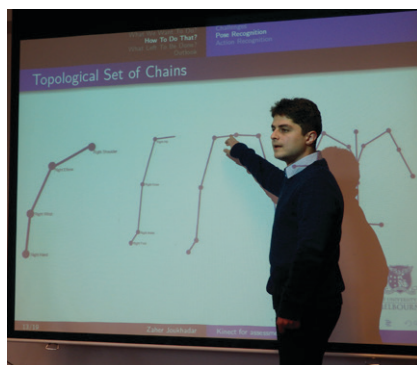
Approximately 70 people participated in the Telework Congress on Tuesday 19 November 2013. IBES hosted the Telework Congress in partnership with the Australian Human Resources Institute (AHRI), the Australian Information Industry Association (AIIA), Ai Group, Cisco, Telstra and the Department of Communications.

The Congress was opened by the Hon. Malcolm Turnbull, Minister for Communications, who delivered his address via a video presentation due to parliamentary commitments. Cindy Auten from the Mobile Work Exchange in Washington DC delivered a keynote presentation via telepresence while Peter Wilson AM Chairman of the Australian Human Resources Institute (AHRI) provided an insight into the issues and opportunities arising from telework in the workplace from a HR perspective.



Malcolm Turnbull's video presentation to the Telework Congress

Two panel sessions brought together leaders from industry and academia to explore telework leadership and management, and telework leadership in practice. The sessions provided a stimulating and engaging look at how organisations use, respond and adapt to the changes being brought about by flexible working arrangements.



Zaher Joukhadar presenting at an IBES research seminar

Research Seminars

Throughout Semester One 2014 IBES hosted a range of research seminars over morning tea. The seminars provided a forum for researchers to present their ideas, receive feedback and to build networks to encourage further interdisciplinary collaborations.

Three seminars were hosted exploring *Participatory Sensing for Interactive Local Governance*, *Open Food Network: Connecting and Supporting the Sustainability of Regional Food Supply Chains* and *Microsoft Kinect for the Assessment of Autism*

Meetings

IBES Executives represent the Institute at a range of forums contributing to debates to set the agenda, contribute to policy development and build awareness about the role of broadband and IBES research to shape society.

Two key meetings were a presentation to the Parliament of Victoria's Committee for Rural and Regional Affairs for the Inquiry into the Opportunities for People to Use Telecommuting and E-Business to Work Remotely in Rural and Regional Victoria, and a presentation to the Independent Cost-Benefit Analysis of Broadband and Review being conducted by the Commonwealth Department of Communications.

Communications

Effective communications are essential to ensure continued engagement. IBES regularly produces a newsletter *IBES Connect* reaching approximately 800 people. At the start of 2014, IBES also launched a blog, also called *IBES Connect* to provide rolling updates of the events and activities of the Institute. *IBES Connect* is available at ibes.org.au.

IBES researchers have contributed to the public debate through outlets such as *The Conversation*. IBES Director, Thas Niramalathas published two articles: [What now for the NBN as taxpayer investment is capped?](#) and [Google's Plan for Internet Access from the Sky](#).

IBES research has also been featured in the media. Details of media coverage for the past year are contained within the appendix on page 60.

Research Publications

Another key communications output increasing engagement and awareness is the series of research publications produced by IBES. The research publications are designed to be accessible to a wide audience, stimulate debate and influence future research and policy choices. In the past year eight IBES projects had their findings published by IBES:

- *Health Provider Broadband Connectivity: A Review of Technical Requirements* (June 2013)
- *Free Wi-Fi and Public Space: the State of Australian Public Initiatives* (August 2013)
- *A Unified Approach for the Evaluation of Telehealth Implementations in Australia* (September 2013)
- *Uni TV: Trialling IPTV for Education* (October 2013)
- *Hear Me Out! Enhancing Social Inclusion and Wellbeing for Deaf and Hearing Impaired Teens Through an Online Peer Support Program* (November 2013)
- *Framing the NBN: Public Perceptions and Media Representations* (January 2014)
- *Telling Our Stories: Aboriginal young people in Victoria and Digital Storytelling* (February 2014)
- *SeeCare IPTV: Broadband Technology for Improved Health Literacy* (March 2014)
- *Paediatric Teledentistry: Delivering Oral Health Services to Rural and Regional Children* (May 2014)

Industry Partner Program

Industry partners are integral to the success of IBES research. IBES continued to work closely with partners on a range of projects and initiatives. Achievements of the Industry Partner Program over the past year include the launch of the Microsoft Research Centre for Social Natural User Interfaces (Social NUI) see page 13. As part of this launch, IBES hosted a public lecture by Tony Hey, Vice-President Microsoft Research Connections, titled *The Fourth Paradigm, Data-Intensive Discovery*, attracting over 100 attendees.



Tony Hey, Microsoft Research



Liza Noonan from ng Connect presenting at IBES

IBES continued close collaboration with Alcatel-Lucent through the Centre for Energy-Efficient Telecommunications (CEET) and by becoming a foundation Australian member of Alcatel-Lucent's global innovation program ng Connect in October 2013. The program aims to attract the brightest and most passionate local innovators to develop new service concepts that bring forward the next generation of high-speed broadband user experience. IBES hosted a workshop to connect researchers at the University of Melbourne with the ng Connect in January 2014.

Industry partners have provided active support to projects. Google has contributed to two projects: *Paediatric Teledentist: Delivering Oral Health Services to Rural and Regional Children* and *Blended Learning Across the Secondary-Tertiary Divide*. While Ericsson has supported the project *Uni TV*.

IBES has actively collaborated with Cisco to further research in Telework. Outcomes included the publication of the *Trans-Tasman Telework Survey*, in partnership with AUT University and hosting the second Telework Congress in November 2013.

Finally, IBES welcomed JetBrains as a partner. JetBrains is a technology-leading software development firm specialising in the creation of intelligent, productivity-enhancing software. JetBrains is providing specialist software to the IBES Lab supporting the continued research and development effort of IBES.



Cindy Auten, General Manager from the Mobile Work Exchange appears at the Telework Congress from Washington DC

The IBES Laboratory

The IBES Laboratory is the technical heart of the Institute. The Lab's expertise and facilities play an important role in working with researchers to deliver projects. Additionally, the Lab provides an opportunity to showcase IBES research and applications.

The Lab was opened to the public for the first time at the IBES Annual Symposium, with the demonstrations being very well received. In February 2014 a delegation of Brazilian researchers toured the Lab as part of the Australia-Brazil Urban Research Think Tank hosted by the Faculty of Architecture, Building and Planning at the University of Melbourne. Participants viewed the facilities of the IBES Lab sowing the seeds for research collaboration.

MIT Student Internships

As part of a program to increase research capacity, provide additional support to research projects and to facilitate student learning the IBES Lab has been hosting Masters of Information Technology (MIT) student interns from semester two 2013. The students work closely with IBES researchers to develop software solutions for IBES projects. The program has provided additional software engineering resources for projects and enabled the development of new applications and software components.

The scheme commenced in Semester Two 2013, with the first cohort of four students: Jingbo Wang working on the interactive visualisation of NBN speeds, Zhiyi Yang on NBN performance from distributed measurements, Noot Fang on a smart pulse oximetry app for virtual physiotherapy classes, which is an integral component for the seed funded project: *Telerehabilitation for Chronic Obstructive Pulmonary Disease: Optimising the Model*, and Zaher Joukhadar who worked on Kinect based action recognition of children with Autism Spectrum Disorder and their caregivers providing the foundation of the seed funded project *Kinect Technology for Remote Assessment of Interventions for Young Children with Autism Spectrum Disorders*.

In Semester One 2014, three students were enrolled in the internship at the IBES Lab: Gursharan Singh working on the project Create Your Story: Aboriginal young people in Victoria and Digital Storytelling. Two interns supported the work of IBES seed funded projects: Shuo Zhou *Making the Invisible Visible: Digital Storytelling for Neighbourhood Social Cohesion* and Anurag Kulkarni on *Open Food Network (OFN) Creating Sustainable Regional Food Supply Chain Communities*.

The internships have been well received by students, researchers and provide a tangible way for IBES and the Lab to build and develop the technical knowledge and skills of the future workforce.



Semester One 2014 Interns: Gursharan Singh, Shuo Zhou and Anurag Kulkarni.

Research

The Institute for a Broadband-Enabled Society has continued its impressive field of research over the past year. IBES researchers have produced 41 publications published in books, academic articles and presented at conferences. IBES has also produced a range of research publications that aim to deliver research to a broad audience.

IBES actively supports a range of research projects through an annual seed funding round, supporting innovative research projects and leverage the Institutes influence by contributing to larger, externally funded research projects. Additionally, IBES also funds the next generation of researchers through PhD Top-Up Scholarships.

IBES seed-funding has provided the catalysis for larger projects. Three projects received external funding: *Aboriginal young people in Victoria and digital storytelling* is an ARC Linkage Project, *Digital Commemoration* is an ARC Discovery Project, while the Commonwealth Department of Health funded *the NBN Enabled Telehealth pilots program project*.

PhD Top-Up Scholarships

PhD Top-Up scholarships support the next generation of researchers, increasing knowledge and building research capacity. As part of the process in celebrating our PhD researchers, IBES hosted a PhD research seminar on Thursday 27 February, where eight students presented an overview of their research on topics such as propaganda in video games, the quantified-self and MOOCs, demonstrating the breadth of research being undertaken.

IBES awarded four PhD top-up scholarships over the past year to support the following students in their research.

- **Ibrahim Al-Mahdi** from the Health and Biomedical Informatics Centre researching: *An evaluation of Online Medical Consultation: Examining Theory, Practice, Sustainability Challenges and Consumer Perspective* (page 55).
- **Andrea La Nauze** from the Department of Economics working on the project *Tell Me Something I Don't Already Know: Consumer (un)informedness and the impact of new technologies on residential energy consumption* (page 29).
- **Tshepo M. Rasekaba** from the Department of General Practice researching *Telemedicine for the Management of Gestational Diabetes Mellitus* (page 55).
- **Behnaz Yeganeh** from the Department of Computing and Information Systems researching *Video Conferencing for Domestic Social Interactions* (page 29).



Marcus Carter presents at the IBES PhD Seminar

Seed Funding

IBES provides seed funding to support innovative interdisciplinary research across the University of Melbourne. In 2013, the Institute awarded seed funding to 11 projects from a pool of 30 applicants across three priority areas: urban connectedness, regional and rural digital development, and digital social inclusion and cohesion. Ten projects have commenced, with one project, the *Dialogic Democracy Project* not commencing due to the departure of the chief investigator from the University of Melbourne.

The following projects were successful in obtaining seed funding.

- *Creating Musical Futures for Students in Rural and Remote Communities* (page 34)
- *Cultural Respect Encompassing Simulation Training (CREST): Being Heard About Health Through Broadband* (page 44)
- *Dialogic Democracy Project: Widgets for Enhanced Citizen-Government Dialogue*
- *Kinect Technology for Remote Assessment of Interventions for Young Children with Autism Spectrum Disorders* (page 43)
- *Making the Invisible Visible: Digital Storytelling for Neighbourhood Social Cohesion* (page 23)
- *Non-Contact 3D Falls Detection Prevention & Behavioural Monitoring in Aged Residential & Home Environments* (page 46)
- *Open Food Network (OFN): Creating Sustainable Regional Food Supply Chain Communities* (page 16)
- *Telerehabilitation for Chronic Obstructive Pulmonary Disease: Optimising the Model* (page 45)
- *Telework and Disability: Exploring Barriers and Opportunities* (page 19)
- *Improving the Language Learning and Technology Connection* (page 31)
- *Wadeye IPTV: Delivering Audiovisual Archives to Remote Aboriginal Communities via IPTV* (page 24)

Centre for Energy-Efficient Telecommunications (CEET)

CEET has built one of the world's leading research groups in energy efficiency and telecommunications to create a sustainable future. CEET's mission is to provide global leadership to drive the creation of energy-efficient telecommunication networks, by fostering collaborative research, education and innovation.

The Centre is a partnership between the University of Melbourne, Alcatel-Lucent, Bell Labs and the Victorian State Government. CEET provides an innovative model for building lasting collaborations with industry, resulting in genuine collaboration and knowledge transfer to deliver practical research outcomes.

CEET's research agenda aims to reduce the energy consumption arising from the increasing demand for high-bandwidth services. Ensuring the sustainability of telecommunications networks is essential to support increased growth and adoption across the economy. CEET plays an important role in fostering R&D across the telecommunications network allowing for new advancements in ICT to achieve broad-based reductions in energy consumption.

CEET's achievements over the past year include:

- Finalist for the 2014 Victorian International Education Awards in the Excellence in Innovation in Industry Partnerships category for the CEET.
- The provisional US filing of CEET's fourth and fifth patents with Bell Labs, *Sleep Transmit Mode* and *Internet Services Energy Assessment Methodology*.
- Involvement in Alcatel-Lucent's [eco-sustainable networks strategy](#).
- Commencement of the *Energy Impact of the Internet of Things* project.
- Hosting China Mobile's Chief Scientist of Wireless, Dr Chih-Lin I for a public lecture: *The Wireless 5G Future Vision 2020* in June 2014.

For more information about CEET visit: www.ceet.unimelb.edu.au



Dr Chih-Lin I, China Mobile, presenting a public lecture on Wireless 5G in June 2014.

Microsoft Research Centre for Social Natural User Interfaces (Social NUI)

SocialNUI is a newly created Australian research centre dedicated to new social interactive technologies. The Centre is collaboration between Microsoft Research, the University of Melbourne and the Government of Victoria and will be growing to a team of approximately 28 researchers over the next three years. The Centre was proudly opened by the Victorian Minister for Technology the Hon. Gordon Rich-Phillips, Vice-President Microsoft Research Tony Hey, and Deputy Vice-Chancellor (Research) Prof James McCluskey on 5 December 2013.

The SocialNUI Centre will be a focal point for researchers to undertake research on the social aspects and applications of NUI technologies that affirm and nurture human interactions. Natural user interactions are found in technologies that, for example, benefit from voice, gesture recognition, eye gaze, body-movements and touch. The team will explore how such technologies can enable new forms of social and collaborative behaviours, including how people communicate, play, learn and work together in different settings - in the home, the work place, in education, health and public spaces such as museums and public squares.



The Hon. Gordon Rich-Phillips launching SocialNUI

Academics and PhD students will undertake research alongside some of the leading Microsoft researchers from around the globe and will have the opportunity to spend time at Microsoft's research centres such as Cambridge, United Kingdom, Beijing, and Redmond.

On 18 March 2014 researchers from SocialNUI demonstrated their research at the Microsoft's Parliamentary Technology Showcase in Canberra attended by Ministers, their advisors and parliamentary

staff. The showcase included emerging products and innovative achievements from Microsoft R&D and its innovative Australian partners.

The demonstration included a Microsoft project exploring the use of gesture recognition to detect and understand sign language of those with hearing impairments and a system for using gesture and body movement to paint on a virtual canvas.

To find out more about the Centre visit:
www.socialnui.unimelb.edu.au



Ed Husic MP, Pip Marlow, Microsoft and Frank Vetere at Microsoft's Parliamentary Technology Showcase

Health & Biomedical Informatics Centre (HaBIC)

HaBIC was established in May 2013 and formally launched in March 2014 at the First International Symposium on Clinical and Translational Research Informatics. The symposium, co-hosted with Biogrid, involved 30 speakers presenting over two days to an audience of over 200 researchers, shaping the research agenda for health and biomedical informatics. This has established HaBIC as a reference point for health informatics across Australia, which is supported by active research collaborations with hospital clinical groups, primary care centres and the eHealth industry.

Three research projects feature in this report. They are:

- *SELFOMICS: Addressing The Information And Communication Needs of The Quantified Individual For Enabling Participatory And Personalised Medicine* (page 48)
- *Non-Contact 3D Falls Detection Prevention & Behavioural Monitoring in Aged Residential & Home Environments* (page 46)
- *Health Service Provider Data Connectivity Requirements: Mapping A Path For A Broadband Enabled Healthcare Future* (page 52)

HaBIC provides education through taught programs in the School of Engineering along with invited lectures taught within health disciplines. The eHealth and Biomedical Informatics System subject has seen a marked increase in student interest, while the other subjects offered have continued to be well received by students.

HaBIC has actively collaborated with the GRHANITE™ Health Informatics Unit, enabling the delivery and use of REDCap® an application that allows users to build and manage online surveys and databases quickly and securely and GRHANITE™ technology supporting some of the largest ethical collections of data for audit and record-linked research in Australia.



Fernando Martin-Sanchez, HaBIC Director, presenting at the launch of the HaBIC, March 2014.

Finally, HaBIC has an active engagement portfolio providing a major influence on the development of the Health Informatics and eHealth community throughout Australia. The Centre's expertise has been recognised working closely with the Health Workforce Australia and the Victorian Department of Health.

For more information about HaBIC visit:
www.healthinformatics.unimelb.edu.au

Business and Government

Networked technologies are transforming how business is conducted and the delivery of government services. Investment in broadband infrastructure is creating new commercial opportunities and supporting innovation.

