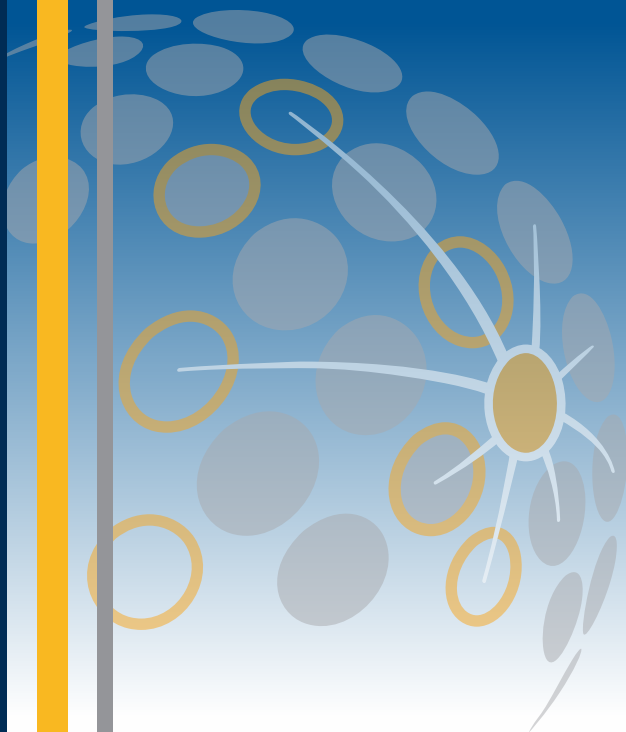


# IBES

Institute for a Broadband-Enabled Society

Annual Report 2013



**IBES**

Institute for a  
Broadband-Enabled Society



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## Director's Welcome

Welcome to the 2013 IBES Annual Report. The past year has seen the Institute grow, develop and consolidate its place as a leader in interdisciplinary research exploring broadband-enabled applications. It has also been a year of changes in staff, including the appointment of Emma Dawson as Executive Director, and new appointments to the Executive Committee. These changes bring new and different outlooks to the Institute, and bode well for its future growth.

In addition to these staff changes, this will be my last welcome as Director of IBES. I will be retiring as Director of IBES on 30 August, having served as the Foundation Director of IBES since 2009. My retirement will bring to an end my 24 years as a Professor at the University of Melbourne.

In December 2012 the Institute was reviewed by a panel of experts both internal and external to the University. The outcome of the review was positive, and confirmed that the Institute is fulfilling its mission to develop innovative interdisciplinary research, connecting and collaborating with industry and engaging the community to explore the impact of broadband-enabled technologies.

One highlight of the past year was the hosting of the first Australian Telework Congress, the launch event of National Telework Week, at the University of Melbourne. IBES hosted the Congress in partnership with the Commonwealth Department of Broadband, Communications and the Digital Economy, the Australian Information Industry Association (AIIA), Australian Industry Group (Ai Group), Telstra and our industry partner Cisco. Over 350 people attended the event, bringing together government, industry and academia, with the Prime Minister presenting an address to the Congress via Telepresence from her office in Parliament House.

Another highlight was then IBES Executive Director Dr Kate Cornick receiving a 2012 Vice-Chancellor's Award for Outstanding Contribution for creating connections, recognising her contribution to engagement at the University. Also recognised was Fiorella Chiodo for her service to the University, receiving a Bronze Medal acknowledging her 25 years of service.

There were many other exciting activities during the year, and I encourage you to read this report for details.



**Rod Tucker OAM**

Laureate Professor  
Director, IBES

On a personal note, it has been a great experience stewarding IBES from its inception to where it is today. I have enjoyed many personal interactions with researchers from across the University and with our many industry partners. I look forward to watching it grow on the next phase of its journey.



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## Overview

Broadband is fast becoming an essential component of contemporary human life. Across the planet demand for data is growing as the number of devices accessing broadband networks proliferates. In Australia the Commonwealth Government is investing in the provision of high-speed broadband increasing the access and connectivity available to Australian households.

The Institute for a Broadband-Enabled Society (IBES) is researching the impact that broadband is having across society and developing new and innovative services to harness the potential of increased connectivity.

Established in 2009, IBES is an interdisciplinary research institute at the University of Melbourne. IBES is supported by the Victorian State Government, the University and our industry partners.

This annual report provides details of IBES' activities over the year 1 July 2012 to 30 June 2013.

The past year has seen the Institute for a Broadband-Enabled Society consolidate its position as a leader in supporting interdisciplinary research. This has been achieved through an active program of events, engagement with industry, government, and academia and the ongoing dissemination of research outcomes. In this report you will find details about IBES' activities over the past year and information about our seed funded and PhD research projects across our four themes of business and government, culture and community, education and learning, and health and ageing.



Steve Wood, CEO Tennis Australia and IBES Advisory Board Chair presents at the 2012 Annual Symposium



## Staff

In 2013 IBES witnessed the departure of Dr Kate Cornick as Executive Director, Brad Gathercole as Senior Telecommunications Engineer and Monjita Dutta-Doloi as Finance Officer. The following three staff were welcomed into IBES.

### **Emma Dawson, Executive Director**

Emma joined IBES as Executive Director in March 2013. Emma was an adviser to the Minister for Broadband, Communications and the Digital Economy, Senator Stephen Conroy from 2008, overseeing the switchover from analogue to digital television, and was responsible for media policy, including ABC and SBS funding, broadcast policy, spectrum policy and the Convergence Review. Prior to joining the Minister's office, Emma was a Research Fellow at the Institute for the Study of Global Movements, and a PhD candidate at the National Centre for Australian Studies at Monash University.

### **Dr Julien Ridoux, Senior Telecommunications Engineer**

Julien received a PhD in Telecommunications and Computer Science in 2005, from the Pierre and Marie Curie University. Since joining the University of Melbourne in 2006, Julien has managed and developed several research projects on Internet performance measurement and clock synchronisation. As the Senior Telecommunications Engineer, Julien brings his technical expertise to the Australian Broadband Applications Laboratory.

### **Roger Hughes, Finance Officer**

Roger joined IBES in April 2013. Roger has been working at the University of Melbourne for 15 years starting in the School of Behavioural Science. Roger was Department Manager of the Department of Medicine at St Vincent's Hospital and then Business Manager for UniWater and the Australia - China Centre for Water Resources Research.



New IBES Staff, Dr Julien Ridoux, Emma Dawson & Roger Hughes



## Executive Committee

2013 also saw changes to the IBES Executive Committee. Dr Kathleen Gray from Health & Biomedical Informatics stepped down after serving on the committee since 2009. IBES welcomed two new members to the Executive Committee. Simon Bell, Professor of Marketing, Faculty of Business and Economics and Director of Executive Education at the University of Melbourne and Andrew Kenyon Professor of Law and a Director of the Centre for Media and Communications Law in the Melbourne Law School.



Simon Bell

Andrew Kenyon

The IBES community was saddened at the death of Steve Howard in April. Steve, who worked in the Department of Computing and Information Systems, was a valued member of the IBES Executive Committee and he is sorely missed by his colleagues.

## Advisory Board

The IBES Advisory Board also witnessed change with the departure of Mark Iles from Juniper, replaced by Mark Ablett Juniper Networks Vice President Australia and New Zealand.

## Staff Achievements

Then IBES Executive Director, Dr Kate Cornick received a 2012 Vice-Chancellor's Award for Outstanding Contribution for her work in strengthening relationships across industry and academia and enhancing opportunities for research collaboration.

Fiorella Chiodo, Executive Assistant to the Directors, was recognised for her 25 years of service to the University of Melbourne. Fiorella received a bronze medallion in recognition of her contributions. Fiorella started her career at the University as an Admin Assistant in the Biochemistry Library in 1987.



Kate Cornick receives the award from Vice-Chancellor Glyn Davis



Fiorella Chiodo is recognised for 25 years of service to the University by Rod Tucker



## Australian Broadband Applications Laboratory

The Australian Broadband Applications Laboratory (ABAL) is a key part of IBES, providing a technical environment to support research, testing and development of broadband applications and services. ABAL is actively involved in a number of IBES research projects providing technical support, equipment and infrastructure. The Lab is also an ideal forum to showcase the new technologies and has hosted two technology demonstrations over the past year.



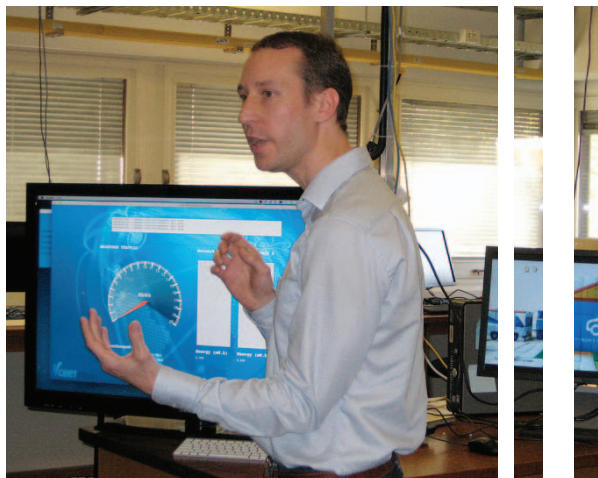
ABAL delivers testing services to enabling companies to migrate new and existing communications technologies onto high-speed broadband infrastructure. Development services to assist entrepreneurs to develop new broadband-enabled services in an independent environment housing state-of-the-art telecommunications equipment. Professional services to assist organisations and individuals to understand the impact of the Digital Economy on their business, including technical and innovation advice.

Ubiquitous access to broadband technologies will dramatically transform the Australian economy and drive innovation in broadband applications and services that will transform service delivery across the economy including in health, education, retail, manufacturing, mining, tourism and energy industries.

ABAL is driving this transformation by assisting organisations to be at the forefront of the emerging digital economy. ABAL is collocated with the Institute for a Broadband-Enabled Society, leveraging state-of-the-art facilities and research at the University of Melbourne.



Channel 7 Sunrise filming a story about teledentistry at ABAL



Julien Ridoux demonstrating the Universal Router Energy Model at ABAL



## Industry Partner Program

The IBES Industry Partner Program facilitates increased collaboration between researchers and industry to support research that tackles the real-world problems of a broadband-enabled society.

The support of IBES' industry partners including Alcatel-Lucent, Cisco, Google, Huawei, Juniper and Microsoft is essential to the Institute achieving its research goals. Industry Partners provide cash and in-kind support and have an essential role in shaping the work of IBES through the provision of knowledge, resources and expertise.

Partners have an active role in many research projects.

- Alcatel-Lucent supports the Centre for Energy-Efficient Telecommunications (CEET) whose research program aims to reduce the power consumption of the Internet by a factor of 1000.
- AARNet is providing broadband connectivity via the NBN to support field trials across a number of IBES research projects.
- Cisco is working with IBES to increase knowledge about telework (page 17).
- Ericsson supports research in the use of IPTV in health, *SeeCare IPTV* (page 39) and education, *Uni TV* (page 29).
- Google funds two projects: *MUGLE: A collaborative and interactive game-based learning platform for distance learning* (page 30) and *Paediatric teledentistry* (page 30).
- Huawei is working with researchers to connect hospitalised children to their classrooms in the *Getting well and being present* project (page 33).
- Microsoft is working with IBES to explore how the Kinect for XBox 360 can be used to deliver exercise classes to elderly people in their homes (page 44).

Industry partners have also provided equipment and technical support to the Australian Broadband Applications Laboratory (ABAL).

### Platinum Partners



### Gold Partners



### Partners





# Engagement

Over the past year, IBES has had an active program of engagement involving events, presentations by IBES staff, affiliated researchers and guests, and the communication of research in white papers, the media and academic publications. Members of the IBES community are kept up to date through IBES' communications channels: the newsletter *IBES Connect*, the website and Twitter account: [@IBESUnimelb](https://twitter.com/IBESUnimelb).