Research into business and government at IBES has explored the impact of broadband technologies to revolutionise the food distribution network, increase the adoption and uptake of telework delivering greater workforce participation, examining the use of sensors to support local governance and understanding how the rollout of the NBN is received throughout the community.



Open Food Network (OFN) Creating Sustainable Regional Food Supply Chain Communities

The Open Food Network (OFN) is building an open source marketplace to connect farmers with local food consumers. The OFN aims to reduce the costs of food businesses, improve access to markets for farmers and increase the supply of fresh produce.

The project is supporting the development of the OFN platform and will explore how farmers and other stakeholders interact with the OFN to evaluate the effectiveness of the network in connecting and supporting sustainable regional food supply chains. The findings from this research will feedback into the development process allowing the OFN to be optimised to meet the needs of all stakeholders.

Central to the operation of the OFN are food hubs. A Food Hub is a business or organisation that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand. The food hubs connect farmers to consumers throughout the OFN. The network allows farmers to supply produce and consumers to browse and purchase produce. The OFN enables the different cost components to be made transparent to the final consumer such as 'how much did the farmer get paid?' or 'how much went to a logistics provider for transport or aggregation?'

The OFN will provide a new way for consumers to get food directly from the farm gate delivering a real return for agricultural workers and supporting the regional economy. The OFN is due to commence operation in early 2015. For further information visit:

<http://openfoodnetwork.org>



Model of the Open Food Network



Open Food Network Users

Sherah Kurnia | Computing and Information Systems
Kirsten Larsen | Architecture, Building & Planning
Prakash Singh | Management and Marketing
Serenity Hill | Open Food Foundation | **Rahim Md Mahbubur** | Monash University
Patrice Braun | University of Ballarat

Framing the NBN

Public Perceptions and Media Representations

The success of the National Broadband Network (NBN) in fulfilling its ambition to connect every business and household in the country, grow the digital economy, and support digital inclusion by upgrading Australia's communication infrastructure, will be shaped by how it is understood, adopted and appropriated by end-users.

Since the project was announced the NBN has attracted a great deal of media coverage; coupled with, at times, divisive political debate around the model, costs and technology. The rollout of the NBN is now well underway in major cities and regional areas around the country. However, the future model of broadband delivery will change given the outcome with the Coalition Government promising to install a Fibre to the Node (FttN) infrastructure – in place of the previous Fibre to the Premises (FttP). Nevertheless, ongoing uncertainty around the eventual configuration of the NBN, as well as its uses and benefits are far from resolved.

A critical element of NBN adoption is how the NBN is represented or framed and how this framing mediates public perceptions and decision-making. This project report sampled and analysed public perception and media representation of the NBN during the early stages of its discussion, installation, and adoption.

The project used three methods of evidence gathering: a national online survey of 2180 people to identify broad trends in public attitudes towards the NBN; an analysis of mainstream press coverage and newspaper editorials to understand the topics surrounding the NBN; and 25 qualitative interviews with various household types to gain deeper insights into how the NBN is understood in the public context.

The project builds upon previous studies by the research team into the domestic adoption of broadband, including, which focused on the expectations, uses and impacts of the NBN for early adopters in first release sites.

The findings were published in a research report: [*Framing the NBN: Public Perceptions and Media Representations* \(pdf\)](#) in January 2014.

Bjorn Nansen, Martin Gibbs, Craig Bellamy | Computing and Information Systems

Michael Arnold | Historical and Philosophical Studies | **Brent Coker** | Management and Marketing

Telework, Productivity and Wellbeing in Australia and New Zealand

Work patterns and places of work are changing dramatically as a result of increased adoption of digital technologies. As work and family life is becoming more blended and entwined these elements pose unique challenges to successfully manage a new era of flexible workers and measure outputs.

Telework offers many potential benefits for organisations including productivity improvements, employee retention, and other forms of competitive advantage. In collaboration with AUT University's New Zealand Work Research Institute this project builds upon the 2012 seed funded project: Telework, Productivity and Wellbeing. The primary aim of this project was to examine manager and employee perspectives on telework productivity and wellbeing in Australia and New Zealand.

The research surveyed more than 1,800 employees and almost 100 human resources and team managers across 50 businesses and organisations. Managers were interviewed on issues such as telework policy, processes, attitudes and outcomes, while organisational members were surveyed in relation to their telework experience focusing on support, productivity and wellbeing.

The study found strong evidence of the positive benefits of telework for both individual workers and their organisations. Telework improves productivity and satisfaction with work, and hybrid teleworkers – those teleworking 1 to 3 days per week were performing better than those who do little or no telework.

However, there were also some small negative effects arising from hybrid telework including higher perceived social isolation, strain and stress. These potentially negative impacts can be addressed through the provision of organisational, peer and technical support. Other essential elements include positive manager attitudes towards telework and appropriate technology training and ICT support.

This project confirms that flexible work is a way for managers to invest in the wellbeing of their workers increasing productivity, job satisfaction, and retaining talented workers. Download the [*The Trans-Tasman Telework Survey \(pdf 580kb\)*](#).

Rachelle Bosua, Marianne Gloet | Computing & Information Systems | **Tim Bentley, Laurie McLeod, Stephen Teo, Erling Rasmussen, Felix Tan** | NZ Work Research Institute, AUT University

Telework and Disability

Exploring Barriers and Opportunities

Telework (or flexible work) involves working from home or any other place that is removed from the physical infrastructure, colleagues, clients and the employer. The rollout of the National Broadband Network has generated increasing interest in flexible work arrangements and practices. While telework is encouraging from a digital connectivity, social inclusion and wellbeing perspective, there is also the promise that home-based telework may help to integrate a large community of disabled workers into the workforce. Flexible work can open up new opportunities to hire disabled people however, there may also be constraints such as the type of work, the workplace environment and interactions with other workers, as well as the social inclusion of disabled workers.

Disability varies in terms of type, form and severity, and is generally considered to be a condition caused by accident, trauma, genetics or disease. With an estimated 4 million, or 18.5%, people in Australia having one or more forms of disability, telework may to increase employment opportunities. While the potential is certainly there, a number of barriers exist with respect to the successful deployment of telework for the disabled. This research project, together with partner Infoxchange, investigates the opportunities and challenges associated with the adoption of telework for the disabled, both from the point of view of disabled employees, as well as managers.

Researchers have conducted a number of in-depth interviews with disabled employees who telework either on a part-time or full-time basis, with a view to understanding their motivation to be part of a flexible workforce, as well as their individual experiences of telework. Additional information has been collected on their perspectives in relation to productivity and wellbeing associated with the ability to work flexibly, and perceptions regarding the challenges associated with teleworking. Participants were also asked to comment on whether they felt that flexible work arrangements led to social exclusion.

Combined with this information, researchers have interviewed line managers, and HR and diversity managers for their insights and experiences of managing disabled flexible workers. Key themes emerged from this research specific to the opportunities, barriers, productivity and wellbeing associated with the inclusion of disabled flexible workers have emerged as a result. Preliminary findings indicate that there are a number of challenges with regard to telework as a means of increasing employment for the disabled, including the need for greater awareness and training with respect to both disability and telework, as well as specialised ICT and management support.

Rachelle Bosua, Marianne Gloet | Computing and Information Systems
Jongsay Yong | Melbourne Institute for Economic and Social Research | **Brendan Fitzgerald** | Infoxchange

Participatory Sensing Enabling Interactive Local Governance

Local government is accountable and responsible for the establishment, execution and oversight of strategic objectives and resource management in the metropolis. Faced with a rising population, the City of Melbourne has in place a number of strategic plans to ensure it is able to deliver services that maintain quality of life for its citizens. Noise management is essential for health and the preservation of quality of life. Smartphones via the use of participatory sensing can provide indicative measures of noise supporting noise management throughout the community.

This research project conducted a pilot study with the City of Melbourne in the use of participatory sensing to directly engage citizens in noise monitoring. The study was based on a noise measurement app and central server for data aggregation and display. The app provides a spectrum of privacy level options, to be selected by the user, that reflect the type and amount of data to be collected and shared, balancing of data collection and handling with privacy principles

Systems for protection of personal information are essential to maintain and build trust between organisations and citizens reflecting privacy concerns, principles of open and responsive government, and value in citizen contributions to governance. Effective participatory sensing needs to overcome the limitations of privacy legislation by developing supplementary measures such as privacy by design to ensure that any use meets the needs of all users.

The research focused on the barriers affecting the uptake of participatory sensing including privacy, technology and social impacts, and the capacity of participatory sensing to deliver a new communication link between citizens and government.

The successful adoption of participatory sensing requires an active role for the user. There must be effective engagement and mitigation of any perceived disincentives such as privacy concerns. To encourage uptake incentivisation schemes are important recognising the value of the data being provided by the user and its access by the local government authority in order to manage and regulate the urban environment.

The project recommends that prior to embarking on participatory sensing implementations organisations need to thoroughly address all stakeholder concerns and that policy makers review existing organisational structures to remove any barriers to effective citizen engagement.

Slaven Marusic, Jayavardhana Gubbi, Yee Wei Law, Marimuthu Palaniswami | Electrical & Electronic Engineering
Helen Sullivan | Melbourne School of Government

Culture and Community

Networked technologies, such as high-speed broadband are having an impact upon culture and across communities. Research at IBES is examining how networked technologies can support the preservation and archiving of indigenous cultural materials ensuring their longevity for future generations. IBES researchers are examining how broadband technology can connect people to improve their access to the community. Successful projects have explored the application of broadband to connect elderly people and others isolated from their community.

IBES research demonstrates the positive effect that connectivity and its application has across society. Network technologies allow people to access, preserve, create and share their stories throughout the community.



From Information Kiosks to Community Hubs Information Provision in Indigenous Communities

Aboriginal and Torres Strait Islander Australians are under-served by digital technologies, with indigenous Australians being 69% less likely than non-indigenous people to have any Internet connection and are about half as likely to have broadband access. This 'digital divide' contributes to and reinforces educational, income, employment and geographical disadvantage. While uneven access remains a particular problem for rural and remote Aboriginal communities, digital technology also provides a way of overcoming Indigenous social disadvantage.

This project examines how to foster provision of culturally relevant information to Indigenous communities enabled by broadband connectivity. The research focuses upon the network of 70 touch screen kiosks installed at key community locations in remote, regional and urban communities operated by HITnet. The HITnet network is designed to address 'information disadvantage' by using IT to improve and maintain community connectedness, digital development and digital social inclusion.

Content for the information kiosks focuses on a range of critical Indigenous health issues including sexual health, cancer, mental health and nutrition. The kiosks provide a gateway to tailor-made interactive content for low literacy and inexperienced technology users with the program attracting over 100,000 users in 2012.

Currently, the kiosks face bandwidth constraints. Higher bandwidth made available via broadband creates the potential to increase community participation in content creation, including the local upload of rich media content such as video.



Using and creating media content for indigenous communities

This research project aims to assess current user practice around the kiosks to consider what features contribute to a successful interaction, such as physical placement, digital literacy and the relevance of the content. Linked to this is how the kiosks can be adapted to meet the evolving and diverse needs of Indigenous people, particularly, the potential for a transition from kiosk as information delivery system to digital community hub enabling new possibilities for local community co-creation/co-management of content.

Richard Chenhall | Population and Global Health | **Emma Kowal** | Social and Political Sciences
Scott McQuire | Culture and Communication | **Julie Gibson, Helen Travers, Ernest Hunter** | HITnet

Making the Invisible Visible

Digital Storytelling for Neighbourhood Social Cohesion

Disability, age and other mobility constraints can confine people to their homes, leaving them with few opportunities to participate in local community activities. New technologies offer enormous opportunities for housebound people, allowing them to not only access information, but to also create and share content. In this project, researchers are exploring how housebound residents can contribute to their community's social and cultural life by sharing stories about their lives, created from digital photographs, text, audio and video. The digital stories will be shared on public displays situated in local settings such as libraries and neighbourhood houses.

The project team has established a partnership with a community-based health services organisation, Darebin Community Health, which provides occupational therapy services to housebound residents. Researchers have begun working with housebound clients of Darebin Community Health, to help them create digital stories.

Working in collaboration with Julien Ridoux, Chamil Jayasundara, and Ken Clarke from the IBES Lab, the project has developed an interactive public display which will be used to share the digital stories that participants create. Audience members can interact with the display using their own mobile phones or tablets and can write comments in response to particular stories. After moderation, these audience comments will appear on the display and will be shared with the housebound residents who created the stories. The project team has run preliminary in-house tests of the display and will conduct a demonstration in front of a university Interaction Design group in order to gain feedback about the design. In late 2014, the display will be implemented in field studies conducted in community settings in Darebin. The studies will collect data of audience participation and feedback, which will be used to further refine the display and to explore how audience members engaged with the digital stories.

Jenny Waycott, Hilary Davis | Computing and Information Systems | **Deborah Warr** | Population and Global Health
Fran Edmonds | Culture and Communication | **Shuo Zhou** | IBES
Bridget Monro-Hobbs, Gillian Damonze | City of Darebin



Left: Screenshot of program and Right: User remote control

Wadeye IPTV

Delivering Audiovisual Archives to Remote Aboriginal Communities via IPTV

Wadeye began as a Catholic mission on the coast of the Northern Territory (NT) in 1935 and the region is known as Thamarrurr. The population at Wadeye is 93% indigenous with slightly less than half the population under 20 years of age.

The project will use IPTV and the National Broadband Network in the preservation and access of audiovisual materials at Wadeye. In partnership with Kanamkek-Yile Ngala Museum at Wadeye and the Thamarrurr Development Corporation, this research project will trial how culturally significant and endangered audiovisual archival material might be most effectively and appropriately preserved and made accessible for future generations. The Wadeye museum currently holds significant collections of audiovisual recordings of ceremonies, songs and dances, languages and local ecological knowledge covering at least six different languages and tribal groups, many of which are now highly endangered much of this material irreplaceable.



Mark Crocombe, Kanamkek-Yile Ngala Museum, Wadeye, NT

This pilot project will leverage off an existing in-lab proof of concept to stream content to a smart-phone/ PC/TV but which will also demonstrate automated replication and updating of "remote" video servers such as at Wadeye from a centralised, secure archive server based at IBES. The project intends to trial various forms of IPTV at Wadeye museum. IPTV is seen as an excellent technology fit as it can provide very granular, controlled access to content by separate cultural groups, and provides metadata to allow easy searching of the video archive by users, which also makes it a valuable resource for specialists such as linguists.

The project will deliver IPTV to a variety of screened devices in Wadeye with potential for further expansion across the Australian Aboriginal media sector. The trial will develop an off-site back-up of audiovisual materials while providing access to them and directly positioning Aboriginal people to take a technological leap forward by using the NBN and IPTV to ensure local communities can produce, view and exchange audio visual material of a cultural or informational nature, in accordance with the Review of Australian Government Investment in the Indigenous Broadcasting and Media Sector.

Lyndon Ormond-Parker, Marcia Langton, Sharon Huebner, Caden Pearson | Centre for Health and Society
Rachel Nordlinger | Languages and Linguistics | Robyn Sloggett | Centre for Cultural Materials Conservation
Julien Ridoux, Ken Clarke | IBES | Mark Crocombe, Jacinta Crocombe | Kanamkek-Yile Ngala Museum
Rosa McKenna | Thamarrurr Regional Authority Aboriginal Corporation

Telling Our Stories

Aboriginal Young People in Victoria and Digital Storytelling

This project builds on information from the Aboriginal young people in Victoria, mobile phone and social media project completed in 2012. The project worked with Aboriginal youth under the age of 25. This age group form the majority of the Aboriginal population in Victoria, they are also among the highest users of mobile phones, actively engaging in social media and other online platforms. With the advent of Web 2.0 technologies, Aboriginal youth throughout Australia are increasingly using digital technologies, especially mobile phones and the Internet, to produce and tell their stories in ways determined by them.

For Aboriginal people storytelling is central to maintaining knowledge and culture. Stories embrace the integration of all aspects of life in accordance with Aboriginal worldviews, spanning art, song, performance and other cultural expressions, assisting the transfer of cultural information from generation to generation. Digital technologies and new media can enhance and support the transmission of this oral information and material culture, including connections to Country and kin.



The Digital Storytelling Workshop

This project implemented a pilot Digital Storytelling Workshop conducted over 3.5 days with young people and older community representatives associated with Bert Williams Aboriginal Youth Services in Melbourne. The program consisted of a co-creative digital workshop conducted at the Aborigines Advancement League and was facilitated by Kimba Thompson from Sista Girl Productions. The project highlighted the importance of working with the Aboriginal community to find out how Aboriginal young people engage with digital technology.

The outcomes from the workshop revealed that expanding digital literacy skills, through close and supportive collaborations with the Aboriginal community, can enhance young people's potential to creatively use technology to build identity, affirm connections to culture and improve their capacity for positive self-representation.

The findings of this project were published in a research report in February 2014:

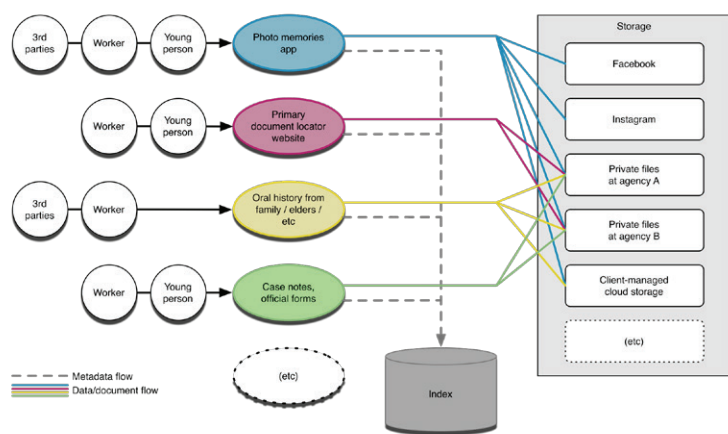
[*Telling Our Stories: Aboriginal young people in Victoria and Digital Storytelling* \(pdf: 1.5mb\)](#)

Fran Edmonds, Susan Lowish | Culture and Communications | **Richard Chenhall** | Population and Global Health
Michael Arnold | Historical and Philosophical Studies | **Tania Lewis** | RMIT University

Working in the Cloud

Developing Identity Resources for Care Leavers

Children growing up in out-of-home care often don't have access to the rich oral history, the family photo albums and so on that most of us do. As children and young people in out-of-home care often face difficulty in accessing personal records created by and about them. For these children, for the adults they grow into, out-of-home care records may be the only resource available to provide information about their families, their origins and their lives before and during care.



Concept of the Virtual Locker

This project is attempting to increase the availability of records by developing a virtual locker for the digital copies of personal documents for children in care. The locker makes use of a range of digital technologies to engage young people in therapeutic work and safely store the resulting information in a repository that meets archival standards.

The virtual locker seeks to transform the dynamic of therapy by involving young people in the creation and management of their own records and making the data accessible into the future. Therefore, ethical

considerations were essential to the development of the project as the locker needed to incorporate and manage the dimensions of co-creation by allowing people to add to their records. Personal control is important as it gives young people the power to exercise informed consent and make independent decisions relating to their records. Finally, the locker needed to ensure that data was only used for legitimate uses therefore needed to have an appropriate regulatory mechanism.

In addition to the ethical layer, privacy was also a central concern of the project as the data contained within the locker contains personal and sensitive information. Therefore, care must be given to security and access.

The final consideration of the project involved the technical and governance framework, which includes where the locker would be hosted. This would be ideally in Victoria and with governance occurring via an independent authority, such as the Children's Commissioner, to safeguard the data, access and process. The project has established that a virtual locker can provide an essential tool in managing the records of children in care, which provides the foundation for turning the idea from prototype to production.

Cathy Humphreys | Social Work | **Gavan McCarthy** | eScholarship Research Centre

Merle Spriggs | Population and Global Health

Udaya Parampalli, Sarah Webber | Computing and Information Systems | **Richard Rose** | LaTrobe University

Jurgen Schaub, Amanda Jones | Berry Street

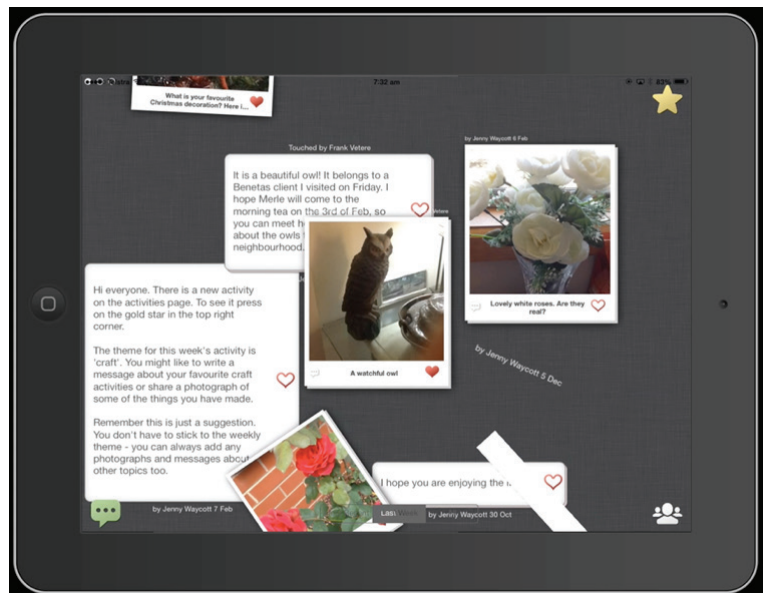
Growing Old and Staying Connected Ameliorating Older People's Experience of Social Isolation

Many of the factors associated with ageing – such as deteriorating health and limited mobility – make it difficult for older people to socialise and engage in local community activities. Social isolation, or having limited contact with other people, is recognised as a significant problem for today's ageing society. While social isolation can occur at any age, and many older adults enjoy strong family and social connections, older adults without those connections are particularly vulnerable to isolation. New communication technologies, such as touch-screen tablet devices, are becoming more accessible and easier to use, making them potentially valuable as tools for supporting older adults who are socially isolated.

This ARC Linkage project has been examining how touch-screen technologies can be used to help alleviate older adults' experience of social isolation. Working in collaboration with IBES and Benetas Aged Care Services, the project has developed Enmesh, an iPad application used to share photographs and messages within a closed social network. A series of field studies have explored how this new form of communication can be used to enrich the social lives of aged care clients who live independently at home, have significant health or mobility constraints, and who are considered to be at risk of social isolation. In the past year the project has implemented an extended ten-month study involving two groups of aged care clients and their care managers who used Enmesh to share photographs and messages with each other. The research has yielded valuable insights about several issues, including:

- Older adults' experiences of social isolation and digital exclusion
- How new technologies can be used to support older adults' self-expression and social engagement
- The challenges of introducing new technologies and facilitating communication within groups of socially isolated older adults.

Frank Vetere, Lars Kulik, Jenny Waycott, John Downs | Computing and Information Systems |
Elizabeth Ozanne | Social Work | **Brendan Lillywhite** | Age Care Consultant
Sonja Pedell | Swinburne University of Technology



Screenshot of the app

Participatory Public Space a Right to the Networked City

The rollout of high-speed broadband is one of the largest public investments in Australian history. Access to new technologies is transforming how people engage with digital networks, not only at home, but within urban environments. This research seeks to understand how digital connectivity can contribute to improvements in civic life. Improving participation in public space can address problems such as social isolation, enhance citizen empowerment and develop a sense of collective belonging.

This ARC Project involves a comparative study of the impact of high-speed broadband networks on public space in three cities: Melbourne, Amsterdam and Songdo City, Korea. The aim is to explore the interplay between regulatory and planning settings, and distinct cultures of use in enabling public participation in networked urban public spaces.

As a component of this project, researchers investigated the transformation of public spaces through free Wi-Fi services offered by Australian cultural institutions and municipalities. The findings of the investigation state that Wi-Fi services can enhance public spaces by adding to their vibrancy and atmosphere. Wi-Fi services also provide a valuable digital resource for different mobile users, including out-of-office workers and travellers. However, Wi-Fi services should not be launched indiscriminately. Poorly thought out services can also support uses that isolate groups of users and prevent cross-group mingling in public space. The findings were published in August 2013 in [*Free Wi-Fi and Public Space: The state of Australian public initiatives* \(pdf 2.9MB\)](#).

The future outcomes of this project will contribute to a better understanding of how digital networks can improve civic life by investigating the interplay between formal processes, and emergent practices involving the use of digital media in urban public space, many of which are currently informal or incompletely formalised. The project will generate a body of comparative, fine-grained knowledge capable of informing conceptual frameworks, and better policy settings for networked cities.



Using free WiFi in Federation Square, Melbourne

Scott McQuire, Nikos Papastergiadis, Alex Lambert | Culture and Communication
Sun Yung | National University of Singapore | **Michael Dieter** | University of Amsterdam

PhD Projects

Tell Me Something I Don't Already Know

Consumer (Un)informedness and the Impact of New Technologies on Residential Energy Consumption

The rollout of smart meters in Victoria, which record real-time electricity use is expected to transform the demand side of the electricity market. These meters provide customers the opportunity to understand and manage their energy consumption in real time. However outside small-scale pilots there is little evidence of their actual impacts.

This project will use econometric methods to evaluate whether households use the web portal to manage their electricity consumption. In a large scale field experiment, a subset of consumers (the treatment group) was provided with an online portal containing information about their own electricity consumption, together with comparative information on the consumption of similar households. The electricity use of both the treatment and control groups (along with actual use of the web portal) was then tracked. The project will utilise up to a year of electricity meter readings at 30 minute intervals to evaluate the impact that the online portal has on household electricity consumption. The results will have important implications for environmental policies designed to conserve energy. The project also has immediate relevance for the rollout of smart meter and web portal technologies in electricity markets across the globe.

Andrea La Nauze | Economics

Video Conferencing for Domestic Social Interactions

Living apart from families and friends, either temporarily or permanently, is sometimes inevitable. However, people stay connected to their family members and friends when circumstances impose distance upon them using different combinations of technologies. Video conferencing has been widely used to connect geographically separated people playing an important role in maintaining distance relationships.

Research on domestic use of video conferencing tools has demonstrated their significant role on reinforcing family identity and promoting family values, as well as strengthening relationship and shared identity of participants. However, recent literature has revealed that nowadays people not only use video conferencing tools to converse with others, but they also use it to share everyday activities. These activities include but not limited to running house tours, watching TV programs together, cooking and eating together. Although findings of initial studies emphasise the importance of these types of interactions, they demonstrate the inability of current video conferencing tools to fully support them. This research tries to understand how design of video conferencing tools should be improved to support newly emerged activities in domestic video conferencing.

Behnaz Yeganeh | Computing and Information Systems

Crisis Information from the Internet User's Perspective

Individuals affected by a disaster can find themselves faced with a multitude of losses and challenges. This project is examining post-disaster online experiences to develop an in-depth understanding of how Internet use has influenced people's experiences following a disaster. The findings from this research will provide an understanding of why self-motivated individuals have entered the Internet's online space in a post-disaster context.

Marian Lok | Social Work

Exploring Technology-Mediated Unstructured Play

Unstructured play is informal and does not have strict rules and procedures. Physical console gaming technologies such as Microsoft's Kinect for Xbox 360 can enhance social gaming by enabling unstructured playful interactions between players. This project explores how unstructured play on physical console gaming systems enhance social interactions via a detailed examination of interactions between players in a mediated environment.

John Downs | Computing and Information Systems

New Forms of Social Interaction Through Universal Broadband Access in Public Spaces

The proliferation of smartphones and tablet devices accompanied by increases in broadband connectivity are transforming how people interact in public spaces. This project is examining how broadband technologies in public spaces can be used by artistic collectives to develop artworks that foster user collaboration to facilitate social interaction.

Marcos Dias | Culture and Communication

Online Communities in Massively Multiplayer Online Games

Massively Multiplayer Online Games (MMOGs) are video games where large numbers of players play simultaneously. Currently over 20 million people play this kind of game globally. This project is exploring participants in the game EVE Online to understand how online communities are formed, what effects memberships and how internal and external conflict is resolved.

Marcus Carter | Culture and Communication

Post Autonomist Political Theories and Philosophies of Network Communication

This project examines the importance of communications networks for enabling engagement in political life – both nationally and internationally – and assessing them from a theoretical and practical level. This project is contributing a unique insight into the problems and potentials of Australian political practices as they function in a new technological context by providing insight into whether or not the NBN can add to the potential of the democratic process in Australia, and whether Australians will be usefully served by further and deeper involvement within a networked society about which we currently know so little.

Robbie Fordyce | Culture and Communication

Situated and Connected Digital Memorials Technology to Commemorate Natural Disasters

Earthquakes in New Zealand and Japan created an aftermath of tragedy. Memorialisation provides an avenue for grieving, remembering, and honouring the resilience of the survivors. This project is designing meaningful memorials by bridging the gap between the types of memorials seen at a local level versus those available online by installing physically situated, connected digital memorials.

Joji Mori | Computing and Information Systems

Understanding the Role of Broadband Technologies in Periodically Reunited Families with Preteen Children

Industries such as mining and defence require people to work away from their families. This research project is exploring the use of immersive communications technologies that allow interactions among family members regardless of their location. The project is increasing the understanding of separation and reunion and how broadband technologies can increase connection.

Konstantinos Kazakos | Computing and Information Systems

Wireless Sensor Networks for the Forest Environment

Elephants and people have a long history of interdependence in Sri Lanka, featuring in work, warfare and culture. The colonisation of Sri Lanka altered the ecological landscape and coupled with rapid population growth there is increasing conflict between humans and elephants. This project aims to reduce conflict by using sensor networks to track elephants. The sensors will capture the noise made by elephants as they travel through forests providing an early warning system to alert villages and law enforcement.

Chinthaka Dissanayake | Electrical and Electronic Engineering

Education and Learning

Networked technologies are transforming the delivery of educational services. Online education, such as the proliferation of Massively Open Online Courses (MOOCs) is increasing access to education. Broadband is connecting communities to educational opportunities supporting professional development and training to increase knowledge and skills across the workforce.

Research at IBES is exploring how broadband can increase the delivery of education across society by connecting schools, students and universities. IBES researchers are seeking innovative ways to increase quality and support service development across the economy.



Improving the Language Learning and Technology Connection Identifying and Understanding Current Challenges to Broadband Enabled Language Learning in Regional, Rural and Urban Schools in Victoria

Languages education is a national key learning area for all Australian students. The Victorian government has a strategy for compulsory languages education from 2015 in an effort to reverse a recent pattern of marked decline in language provision, especially in primary schools. In realising this vision regional, rural and disadvantaged urban schools are most likely to struggle with provision of language education due to the challenges of teacher supply.

Broadband technologies potentially allow for language learning in a range of different ways. This project explores the best approaches for the use of technology in language learning. The project will also examine how best to ensure viability over the longer term and ascertain the requirements for teacher and resource development to ensure the effective use of technology to support language learning.

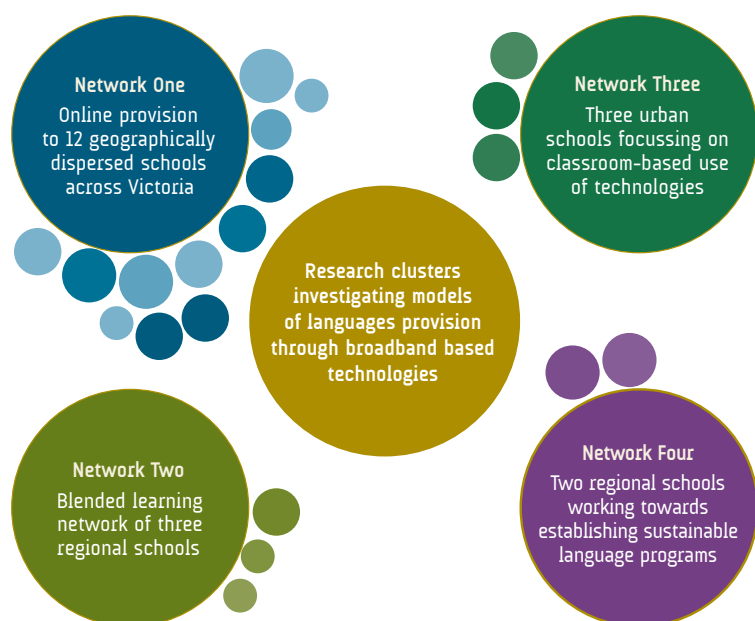
The project is examining four networks of schools (pictured opposite) and how each has approached the challenge of introducing languages education.

The first network revolves around a small, regional school offering language programs through video conferencing to 12 different schools across Victoria. The second network uses a blended approach to languages learning, with each school rotating through face-to-face and online language learning, with the teacher physically moving location each week. The third network is urban and is advanced in the use of and integration of technologies and language education reflecting best practice. The final network provides an illustration of the challenges facing rural schools.

Researchers are currently undertaking data analysis to develop a set of guidelines to inform the effective development of tools, technologies and policy to deliver languages education to all Victorian school children.

This project has received extensive support from the Victorian Department of Education and Early Childhood.

John Hajek, Yvette Slaughter | Languages and Linguistics
Shanton Chang, Suelette Dreyfus, Wally Smith | Computing and Information Systems



Creating Musical Futures for Students in Rural and Remote Communities

A major disadvantage experienced by music performance students living in rural and remote communities is the lack of access to specialist instrumental tuition. High-speed, low-latency video and audio communication technologies offer the potential for these students to receive expert tuition online from specialist teacher-musicians enabling them to achieve their full musical potential during their secondary school years.

This project has involved identifying, testing and evaluating infrastructure utilised by a team of specialist instrumental teachers operating from the University's Parkville Campus and students located in Ballarat. This part of the project has also enabled on-going refinements to audio and video transmission and capture (recording) procedures as well as studio set-up and protocols.