## Events

IBES hosted Mark Scott AO, Managing Director of the ABC in September 2012 for a public lecture entitled: *Disruptions and Dividends: A Fast Broadband Australia*. Mr Scott noted the impact that broadband is having on the media sector and how organisations need to adapt to meet the challenges and opportunities presented by fast broadband.

In October 2012 over 120 people attended the *IBES Annual Symposium*, which showcased the work of IBES researchers and provided an opportunity for collaboration between researchers, industry and the broader community.

On 12 November 2012, IBES hosted the *Telework Congress* in partnership with the Department of Broadband, Communications and the Digital Economy, Australian Information Industry Association (AIIA), Australian Industry Group, Cisco and Telstra at the University of Melbourne. The Telework Congress was the opening event of the Commonwealth Government's National Telework Week, 12–16 November 2012. The Congress brought together over 350 leaders from government, academia and industry to explore the potential of telework and to highlight the benefits to employees, employers and the community. The Prime Minister, Julia Gillard, delivered a keynote presentation via Telepresence from her office in Parliament House to the University of Melbourne. The Telework Congress also featured keynote presentations from Ministers Shorten and Conroy, while the US Ambassador joined the event via Telepresence from Perth.



Prof Glyn Davis, Vice-Chancellor the University of Melbourne welcomes attendees to the Telework Congress



## White Papers

IBES actively encourages researchers to present their findings to a wider audience. White papers provide an accessible and convenient way to achieve this goal. Over the past year IBES released five white papers:

- *Interface, Information & Interaction: An Exploration of Mobile Augmented Reality Present and Future* (August 2012, page 46)
- *Keeping Intouchable: A Community Report on the Use of Mobile Phones and Social Networking By Young Aboriginal People In Victoria* (August 2012, page 22)
- *Telework, Productivity And Wellbeing* (November 2012, page 17)
- *Self-Quantfication: The Informatics of Personal Data Management for Health and Fitness* (May 2013, page 47)
- *Health Provider Broadband Connectivity: A Review of Technical Requirements* (June 2013, page 41)

## Technology demonstrations

Media, industry and stakeholders attended three technology demonstrations of IBES research projects.

- The *SeeCare IPTV* (page 39) proof-of-concept was demonstrated in ABAL in March 2013, allowing a hands-on look at the platform.
- In April 2013 *Uni TV* (page 29) was switched on at the Rural Clinical School in Shepparton by The Hon. Gordon Rich-Phillips Minister for Technology. The event allowed people to witness live instruction of a dental procedure and access video-on-demand content.
- ABAL hosted a CEET demonstration of the Universal Router Energy Model in May 2013. The Model provides a comprehensive tool to measure and monitor the energy of routers in telecommunications networks.



Researchers at the IBES Annual Symposium 2012



## Research

IBES has had an active research program over the past year. IBES has supported new research projects, collaborated with researchers to contribute to externally funded projects and appointed three early career researchers.

### Early Career Researchers

In 2012, IBES offered a round of post-doctoral positions to emerging research leaders to work on IBES projects. IBES made three appointments in the post-doctoral scholars program.



#### Dr Tom Apperley

Tom is a researcher of digital media technologies focused on digital games, and mobile and networked technologies. Tom worked on the IBES project *Regulation in the Digital Economy* and is researching: *The Post-Convergence Regulatory Environment* (page 15).



#### Dr Bjorn Nansen

Bjorn completed his PhD in the School of Culture and Communication at the University of Melbourne in 2011. Bjorn's research interest is digital culture. Bjorn is researching *Non-users and the National Broadband Network* (page 14).



#### Dr Greg Wadley

Greg is a researcher in the Interaction Design Lab in the Department of Computing and Information Systems. Greg has a PhD in Human-Computer Interaction from the University of Melbourne and is working on the project *Getting Well and Being Present: Connecting Hospitalised Children to their School and Family* (page 33).

### PhD Top-up Scholarships

IBES is supporting the next generation of scholars through the provision of PhD Top-up Scholarships. IBES offered four PhD Scholarships in 2013 to the following PhD Candidates and projects:

- Manal Almalki, Health & Biomedical Informatics: *Toward a Comprehensive Self-Quantification Personal Health Information Management System* (page 50)
- Robbie Fordyce, Culture & Communication, *Post Autonomist Political Theories and Philosophies of Network Communication* (page 25)
- Marian Lok, Social Work: *Crisis Informatics from the Internet User's Perspective* (page 25)
- Kate O'Connor, Melbourne Graduate School of Education, *New Forms of Online Learning and the Production of Knowledge in Changing Times* (page 35)



## Research impact

IBES seed funding provides the catalyst for larger research projects. Over the past year IBES projects have been successful in attracting over \$2 million in external research funding. The following projects build upon past research endeavours:

- *The HORYZONS project: Moderated online social therapy for maintenance of treatment effects from specialised first episode psychosis services (NHMRC: \$931,521)*
- *Children's active video games: Family perceptions, uses and negotiations and negotiations (ARC: \$365,314)*
- *An investigation of the early adoption and appropriation of high-speed broadband in the domestic environment (ARC: \$208,000)*
- *Designing for scale: Understanding the value of information and communication technologies for individuals, communities and movements (ARC: \$330,000)*
- *Aboriginal young people in Victoria and digital storytelling (ARC: \$248,375)*

## Seed funding

IBES seed funding supports innovative research projects that will foster new collaborations and research teams and provide opportunities for new funding. In the 2013 seed funding round, IBES targeted three priority areas:

- **Urban connectedness:** focusing on how broadband-enabled technologies can underpin and the development of connected cities, supporting the health and wellbeing of urban communities, increasing opportunities for educational and social development, and improving business and government service delivery in urban environments.
- **Regional and rural digital development:** exploring how broadband-enabled technologies can increase service delivery in regional and rural areas, often limited by economies of scale, and increase the capacity for economic and social development in smaller and more isolated communities.
- **Digital inclusion and social cohesion:** addressing the challenges in overcoming the "digital divide" in Australia and internationally, which is essential if the broadband-enabled society is to be fully inclusive of citizens whose participation has been limited due to restrictions of disability, age, education, income and health concerns.

The seed funding process commenced in July 2013, with successful projects to be announced on 30 September 2013.



## Research Centres

### Centre for Energy-Efficient Telecommunications (CEET)

The consumption of energy by the ICT industry could become 10-15% or more of the global electricity supply by 2025. Supported by Alcatel-Lucent, the Victorian Government and the University of Melbourne, the Centre for Energy-Efficient Telecommunications (CEET) is a research centre that is dedicated to reducing the energy consumption of the ICT industry to ensure that society can harness the benefits of the Information Age.



CEET and Alcatel-Lucent were recognised for their partnership and strong collaborations through the Business and Higher Education Round Table (B-HERT) 2012 award for Outstanding Achievement in Collaboration in Research and Development.

Over the past year CEET continued to actively shape the debate around sustainability in telecommunications by hosting the Australian Energy-Efficient Internet Summit and releasing the white paper *The Power of Wireless Cloud*.

Full details of CEET's activities are available in the 2013 CEET Annual Report.



Receiving the B-HERT Award

Left to right: André Gygax, Chris Leckie, Kate Cornick, Chris Evans, Kat Franks, Tim Marshall and Simon Harriss.

Photo credit: B-HERT, Leisa Hunt.

### Health and Biomedical Informatics Centre (HaBIC)

The Health and Biomedical Informatics Centre is being established from the Health and Biomedical Informatics Research Unit located in the Melbourne Medical School.



Under the leadership of Prof Fernando Martin-Sanchez, the Centre is establishing an exciting research program in health and biomedical informatics, which is acquisition, storage, retrieval and use of information about human health, and the design and management of information systems to improve healthcare.

HaBIC is working closely with the Melbourne Schools of Medicine and Information to support and teach the new Masters of Information Technology (Health). This program is meeting the shortage of Health IT specialists in Australia and internationally providing training in the use of IT to process health information to support the delivery, management and administration of healthcare.



# Business & Government

High-speed broadband is transforming how business operates and offers new opportunities for the delivery of government services. New technologies are presenting regulatory challenges for existing industries, while enabling increased flexibility and the emergence of new business models. Research at IBES is investigating how high-speed broadband is affecting business and government.

The Commonwealth Government's rollout of the National Broadband Network (NBN) aims to deliver high-speed broadband across Australia. IBES researchers are investigating the impact that the NBN will have on communities, the challenges for uptake and how the full benefits of high-speed broadband can be realised across the community.

High-speed broadband will support an increasingly mobile workforce. Research into telework is examining the benefits of broadband for management and workers in order to support increased uptake and adoption of flexible work practices. High-speed broadband also allows for the increased capture of data within the community. IBES researchers are working with the City of Melbourne to monitor and manage noise pollution to inform planning and development within urban environments.



Office buildings in the Melbourne CBD.



## Non-users and the National Broadband Network

**B Nansen:** IBES Early Career Researcher, Computing & Information Systems

This project investigated household non-adoption and the non-use of broadband services and devices in the context of the National Broadband Network (NBN) rollout.

While non-use has historically been a question of digital access and inequality, recent research has pointed to a growing population of individuals who actively choose to evade, reject or resist digital media. This highlights the role of the individual in the diffusion and utilisation of technology leading to uneven, yet inevitable, adoption. The project contributed to this evidence by extending the scope of analysis to consider the technological and cultural contexts in which individual decisions are made. The findings drew on mixed-method research with households, using surveys and interviews conducted between 2011 and 2013, in early release areas of the NBN rollout, Midway Point, Tasmania and Brunswick, Victoria.

The findings of the project show that households have an increasing number of internet options available to them (e.g. dial-up, DSL/ADSL, cable, satellite, wireless or mobile), and this already wide choice of Internet service provision is further complicated by the introduction of fibre-optic cable services. Households in early NBN release sites were confronted with an unfamiliar broadband technology, a still developing installation process and newly emerging retail service offerings. In addition, they faced difficulties integrating new technologies into the existing household ecology of hardware devices, internal connections and software. Challenges to their digital literacy, competency and interest were another consideration.

Across the spectrum of technology use and non-use the research identified varied forms of refusal and reluctance to use new and emerging broadband services, platforms or devices. Yet, the findings suggest that use and non-use of high speed broadband does not occur in isolation or as an expression of individual choice, instead they are part of increasingly dense and dynamic household media ecology shaped by issues such as complexity, accumulation, functionality, interoperability and management.

Bjorn Nansen's IBES Postdoctoral Fellowship has contributed to a number of collaborative publications, presentations and grant applications, within a broader interdisciplinary research team focused on domestic adoption and use of broadband.