Vocal music teacher Louisa Rankin giving online tuition to a Ballarat Clarendon College student

In addition, the project has trialled and documented methods and techniques for implementing Internet-based teaching, chiefly the effectiveness of student-teacher interaction and online pedagogy. A team-based action research approach has involved specialist teachers giving online tuition in keyboard, voice, oboe and drums to senior secondary school students at Ballarat Clarendon College. All participants—online teachers, instrumental students and the research team—have contributed data which is currently being analysed and will result in valuable guidelines for future implementation of online teaching in the Australian context.

The project has potential for future collaborations with industry partners, other universities, the secondary education sector and professional music organisations. In particular, partnerships will be developed with leading universities in the Asia-Pacific region to facilitate collaborative teaching, ensemble performances, and online streaming of lectures and symposia.

This project forms part of the iMCM initiative being developed by the Melbourne Conservatorium of Music that aims to support development of musically-talented young people and to facilitate research into music learning and pedagogy through innovative applications of information and communication technologies.

Gary McPherson, Robin Stevens, John Baratta | Melbourne Conservatorium of Music
Graham Moore | Infrastructure Engineering

Uni TV

Students and professionals who live and work in outer-metro, regional and rural communities often find it very difficult to attend classes on a university campus and engage in continuing professional development. Lecturers and tutors may also spend a lot of time travelling between widely separated campuses. Thus so called time- and place-shifting in learning is growing.

This project developed a platform, Uni TV built upon Ericsson's Internet Protocol Television (IPTV) system to deliver educational content from the Melbourne Dental School. IPTV is capable of delivering very high quality video content via a managed data service.

Uni TV requires a set top box to decode the incoming broadband data and display it on a high definition TV. Although IPTV has traditionally been an entertainment platform, this project examined the use of IPTV for educational content and services.

The project found that Uni TV is an excellent method of delivering high quality educational video material to a range of end users at various locations over a broadband network. High-definition (HD) video material can be broadcast live in a TV channel and also as video-on-demand (VoD). Flexibility of access is important as it allows repeated review prior to examinations, or concentration on particular techniques being demonstrated, such as 3D which allows the viewer to receive extra depth-of-field clues, for example, the proper angle and depth of drilling in dental procedures.

Barriers to the use and acceptance of Uni TV relates to the difficulties in translating a service originally designed for mass entertainment into one for relatively limited numbers of users often in niche education markets.

Uni TV demonstrates that IPTV is an effective tool to deliver high-quality educational content.



Uni TV in operation

The findings of this project were published in October 2013: [Uni TV: Trialling IPTV for Education \(pdf: 1.2MB\)](#).

This project was supported by the Victorian Government's Broadband-Enabled Innovation Program.

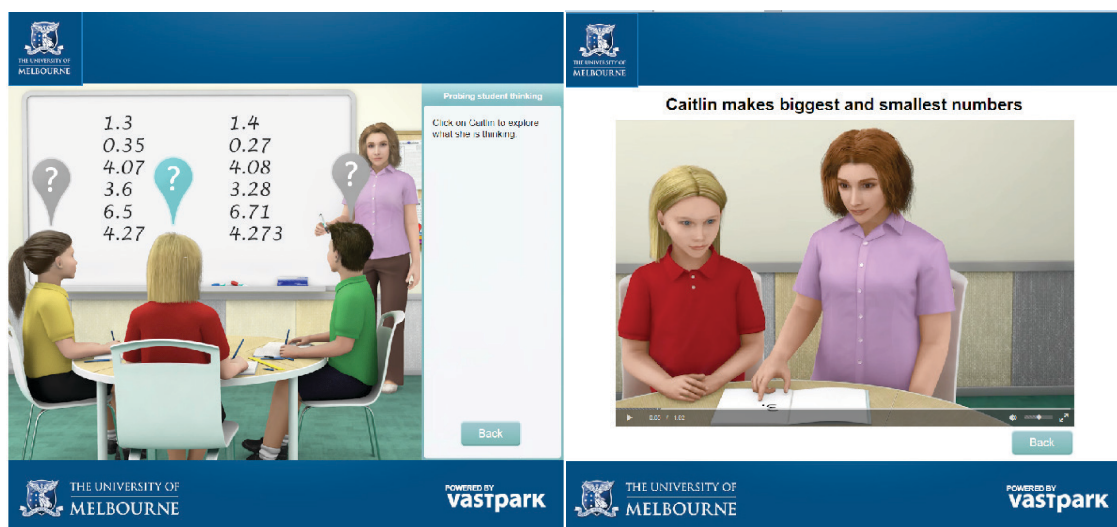
Michael McCullough, Chau Nguyen, Eric Reynolds, Anu Polster, Mike Smith, Roy Judge, Matt Hopcraft | Melbourne Dental School | **Ken Clarke** | IBES | **Mark Munro, Scott Middleton** | Information Technology Services | **Feodor Frukhtman, Vincent Yin** | Ericsson | **Doug Farmer** | AARNet | **Rob Myers** | Panasonic

Teacher Professional Learning in a Virtual Environment

This project explored the feasibility of using a virtual learning environment for professional learning for mathematics teachers to be able to access research-based professional learning regardless of geographical location. High-speed broadband provides the opportunity to rethink the delivery of professional learning via a virtual learning environment that can be accessed by teachers nationwide, and internationally, improving teachers' mathematics pedagogical knowledge.

The material for this proof-of-concept was based on the *Teaching and Learning About Decimals CD*, which focuses on developing a teacher's understanding of whole number thinking through observing a virtual classroom and interactions between a teacher and student.

The virtual learning environment provides a virtual classroom that can deliver a textbook example of a real-life situation. The environment allows participants to observe teacher and student interactions to set the context for exploration of student thinking, observe a student completing tasks and then listen to them 'thinking out loud' to provide insight into the reasons for their responses, demonstrate knowledge of a misconception by predicting the responses of a student with this misconception, and reflect on their learning.



Screenshots from the virtual learning environment

Eight participants trialled the environment selected, which was found to be both easy to use and useful for helping participants identify student thinking. The participants were very favourable about the environment and its potential to include different mathematical thinking and teaching exemplars. Overall, the study found that there was potential for a virtual learning environment to be used to provide meaningful professional learning for mathematics teachers.

Lynda Ball, Vicki Steinle, Kaye Stacey, Robyn Pierce | Melbourne Graduate School of Education
Shanton Chang | Computing and Information Systems | **Ken Clarke** | IBES

Blended Learning Across the Secondary-Tertiary Divide

Despite the central role of computation in our society and economy, the underlying science is absent from the secondary curriculum in Victoria. While rigorous formal content is taught in VCE mathematics and science, the VCE IT curriculum focuses on vocational skills. Many students choose not to enrol in tertiary computer science degrees because they fail to realise the programs contain a body of knowledge that can lead to diverse and rewarding employment opportunities.

The Victorian Curriculum and Assessment Authority (VCAA) has recognised this problem and is working with Monash and Melbourne universities to create new units in computer science. In order to increase access to computer science different models of delivery are required. Moving away from face-to-face delivery presents challenges in delivering a new curriculum via blended learning and remote assessment. The project aims to address these key challenges.

This project, supported by Google, is orientated around a graphical programming language called *Snap!* which will form the basis of a platform to establish an educational platform and evaluate its effectiveness for delivering tertiary computer science content at secondary level. The project team are extending the functionality of *Snap!* supporting the logging of student programming and engagement in fora to provide assessment and to develop ways to tailor teaching that adapt to the complex interactions between attitude, engagement, gender and achievement.

Linked to this is increased support to teachers, many with limited computer science training, in the use of the platform to develop their role of teacher as facilitator. It is envisaged that this program will increase the uptake and interest of students in computer science and related careers.

Steven Bird, Shanton Chang, Wally Smith | Computing and Information Systems



South Lawn, the University of Melbourne

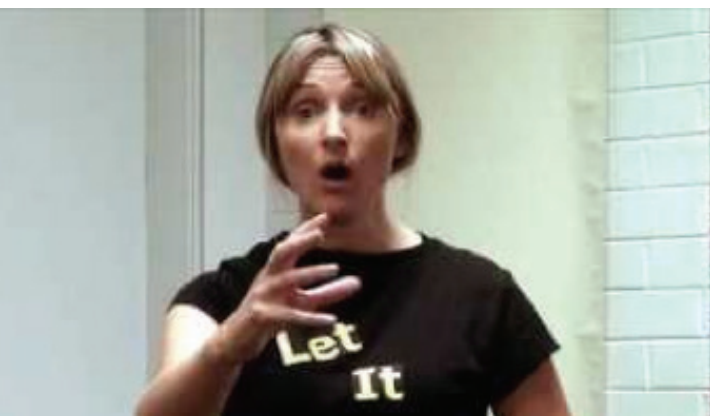
Hear Me Out!

An Online Peer Support Program for Deaf and Hearing Impaired Teens

There are an estimated 20,000 Australians under the age of 21 years who are deaf or hearing impaired. Children whose voice and speech quality can impact on how well they are understood by their listeners are at high risk of social isolation and are four times more likely to have a mental health disorder.

In Australia, over 83% of deaf and hearing impaired children and adolescents attend mainstream schools, where they are often the sole student in their class or school that is deaf or hearing impaired. These young people face attitudinal barriers in the workplace when they cannot communicate directly with other employees and employers, a barrier that the vocal training component of Hear Me Out! sought to address.

High-speed broadband has the capacity to enable the delivery of assistive technologies such as live video streaming and captioning in classrooms and homes, in order to support interventions for deaf and hearing impaired people. The United Nations Convention on the Rights of Persons with Disabilities outlines the importance of access to new media technology for this population.



Jodie, a Hear Me Out! mentor

This project recast two 'live' programs, Let It Out and Hear For You, into a virtual form through broadband technology using an action research approach. The overarching intention of Hear Me Out! was to reach more participants through on-line delivery than the current "live" programs with a particular emphasis on those living in rural regions. A shift to a virtual environment allows the possibility of building communities of young deaf people who could access peer-mentoring and coaching techniques for effective communication.

The major outcome of this project was the development and successful delivery of four Hear Me Out! online modules to thirty-eight participants, which was well received.

The findings from this project were published in November 2013: [*Hear Me Out! Enhancing social inclusion and wellbeing for deaf and hearing impaired teens through an online peer support program* \(pdf 1.2mb\)](#)

Geraldine Cook | VCA | Robyn Woodward-Kron | Medical Education Unit
Gavan McCarthy, Peter Mellow | Scholarly Information | Sophie Li, David Brady | Hear For You
Zoe Black | Australian Communication Exchange

2D v 3D for Improved Learning Outcomes

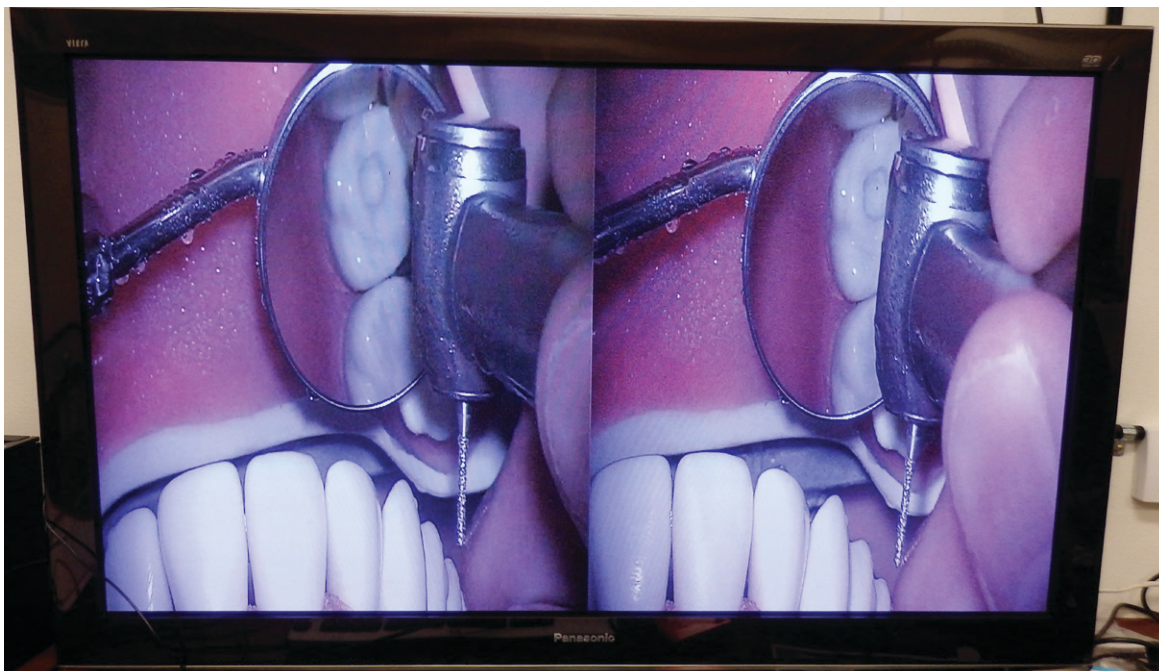
3D display technologies add an extra level of information, which can be invaluable for those professions where depth perception is critical to success. This project is examining the use of 3D technologies in surgical and dental education and to assess whether 3D can deliver better learning outcomes for students.

The project has set up a clinical stereomicroscope with a live and recordable 3D video feed in the Melbourne Dental School. This can provide 3D video streams to both local and remotely located students and professionals to help train them to perform complex dental procedures by watching experts perform. The 3D video content has been well received as it can provide greater understanding of the processes and techniques involved.

The research team is currently installing and trialling a similar 3D capture and display suite in an operating theatre at the Royal Victorian Eye and Ear Hospital. The team are working on optimising the alignment of the cameras to a surgical microscope which will allow the simultaneous use by the surgeon and transmission of the images during ear surgery. The surgeon will also be able to then use the same system to oversee the work of trainees.

The final component of this project has seen research conducted with students to assess their preferences for 2D compared to 3D learning. Preliminary findings indicate that students find that the extra depth information provided by 3D does aid their learning.

Stephen O'Leary | Otolaryngology | **Ken Clarke** | IBES | **Michael McCullough** | Melbourne Dental School
Ben Loveridge | Scholarly Information | **Paula de Barba** | Melbourne Graduate School of Education

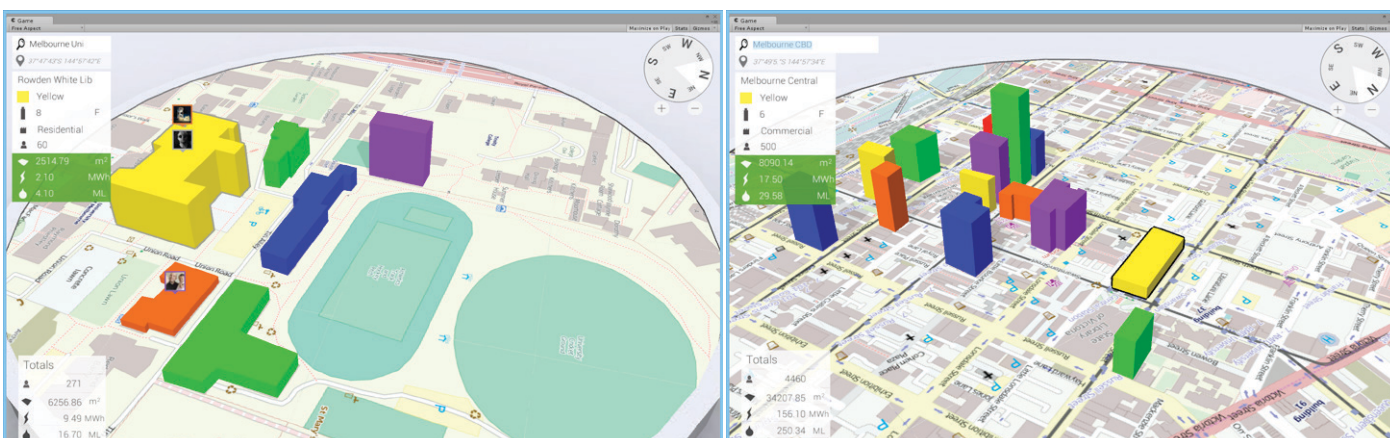


A 3D dental image. The side-by-side images are converted to 3D by the viewer wearing special glasses.

3D Simulation Based Learning Environments

This project explores the use of 3D simulation-based learning environments to support learning activities in higher education. This project leverages existing, innovative technologies developed by VastPark and the University of Melbourne to develop an online collaborative environment that supports 3D simulation-based learning. The aim of the research is to test the usability, utility and educational design of a prototype of the 3D simulation-based learning environment with groups of engineering students.

To date, the project team has developed the prototype of the 3D, simulation-based learning environment which has been named *Groupia*. The *Groupia* prototype is currently undergoing pilot testing with student groups. The pilot involves groups of engineering students who will each be asked to work collaboratively to resolve a complex urban planning problem scenario using the prototype environment. Students will be observed and then asked to participate in a survey that will focus on both the technical usability and utility of the platform and the educational design of the problem scenario.