## The post-convergence regulatory environment

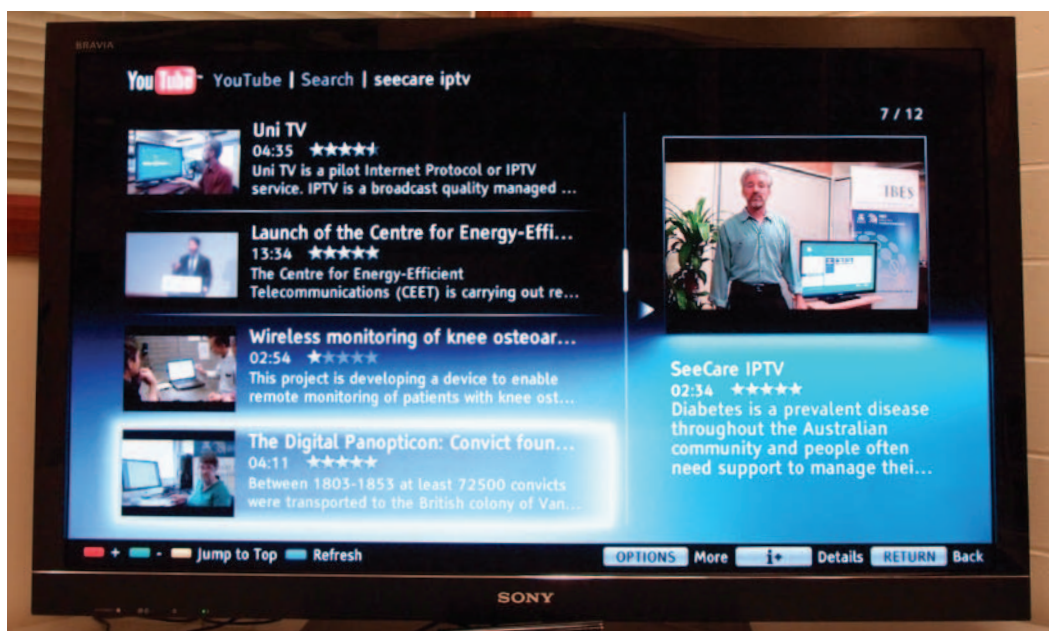
T Apperley: IBES Early Career Researcher, Culture & Communication

The aim of this project is to examine the implications of the post-convergent broadband environment in Australia in the wake of the Convergence Review. The Convergence Review identified two key issues for the future: the transformative effects of increasing User Generated Content through social media and other platforms, and the potential entry of new content providers.

However, since the terms of the review were heavily shaped by existing media industries (and concerns to substantiate support for local and Australian content in the new environment), these important issues were scarcely developed.

The National Broadband Network is likely to increase the role of 'audiences' as producers and distributors of content, as well as enabling the entry of new players who are not part of traditional media and content industries. This project examines the implications of both these developments. It maps the new players, examines what innovative services they are developing, and establishes the implications of these developments for regulation of the NBN, including the scope and expertise of a possible new 'super regulator' as recommended by the Convergence Review.

The research draws upon the knowledge of industry experts across relevant sectors of the digital economy to gather original data and pinpoint possible future issues from the perspective of different stakeholders. The findings aim to inform policy and legislative approaches that embrace the post-convergent environment in a manner that supports and sustains development and investment in innovative broadband applications and services in Australia at local, national and international levels.



Services such as YouTube are increasingly available on televisions highlighting increased media convergence.



## Framing the NBN: Consumer attitudes and perceptions

M Gibbs, B Nansen, C Bellamy: Computing & Information Systems  
M Arnold: Historical & Philosophical Studies – B Coker: Management & Marketing  
R Wilken: Swinburne Institute for Social Research – K Harrison: NBN Co

The National Broadband Network is being built to deliver high-speed broadband across Australia. However, it is often misunderstood in the community. Therefore it is essential to understand the differing consumer perceptions of high-speed broadband in order to frame the benefits.

This research project explores how people understand the role of high-speed broadband in relation to their daily activities in order to ascertain the challenges and opportunities for uptake of broadband technologies by end-users. A critical element shaping consumer adoption rates is the framing of the NBN. The framing of the benefits of the NBN affects household decision-making in whether or not they will purchase high-speed broadband.

In order to understand consumer attitudes and perceptions the researchers used three interlocking mechanisms: over 2,000 people responded to an online survey to identify factors shaping current attitudes towards; secondly, media content analysis explored how the NBN specifically and high-speed broadband generally are being publicly defined, assessed and critiqued. Finally, interviews with people in different market segments to gain deeper insights into how they understand the NBN and whether public discourse is influencing their perceptions and attitudes towards the NBN.

Researchers working on this project were successful in receiving \$208,000 in funding for an ARC Discovery Project: *Broadband-enabled homes: An investigation of early adoption of high-speed broadband in the domestic environment*.



Brunswick, Victoria one of the first sites for the NBN rollout.



## Telework, productivity and wellbeing

R Bosua, M Gloet, S Kurnia, A Mendoza: Computing and Information Systems  
JYong: Melbourne Institute of Applied Economic and Social Research

This project explored perceptions, issues and key considerations that relate to the productivity and wellbeing of hybrid teleworkers in Australia. Hybrid telework is a way of work in which teleworkers attend a workplace during the week but work between one and two days from a location other than the workplace. In most cases this means working from home.

Researchers interviewed 28 employees across six organisations to gain the perspectives of management and employees about telework in terms of productivity and wellbeing. Some participants also completed daily logs of their activities to allow a comparison across telework and non-telework days.

The research found that telework is a viable alternative to face-to-face work, which can yield productive outcomes for both employers and employees. However, to be successful, telework is dependent on a number of factors. Telework requires a different management style based on trust, and management of clearly defined individual and team deliverables based on shorter (or day-to-day) time frames. Additionally, IT support is essential as specific collaborative tools are required to enable teleworkers to work seamlessly from anywhere and contribute to individual and team productivity.

On the wellbeing front, the results from telework were positive. Working away from the office created a more positive attitude towards work from teleworkers. This is the result of teleworkers feeling in greater control of their work, easing work-related stress and allowing a better balance between family and work commitments. The

ability to hybrid telework often makes workers more productive, fostering individual wellbeing and promoting better work-life balance.

The findings of this research project were delivered in a White Paper launched at the Telework Congress hosted by IBES in November 2012. The research contributes to a larger project investigating telework, productivity and wellbeing in Australia and New Zealand with the New Zealand Work Research Institute, Auckland University of Technology and Cisco.

This research project was supported by Cisco Australia.



IBES Director Rod Tucker launching the telework white paper at Telework Congress 2012.



## Participatory sensing: Enabling interactive local governance

S Marusic, YW Law, M Palaniswami, J Gubbi, A Rao: Electrical & Electronic Engineering  
H Sullivan: Melbourne School of Government – A Ley: City of Melbourne

This research project is identifying and addressing the key hurdles affecting the take up of participatory sensing by citizens and government in order to realise a meaningful platform, built upon the Internet of Things, to support the delivery of local government services. In partnership with the City of Melbourne, researchers are developing a prototype participatory sensing system to manage and monitor noise pollution in urban environments.

In order to achieve this goal, researchers are focusing their attention beyond the technology to address the social impact and implications of the Internet of Things. As such, there are two distinct streams to the research the first is citizen engagement, while the second is determining government requirements.

On the citizen engagement front techniques to motivate participation are an important aspect in ensuring take up of the system to support data capture. Researchers are tackling ways to overcome negative perceptions of pervasive sensing as well as genuine concerns about privacy and data utilisation. Much of the existing literature employs ad hoc measures, or only seeks to address specific concerns in isolation, a comprehensive approach is required. However, the complexity of the challenge in finding the appropriate balance between the competing objectives of different stakeholders as well as the variety of perspectives within the same stakeholder groups has become apparent.

Researchers are also working on determining government requirements for the participatory sensing system. Key issues are ensuring data quality, integrity and reliability to meet the differing needs of government. Stakeholders include: city planners who require soundscape knowledge enhanced by contextual information through citizen feedback; compliance officers who require accurate measurements with specific times, location and nature to respond to complaints; and councils, to develop comprehensive noise maps to inform zoning, public space utilisation and policy and strategic planning decisions.

Working in partnership with the City of Melbourne it is envisaged that participatory sensing for noise monitoring will become a key tool to support governance and service delivery.



## Culture & Community

The increasing bandwidth available from high-speed broadband is forging connections across the community and allowing for new forms of cultural expression and collaboration. IBES' Culture and Community research examines the impact of high-speed broadband upon the community and seeks to understand how broadband-enabled technology can be used to support rich cultural engagement.

The growing availability of broadband in public spaces via Wi-Fi is transforming interactions between people, their devices and their experience of community and place. Indigenous communities are adopting new communications technologies such as smart phones to tell and transmit their stories in new and innovative ways. High-speed broadband is also assisting the delivery of resources to specific communities such as supporting the communication skills of deaf and hearing-impaired teens and the identity of people who have been in residential care.

The culture and community research stream is also home to a large number of emerging researchers, with IBES supporting PhD scholarships ranging from the examination of digital memorialisation following tragic events through to reducing conflict between humans and elephants in Sri Lanka.



Dance Battle between Melbourne, Seoul and Perth connected as part of the Participatory Public Space research project.



## Hear me out: Developing an online peer support program for deaf and hearing impaired teens

**G Cook:** Victorian College of the Arts – **R Woodward-Kron:** Melbourne Medical School  
**G McCarthy:** eScholarship Research Centre – **H Harrington-Johnson:** Victorian Institute for Deaf Education  
**S Li:** Hear for You – **Z Black:** Australian Communication Exchange

In Australia there are over 16,000 deaf and hearing-impaired children aged under 21. More than 83% attend mainstream schools, where they are often the only student in their class who is deaf or hearing-impaired. There is a high risk of social isolation and mental health disorders for children who have difficulties making themselves understood, which in turn affects their education and career prospects.

This project is developing an online blended learning environment called *Hear Me Out* to deliver training modules based upon two successful 'live' coaching programs that support the development of deaf and hearing impaired teens: Hear for You and Let it Out! The environment will allow for the delivery of an immersive experience increasing access to the program.

*Hear Me Out* enhances participants' communication skills through a non-interventionist and non-medicalised approach. This is achieved by the building of online communities for young hearing impaired and deaf teens, creating a sustainable future of socially engaged support for young deaf people.

The Australian Communication Exchange and the Victorian Institute for Deaf Education are supporting this project.



*Hear Me Out* will increase access to training for deaf and hearing impaired teens.



## Participatory public space: A right to a networked city

S McQuire, N Papastergiadis, A Lambert: Culture & Communication  
SYung: National University of Singapore – M Dieter: University of Amsterdam

The rollout of the National Broadband Network marks a critical moment in the future of Australian cities. High-speed broadband networks are profoundly altering the relationship between communication, place and social agency. As access to digital networks becomes ubiquitous, new possibilities for citizen participation in the making and remaking of cities are emerging. This project explores the potential for and obstacles to, employing pervasive digital networks in order to deepen citizen engagement in the planning organisation and utilisation of urban public spaces.

Funded by the Australian Research Council (ARC), the project builds upon the IBES project *Public Screens: from display to interaction*. It involves a comparative study of the impact of high-speed broadband networks on public space in three cities – Melbourne, Amsterdam and Songdo City in Korea – to understand how new forms of communication and collaboration contribute to fostering socially inclusive public spaces in networked cities.

Researchers are undertaking a detailed policy analysis of the urban, media and cultural sectors to better understand the influences at play. This is supported by fieldwork involving participants, policy makers and users which has been conducted in each of the three cities.

This project is contributing to a better understanding of how digital networks such as the NBN can improve civic life. The investigation of the interplay between formal processes and emergent practices involving the use of digital media in urban public spaces, many of which are currently informal or incompletely formalised, will generate a body of comparative, fine-grained knowledge capable of informing conceptual frameworks and better policy settings for networked cities.



People accessing public Wi-Fi on the steps of the Victorian State Library, Melbourne.



## Working in the cloud: developing identity resources for care leavers

C Humphreys: Social Work – G McCarthy: eScholarship Research Centre – M Spriggs: Population Health  
U Parampalli, S Webber: Computing & Information Systems – R Rose: LaTrobe University  
J Schaub, A Jones: Berry Street

Research conducted by the ARC Linkage Project: *Who am I? Every record tells a story*, highlighted the problems of accessibility in records being created about children and young people in out-of-home care. As a result practitioners do not have access to the information they need to provide good care and adults who have grown up in care are forced to apply to a number of different organisations to access all their personal records.

Broadband-enabled technologies can create a more accessible personal archive for young people who have grown up in out-of-home care. This research project is developing a prototype virtual locker or storage space for the digital copies of personal documents of children in care. While not replacing their administrative file, the virtual locker would significantly lessen the difficulties faced by care-leavers in searching for and accessing records relating to their time in care.