The Groupia 3D, simulation-based learning environment prototype

The results of this investigation will shed light on how online 3D learning environments that use real-time data feeds for simulation-based learning can be created technically and used educationally for effective online learning.

Gregor Kennedy, Linda Corrin | Centre for the Study of Higher Education

Tuan Ngo | Infrastructure Engineering | **Bruce Joy** | VastPark | **Barney Dalgarno** | Charles Sturt University

PhD Projects

Don't Forget to be Awesome

Young Adult Literature, Heterotopia and Adolescent Civic Engagement Online

This project is investigating the use of online social networks – specifically literary fandoms and exploring how they extend and develop the transformative spaces offered by Young Adult literature, creating new spaces where teenagers can be genuine participants in the civic process.

Lili Wilkinson | Culture and Communication, Melbourne Graduate School of Education

Motivation and Autonomous Learning in Online Learning Environments

Online learning is one of the fastest growing components of the global education industry. This project aims to increase understanding of the characteristics of students in designed learning environments. The research explores the relationships between students' motivation and interaction to see how learning design impacts students' autonomous online learning. The findings from this project will support the creation of optimal conditions that will encourage students to both get to the computer and to stay with the learning task.

Paula de Barba | Psychological Sciences, Centre for the Study of Higher Education

New Forms of Online Learning and the Production of Knowledge in Changing Times

In the 21st century universities are confronting major questions about forms of knowledge and the aims and purposes of curriculum and formal education in the context of rapid technological and social change. This project is empirically investigating the changes in process at universities focusing on questions of knowledge and epistemic authority as courses are reconfigured for new kinds of online forms.

Kate O'Connor | Melbourne Graduate School of Education

Unpacking the Ultranet Home-School Uses

This project examines the social and technological impact of broadband technology in homes and classrooms via an analysis of the Ultranet, a learning resource accessible to teachers, students and parents in Victorian government schools. Empirical research is being conducted to ascertain the first-hand experiences of children, parents and teachers to qualitatively analyse how the Ultranet connects education and home media spaces. The research provides opportunities to analyse how interactivity and participation is contributing to a growing dialogue on current and future digital media and learning needs of Victorians.

Veronica Fitzgerald | Culture and Communication, Melbourne Graduate School of Education

Health and Ageing

Managing health is an essential concern as Australia's population ages. Broadband connectivity is driving innovation within the healthcare sector supporting the emergence and development of new services and new modes of delivery.

Research at IBES is exploring how healthcare can be delivered in a networked society to increase access, reduce cost and promote better health outcomes. IBES researchers are using novel technologies to treat and manage diseases, train medical practitioners and understand the impact of data-driven healthcare.



Kinect Technology for Remote Assessment of Interventions for Young Children with Autism Spectrum Disorders

This project aims to provide innovative speech pathology services for children with Autism Spectrum Disorder (ASD) and their families in rural areas. The Kinect sensor plays a key role, being used as a novel remote feedback and assessment tool for the quality of parent-child interactions.

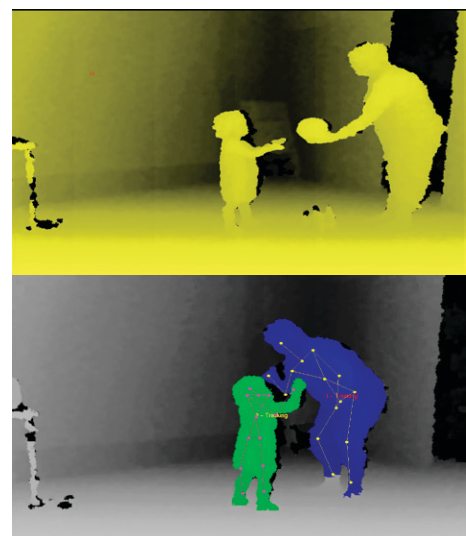
Kinect sensor data was collected at the Clear Messages speech pathology clinic in the Victorian regional town of Ballarat where volunteer parent-child sessions were recorded. This data was combined with further parent-child interactions recorded in March 2014 in the IBES Lab with 'neuro-typical' children, i.e. those unaffected by ASD, to act as a baseline against which ASD behaviours could be compared and contrasted. A variety of activities were recorded, including active and passive play such as jumping and dancing, shared book reading, and playing the 'Simon Says' mimicking game.

This project is developing an automated tracking and analysis system. The software provides meaningful statistics based on the quality of the parent-child interaction with a prototype dashboard display developed that takes the output of the Kinect sensor and displays both real-time and cumulative measurements alongside avatar skeleton figures. Measurements include head-height offset, proximity, number and position of touches, voice recognition, real-time static pose recognition, as well as a rudimentary overall 'Q' factor for the session. A second Kinect sensor allows continuous measurements if the first Kinect's view is blocked. This also opens up the possibility for a 'second opinion': the analysis from the two sensors can be compared and the measurement with the highest confidence selected. Currently, the software modules are being rewritten to encompass the recently released second generation Kinect sensor, which has higher resolution and better feature recognition.

It is envisaged that as the speech-pathology intervention progresses the automatically generated quality factors from the toolbox will show a marked improvement. This would also independently validate the intervention process. The toolbox could be used in future iterations as an 'expert system' that would provide speech-pathology support in areas that are typically underserved.

The project also includes the testing of technologies proposed for remote delivery of the Hanen More Than Words parent education program. For example, various videoconferencing tools on PC's, laptops and iPads have been trialled along with specialised video recording software that captures interactions for subsequent review in the education sessions. Trials of the selected technology have started with a small number of volunteer families, and their feedback will form part of the project outcomes.

Patricia Eadie, Bronwyn Davidson, Robyn Garnett | Audiology and Speech Pathology
Ken Clarke, Zaher Joukhadar | IBES



Using the Kinect to track movement

Cultural Respect Encompassing Simulation Training (CREST) Being Heard About Health Through Broadband

Culturally and linguistically diverse migrant communities and ethnic minority groups have traditionally had poorer health outcomes than the Australian born population. The Cultural Respect Encompassing Simulation Training (CREST) is a series of modules for pre-vocational health students to develop competencies in cultural sensitivity. In 2013 the modules were delivered to over 1300 students.

However, technical constraints have seen a low uptake in training services in rural and remote Australia. This project has examined how broadband can expand and improve the delivery of CREST into rural and regional communities. The project trialled the delivery of the service via video linked facilities at four rural sites including two clinical schools and one hospital. CREST was provided at these four sites to medical and nursing students, and medical practitioners.



MD students at Shepparton Clinical School eliciting a simulated patient's explanatory model of illness via videoconference.



'Why is she not taking her diabetes tablets?' MD students at Wangaratta Clinical School found out how different health beliefs influence a simulated patient's views on western medicine.

Preliminary findings indicate an improvement in the cultural competency of participants and an acceptance of delivery of the training via broadband. However, the quality of delivery was often hampered by technical inconsistencies across different campuses and a lack of experienced facilitators at rural locations. Organisation of each video-conference was essential to ensure the fidelity of the simulation. Considerations included room set up, how the interviewing students would be seated and how the simulated patient would be led into the room, to enable the recording of participants' expressions and statements.

The next stage of the project is to develop how to deliver CREST from a bespoke video-conferencing facility to provide the simulation to rural and remote areas.

Phyllis Lau | General Practice | **Robyn Woodward-Kron, Kris Elliott** | Medical Education Unit
Patricia Nicholson | Nursing | **Karen Livesay** | Victoria University

Telerehabilitation for Chronic Obstructive Pulmonary Disease Optimising the Model

Pulmonary rehabilitation is a highly effective treatment for people with chronic respiratory disease that improves quality of life and reduces hospital admissions. It consists of exercise training and education that is delivered in a group setting. Access to these programs is often limited by debilitating symptoms and inability to travel. As a result, less than 10% of people who need pulmonary rehabilitation ever undertake this program.

Telerehabilitation, where supervised rehabilitation is delivered directly into the home using broadband technology, has potential to improve access to this important treatment. If telerehabilitation is to be adopted in clinical practice it must use a cost effective model where multiple patients can be treated at once, similar to the group setting where pulmonary rehabilitation is traditionally delivered. This project has optimised a multi-participant telerehabilitation model via video conferencing, which can support six patients and a clinician using common network conditions and a readily available videoconferencing solution.



A clinician can review up to six patients simultaneously



Pulse Oximetry App

The next step is to utilise this telerehabilitation model in hospital-to-IBES laboratory trials, with the clinician based at Austin Health. This trial solution provides the opportunity to mimic 'real-world' implementation requirements of telerehabilitation and developed scope for adoption of the model into clinical practice. To further enhance the application of our model to the clinical setting, a pulse oximetry app has been developed, which provides real-time feedback of the physiological responses of patients during rehabilitation sessions. This will assist clinicians to monitor individuals during home-based programs.

Overall, this project will define a real-time multi-participant telerehabilitation model that will provide access to a low-cost, easily accessible and viable model of pulmonary rehabilitation for individuals with chronic lung disease.

Christine McDonald, Peter Rochford | Institute for Breathing & Sleep | **Ken Clarke, Noot Fang** | IBES
Anne Holland, Alice Watson | LaTrobe University | **Doug Farmer** | AARNet

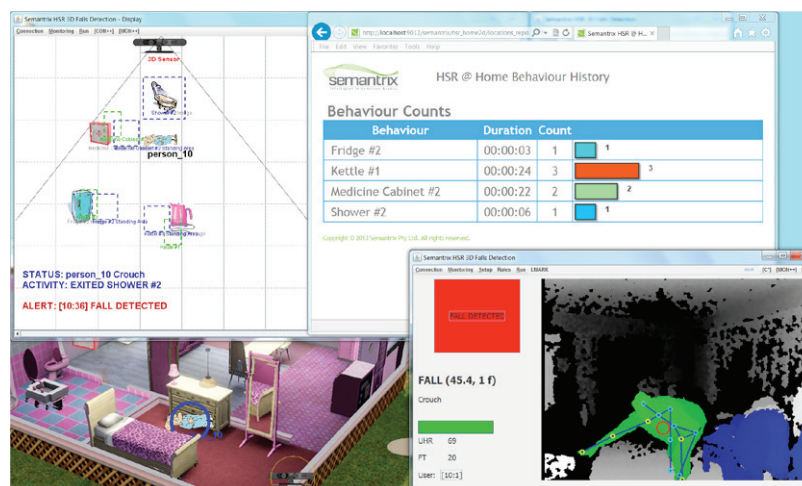
Non-Contact 3D Falls Detection Prevention and Behavioural Monitoring in Aged Residential and Home Environments Developing a Clinical Evaluation and Application Framework

Over the next 10 years in Australia the population of those aged 65 years and older will increase, placing additional stress on society's ability to care for the elderly. Serious falls impact around one in three elderly people and often result in hospitalisation costing approximately \$1 billion per annum.

New approaches and supporting technology are required to start addressing this area and improve outcomes. Evidence suggests that more sophisticated systems could facilitate fall victims to return to their home environment with increased confidence and the opportunity to undertake normal activities that are physically safer.

This project will capture pre- and post-fall movement patterns. The data will be captured from multiple sensors located in residential areas. Data from individual sensors will be aggregated and stored in a centralised location with researchers using big data analysis techniques to predict aged population trends and future care needs.

The research will evaluate the technology and incorporate it into the appropriate clinical implementation framework. The framework will be based on the following criteria: falls assessment, future falls detection, and falls prevention.



Application screenshot

Fernando Martin-Sanchez, Kathleen Gray, Cecily Gilbert | HaBIC | **Catherine Said** | Austin Health
Udaya Parampali | Computing and Information Systems | **Paul Wawryk** | Southern-Cross Care
Susan Harrison, Frank Smolenaers | Centre for Health Innovation | **Khalil Sukkar** | Ti Tree Lodge Pty Ltd
Michael McGrath, R Ney, M Harding | Semantrix Pty Ltd

SeeCare IPTV

Personalised Health Literacy Demonstrator

Despite the dramatic rise in accessing health information on the Internet, current health literacy levels of the Australian general public have not been improving. This suggests that new approaches to health literacy information and education are needed.

This project looked at the potential for improving health literacy standards in the community via the integration of two existing broadband technologies; IPTV or Internet Protocol Television and SeeCare which is a web-based, and consumer-led, care and support tool. The project was conducted with volunteers with type 2 diabetes who were invited to test the system in a mocked up lounge-room setting with large screen TV, remote controls, and comfortable chairs.

Following discussion with a diabetes health educator, the client's requirements culminated (after the educator had used the SeeCare web-based tool) in the provision of a tailored selection of videos (delivered from an IPTV server). Users could then select on screen personalised videos from a trusted source of reliable information, rather than be overwhelmed with a range of information of unknown relevance as occurs with typical searches on the Internet. Thus the *SeeCare IPTV* service offered a personalised form of augmentation of conventional telephone or face-to-face consultations between consumer and health educator.

This project found that *SeeCare IPTV* can deliver personalised, high quality and trusted health education via TV, a familiar and useable technology, particularly for those with lower health literacy levels. The platform was very well received by trial participants and the personalised video content was found to be of direct relevance, interesting and useful. However, participants noted that it should not completely replace face-to-face interactions and needs a wide range of compelling video content to engage the viewer over time.



Participants using keyboard-style remote control

SeeCare IPTV has great potential in streamlining the provision and consumption of health information and could remove barriers such as distance to services, and English as a second language by allowing educators to personalise information providing potential alleviation of health educator shortages. The findings of this project were published in March 2014:

[*SeeCare IPTV: Broadband technology for improved health literacy \(pdf 4.2MB\).*](#)

Ken Clarke, Mabel Kwong | IBES | **Kathleen Gray, Basil Alzougool** | Health and Biomedical Informatics Centre
Carolyn Hines | Diabetes Australia - Vic | **Gil Tidhar** | LivBetter (formerly SeeCare)
Feodor Frukhtman | Ericsson

SELFOMICS

Addressing the Information and Communication Needs of the Quantified Individual for Enabling Participatory and Personalised Medicine

Most diseases are the result of a complex interplay between genetic, environmental and physiological factors. However, advances in information and communications technology have seen the emergence of new tools to monitor the health of individuals. These monitoring tools allow the capture and recording of data about nearly all aspects of human health and fitness, including mental, emotional, physical, social and spiritual dimensions. This data allows the construction of the quantified self, allowing people to have greater understanding of their health status in relation to the world around them.

The initial findings were published in May 2013 in *Self-Quantification: The Informatics of Personal Data Management for Health and Fitness*, which provides a summary of the self-quantification landscape, classifying the various tools and mapping the data flows and some of the expected integration challenges. Researchers on this project have mapped the current technologies available for self-quantification and how these can be integrated into clinical databases such as personally controlled electronic health records.

Fernando Martin-Sanchez, Kathleen Gray, Pilar Cantero-Blanco, Cecily Gilbert, Manal Almalki | HaBIC
John Furler | General Practice | **Mark Jenkins** | Population and Global Health | **Sita Venkatraman** | NMIT
Arun Vishwanath | Electrical and Electronic Engineering | **Bernd Ploderer** | Computing and Information Systems
Katrina Allen | Murdoch Childrens' Research Institute



There are a multitude of devices available to monitor and track health

Paediatric Teledentistry

Delivering Oral Health Services to Rural and Regional Children

Many rural, remote and outer suburban areas receive inadequate oral health care services. This is due to workforce shortages, particularly specialist services, and often results in poor oral health outcomes. Teledentistry allows local service providers to seek advice from specialists without the patient having to leave the local practice.

This project conducted a field trial, supported by Google, that used teledentistry to deliver specialist consultations to children in Victoria improving the oral health of children and adolescents. Three Victorian general dental practitioners in Rosebud, Shepparton, and Geelong were trained to use teledentistry to conduct consultations between their clinics and the Royal Children's Hospital in Melbourne. Throughout the trial 43 patients aged from 2 to 18 were involved in teledentistry consultations with cleft lip and palate specialists and orthodontists.

Parents of patients responded positively to the study with the vast majority seeing it as a positive experience and a beneficial way to obtain dental services. Many were impressed by the ability of the local dentist and specialist to conduct the consultation obviating the need for travel.



Teleconsultation at Local Dental Clinic

Metropolitan based dental specialist

Teledentistry Set-up

The success of the trial provides early evidence on how teledentistry is transforming access to specialist care within the community and improving oral health outcomes. Teledentistry delivers tangible results including improved access to services in rural and regional Australia and reduced travel for patients and their families. Practitioners, patients and their parents found that teledentistry is an appropriate substitute to face-to-face consultations.

The findings of this trial were published in research paper in May 2014: [*Paediatric Teledentistry: Delivering oral health services to rural and regional children* \(pdf 2.8MB\)](#)

Rodrigo Mariño, David Manton, Matthew Hopcraft, Michael McCullough, Parul Marwaha | Oral Health Cooperative Research Centre, Melbourne Dental School | **Kerrod Hallett** | Royal Children's Hospital | **Ken Clarke** | IBES | **Ann Borda** | HaBIC

Enabling Social Connection for Long-Term Hospital Patients

Hospitalised children have a significant desire for communication with their families and peers at schools. However, they often face significant constraints upon communication to schools and homes when children are in hospital. This project addressed the needs of hospitalised children by enabling them to remain socially connected with their schools and families.

The research team designed, built and trialled a tablet-based prototype app. The design of the app was informed by workshops hosted with users that explored the use of technology within the hospital, school and home context. To facilitate communication a *Presence App* for Android tablets was developed using an *ambient technology* to create social connection between hospitalised children with their schools and homes without disrupting critical activities and preserving the privacy of children, schoolmates, parents and staff.

The app was trialled with a cohort of young patients undergoing extended hospitalisation along with their schools and families. The findings from the trial show that the novel ambient design worked well at creating social connection in the school and hospital contexts. However, it was less well suited to the family context where distraction and privacy are less of a concern and the needs are socially complex and often highly charged with anxiety.

This project was a collaboration between researchers at IBES, the Department of Computing and Information Systems at the University of Melbourne, the Royal Children's Hospital Education Institute, and the Parenting Research Centre, and was supported by Huawei Australia.

Greg Wadley, Frank Vetere, Lars Kulik | Computing & Information Systems

Liza Hopkins | Royal Children's Hospital Education Institute | **Julie Green** | Parenting Research Centre



A researcher explains the *Presence App* to a hospitalised child and her mother

Mobile Augmented Reality

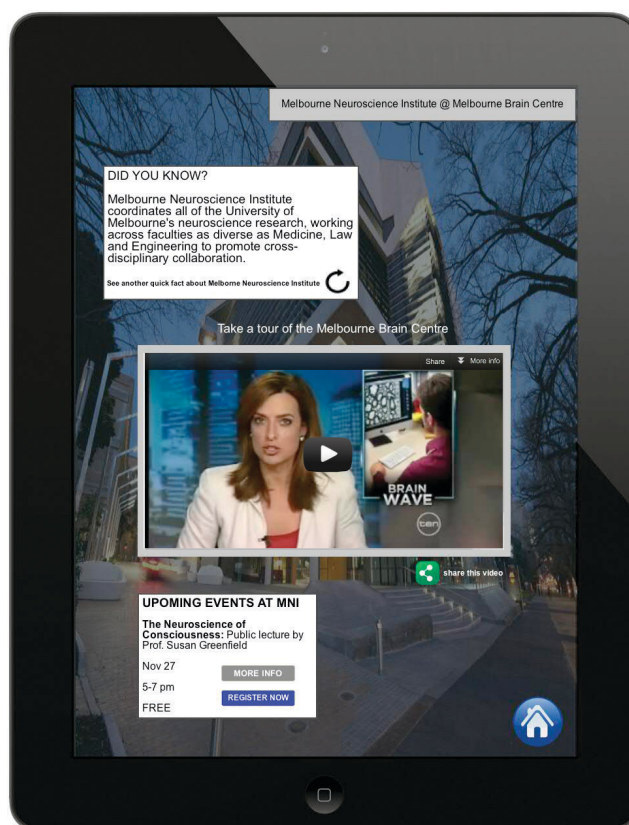
Exploring Interface, Information and Interaction in Blended Environments

Smartphone applications of mobile augmented reality (MAR) take what your eye can see through your phone's camera, blend it with digital sources of information about what you are seeing, and present both to you in a composite view. Such applications promise to mediate and strengthen personalised and serendipitous ways for people to interact with static features and changing phenomena in their vicinity in real time.

This project has conducted a technical review of MAR technologies, which was published in the IBES research publication *Interface, Interaction and Information: An exploration of Mobile Augmented Reality Present and Future* in August 2012.

The project has developed a prototype MAR app for smartphones and tablets, designed to engage the public with scientific research taking place in biomedical research institutes in the Parkville Precinct. The prototype has been field tested by communications staff at major institutes in the Precinct: Doherty Institute, Neuroscience Institute, Victorian Life Sciences Computation Initiative, and Walter and Eliza Hall Institute, and with 16 members of the general public.

Preliminary usability and user experience results from the project have been reported at two international conferences - International Conference on Communities & Technologies, Brisbane, June 2011, and MEDINFO 2013: 14th World Congress on Medical and Health Informatics: Building a healthcare future through trusted information, Copenhagen, August 2013.



A mobile augmented reality app to engage the public with the work of scientific research institutes

Kathleen Gray, **Jess Kilby**, **Fernando Martin-Sanchez** | HaBIC | **Kristine Elliott** | Medical Education
Jenny Waycott | Computing and Information Systems | **Bharat Dave** | Architecture, Building and Planning |
Amy Bujega | Melbourne Neurosciences Institute | **Helen Gardiner** | Victorian Life Sciences Computation Initiative
Liz Williams, **Penny Fannin** | Walter and Eliza Hall Institute | **Adrian Curtis** | Grimshaw Architects
Katherine Stakula | Victorian Comprehensive Cancer Centre

Health Service Provider Data Connectivity Requirements Mapping a Path for a Broadband Enabled Healthcare Future

A limited health workforce faces an increased demand for services due to increases in chronic diseases and an ageing population. Current healthcare practices cannot be sustained in the face of these pressures. Services need to adapt by adopting technology to: increase health workforce productivity, connect patients and clinicians, and facilitate preventative screening. To support the delivery of these services, healthcare service providers need access to high-speed broadband connectivity. However, for healthcare to take advantage of high-speed broadband, integrated planning and coordination of connectivity among health provider organisations is essential.

At present there is little information exchange and knowledge sharing across the health sector in relation to broadband requirements or performance. Current connectivity requirements of health service providers are disparate. In order to leverage new technologies, increased integration and better coordination of the provision of connectivity services is essential. This project examines the requirements for connectivity to support emerging services.

The project addressed a clear gap in knowledge by developing a systematic and strategic map of health provider connectivity pathways. Partnering with the Australian Centre for Health Innovation the project has reviewed the research literature and conducted surveys and interviews with health CIOs in Victoria. The findings of this research will inform policy development to deliver better provision of connectivity to health service providers, which underpins the next generation of health service delivery.

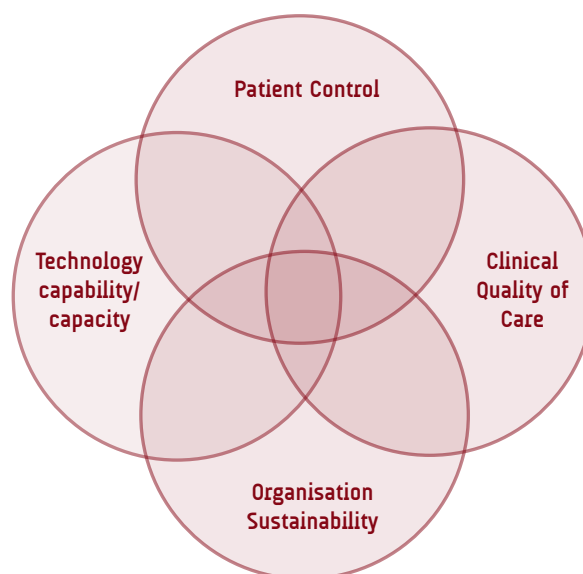
Kathleen Gray, Fernando Martin-Sanchez, Cecily Gilbert | HaBIC
Vikram Bhakoo | Management and Marketing | **Shanika Karunasekera** | Computing and Information Systems
Susan Harrison, Frank Smolenaers | Australian Centre for Health Innovation

An Open Research Initiative to Improve the Evaluation of Australian Telehealth Implementations

Telehealth evaluation is the examination of the effectiveness, appropriateness and cost of a telehealth service. This project is developing a framework for assessing telehealth implementations in Australia.

The framework has been developed by engaging clinical providers of telehealth services, experts from the Australasian Telehealth Society and the V3 consortium, and reviewing the international literature on telehealth evaluation to develop a multi-dimensional framework for evaluating telehealth implementations.

The proposed framework takes into consideration the views of stakeholders including clinicians, and telehealth project coordinators, currently involved in various telehealth projects, in three different organisations in Australia. The framework is linked to an existing framework that provides precise health performance indicators grounded upon technical aspects of telehealth. Additionally, the framework is based on a systematic review of literature related to telehealth evaluations on an international scale and finally, based on the grouping of the evaluation criteria and measures.



Telehealth evaluation framework: 4 interrelated dimensions

Details of the proposed framework were published in September 2013 in [*A Unified Approach for the Evaluation of Telehealth Implementations in Australia* \(pdf 1.8mb\)](#).

The project is now testing the framework with patients, clinicians, health service managers and IT managers at two major clinical sites (Melbourne Health and Royal Children's Hospital). The project has led to additional funding from State and Commonwealth governments for further work with Royal District Nursing Service and Yarrowonga Health on telehealth evaluations, offering additional trial sites for the framework.

Kathleen Gray, Ambica Dattakumar, Ann Borda | HaBIC | **Anthony Maeder** | University of Western Sydney
Beverley-Ann Biggs, Henry Gasko, Thomas Schulz | Royal Melbourne Hospital
David Noble | Private Anaesthetic Consultant | **Susan Jury** | Royal Children's Hospital

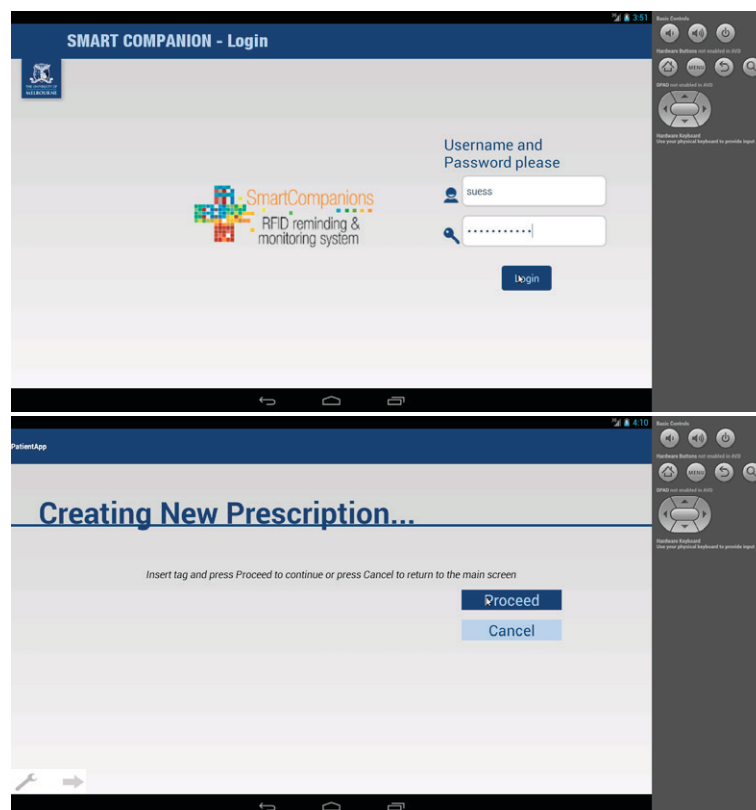
Smart Companion Medication Management for Older People with Chronic Illness

With Australia's population ageing, a significant proportion of older people live alone and many of these people suffer from chronic health conditions requiring multiple daily medications. Management of medication is important and broadband-enabled solutions can provide peace of mind to families and clinicians by ensuring older people adhere to their medication regimes.

This project has aimed to support older people through the development of a smart companion medicine shelf that can assist in the timely delivery of medication and allow the remote monitoring of compliance by health care professionals.

The project has developed a prototype smart medicine shelf based upon RFID and sensor networks. RFID and sensor network based systems can provide tailored messages about medication to older people therefore altering their medication taking behaviour. The smart medicine shelf can track a variety of medications, with each allotted its own compartment. The smart medicine shelf is connected to a health care centre allowing for the monitoring of medication usage.

Udaya Parampalli, Lars Kulik | Computing & Information Systems | **Elizabeth Ozanne** | Social Work
Fernando Martin-Sanchez | HaBIC | **Elizabeth Manias** | Nursing



Screenshots of the Android App that monitors patients medication

PhD Projects

An evaluation of Online Medical Consultation

Examining Theory, Practice, Sustainability Challenges and Consumer perspective

This project aims to provide a comprehensive assessment of the existing online medical consultation (OMC) practices globally on the Internet as well as locally in Australia followed by a design of a service model for proper conduct of such services. A reliable service model is required to address the various consumer concerns and provider challenges. The initial investigation of this study showed that OMC is a considerably growing phenomenon featuring several interaction modalities, covering multiple disciplines, and accessible to consumers throughout the world. On the local context, OMC have been conducted by some Australian health care providers since the approval of video consultations reimbursement scheme by the Australian government mid-2011. OMC is a relatively recent Internet phenomenon, where benefits and risks are not well investigated from consumers' perspective.

The study will investigate the main issues and challenges facing the adoption of online medical consultations as well as their implication on quality and safety. Finally, a comprehensive business model for proper conduct of online medical consultations will be developed to address the main challenges and issues found during the study in order to achieve higher quality and better access to health. The importance of this project stems from the high potential for OMC to address many of the issues related to health care delivery to remote and aged populations in Australia. In addition, OMC attracts demand from other categories like young Internet savvy people, and employees with inflexible working conditions.

Ibrahim Al-Mahdi | Health and Biomedical Informatics Centre

Telemedicine for the Management of Gestational Diabetes Mellitus

Gestational diabetes mellitus (GDM) affects 11-15% of pregnant women. Poorly controlled blood glucose level (BGL) in GDM is associated with poorer maternal and foetal outcomes. At least 50% of women with GDM need insulin to control hyperglycaemia. In the early stages of insulin initiation, women with GDM often require intensive and frequent support to manage GDM and achieve stable BGLs.

Telemedicine is a feasible service approach to support GDM management away from the traditional face-to-face consultations. Limited evidence from studies of telemedicine shows trends towards better BGL control, reduced service utilisation and fewer pregnancy complications in favour of telemedicine compared with usual care. Based at the Northern Hospital, this project will explore the use of telemedicine for up to 200 women with insulin treated GDM. The study will compare the effectiveness of telemedicine for GDM compared with existing approaches. The expected outcomes are a decrease in service utilisation, better BGL control and time to achieve BGL stability, fewer pregnancy complications as well as patient and clinician satisfaction with TeleGDM.

Tshepo Rasekaba | General Practice

Managing Chronic Pain Through Social Media

Chronic pain management is estimated to cost the Australian economy \$34 billion annually. There is a lack of understanding and stigma associated with chronic pain that presents ample opportunity to explore new and unique methods supported by high-speed broadband. This project explores how peer-to-peer networking and social media can be optimised to improve healthcare by empowering chronic pain patients and enhancing self-management.

Mark Meroli | Health and Biomedical Informatics Centre

Toward a Comprehensive Self-Quantification Personal Health Information Management System

This project reviews the data management capabilities currently available in self-tracking tools and ancillary tools, and it discusses the need for a systematic approach to modelling, managing and making sense of self-tracking data. This research aims to scope what is possible and test what is workable to improve information practice within the self-quantification environment.