The virtual locker adapts new digital technologies for engaging young people in therapeutic work, safely storing the resulting information in a repository consistent with archival standards. It will transform therapeutic dynamics by involving young people in the creation and management of their own records and making the data accessible into the future.

By working in the cloud, care-leavers will have access to their records, supporting their development and increasing the opportunities for therapeutic work and engagement.

## Victorian Aboriginal youth and their use of technology

P Morrisey, O Kelada, C Rachinger: Australian Indigenous Studies, Culture & Communication  
F Edmonds: Culture & Communication – J Waycott: Computing & Information Systems  
R Nordlinger: Languages & Linguistics

This research project studied how mobile phones and online social networks can improve the educational outcomes of young Aboriginal people in Victoria. The project found that mobile phones can provide young Aboriginal people with opportunities for knowledge improvement, enhancing communication skills and allowing engagement in a range of social practices. Mobile phones were also used for online activities allowing the creation, sharing and research of information with friends and peers.



The findings of this project were published in the community report *Keeping Intouchable: A community report on the use of mobile phones and social networking by young Aboriginal people in Victoria* published in August 2012.



## Telling our stories: Aboriginal youth and digital storytelling

F Edmonds, S Lowish: Culture & Communication – M Arnold: History & Philosophical Studies  
R Chenhall: Centre for Health and Society – T Lewis: RMIT University  
K Adams: Victoria University – S Faulkhead: Monash University

Victorian Aboriginal young people are using digital technology to tell stories, which assert and affirm their identities, and to produce and consume information in creative and interactive ways, that are relevant to them. Building upon the *Aboriginal Youth and Their Use of Technology* project, this project is working with the Aboriginal community to determine the impact of digital storytelling as a tool for supporting contemporary urban-based Aboriginal youth culture.

Researchers and Aboriginal young people are working towards developing a prototype for a digital storytelling smartphone app. The app is one of many aspects of the project that will be informed through an innovative and collaborative design process incorporating digital storytelling workshops and exhibitions to foster digital literacy and promote intergenerational dialogue among Aboriginal participants. The project will allow for knowledge exchange between partner organisations and Aboriginal communities and will develop protocols for supporting Aboriginal control of cultural knowledge in digital stories.

The project will advance the social and emotional wellbeing of Aboriginal youth, while providing sustainable, culturally aware models for institutions collecting and displaying contemporary digital expressions of Aboriginal culture. The findings of this project will allow for a better understanding of the use of digital technology as a tool to support Aboriginal culture in Victoria and enhance research networks with the Aboriginal community of Victoria.

Further research will be supported via an Australian Communications and Consumer Network Grant and an ARC Linkage Grant. The ARC will commence in December 2013. Partners in the ARC project are: The Australian Centre for the Moving Image (ACMI), Sista Girl Productions and Victorian Health Promotion Foundation.



Digital Storytelling Workshop, Aborigines Advancement League, June 2013.



## PhD Projects

### Exploring technology-mediated unstructured play

**J Downs:** Computing & Information Systems

“Play” is broader than just gaming comprising structured and unstructured elements. Unstructured play is informal, it does not have strict rules and procedures and is a critical part of human development. 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 is exploring how unstructured play on physical console gaming systems enhance social interactions. The detailed examination of interactions between players in a mediated environment provides insight into how unstructured play arises in games that encourage physical and social interaction both in the game world and in the real world.

### Online Communities in Massively Multiplayer Online Games

**M Carter:** Computing & Information Systems, History & Philosophy of Science

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. These games require low latency, high bandwidth and ‘always on’ connectivity to play, and as a result have encouraged the adoption of high-speed broadband.

This research project is exploring participants in a single game, EVE Online, in order to understand how people engage with these broadband-enabled communities. The findings of this project will increase understanding about how online communities are formed, what effects memberships and how internal and external conflict is resolved. Additionally the project will provide insight into the take up and adoption of high-speed broadband services within Australia.

### Understanding the role of broadband technologies in periodically reunited families with preteen children

**K Kazakos:** Computing & Information Systems

Industries such as mining and defence require people to work away from their families, often for extended periods. There is a sense of reunion when these families come together, which can occur physically or virtually via emerging communications technologies delivered via high-speed broadband.

This research project is exploring the use of broadband-enabled communications technologies that support immersive interactions. Avatar Kinect on Microsoft Kinect for Xbox 360 provides a immersive environment allowing interaction among family members regardless of their location. The project is increasing the understanding of separation and reunion and how broadband technologies can increase connection.



## Crisis Information from the Internet user's prospective

M Lok: Social Work

Individuals affected by a disaster in Australia and New Zealand can find themselves faced with a multitude of losses and challenges. Along with the loss of significant others and personal property, infrastructures of public and community life can be severely damaged, leaving daily routines for most ruptured with an unforeseeable return. Increasingly, disaster affected individuals can utilise the Internet to proactively venture beyond the constraints of their physical environment and seek what they perceive they require online.

This project explores the post-disaster online experiences of participants to develop an in-depth understanding of how they perceive that their Internet use has influenced their experiences following a disaster. The findings from this research will illuminate this online phenomenon and provide an understanding of why self-motivated individuals have entered the Internet's online space in a post-disaster context.

## Post Autonomist Political Theories and Philosophies of Network Communication

R Fordyce: Culture & Communication

This research 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.

The National Broadband Network operates on local, national, and international levels as it improves access to media reporting and representation, facilitates direct engagement between citizens and political parties and allows politically-independent organisations to develop and have influence. Increased access to audio visual materials made available by increased bandwidth allows for greater access to problem-solving 'do-it-yourself' cultures.

Due to the bandwidth required for access, the NBN can be shown to distribute DIY problem-solving skills from the global stage to local communities. It is important that the range and effects of platforms and services that the NBN will make possible, such as YouTube, Twitter, and so on are able to be understood in respect of the effects upon the democratic process.

This project will provide insight into whether or not the NBN can add to the potential of the democratic process in Australia, and whether or not Australians can be usefully served by further and deeper involvement within a networked society about which we currently know so little.



## Situated and connected digital memorials: technology to commemorate natural disasters

J Mori: Computing & Information Systems

This project explores online memorials that are both sensitive to the needs of bereaved community members and also support contributions by the general public. A website, [www.commemoratingblacksaturday.com](http://www.commemoratingblacksaturday.com) commemorating the 2009 Black Saturday was released on the fourth anniversary of the fires, and allowed the general public to send gestures of support. A virtual shape was sent as an offering to the community. Three people received these shapes on small screens in their homes and could create their own personalised collages by using the shapes that were sent from the website.

Strong participation by bereaved community members in the design of online technologies for commemoration can lead to technologies that are relevant to the public and the bereaved communities.

## New forms of social interaction through universal broadband access in public spaces

M Diaz: Culture & Communication

The proliferation of smartphones and tablet devices accompanied by increases in access to high-speed broadband 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.

Research has been conducted on the “A Machine to See With” artwork produced by Blast Theory, a UK based adventurous arts group using interactive media to create new forms of interactive performance, to develop a new framework to examine the societal benefits of universal broadband access in public spaces.

## Wireless Sensor Networks for the Forest Environment

C Dissanayake: Electrical & Electronic Engineering

Elephants and people have a long history of interdependence in Sri Lanka, featuring in work, warfare and culture. The colonisation of Sri Lanka five centuries ago altered the ecological landscape of the nation by clearing vast areas for the plantation of crops such as tea and rubber. Coupled with rapid population growth there is continuing pressure on the forest environment that is the elephants’ natural habitat, with approximately 70 percent of elephants sharing land with people conflict is common.

This project aims to reduce conflict between humans and elephants by using sensor networks to track elephants before they move into rural communities. 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 officials.



# Education & Learning

High-speed broadband is transforming the delivery of educational services and allowing for the development of new pedagogical techniques to support the learning of students from primary school through to those undertaking continuing professional development. IBES researchers are exploring how high-speed broadband can deliver new and innovative educational content.

Education and learning research at IBES draws on the strength of the University of Melbourne. Research projects include using IPTV to deliver dental education, creating a virtual environment to support the development of maths teachers, and connecting students with illnesses to their classrooms. IBES is harnessing the productive potential of high-speed broadband to increase the educational opportunities across the community.



Old Arts Building, the University of Melbourne.



## 2D v 3D for improved learning outcomes

**S O'Leary:** Otolaryngology – **K Clarke:** Institute for a Broadband-Enabled Society – **P Tregloan:** Chemistry  
**C Ogleby:** Infrastructure Engineering – **I Shiel, B Lverage:** Scholarly Information  
**D Manton:** Melbourne Dental School – **A Borda:** Victorian eResearch Strategic Initiative (VeRSI)  
**N Reynolds, P de Barba:** Melbourne Graduate School of Education

This project examines whether 3D instructional and training material can improve the learning processes and outcomes of students compared to similar representations in 2D. Through four case studies the research will develop a better understanding of how 3D technologies and tools can be designed to improve learning in broadband-enabled environments.

The dentistry case study investigates the use of different teaching resources for the same dental procedure: a 2D video for one group and a 3D video for another. To evaluate the outcome, participants will do the procedure using a 3D immersive dental training tool that automatically measures accuracy.

A medicine case study is examining the use of different teaching resources, a 2D or 3D immersive environment, for the same concepts in ear anatomy and pathology. Outcomes will be assessed by students answering questions related to the content.

Another medicine case study is exploring whether a 3D video provides better surgical cues for the proximity of different anatomical structures than 2D. For the formal assessment, different surgical techniques will be recorded, and surgeons who were not involved in the surgery will assess the video recordings of the operations. These will be presented in either 2D or 3D, and the surgeon's confidence in anticipating the approach of anatomical landmarks will be assessed. The outcome will be a comparison of the scores between the 2D and the 3D recordings.

The final case study is in geomatics and is assessing whether students can achieve better learning outcomes arising from complex spatial problems in 3D as opposed to 2D.

The findings from this research will increase knowledge of the use of 3D technology in the educational context, to allow for the future development of learning materials to support students.



Dental procedure in 3D.



## Uni TV

M McCullough, C Nguyen, E Reynolds, M Smith, A Polster, R Judge, M Hopcraft: Melbourne Dental School  
K Clarke: Institute for a Broadband-Enabled Society – M Munro, S Middleton: Information Technology Services  
F Frukhtman, V Yin: Ericsson – R Myers: Panasonic – D Farmer: AARNet

Dental education has traditionally faced constraints, such as students crowding around the mouth of a patient to watch a procedure. Uni TV allows for the transmission of high-definition 2D and 3D images of procedures to students live and on demand.

It is often very difficult for students and those wishing to engage in continuing professional development (CPD) to attend classes and tutorials on a university campus, particularly when they live and work in outer-metro, regional and rural communities.

The Uni TV project seeks to overcome these challenges by using broadband networks to enable students to access learning materials in a much more convenient way, when and where they wish. The project utilises Internet Protocol TV (IPTV) to deliver high quality educational video content via a managed data service. The Melbourne Dental School is the first user of the service, capturing content in their clinical teaching facility on the IPTV platform and distributing it as live broadcasts, or as video-on-demand to students and staff in the Rural Clinical School in Shepparton and Brunswick. This project is leading to increased access to professional development (CPD) for clinical dentists, and supporting a better trained dental workforce.

This project is a collaboration between IBES, the Melbourne Dental School, Ericsson, AARNet and Panasonic and is supported by the Victorian Government's Broadband Enabled Innovation Program (BEIP).



The Hon Gordon Rich-Phillips, Minister for Technology switches on UniTV at the Rural Clinical School Shepparton in April 2013.



# MUGLE: A collaborative and interactive game-based learning platform for distance learning

S Karunasekera, E Kazmierczak: Computing & Information Systems

R Pearce: Melbourne Graduate School of Education – A Ooi: Mechanical Engineering

The Internet has transformed distance education, opening up online learning that delivers a richer, more immersive environment than traditional course packs. One of the challenges facing distance education is the teaching of science and mathematics, where a key component of learning is engagement in practical, team based activities. The aim of this project is to develop an interactive and collaborative game-based eLearning platform.