Manal Almalki | Health and Biomedical Informatics Centre

Appendices

Personnel

Media

Publications

Presentations by IBES Executives

Events

Finance

Personnel

Advisory Board

Steve Wood, Chair
Genevieve Bell, Intel
Chris Hancock, AARnet
Mark Ablett, Juniper Networks
Cathy Steele, Monash University
Jamie Chard, NBN Co (to September 2013)
Kevin Bloch, Cisco (to June 2014)

Executive Committee

Thas Nirmalathas, Director, IBES (from August 2013)
Rod Tucker, Director, IBES (to August 2013)
Emma Dawson, Executive Director, IBES
Lynda Ball, Melbourne Graduate School of Education
Simon Bell, Management & Marketing
Andrew Kenyon, Melbourne Law School (to March 2014)
Jason Bosland, Melbourne Law School (from March 2014)
Fernando Martin-Sanchez, Health & Biomedical Informatics Centre
Scott McQuire, Culture & Communication
Elizabeth Ozanne, Social Work

IBES Staff

Thas Nirmalathas, Director
Emma Dawson, Executive Director
Fiorella Chiodo, Executive Assistant
Ken Clarke, Senior Research Fellow
Roger Hughes, Finance Officer
Chamil Jayasundara, Software Engineer
Adam Lodders, Communications Manager
Julien Ridoux, Chief Technology Officer

Researchers

University of Melbourne

Architecture, Building and Planning

Kirsten Larsen, Bharat Dave

Arts

Robyn Sloggett
Centre for Cultural Materials Conservation
Fran Edmonds, Alex Lambert, Susan Lowish,
Scott McQuire, Nikos Papastergiadis
Culture and Communication
Michael Arnold
Historical and Philosophical Studies
John Hajek, Rachel Nordlinger, Yvette Slaughter
Languages and Linguistics
Helen Sullivan
Melbourne School of Government
Emma Kowal
Social and Political Sciences

Business and Economics

Vikram Bhakoo, Brent Coker, Prakash Singh
Management and Marketing

Jongsay Yong
Melbourne Institute for Economic and Social Research

Melbourne Graduate School of Education

Lynda Ball, Vicki Steinle, Kaye Stacey, Robyn Pierce,
Paula de Barba

Gregor Kennedy, Linda Corrin
Centre for the Study of Higher Education

Engineering

Craig Bellamy, Steven Bird, Rachelle Bosua,
Shanton Chang, Hilary Davis, John Downs,
Suelette Dreyfus, Martin Gibbs, Marianne Gloet, Shanika
Karunasekera, Lars Kulik, Sherah Kurnia, Bjorn Nansen,
Udaya Paramalli, Bernd Ploderer, Wally Smith, Frank Vetere,
Greg Wadley, Jenny Waycott, Sarah Webber
Computing and Information Systems

Jayavardhana Gubbi, Yee Wei Law, Slaven Marusic, Marimuthu
Palaniswami, Arun Vishwanath
Electrical & Electronic Engineering

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Noot Fang, Julien Ridoux, Shuo Zhou
Institute for a Broadband-Enabled Society

Graham Moore, Tuan Ngo
Infrastructure Engineering

Medicine, Dentistry and Health Sciences

Bronwyn Davidson, Patricia Eadie, Robyn Garnett
Audiology and Speech Pathology

Lyndon Ormond-Parker, Marcia Langton
Sharon Huebner, Caden Pearson
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John Furler, Phyllis Lau
General Practice

Manal Almalki, Basil Alzougool, Ann Borda, Pilar Cantero-
Blanco, Ambica Dattakumar, Kathleen Gray, Cecily Gilbert,
Jess Kilby, Fernando Martin-Sanchez
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Robyn Woodward-Kron, Kristine Elliott
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Matthew Hopcraft, Roy Judge, David Manton,
Rodrigo Mariño, Parul Marwaha, Michael McCullough,
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Melbourne Dental School

Amy Bujega
Melbourne Neurosciences Institute

Patricia Nicholson, Elizabeth Manias
Nursing

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Otolaryngology

Richard Chenhall, Mark Jenkins, Merle Spriggs,
Deborah Warr
Population and Global Health

Beverley-Ann Biggs, Henry Gasko, Thomas Schulz
Royal Melbourne Hospital

Cathy Humphreys, Elizabeth Ozanne
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Mark Munro, Scott Middleton
Information Technology Services

Ben Loveridge, Gavan McCarthy, Peter Mellow
Scholarly Information

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Geraldine Cook
VCA

Gary McPherson, Robin Stevens, John Baretta
Melbourne Conservatorium of Music

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Chinthaka Dissanayake
Electrical and Electronic Engineering

Tshepo Rasekaba
General Practice

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Social Work

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Susan Harrison, Frank Smolenaers
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Zoe Black
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Barney Dalgarno
Charles Sturt University

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City of Darebin

Carolyn Hines
Diabetes Australia – Vic

Feodor Frukhtman, Vincent Yin
Ericsson

Adrian Curtis
Grimshaw Architects

Sophie Li, David Brady
Hear For You

Julie Gibson, Helen Travers, Ernest Hunter
HITnet

Brendan Fitzgerald
Infoxchange

Christine McDonald, Peter Rochford
Institute for Breathing & Sleep

Gil Tidhar
LivBetter (formerly SeeCare)

Mark Crocombe, Jacinta Crocombe
Kanamkek-Yile Ngala Museum

Anne Holland, Richard Rose, Alice Watson
LaTrobe University

Rahim Md Mahbubu
Monash University

Katrina Allen
Murdoch Childrens' Research Institute

Sita Venkatraman
NMIT

Sun Yung
National University of Singapore

Tim Bentley, Laurie McLeod, Stephen Teo, Erling Rasmussen, Felix Tan
NZ Work Research Institute, AUT University

Serenity Hill
Open Food Foundation

Rob Myers
Panasonic

Julie Green
Parenting Research Centre

David Noble
Private Anaesthetic Consultant

Tania Lewis
RMIT University

Kerrod Hallett, Susan Jury
Royal Children's Hospital

Liza Hopkins
Royal Children's Hospital Education Institute

Michael McGrath, R Ney, M Harding
Semantrix Pty Ltd

Paul Wawryk
Southern-Cross Care

Sonja Pedell
Swinburne University of Technology

Rosa McKenna
Thamarrurr Regional Authority Aboriginal Corporation

Khalil Sukkar
Ti Tree Lodge Pty Ltd

Michael Dieter
University of Amsterdam

Patrice Braun
University of Ballarat

Anthony Maeder
University of Western Sydney

Karen Livesay
Victoria University

Katherine Stakula
Victorian Comprehensive Cancer Centre

Helen Gardiner
Victorian Life Sciences Computation Initiative

Liz Williams, Penny Fannin
Walter and Eliza Hall Institute

Bruce Joy
VastPark

Media

Releases

Rod Tucker Inducted into the Pearcey Hall of Fame
9 August 2013

IBES Invests \$460,000 in Broadband Research
1 October 2013

Working from Home Increases Productivity
31 October 2013

Microsoft Research Centre for Social NUI launches
5 December 2013

IBES joins ng Connect as a Foundation Partner
10 December 2013

Microsoft Research Centre for Social NUI launches
5 December 2013

Coverage

Mobile devices in power play
The Age, 4 July 2013

Upgrade needed for full NBN firepower
The Age, 8 July 2013

IT energy consumption lower than previously claimed
ComputerWeekly.com, 16 July 2013

Cloud energy consumption estimates challenged by study
Cloud Pro, 16 July 2013

Wireless cloud to consume more and more energy
Techradar, 16 July 2013

Labor and Coalition broadband policies – what's the difference?
The Conversation, 17 July 2013

How The Labor And Coalition Broadband Policies Differ: A Hype-Free Explainer
Lifehacker, 17 July 2013

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The Conversation, 17 July 2013

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Business Spectator, 18 July 2013

NBN Co denies preferential agencies plan
The Age, 23 July 2013

Why can a robot build a car but not a bird's nest?
ABC: The Drum, 2 August 2013

Speed check: what NBN promises really mean
The Age, 7 August 2013

News Corp Australia v the NBN – is it really all about Foxtel?
The Conversation, 8 August 2013

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News Corp Australia v the NBN – is it really all about Foxtel?
The Guardian, 9 August 2013

Alex Zelinksy bags top tech award
The Australian, 9 August 2013

Rod Tucker enters 'Hall of Fame' at iAwards
Comms Day, 12 August 2013

Rod Tucker, Kevin Robert Elz inducted into Pearcey hall of fame
Technology Spectator, 12 August 2013

Bigger frames make Wi-Fi a power miser: boffins
The Register, 12 August 2013

Better public Wi-Fi in Australia? Let's send asignal
The Conversation, 23 August 2013

Can Australia afford the Coalition'sNBN?
The Conversation, 28 August 2013

Australia, what do you think of the NBN?
The Conversation, 4 September 2013

FactCheck: will the NBN take another 20 years to complete?
The Conversation, 5 September 2013

How can big data go the distance for runners (and the rest of us)?
The Conversation, 5 September 2013

Radio Interview with Emma Dawson
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The Wire, 23 September 2013

NBN Co's board members resign – butwhy?
The Conversation, 23 September 2013

NBN Story
The Project, Channel 10, 24 September 2013

Why the NBN Co Board Resigning Is Not Our Biggest Broadband Problem
Lifehacker, 24 September 2013

IBES invests \$460,000 in broadband research
IT Wire, 1 October 2013

IBES Awards \$460,000 in Seed Funding
Comms Day, 2 October 2013

IBES invests \$460,000 in broadband research
WhaTech, 3 October 2013

Fallout over NBN Board line-up
RN Drive, 4 October 2013

End of the Silk Road: how did Dread Pirate Roberts getbusted?
The Conversation, 4 October 2013

Sorry NSA, but the Tor network is secure – and it's here to stay
The Conversation, 7 October 2013

Home-workers are hard workers, study finds
The Age, 30 October 2013

Work from home? Too late, they're already doing it
BRW, 30 October 2013

Interview with Rachelle Bosua about Telework Research
ABC News Radio, 30 October 2013

Teleworking works: study
IT Wire, 30 October 2013

Working remotely: There has to be trust
Nelson Mail, 31 October 2013

Working from home increases productivity
Health Canal, 31 October 2013

A/NZ managers remain wary of teleworking: research
ARN, 31 October 2013

Companies are failing to measure teleworking's benefits: study

Technology Spectator, 31 October 2013

'Hybrid Teleworkers' Produce Better Outcomes - Study

Pro Bono Australia News, 4 November 2013

Teleworking: Corporate Australia's Unrealised Potential

WhaTech, 19 November 2013

Companies form 'bad habits' in managing teleworking

IT Wire, 19 November 2013

Does anyone care about Teleworking?

Technology Spectator, 25 November 2013

The Rise and Fall of Australia's \$44Billion Broadband Project

IEEE Spectrum, 26 November 2013

Telework Finds a Home

Weekend West, 30 November 2013

Building the case for 'Hybrid' Telework

Human Resource Executive Online, 5 December 2013

Microsoft opens social NUI research centre in University of Melbourne

ARN, 5 December 2013

Microsoft, University of Melbourne join forces on Natural User Interface

Technology Spectator, 5 December 2013

Microsoft Kinect research centre opens in Melbourne

CIO, 5 December 2013

Microsoft, University of Melbourne launch high-tech research centre

The Australian, 5 December 2013

\$8m Microsoft Kinect research centre opens in Melbourne

Australian Financial Review, 5 December 2013

World first for Melbourne as Microsoft opens social interactive tech lab

The Age, 5 December 2013

Microsoft, Melbourne University and Victoria in 'flagship' NUI partnership

IT Wire, 5 December 2013

Microsoft Research opens "Microsoft Centre for Social Natural User Interface" in Melbourne

istartedsomething.com, 5 December 2013

What A Social NUI Is (And Why Developers Should Care)

Lifehacker, 5 December 2013

Will your next phone be FairTrade?

The Conversation, 6 December 2013

Institute for a Broadband-Enabled Society joins Alcatel-Lucent's ng Connect

Technology Spectator, 10 December 2013

Alcatel-Lucent call for start-ups to get moving

The Australian, 10 December 2013

Alcatel-Lucent seeks further ng Connect members

Telecom Paper, 10 December 2013

IBES joins ng Connect

CommsWire, 10 December 2013

Institute for a Broadband-Enabled Society joins Alcatel-Lucent's ng Connect

Technology Spectator, 10 December 2013

Innovation multiplied: Collaboration matters for a connected economy

Technology Spectator, 11 December 2013

IBES joins ng Connect as a foundation partner

WhaTech, 11 December 2013

If you don't like Facebook, you can leave - it's easier than you think

The Conversation, 26 December 2013

IBES research suggests public unsure of NBN benefits

CommsDay, 31 January 2014

Public perception of NBN very positive: study

IT News, 7 February 2014

NBN Enjoys Massive Public Support Depite Overwhelmingly Negative Coverage

Delimiter, 10 February 2014

Huawei teams up with Griffith University on research

Technology Spectator, 21 February 2014

Snowden and Berners-Lee's campaign for an open Internet

The Conversation, 13 March 2014

CSIRO, NICTA sign on to ng Connect

Technology Spectator, 7 April 2014

CSIRO, NICTA sign on to ng Connect

The Australian, 7 April 2014

NICTA, CSIRO join ng Connect

Comms Day, 8 April 2014

Slower. Less reliable. Less productive. This is what Turnbull's NBN looks like

The Guardian, 7 May 2014

What now for the NBN as taxpayer investment is capped?

The Conversation, 15 May 2014

Google-backed Vic trial highlights tele-dentistry benefits

IT News, 27 May 2014

Field is Open Wide for Rural Teledentistry

Pulse + IT, 28 May 2014

Google's plan for Internet access from the sky

The Conversation, 16 June 2014

Publications

IBES Research Publications

M Arnold, C Bellamy, B Coker, M Gibbs, P Hill, B Nansen, R Wilken, *Framing the NBN: Public Perceptions and Media Representations* (Institute for a Broadband-Enabled Society, 2014) ISBN 978 0 7340 4883 7

K Clarke, K Gray, M Kwong, B Alzougool, C Hines, F Frukhtman, G Tidhar, *SeeCare IPTV: Broadband Technology for Improved Health Literacy*, (Institute for a Broadband-Enabled Society, 2014) ISBN 978 0 7340 4913 1

K Clarke, M McCullough, F Frukhtman, *Uni TV: Trialling IPTV for Education*, (Institute for a Broadband-Enabled Society, 2013) ISBN 978 0 7340 4868 4

G Cook, R Woodward-Kron, *Hear Me Out! Enhancing Social Inclusion and Wellbeing for Deaf and Hearing Impaired Teens Through an Online Peer Support Program* (Institute for a Broadband-Enabled Society, 2013) ISBN 978 0 7340 4884 4

A Dattakumar, K Gray, S Jury, BA Biggs, A Maeder, D Noble, A Borda, T Schulz, H Gasko *A Unified Approach for the Evaluation of Telehealth Implementations in Australia* (Institute for a Broadband-Enabled Society, 2013) ISBN 978 0 7340 4865 3

F Edmonds, R Chenhall, M Arnold, T Lewis, S Lowish, *Telling Our Stories: Aboriginal Young People in Victoria and Digital Storytelling*, (Institute for a Broadband-Enabled Society, 2014) ISBN 978 0 7340 4909 4

A Lambert, S McQuire, N Papastergiadis, *Free Wi-Fi and Public Space: The State of Australian Public Initiatives*, (Institute for a Broadband-Enabled Society, 2013) ISBN 978 0 7340 4837 0

R Mariño, D Manton, M Hopcraft, M McCullough, K Hallett, K Clarke, A Borda, *Paediatric Teledentistry: Delivering Oral Health Services to Rural and Regional Children* (Institute for a Broadband-Enabled Society, 2014) ISBN 978 0 7340 4919 3

Book Chapters

M Arnold, T Apperley, B Nansen, R Wilken, M Gibbs 'Patchwork Network: Spectrum Politics, the Digital Home and Installation of the Australian National Broadband Network', in J Choudrie and C. Middleton (eds.) *Management of Broadband Technology Innovation* (New York: Routledge, 2014).

K Gray, F Martin-Sanchez, G Bright, A Cheng, 'E-Collaboration in biomedical research: Human factors and social media' in J Rodrigues (ed.), *Advancing Medical Practice Through Technology: Applications for Healthcare Delivery, Management, and Quality* (Hershey, PA: Medical Information Science Reference, 2014).

A Lodders 'Australia's National Broadband Network as an Enabling Platform for Innovation in Health Applications and Services: A Genealogy', in J Choudrie and C. Middleton (eds.) *Management of Broadband Technology Innovation* (New York: Routledge, 2014).

F Martin-Sanchez, K Gray, GH Lopez-Campos, 'Biomedical informatics methods for personalised medicine and participatory health' in N Sarker (ed.) *Methods in Biomedical Informatics: A Pragmatic Approach* (New York: Elsevier, 2014).

Journal Articles

M Dias, M Arnold, M Gibbs, B Nansen, R Wilken, 'Asynchronous speeds: disentangling the discourse of high speed broadband in relation to Australia's National Broadband Network' (2014) 151 *Special issue: Broadband Futures: Content, Connectivity and Control Media International Australia, Incorporating Culture & Policy* 117.

L Fernandez-Luque, A Lau CS Bond, K Denecke, F Martín Sanchez, 'New trends in health social media: Hype or evidence-based medicine' (2013) 192 *Studies in Health Technology & Informatics* 1240.

M Gibbs, C Bellamy, M Arnold, B Nansen, T Kohn 'Digital registers and estate planning' (2013) 16(3) *Retirement and Estate Planning Bulletin* 63.

C Graham, M Gibbs, L Aceti 'Introduction to the Special Issue on the Death, Afterlife, and Immortality of Bodies and Data' (2013) 29(3) *The Information Society: An International Journal* 133.

J Jin, J Gubbi, S Marusic, M Palaniswami, 'An information framework of creating a smart city through Internet of Things' (2014) 1(2) *IEEE Internet of Things Journal* 112.

J Kilby, K Gray, K Elliott, J Waycott, F Martin-Sanchez, B Dave, 'Designing a mobile augmented reality tool for the locative visualisation of biomedical knowledge' (2013) 192 *Studies in Health Technology and Informatics* 652.

A Lambert, S McQuire, N Papastergiadis 'Free Public Wi-Fi and E-Planning: The Use of Online Planning to Build Better Networked Public Places' (2014) 3(2) *International Journal of E-Planning Research* 70.

F Martin-Sanchez, K Gray, R Bellazzi, G Lopez-Campos, G. (2013). 'Exposome informatics: considerations for the design of future biomedical research information systems' (2014) 21(3) *Journal of the American Medical Informatics Association* 386.

S Marusic, J Gubbi, H Sullivan, YW Law, M Palaniswami, 'Participatory Sensing, Privacy and Trust Management for Interactive Local Governance,' (2014) Fall Issue. *IEEE Technology and Society Magazine* 201.

S McQuire 'Photography's afterlife: Documentary images and the operational archive,' (2013) 18(3) *Journal of Material Culture*

T Miron-Shatz, MM Hansen, FJ Grajales III, F Martin-Sanchez, PD Bamidis, 'Social media for the promotion of holistic self-participatory care: An evidence based approach. Contribution of the IMIA Social Media Working Group.' (2013) 8(1) *Yearbook of Medical Informatics* 162.

B Nansen, R Wilken, M Arnold, M Gibbs, Digital Literacies and the National Broadband Network: Competency, Legibility, Context' (2013) 147 *Media International Australia* 18

N Peek, JH Holmes, F Martin Sanchez, J Sun, 'Big Data analytics in biomedicine and health: Trends and challenges' (2013) 192 *Studies in Health Technology & Informatics* 1237.

G Wadley, F Vetere, L Hopkins, J Green, L Kulik 'Exploring ambient technology for connecting hospitalised children with school and home' (2014) 72(8-9) *International Journal of Human Computer Studies Special issue on Designing for Mental Health and Emotional Wellbeing* 640.

R Wilken, M Arnold, B Nansen, M Gibbs, 'National, Local and Household Media Ecologies: The Case of Australia's National Broadband Network' (2014) *Communication, Politics & Culture* 46.2: 136-154.

Conference Papers

M Almalki 'Classification of data and activities in self-quantification systems' *Big Data* 14 3-4 April 2014, Melbourne.

C Bellamy, M Arnold, M Gibbs, T Kohn, B Nansen 'Mediating the digital hereafter: life beyond the timeline' (2013) *Prato Community informatics Research Network (CIRN) Conference*, 28-30 October 2013, Monash Centre, Prato Italy.

M Gibbs, M Carter, M Arnold, B Nansen, B 'Serenity Now bombs a World of Warcraft funeral: Negotiating the Morality, Reality and Taste of Online Gaming Practices' (2013) *Internet Research 14.0: The 14th Annual Conference of the Association of Internet Researchers (AoIR)*, 23-26 October 2013, Denver, USA.

J Gubbi, S Marusic, AS Rao, YW Law, M Palaniswami, 'A Pilot Study of Urban Noise Monitoring Architecture Using Wireless Sensor Networks' *Proceedings International Conference on Advances in Computing, Communications and Informatics (ICACCI-2013)*, 22-25 August 2013, Mysore, India.

A Holland 'Is eHealth the way forward?' *Victorian Allied Health Conference*, 28 March 2014, Melbourne.

M Kertesz, C Humphreys, 'Working in the Cloud: Making Personal Records Accessible' *13th Australasian Conference on Child Abuse and Neglect*, 10-13 November 2013, Melbourne.

F Martin-Sanchez 'Self-quantification systems: Big Data prospects and challenges' *Medinfo 2013*, Copenhagen, Denmark.

F Martin-Sanchez 'Interactive digital technologies for health and wellness' *HIC 2013*, Adelaide.

F Martin-Sanchez 'Participatory health: The Role of informatics and implications for the patient-physician encounter' *Communication, Medicine and Ethics (COMET) 2013*, Melbourne.

F Martin-Sanchez, 'Biomedical informatics: Its role in merging participatory health and personalised medicine' *International Workshop on New Technologies in Medicine*, 26 August 2013, A Coruña, Spain.

F Martin-Sanchez 'Self-monitoring devices: Information processing challenges for health applications', *24th Australasian Conference on Information Systems*, 6 December 2013, RMIT University, Melbourne.

F Martin Sanchez, 'Self-quantification systems: Big Data prospects and challenges', *American Medical Informatics Association, Annual meeting*, November 2013, Washington DC.

B Nansen, M Arnold, R Wilken, M Gibbs (2013) 'Users and Non-Users of Next Generation Broadband' *Internet Research 14.0: The 14th Annual Conference of the Association of Internet Researchers (AoIR)*, 23-26 October 2013, Denver, USA.

L Ormond-Parker, W Patrick, A Corn, C Pearson, '2064: 50 years from how, strategies and case studies for technology driven Indigenous futures' *Australian Institute for Aboriginal & Torres Strait Islander Studies National Indigenous Studies Conference*, 25 March 2014, Canberra.

Presentations by IBES Executives

Rod Tucker

CIO Summit, Gold Coast
29–31 July 2013

American-Australian Leadership Dialogue
7 August 2013

Thas Nirmalathas

Research Presentation Ryerson University, Canada
Canada 15 March 2014

IEEE Chapter Seminar, Ryerson University, Canada
17 March 2014

Presentation to the Independent Cost-benefit Analysis of Broadband and Review, Department of Communications
15 April 2014

IEEE International Microwave Symposium, Tampa Florida
3–6 June 2014

International Conference on Communications, Sydney
10–14 June 2014

Collaborative Research Network, Edith Cowan University
26–27 June 2014

Emma Dawson

Australia 3.0 Forum, Melbourne
8 August 2013

M-Enabling Australasia 2013 Forum, Sydney
14 August 2013

Committee for Regional and Rural Affairs, Parliament of Victoria
16 September 2013

Forum on Leadership in the Digital Age (LIDA)
25 September 2013

Events

Being Social in Online Games: Five Research Elements to Consider

Monday 8 July 2013. Public Lecture by Mia Consalvo, Canada Research Chair, Game Studies and Design, Concordia University, Montreal

Urban Connectedness Workshop

Tuesday 30 July 2013. IBES Seed Funding Workshop.

Rural and Regional Digital Development Workshop

Wednesday 31 July 2013. IBES Seed Funding Workshop.

Digital Social Inclusion and Cohesion Workshop

Wednesday 31 July 2013. IBES Seed Funding Workshop.

Free Wi-Fi and Public Space: The State of Australian Public Initiatives

Tuesday 13 August 2013. IBES research publication launch.

The National E-Health Initiative

Friday 20 September 2013. Public Lecture by Peter Fleming, National eHealth Transition Authority.

IBES Annual Symposium

Monday 30 September 2013. IBES research showcase.

Telework Congress

Tuesday 19 November 2013. Lead event of the Australian Government's Telework Week.

IBES End of Year Celebration

Tuesday 3 December 2013.

Launch of the Microsoft Research Centre for Social Natural User Interfaces

Thursday 5 December 2013.

The Fourth Paradigm: Data-Intensive Scientific Discovery

Thursday 5 December 2013. Public Lecture by Tony Hey, Vice-President Microsoft Research Connections

ng Connect Research Workshop

Thursday 16 January 2014. Workshop hosted by IBES and ng Connect to foster research collaboration.

PhD Research Seminar

Thursday 27 February 2014. Seminar by IBES PhD candidates showcasing their research.

Participatory Sensing for Interactive Local Government

Friday 7 March 2014. IBES Research Seminar by Slaven Marusic.

Seminar: Infrastructure & Regional Development: The Case of Broadband in the US

Tuesday 11 March 2014. Seminar by Kingsley E Haynes, School of Public Policy, George Mason University

Launch of the Health & Biomedical Informatics Centre

Tuesday 28 March 2014.

Open Food Network (OFN) System: Connecting and Supporting the Sustainability of Regional Food Supply Chain Communities

Friday 4 April 2014. IBES Research Seminar by Sherah Kurnia and Kirsten Larsen.

Wireless 5G Future

Wednesday 11 June 2014. CEET Public Lecture by China Mobile's Chief Scientist of Wireless, Dr Chih-Lin I

Consulting Technology

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Schedule 1

Audit Opinion

Department of State Development, Business and Innovation
Level 35, 121 Exhibition Street
Melbourne 3000

THE INSTITUTE FOR A BROADBAND ENABLED SOCIETY (IBES)

THE UNIVERSITY OF MELBOURNE

This Audit Opinion is prepared for the purposes of the Grant Agreement dated 24th June 2011 ("the Agreement") between the Crown in Right of the State of Victoria as represented by its Department of Business and Innovation and the University of Melbourne ("the University").

Scope

We have conducted an independent audit in accordance with Australian Auditing Standards of the Financial Report for the period 1 July 2013 to 30 June 2014 provided by the University which specifies an amount of \$2,241,075.60 of expenditure on the Project and \$6,378,014.19 as Participants in-kind Contributions towards the Project, in order to express an opinion on it for the purposes of the Agreement.

Our audit involved an examination, on a test basis, of evidence for supporting the amount of expenditure incurred, including all Grant funds and the amount of contributions (both cash and in kind) received. This included an examination of the financial records and receipts, and an evaluation of the policies and procedures used to calculate the expenditure of the Project and the Participants Contributions. These procedures have been undertaken to form an opinion as to whether the methodology used to calculate the expenditure and the in-kind contributions is in accordance with the Agreement, and that the figures stated are true and fair.

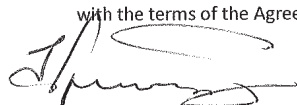
The prevention and detection of fraudulent activity is the responsibility of University of Melbourne management. Our audit procedures were conducted with a focus on addressing specific objectives from a control systems design perspective. We did not examine all transactions over the defined review period, and while an outcome of these procedures may be the detection of fraud, this was not the objective of the review. As a consequence, we do not provide a guarantee that all errors or omissions, whether intentional or otherwise were detected.

The Audit Opinion expressed in this report has been formed on the above basis.

Audit Opinion

We confirm that in our opinion:

- expenditure of \$2,241,075.60 has been incurred on the Project; and
- the Participants In-kind Contributions to the Project is \$6,378,014.19 in accordance with the terms of the Agreement.



John Phillips
CFO and Partner, Accounting and Assurance

Date: 25 September 2014

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Sydney Level 3 65 Berry Street North Sydney NSW 2060 Australia t +61 2 9923 9800 f +61 2 9929 6731
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Brisbane Level 5 200 Mary Street Brisbane QLD 4000 Australia t +61 7 3136 2900 f +61 7 3136 2999
Perth Level 14 Governor Stirling Tower 197 St Georges Terrace Perth WA 6000 Australia t +61 8 6188 7680 f +61 8 6188 7607
Hyderabad Krishi-e 8-2-293 Plot 499 Road 36 Jubilee Hills 500033 Hyderabad India t +91 40 23552694 VoIP: +61 3 9617 0294

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**Consolidated Financial Statement of Income and Expenditure
for the year 1 July 2013 to 30 June 2014**

Project Title: The Institute for a Broadband Enabled Society (IBES)
 Grantor: Dept of Innovation Industry & Regional Development
 Chief Investigator: Prof. Thas Nirmalathas (IBES Director)
 UOM Reference: 051196, 051197 (099646)
 Start Date: 1-Jul-11 End date: 30-Jun-15

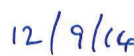
	<u>Actual</u>
	<u>Excl GST</u>
	\$
INCOME	
University of Melbourne Cash Contribution Year 3	1,040,000.00
Interest Earned on Funds	63,197.95
Total Income for the reporting period	1,103,197.95
EXPENDITURE	
Salary & Oncosts Expenses	1,111,431.05
Research SEED Funding Expenses	650,215.29
Contracted Services Fees(Seed Funding)	22,275.00
Scholarship	56,250.00
Travel and Conference Expenses	17,997.98
Consumables & Supplies	18,547.88
Event Launch expenses- Habic	2,000.00
Bursaries	2,000.00
Equipment Hire	2,599.09
Grants (Seed Funding)	22,302.00
Infrastructure related expenses	2,087.46
Audit Expense	7,450.00
Asset Expenses(Seed Funding)	25,919.85
Microsoft Centre Contribution(SNUI)	300,000.00
Total Expenditure for the reporting period	2,241,075.60
Surplus / (Deficit) for reporting period	(1,137,877.65)
Carryforward Surplus/(deficit) from previous period	3,865,387.67
Project balance as at 30 June 2014	2,727,510.02

I certify that:

- a) the income and expenditure shown above has taken place and is true and correct as reflected in the University's accounting system; and
 b) salaries paid under the grant accord with the general rates in force at the University.



Orazio Francavilla CPA
 Senior Research Accountant
 Finance & Planning Group
 The University of Melbourne



Date

**Statement of In-Kind Contributions
for the period 1 July 2013 to 30 June 2014
University of Melbourne**

Project Title: THE INSTITUTE FOR A BROADBAND ENABLED SOCIETY (IBES)
Grantor: Department of Innovation, Industry & Regional Development
Chief Investigator: Prof. Thas Nirmalathas
Our Reference: 051197
Commencement: 1-Jul-11 Conclusion: 30-Jun-15

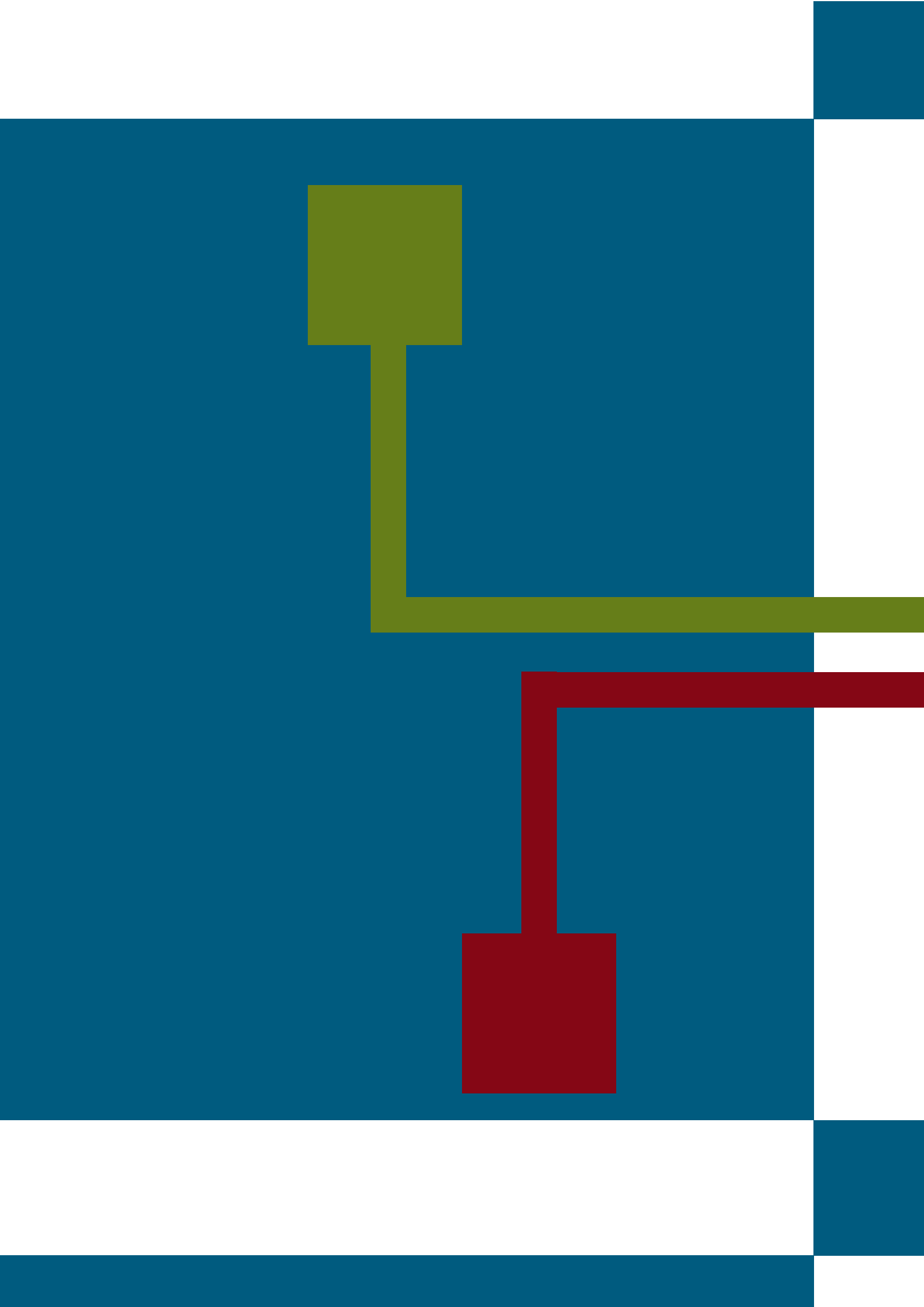
	<u>\$</u>
Salary & Oncosts	1,050,422.51
Indirect costs	1,713,216.68
Industry In-kind and Cash	-
In-kind from Investment	<u>3,614,375.00</u>
Total In-Kind Contributions as at 30 June 2014	<u><u>6,378,014.19</u></u>


Certification:

I hereby certify that the In-Kind contributions have been provided in accordance with the agreement between the Department of Business and Innovation (DBI) and The University of Melbourne.



Prof. Thas Nirmalathas
Chief Investigator





Institute for a Broadband-Enabled Society
Level 4, Building 193
The University of Melbourne, Victoria 3010
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