Collaborative games provide an opportunity to overcome some of the challenges currently faced by distance education, using them as a replacement for practical work and team-based learning. Education games are engaging and are effectively used by educators as a tool to teach abstract concepts in science and mathematics. This allows for greater participation by students who cannot access practical classes or to access additional educational resources outside of teaching hours.

MUGLE, the Melbourne University Game-based Learning Environment is a platform for developing and publishing interactive educational games, as a web-based application running on the Google App Engine, a cloud computing platform for web applications. The researchers have developed a set of Application Protocol Interfaces to support the services required for users and to facilitate multiplayer interaction.

Through the use of the Google App Engine, MUGLE is able to scale automatically and seamlessly, allowing for the distribution of content to a multitude of locations supporting the delivery of educational content to a variety of audiences. In the future it is envisaged that environments such as MUGLE will increase access to educational opportunities across Australia to study advanced science and mathematics.



MUGLE will increase access to distance education.

Image Courtesy of Learning Environments, Library: The University of Melbourne



## Teacher professional learning in a virtual environment

L Ball, V Steinle, K Stacey, R Pierce: Melbourne Graduate School of Education  
S Chang: Computing & Information Systems  
K Clarke, B Gathercole, J Ridoux: Institute for a Broadband-Enabled Society

The rollout of high-speed broadband to rural communities allows for the delivery of immersive educational environments. Many teachers outside of metropolitan areas are unable to access professional learning opportunities due to distance or difficulty in getting time off from teaching duties to travel to attend classes. Having access to high-speed broadband provides an opportunity to deliver professional learning to teachers living outside of metropolitan areas increasing their access to educational opportunities.

This project is making use of high-speed broadband to deliver professional learning to teachers in a virtual environment. Working with VastPark, researchers have developed a virtual classroom that allows participants to understand student and teacher thinking. The initial module explores one mathematics topic for teachers, decimal numbers. The content is adapted from the existing resource developed by Vicki Steinle, Kay Stacey and others, *Teaching Number in the Middle Years CDROM*.

In the virtual environment, participants can view an individual student's work; listen to a justification from the teacher for their choices; hear the 'thinking' of a particular student to provide insight into their understanding; ask an expert for more information; and watch demonstrations of effective teaching.

The proof-of-concept will be trialled with an initial group of teachers to explore its effectiveness in delivering well-researched educational resources in an innovative, interactive environment. The technology is scalable allowing for the incorporation of additional educational topics to support professional learning.



Screenshots of the virtual learning environment.



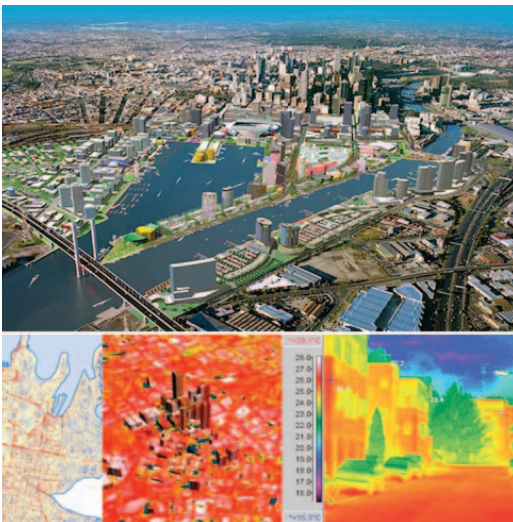
## Reusable 3D simulation-based learning environments

**G Kennedy, L Corrin:** Centre for the Study of Higher Education – **B Joy:** VastPark  
**T Ngo:** Infrastructure Engineering – **B Dalgarno:** Charles Sturt University

Online environments that support 3D, simulation-based learning tasks can support significant learning outcomes in a range of educational contexts. The effectiveness of these environments is based on their 3D nature and the scenarios they support. They can provide collaborative and experiential learning increasing student engagement, contextualisation and the development of spatial skills while experiencing authentic scenarios in a risk free context on multiple occasions. Creating engaging 3D online educational simulations is a complex activity requiring both technical ability and a detailed understanding of the dynamic educational scenarios that underpin the learning activity.

This project is developing an online collaborative environment that features a 3D simulation-based learning model addressing the technical and educational underpinnings. A technical framework will be developed to generate online 3D learning environments that use real time data feeds for simulation-based learning. It will be supported by an educational framework developed to assist educators in their development of scenarios for 3D simulation-based learning tasks. The collaborative learning environment is a virtual tabletop allowing students to work collaboratively, which supports visualisation and text based problem scenarios.

This platform will leverage the technologies of VastPark, who have developed a leading edge online virtual world platform supporting 3D and 2D virtual worlds, and the University of Melbourne. The data for the platform will be provided by *MUtopia*, an advanced simulation platform developed by researchers at the University of Melbourne, which enables users to monitor and test the relationship between key sustainability parameters in urban environments. *MUtopia* simulates metropolitan energy use, water use, waste production, transport, and social and economic factors.



The prototype system will be used by small groups of students who will engage with the *MUtopia* data to solve a variety of problem scenarios.

*MUtopia* platform.



## Getting well and being present: Connecting hospitalised children to their school and family

**F Vetere, L Kulik, G Wadley** (IBES Early Career Researcher): Computing & Information Systems  
**J Green:** Parenting Research Centre – **P Rossi:** Huawei Australia  
**G Strong:** Royal Children's Hospital Education Institute

Annually over 10,000 school-aged children are admitted to the Royal Children's Hospital. Many of these children experience dislocation from school reducing motivation to engage in hospital-based learning and increasing anxiety about the return to school. This can affect long-term educational and developmental outcomes.

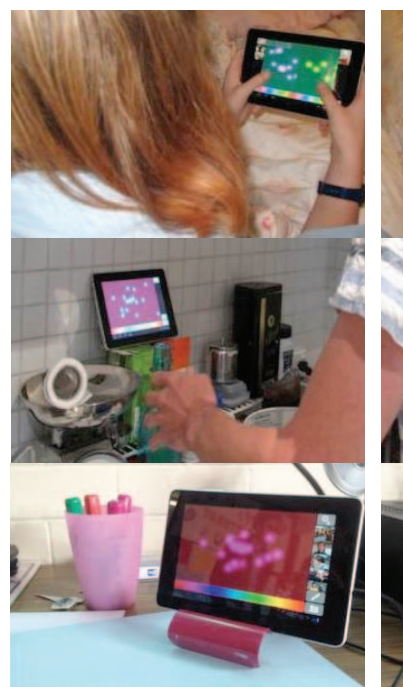
Communication technology can help to bridge this divide. Some schools are already employing off-the-shelf technologies like iPads and Skype, but unique contextual factors mean these popular technologies are not sensitive to particular needs in the classroom and hospital wards. This project attempts to address that gap, investigating how mobile devices can be used to create social connection through the exchange of passive messages, such as colour, between users.

The researchers developed an application to create social connection between children in hospital, their families, and their classmates and teachers at school. The app was developed in conjunction with stakeholders and interaction design experts. The app allows children at both ends to send a colour to convey a mood or feeling while also allowing for the exchange of photos. The tablet detects the level of local activity through its microphone, representing this on the remote tablet in a visually evocative form. In this way children feel connected and aware of the remote site without using audio, video or text messaging. The tablet screen becomes an engaging but ambient display where bubbles float against a background colour and photos and school timetables occasionally scroll into view.

The app was trialled by nine inpatients aged 7 to 12 at the Royal Children's Hospital with serious health conditions. Children liked the ambient display and enjoyed colour-sharing, finding the tablet easy to understand and fun to use. Hospitalised children liked receiving photos of their classmates' activities at school, and liked sending photos that expressed the situations they faced at the hospital. Most importantly, children felt the tablet had created a stronger connection between school and hospital, and teachers felt the tablet did not disrupt classroom activities.

The ultimate aim is to release the app to the public.

This project is supported by Huawei Australia.



The app on the Huawei Media Pad.



## Connecting learners for collaboration across diverse communities

**L Joubert:** UNESCO Observatory, Architecture, Building & Planning  
**S Malcolm:** Social & Political Sciences – **J Pearce, S Chang, S Dreyfus:** Computing & Information Systems  
**C Platania-Phung:** Central Queensland University – **G Kennedy:** Centre for the Study of Higher Education

The Yiramalay-Wesley Studio School in the Kimberley region of Western Australia is a joint development of Wesley College, the Bunuma people of Fitzroy Crossing and the Bunuba Cattle Company at Leopold Downs. High-speed broadband provides the opportunity to link remote schools such as the Yiramalay-Wesley Studio School with schools in metropolitan regions to foster collaboration and cross-cultural learning.

This project was part of a larger IBES project exploring collaborative learning. The project developed an online system called iFish which enables students to connect with remote, like-minded students. Students enter their preferences and are able to choose a remote partner with similar interests for collaboration. In order to facilitate cross-cultural interaction the iFish system had to be adapted to accommodate cultural differences. A key component of this research project was the development of imagery to serve as an anchor point for the learner to support cross-cultural connections.

The team developed a thoughtfully researched aboriginal pedagogy including a number of culturally specific ways to learn. These include: sharing narrative and telling stories, mapping and visualisation processes, intrapersonal hands-on and kinaesthetic non-verbal skills, and the use of symbols and metaphors to understand concepts and content.

Students were introduced to the system at the beginning of term 1, 2013. After partnering and working on a collaborative project, participants were interviewed in relation to the efficacy of the system. The iFish system delivered a benefit to students, as it was built and developed in a culturally appropriate way and provided an engaging and informative learning environment supported by culturally relevant pedagogies for the delivery of indigenous education. The system connected students to remote communities, homes and families and has the potential to support indigenous students studying away from their communities to help overcome homesickness and support wellbeing.



The opening of the Yiramalay-Wesley Studio School in 2011



## PhD Projects

### **New forms of online learning and the production of knowledge in changing times**

K O'Connor: Melbourne Graduate School of Education

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 designed to empirically investigate some examples of the changes in process in universities, with specific attention to questions of knowledge and epistemic authority as courses are reconfigured for new kinds of online forms.

This PhD project aims to explore how knowledge is being put together, configured and validated in the new course constructions, and to reflect on and provide some test of the different ways of thinking about knowledge, authority and universities today. It hopes to generate new insights about the emerging possibilities for the development of knowledge in changing times that will be of relevance to institutional interests as well as broader international research and thinking.

### **Motivation and autonomous learning in online learning environments**

P de Barba: Psychological Sciences & Centre for the Study of Higher Education

Online learning is rapidly transforming, allowing students to undertake a vast variety of educational courses and programs. The growth of online learning is seen in the recent appearance of Massively Open Online Courses (MOOCs). However, many of these courses have witnessed a high proportion of student drop-outs and low engagement.

High-speed broadband provides an opportunity to enhance students' learning through increasing access to course materials and the use of technology to create media rich experiences to increase engagement.

This research project is examining the characteristics of students to increase understanding in order to design better learning environments. The combination of psychological and educational approaches will assess individuals' motivation factors when engaging with online learning, allowing the development of optimal conditions to support student learning at the computer and motivation to stay on the task.



## Unpacking the Utranet: home-school uses

V Fitzgerald: Asia Institute, Melbourne Graduate School of Education

The Victorian government provides a number of online educational tools to students, parents and teachers via the Utranet. The site provides for online learning activities, such as homework while also allowing students to collaborate with their peers. Additionally the Utranet supports parents, allowing them access to assist their child's education.

This research project is examining how the Utranet is used for home-school communication. The first phase of the project involved the gathering of empirical data to capture the insight of users. The data collection was completed in December 2012 and is currently being analysed. Initial findings from this research were presented at the Australian Anthropological Society Conference in September 2012.

## Don't forget to be awesome

L Wilkinson: Culture & Communication

The emergence and growth of social networking has transformed reading from a solitary activity to an engaged and communal activity. This is witnessed in a number of online communities such as the *Harry Potter Alliance*, which examines genocide, homophobia and illiteracy in the real world.

This research project is exploring how the transformative spaces offered by Young Adult literature is extended via literary social networks. To support this, the project is creating a work of young adult fiction, *The Wild Kindness*, to accompany the research thesis. This project is expected to be complete by March 2014.

## Real-time feedback for surgical simulation using data mining

Y Zhou: Computing & Information Systems

A haptic temporal bone simulator allows surgeons to train and develop their skills in a virtual environment before entering the operating theatre. This project is looking to increase the functionality of the simulator by evaluating surgical performance to give context aware feedback akin to a human expert.

The prediction algorithm provides feedback by rating the user from novice to expert, allowing them to refine their skills in the procedure, while avoiding critical areas such as the facial nerve. The use of data mining combined with expert knowledge has allowed for the construction of a robust feedback mechanism to support continued learning and skills development.



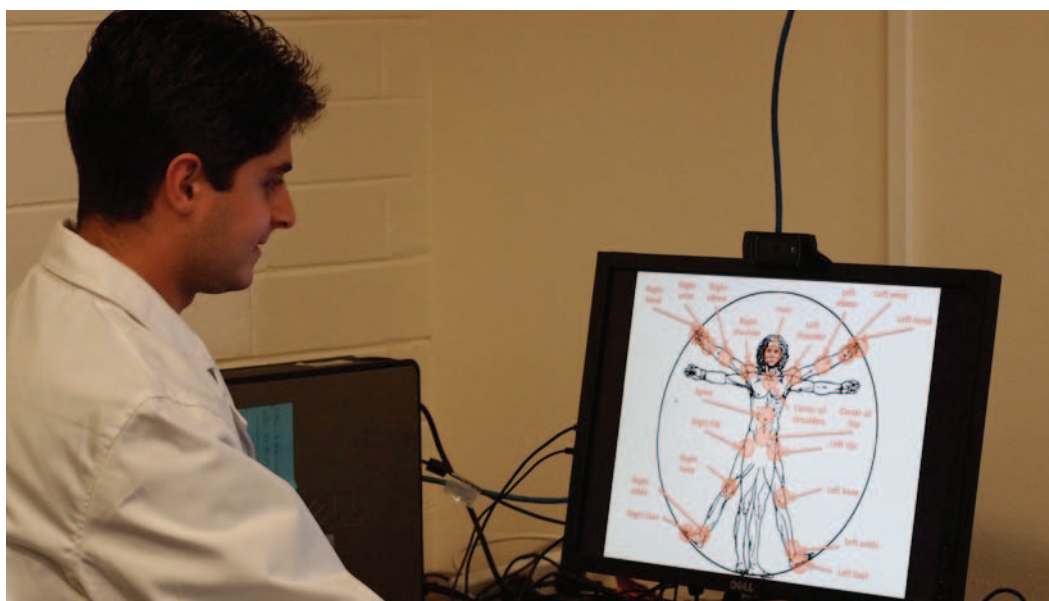
# Health and Ageing

The provision of health services and support for an ageing population are two pressing issues facing Australia over the next 30 years. Broadband-enabled technologies have an important role in improving the range of services available to a growing number of people while also reducing the cost of health and aged care. IBES is researching and developing new and innovative ways to connect people to health and aged care services.

IBES supports a number of projects in telehealth, which make use of high-speed broadband to provide high-definition video conferencing that allows the delivery of new clinical services and increased access to specialist knowledge by patients in rural and regional Australia. Clinical trials are underway in telehealth delivering for dentistry, oncology, psychiatry and wound management. To support the take up of telehealth IBES is researching the connectivity requirements of health care providers to deliver emerging services, along with developing a framework for evaluation.

Broadband-enabled technologies support the management and monitoring of healthcare within the community. Examples are the provision of diabetes information to patients and carers via television and the capturing of data to create a quantitative picture of the individuals to better monitor their health.

A suite of projects is examining the benefits of high-speed broadband for older people. Researchers are working on projects to manage medication administration, provide virtual exercise classes in the home and combat social isolation.



Researching the human body to better understand how to capture data via the Microsoft Kinect



# Smart companion: Medication management for older people with chronic illness

U Parampalli, L Kulik: Computing & Information Systems – E Ozanne: Social Work  
F Martin-Sanchez: Health & Biomedical Informatics – E Manias: Nursing

An ageing population sees many older people living alone. Chronic illnesses increasingly affect older people, requiring them to take multiple daily medications regularly and reliably.

Current solutions to manage medication include reminding patients via telephone or text message, but this does not allow carers to accurately determine whether patients have taken the correct drug at the correct time in the correct dose. To overcome this issue, a broadband-enabled medicine shelf is being developed to assist older people in the management of their medication.

The smart companion is a smart medicine shelf that manages and monitors the administration of medication. The shelf uses a Radio Frequency Identification (RFID) sensor network to give each medicine on the shelf a specific marker. This is coupled with a sensor network that monitors the amount of medication left within each medicine, allowing for the calculation of both usage and quantity.

The smart medicine shelf will assist older people by providing tailored information to patients, allowing the easy identification of which drug to take and what dose they should administer. The technology will also support carers and clinicians by providing information enabling the remote monitoring of medication usage.



Prototype shelf (L) and app screenshot (R).



## SeeCare IPTV: personalised health literacy demonstrator

K Gray: Health & Biomedical Informatics Centre – G Tidhar: SeeCare – F Frukhtman: Ericsson Australia  
K Clarke, M Kwong: Institute for a Broadband-Enabled Society – V Hagger: Diabetes Australia – Vic

Diabetes is a serious condition, which requires careful daily self-management. With an estimated 280 Australians developing diabetes each day, it is vital that timely and relevant information on diabetes is provided in a format that is easy to understand and meets individual needs.

This project, in partnership with SeeCare, Diabetes Australia (Victoria) and Ericsson Australia has created an innovative platform to allow people with diabetes and their carers to access high quality, trusted health information about diabetes in their home via their television. The proof-of-concept system delivers tailored video content to the user's television screen via a broadband connection, integrating the SeeCare support solution into Ericsson's IPTV platform.

The SeeCare system helps people in need to coordinate support and care for themselves, and for others. It enables the sharing of responsibility, support, and decision making with different professionals, as well as with family and friends. An appropriate level of health literacy is required to be actively involved in improving health and wellbeing.

The SeeCare IPTV system demonstrates how diabetes educators can use SeeCare to deliver personalised education videos conveniently to people-in-need using their home television. Often older people are more comfortable using familiar technology, such as a television.



Participants trial SeeCare IPTV in the Australian Broadband Applications Laboratory at IBES.



## Open research initiative to improve the evaluation of Australian telehealth implementations

A Dattakumar, K Gray: Health and Biomedical Informatics – A Maeder: University of Western Sydney  
A Borda: Victorian eResearch Strategic Initiative (VeRSI) – D Noble: Private Anaesthetic Consultant  
BA Biggs, H Gasko, S Jury, T Schulz: Royal Melbourne Hospital

Telehealth has the potential to transform the delivery of health services across the population. However, to date, little has been known about the effectiveness of telehealth projects across Australia. This is due to the difficulty of capturing the various data arising from clinicians and patients. This research project is attempting to overcome these difficulties by creating a platform to share the findings of telehealth implementation in Australia to guide future deployment and improve current practice.

This project is developing and testing a framework that provides for the evaluation of telehealth implementations. The framework provides a set of methods, criteria and standard measures that allow for the comparison of different forms of implementation.

Based on the strength of the work in the conceptual phase, the University of Melbourne has become an evaluation partner on an NBN-enabled telehealth pilot program, *Integrated Home Telehealth* funded through the Commonwealth Department of Health and Ageing. The researchers will be responsible for evaluating three NBN supported telehealth platforms that will be used to provide care to chronically ill patients. Partners in this project include the Royal District Nursing Service, Precedence, Telstra and Healthnet.



Telehealth can increase access to health services across the community.



## Health service provider data connectivity requirements: Mapping a path for a broadband enabled healthcare future

K Gray, F Martin-Sanchez, C Gilbert: Health & Biomedical Informatics Centre  
V Bhakoo: Management & Marketing – S Karunasekera: Computing & Information Systems  
B Gathercole, J Ridoux: Institute for a Broadband-Enabled Society  
S Harrison, F Smolenaers: Australian Centre for Health Innovation (ACHI)

Health is one of the key industry sectors which will be transformed by the implementation of a high-speed broadband. There is recognition that existing healthcare practices will not be sustainable given the twin pressures of a limited health workforce and an increased demand for services due to the higher prevalence of chronic diseases as the population ages. Services will need to adopt smart electronic technologies that increase health workforce productivity and patient self-management, connect consumers and clinicians regardless of place, optimise hospital bed occupancy, and enable preventive screening in infant health centres, schools and aged care facilities. These technologies require high capacity data networks. This project aims to optimise the provision of data connectivity in healthcare provider organisations, so they can take advantage of high capacity broadband in future health service scenarios.

Increased integration and better coordination of the provision of connectivity is crucial to support health providers if they are to take advantage of high capacity broadband infrastructure. To date almost no studies in the public domain have reported real-world research findings about network and data connectivity in health that could inform planning for this connectivity, as the sector moves toward the new kind of service delivery that will be enabled by high-speed broadband.

An IBES White Paper, *Health provider broadband connectivity: A review of technical requirements*, was released in June 2013 examining the available knowledge of current practices and identifying apparent gaps. These findings are supported by qualitative research surveying Chief Information Officers to complete the picture of the opportunities, risks and resources required for health providers to harness the benefit of high-speed broadband. The findings will inform the development of service delivery models to support the management, financing and governance of data connectivity in health providers.



## Interpreter mediated cognitive assessments

D LoGiudice, J Tinney, B Haralambous, E Cyarto: National Ageing Research Institute  
E Zucchi: The Northern Hospital

Cognitive assessment involves the measurement of responses by patients to a range of exercises. Communication is an essential element to assessment, however frequent difficulties occur between mental health staff and clients. This occurs when staff and client speak the same language but is exacerbated when they speak different languages. There is a shortage of interpreters outside the metropolitan areas, and even in the metropolitan areas there are many people who are unable to access health services where an interpreter can be used. This has exacerbated the gaps in the process for people from culturally and linguistically diverse backgrounds.

Recent developments in telehealth have improved the access of some people to healthcare, however little research has been undertaken examining the efficacy of using videoconferencing in mental health assessments. This research project is attempting to address this gap by using video conferencing to increase access to interpreters during cognitive assessments. The technology relies upon high-speed broadband and will provide the capability to connect individuals, families and their clinicians to high-quality interpreting services to improve communication and, ultimately, cognitive assessment.

This project is exploring the acceptability and feasibility of video interpreters compared to face-to-face interactions. Building upon previous research undertaken by the National Ageing Research Institute, the project will also assess the challenges of engagement in a clinical setting between clinician and interpreter. The findings from this project will inform the development of guidelines to support stakeholders throughout the community.

This project is supported by a Hazel Hawke Research Grant in Dementia Care.



## Broadband 3D telehealth applications for patients

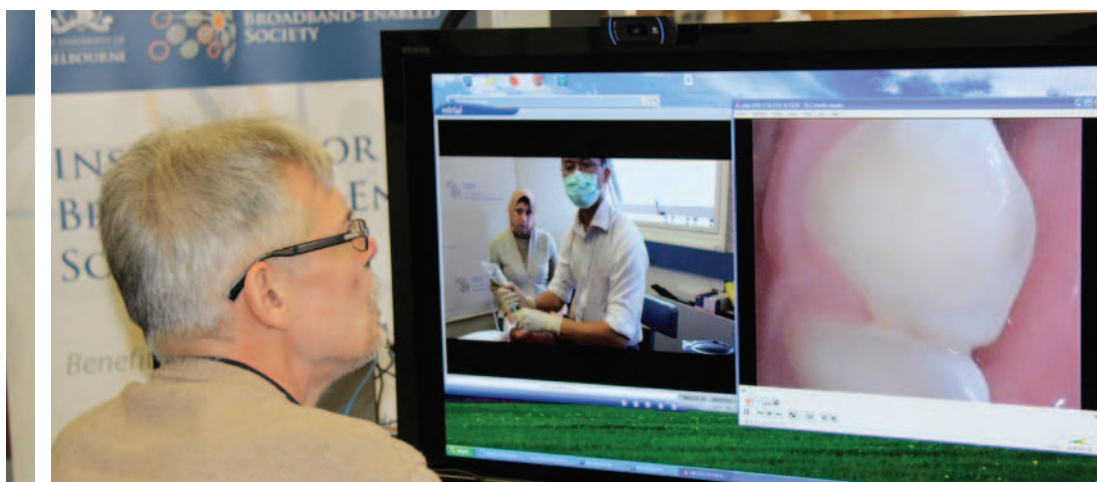
I Everall, R Mocellin: Psychiatry – R Mariño, D Manton, P Marwaha: Melbourne Dental School  
K Clarke: Institute for a Broadband-Enabled Society – A Stranieri: University of Ballarat  
K Lim: Northern Health – S Vaughan: Grampians Integrated Cancer Services  
C Cheesman: Heritage Lakes – D van der Knijff: Information Technology Services  
A Borda, K Chiu, R Collmann, C Myers, R Lindsay: Victorian eResearch Strategic Initiative (VeRSI)

This project is undertaking clinical trials at various locations in northern metropolitan Melbourne and Western Victoria. It consists of various medical specialities (teledentistry, teleoncology, telegeriatics, telewound and telepsychiatry) all of which share, and benefit from, the same basic technology platform that can be adapted with either 2D or 3D cameras in either standard or high-definition. Patient consultations can also be live or in a so-called 'store and forward' mode for offline reviews.

The teledentistry project, under the direction of the Melbourne Dental School, has used an intra-oral camera to provide dental assessments and treatment plans remotely for 50 elderly residents at Heritage Lakes aged care facility in Bundoora, Victoria.

Other field trials are due to start in September 2013 after equipment installation is complete and ethics clearance obtained from the various bodies involved. For example, 3D telepsychiatry services will be provided from the Department of Psychiatry at the RMH to several locations: Goulburn Valley Hospital in Shepparton, Ballarat Hospital, and Horsham Hospital. Videoconferencing equipment is installed at Royal Melbourne Hospital and the remote locations are being fitted out for field trials.

A mobile telewound kit comprising camera and tablet will be used by nurses from both Ballarat District Nurse and Healthcare and West Wimmera Health Service visiting patients in their homes. The installations have been designed for images of wounds to be automatically transmitted from the camera to the tablet for selection and upload to a project Store and Forward Server. A wound specialist at the Nhill Hospital and another at Department of Health in Horsham download the images to a PC/3D TV for viewing and annotation.



Rodrigo Mariño performs a teledentistry examination of a patient.



## Ageing well at home with broadband

R Haack: Moreland City Council – D O'Connor, E Cyarto, F Bachelor, E Renehan: National Ageing Research Institute – D Farmer: AARnet – J Ridoux: Institute for a Broadband-Enabled Society  
P Price: Merri Community Health – D Spriggs: Infoexchange – S Healy: Council on the Ageing

Australia's population is ageing: the proportion of the population aged over 65 years is expected to double within the next 45 years. This trend will lead to increased demand for aged care services and increased spending on aged care. Older Australians value their independence and it is the wish of most people to remain living at home for as long as possible. However, some are at risk of social isolation. Currently there are more than 50,000 socially isolated older Victorians with this number predicted to increase by 46% by 2020.

This project involves the development and implementation of a home exercise program using Microsoft's Kinect for Xbox 360 gaming technology. A virtual exercise class delivered real-time via the National Broadband Network (NBN) will be trialled with people aged 60+ from the Brunswick area. An avatar represents each participant and participants will be able to see each other and the instructor on their television.

The project will assess the effectiveness of the exercise class in improving or maintaining their health and social connectedness while also determining the acceptability and feasibility of service delivery to older people in their homes via broadband-enabled technologies.

Collaborating organisations in this project include Moreland City Council, National Ageing Research Institute, Microsoft, NBN Co, AARNet, Infoexchange, Council on the Ageing and Merri Community Health Services.

This project is funded by the Victorian Government's Broadband Enabled Innovation Program (BEIP).



Trialling the exercise class on Microsoft's Kinect for Xbox 360.



## Growing old and staying connected: Ameliorating older people's social isolation

F Vetere, L Kulik, J Waycott: Computing & Information Systems – E Ozzanne: Social Work  
S Pedell: Swinburne University of Technology – A Grunter: Benetas – B Lillywhite: Aged Care Consultant

This ARC Linkage project builds on pilot work funded by IBES. The project aims to develop and implement new communication technologies to help alleviate older people's experience of social isolation. Social isolation occurs when a person has limited social support and feels disconnected from society, and can be a particular problem for older adults who live alone. To address this problem, the project has developed a novel iPad application, Enmesh (Engagement through Media Sharing), allowing users to create photographs and messages which are sent to an interactive shared display. In the past year, Enmesh has been further refined and evaluated in a field study of the technology-in-use. Working in partnership with the aged care provider, Benetas, the project supplied iPads to eight socially isolated older adults, who used Enmesh to share photographs and messages with each other over a five month period. Participants enjoyed using Enmesh. They regularly checked if there was new content on the display and they enjoyed reading each other's messages and seeing new photographs. Sharing information with other Benetas clients gave them the opportunity to connect with new people.

As one participant said: "It has given me a sense of belonging to a group. I'm not a great seeker out of group activities, mainly because I don't like to make time commitments given that lots of things crop up such as medical appointments that interrupt me almost without notice. This is a group which I can belong to in my own time, which is unique."

Benetas care managers also contributed their own photographs and messages, which they shared with their clients. They found this to be a useful way of maintaining contact with clients, while being careful not to cross personal-professional boundaries. The field study provided insights about how to create enjoyable and interesting social activities and help to build social connections among older adults. This knowledge will be used to inform further developments of the technology and methods for a longer field study, which will take place from September 2013.



The Hon Susan Ryan, Aged Discrimination Commissioner (L) meets with Lars Kulick, Elizabeth Ozzanne and Frank Vetere to discuss the project and its impact for older Australians.



# Mobile augmented reality: Information, interface and interaction in blended environments

K Gray, J Kilby, F Martin-Sanchez: Health and Biomedical Informatics Centre  
K Elliott: Medical Education Unit – J Waycott: Computing & Information Systems  
B Dave: Melbourne School of Design – K Stakula: Victorian Comprehensive Cancer Centre  
P Fannin, L Williams: Walter & Eliza Hall Institute of Medical Research  
H Gardiner: Victorian Life Sciences Computational Initiative

Mobile Augmented Reality (MAR) is an emerging technology that will be made more accessible by the increased availability of high-speed broadband. There are many facets to the MAR experience, including considerations of interface, informational content and user interaction.

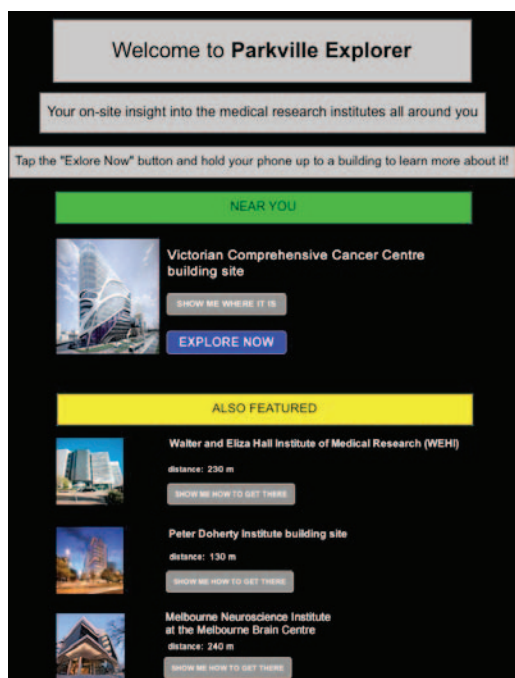
This project is developing a Mobile Augmented Reality application that uses buildings in the physical environment as portals or interfaces to information generated within or associated with those buildings. It is exploring how people interact and engage with this information within their physical environment. The research is informed by the interrelated themes of interface, information and interaction that are examined in a case study involving smartphone-based mobile augmented reality to enable the public to explore health science and biomedical information associated with research institutes in the Parkville Precinct.

Initial research examined the available mobile augmented reality technologies and the interaction between interface, information and interaction. These findings were published in an IBES White Paper in August 2012 entitled: *Interface, information & interaction: An exploration of Mobile Augmented Reality present and future*.

Following this, user-testing of a prototype mobile augmented reality tool for the Parkville Precinct has occurred featuring content from research institutes.

The research institutes involved are: Walter and Eliza Hall Medical Institute, Victorian Comprehensive Cancer Centre, Victorian Life Sciences Computing Initiative, Melbourne Neuroscience Institute and Grimshaw Architects.

It is envisaged that the mobile augmented reality tool will increase accessibility and navigation around the Parkville Precinct, promoting knowledge and awareness of the world-leading research and opportunities to become involved.



Screenshot of the prototype mobile augmented reality tool for the Parkville Precinct



## Selfomics: Addressing needs of the ‘quantified individual’ for enabling participatory & personalised medicine

F Martin-Sanchez, K Gray, M Almalki: Health & Biomedical Informatics Centre  
K Allen: Murdoch Childrens Research Institute – M Jenkins: Population Health  
B Ploderer, M Whooley: Computing & Information Systems – J Furler: General Practice  
A Vishwanath: Electrical & Electronic Engineering – S Venkatraman: University of Ballarat

Most diseases are the result of a complex interplay between genetic, environmental and physiological factors. However, advances in information and communications technology has 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 a greater understanding of their health status in relation to the world around them.

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. Initial findings were published in an IBES White Paper in May 2013 entitled: *Self-Quantification: The Informatics of Personal Data Management for Health and Fitness*.

The White Paper provides a summary of the self-quantification landscape, classifying the various tools and mapping data flows and some of the expected integration challenges. Building upon the findings in the White Paper, the researchers will provide the devices to a number of people to monitor their activities and environment. The data gathered will be integrated into a chimeric quantified individual data repository. The ultimate aim is to incorporate this data into an individual’s personally controlled electronic health record.



Self-quantification technologies capture health and fitness data from a range of sources.



## Refugee health hub

**BA Biggs, T Schulz, H Gasko** : Royal Melbourne Hospital  
**M Hibbert**: Precedence HealthCare – **J Lohrey**: Architecta – **G Paxton**: Royal Children's Hospital  
**E Athan, D O'Brien, K McCloskey**: Barwon Health – **C Lemoh, A Block**: Southern Health

Refugees and immigrants arriving in Australia often have complex health conditions that require medical care from both general practitioners and specialists multiple times over the course of their treatment. Annually, approximately 3,500 humanitarian refugees, half aged 19 years or younger, arrive in Victoria. To improve the quality of care available to these patients researchers are developing an online electronic health record system to connect specialists and GPs to support continued communication in the management of complex health needs.

The clinical hub provides access to specialist care summaries from four Victorian refugee health clinics at the Royal Melbourne Hospital, Royal Children's Hospital, Geelong Hospital and Dandenong Hospital. The hub supports video conferencing for specialist consultations and interpreting and aims to deliver specialist support for GPs in regional areas. The development of the hub provides a technology platform that is transferable to other complex patient groups requiring coordinated care.

The hub provides a web-based patient health record for use in hospital refugee clinics and the collection of health data to facilitate research to deliver preventative health initiatives via a patient portal. It has been installed at Royal Melbourne Hospital and is currently in use. The system will be installed at Royal Children's Hospital, Barwon Health and Dandenong Hospital.

The project is funded by the Victorian Government's Broadband Enabled Innovation Program (BEIP).

## Improving access to interpreters during clinical consultations for refugee and immigrant patients

**T Schultz, K Leader, BA Biggs**: Royal Melbourne Hospital – **I Akinci**: All Graduates Interpreter Service

This research project is evaluating the use of video-conferencing by interpreters for clinical consultations. Trials involve three uses of interpreter video conferencing: specialist and patients in a consulting room at the Royal Melbourne Hospital with the interpreter located remotely; telemedicine consultations where specialist, patient and interpreter are at separate sites; and consultations where specialist and interpreter are together while the patient is at a remote location.

Over 50 consultations have occurred, allowing the researchers to assess patient attitudes and satisfaction. The trial has demonstrated the potential of using interpreting services delivered via video-conferencing. Should the program be incorporated into routine practice it will increase access to healthcare services by patients from culturally and linguistically diverse backgrounds, especially in rural and regional Australia.



# Teledentistry

R Mariño, M Hopcraft, D Manton, M McCullough, P Marwaha: Melbourne Dental School  
A Borda, C Myers: Victorian eResearch Strategic Initiative – E Ozanne: Social Work  
K Clarke: Institute for a Broadband-Enabled Society – I Blackberry: National Ageing Research Institute  
K Hallett: Royal Children's Hospital

Teledentistry increases access to dental care by allowing for the remote diagnosis and management of dental conditions by a clinical professional. A teledentistry examination involves the practitioner or dental assistant manipulating an intra-oral camera in the patient's mouth. The live video is transmitted via high-speed broadband to a qualified dentist or specialist for examination, allowing the assessment and development of an appropriate treatment plan. Two applications of teledentistry are currently being researched, one involving children and the other involving older people.

## Paediatric Teledentistry

There is a shortage of dental specialists in rural and regional Australia. Patients who require treatment for conditions such as cleft lip and palate, dental trauma and orthodontics are often required to travel to metropolitan centres for check-ups. This project is using teledentistry to provide remote assessments of children living outside of metropolitan areas, thereby reducing families' travel times.

Clinical trials are connecting paediatric dental specialists from the Royal Children's Hospital to clinics in Shepparton, Geelong and Frankston. This project is supported by Google Australia.

## Teledentistry in aged care

Teledentistry can also address the oral health workforce shortage to increase access to oral health services for segments of the population. Older people in residential aged care face physical or psychological barriers in accessing dental services. Only 11 percent of residents have seen a dentist in the past year, leading to poor oral health.

To increase access to oral health care this project is trialling the delivery of teledentistry consultations at residential aged care facilities, Benetas in Brunswick



West and Heritage Lakes in South Morang. This project is supported by a Dental Health Service Victoria Grant.

Dr Kerrod Hallett and Dr Parul Marwaha examine a paediatric dental patient



## PhD Projects

### **Toward a Comprehensive Self-Quantification Personal Health Information Management system**

M Almalki: Health & Biomedical Informatics Centre

The self-tracking of personal health and fitness data can contribute to better health outcomes by allowing clinicians to monitor the health conditions and supporting increased patient self-management. Self-tracking technology is becoming more widespread with the development of low-cost, user-friendly mobile wireless sensing devices and associated web services. To take advantage of these benefits a comprehensive approach is required to support the management and analysis of self-tracking.

In using multiple self-tracking devices, individuals generate and aggregate physiological, environmental and genetic data on a grand scale. However, the lack of a formal architecture for information practice adds complexity to data management. This project is reviewing the data management capabilities currently available for self-tracking tools and ancillary tools, which need a systematic approach to modelling, managing and making sense of data. This research aims to scope what is possible and test what is workable to improve information practice within the self-quantification environment.

### **Managing chronic pain through social media**

M Merolli: Health & Biomedical Informatics

Chronic pain management costs the Australian economy approximately \$34 billion annually. Social media technologies can support sufferers of chronic pain by empowering patients and increasing self-management. The future for social media in chronic disease management appears to be optimistic. However, there is limited concrete evidence indicating whether and how social media use significantly improves patient outcomes.

This research project is attempting to overcome this gap by investigating ways in which social media can be optimised to improve healthcare for chronic illness sufferers. The aim is to develop a theoretical framework for evidence generation of improved health outcomes from social media use in chronic disease management and on a practical level to aid decision-making about social media use in chronic disease. For social media to form a more meaningful part of effective chronic disease management, interventions need to be tailored to the individualised needs of sufferers.



# Appendices

Personnel

Media

Publications

Presentations by executives on behalf of IBES

Events

Finance



The Hon Julia Gillard, Prime Minister, presents to the Telework Congress via telepresence from Parliament House.



# Personnel

## Advisory Board

**Steve Wood:** CEO, Tennis Australia  
**Mark Ablett:** Vice President, Australia/New Zealand, Juniper Networks  
**Genevieve Bell:** Director Interaction Experience Research, Intel  
**Chris Hancock:** CEO, AARnet  
**Cathy Steele:** Associate Professor Monash University  
**Mike Quigley:** CEO, NBN Co  
**Kevin Bloch:** Chief Technology Officer, Cisco  
**Mark Iles:** Vice President, Australia/New Zealand, Juniper Networks (to Oct 2012)

## Executive Committee

**Rod Tucker:** Director, IBES  
**Emma Dawson:** Executive Director, IBES  
**Lynda Ball:** Melbourne Graduate School of Education  
**Simon Bell:** Management & Marketing  
**Andrew Kenyon:** Melbourne Law School  
**Fernando Martin-Sanchez:** Health & Biomedical Informatics  
**Scott McQuire:** Culture & Communication  
**Elizabeth Ozanne:** Social Work  
**Gregor Kennedy:** Centre for the Study of Higher Education (to Jul 2013)  
**Kathleen Gray:** Health & Biomedical Informatics (to Jun 2013)  
**Steve Howard:** Computing & Information Systems (to April 2013)  
**Kate Cornick:** Executive Director, IBES (to Dec 2012)

## IBES Staff

**Rod Tucker:** Director  
**Emma Dawson:** Executive Director  
**Fiorella Chiodo:** Executive Assistant  
**Ken Clarke:** Senior Research Fellow  
**Adam Ladders:** Communications Manager  
**Julien Ridoux:** Senior Telecommunications Engineer  
**Roger Hughes:** Finance Officer  
**Monjita Dutta-Doloi:** Finance Officer (to Mar 2013)  
**Brad Gathercole:** Senior Telecommunications Engineer (to March 2013)  
**Kate Cornick:** Executive Director (to Dec 2012)

## Researchers

### Architecture, Building & Planning

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### Arts

O Kelada, P Morrissey, C Rachinger  
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M Arnold, **Historical & Philosophical Studies**  
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H Sullivan, Melbourne School of Government  
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### Business & Economics

V Bhakoo, B Coker, **Management & Marketing**  
J Yong, Melbourne Institute of Applied Economic and Social Research

### Medicine, Dentistry & Health Sciences

R Chenhall, Centre for Health and Society  
J Furler, **General Practice**  
A Dattakumar, J Kilby, C Gilbert, K Gray, **Health & Biomedical Informatics**  
K Elliott, **Medical Education Unit**  
M Hopcraft, R Judge, D Manton, R Mariño, P Marwaha, M McCullough, C Nguyen, A Polster, E Reynolds, M Smith, **Melbourne Dental School**  
R Woodward-Kron, Melbourne Medical School  
E Manias, **Nursing**  
S O'Leary, **Otolaryngology**  
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C Humphreys, **Social Work**

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C Bellamy, R Bosua, SChang, S Dreyfus, M Gibbs, M Gloet, S Karunasekera, E Kazmierczak, L Kulik, S Kurnia, A Mendoza, B Nansen, U Parampalli, B Ploderer, F Vetere, J Waycott, S Webber, M Whooley, **Computing & Information Systems**



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C Ogleby, T Ngo, **Infrastructure Engineering**  
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G Cook

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M Carter, **Computing & Information Systems, History & Philosophy of Science**  
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J Downs, **Computing & Information Systems**  
V Fitzgerald, **Asia Institute, Melbourne Graduate School of Education**  
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L Wilkinson, **Culture & Communication**  
Y Zhou, **Computing & Information Systems**

## External Collaborators

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I Akinci, **All Graduates Interpreter Service**  
J Lohrey, **Architecta**  
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Z Black, **Australian Communication Exchange**  
E Athan, K McCloskey, D O'Brien, **Barwon Health**  
A Grunter, **Benetas**  
J Schaub, A Jones, **Berry Street**  
C Platania-Phung, **Central Queensland University**  
B Dalgarno, **Charles Sturt University**  
A Ley, **City of Melbourne**  
S Healy, **Council on the Ageing**  
V Hagger, **Diabetes Australia - Vic**  
F Frukhtman, V Yin, **Ericsson Australia**  
S Vaughan, **Grampians Integrated Cancer Services**  
S Li, **Hear for You**  
C Cheesman, **Heritage Lakes**  
D Spriggs, **Infoexchange**  
R Rose, **LaTrobe University**  
P Price, **Merri Community Health**  
S Faulkhead, **Monash University**  
R Haack, **Moreland City Council**  
K Allen, **Murdoch Childrens Research Institute**  
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S Yung, **National University of Singapore**  
K Harrison, **NBN Co**  
K Lim, **Northern Health**  
M Hibbert, **Precedence HealthCare**  
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S Pedell, **Swinburne University of Technology**  
E Zucchi, **The Northern Hospital**  
M Dieter, **University of Amsterdam**  
A Stranieri, S Venkatraman, **University of Ballarat**  
A Maeder, **University of Western Sydney**  
B Joy, **VastPark**  
K Adams, **Victoria University**  
K Stakula, **Victorian Comprehensive Cancer Centre**  
A Borda, K Chiu, R Collmann, R Lindsay, C Myers  
**Victorian eResearch Strategic Initiative (VeRSI)**  
H Harrington-Johnson, **Victorian Institute for Deaf Education**  
H Gardiner, **Victorian Life Sciences Computational Initiative**  
P Fannin, L Williams, **Walter & Eliza Hall Institute of Medical Research**



# Media

## Media Releases

### **National Congress to establish the benefits of telework**

Thursday 1 November 2012

### **Telework delivers increases in productivity and wellbeing**

Monday 12 November 2012

### **Delivering diabetes education via television**

Friday 22 March 2013

### **Delivering dental education via television**

Friday 12 April 2013

Online sharing reduces loneliness among the aged, *The Age*, 2 Jul 2012

Social media could help improve quality of life for elderly Australians, *Castleford*, 3 Jul 2012

Appy days are here again for seniors who plug in to social media, *The Age*, 3 Jul 2012

NBN Co opens app testing sandpit, *CRN*, 26 Jul 2012

2012 Communications Alliance and CommsDay Awards winners announced, *Rust Report*, 30 July 2012

High life in the NBN fast lane, *The Age*, 2 Aug 2012

Digital Dentists, *The Age*, 8 Aug 2012

The dentist will see you now, online, *The Age*, 9 Aug 2012

Death, Data and our digital legacy, *RN Future Tense*, 12 Aug 2012

Piracy to blame for Ten slump: Scott, *The Age*, 20 Sep 2012

Snoozing, losing a problem for TEN according to ABC boss, *TV Tonight*, 21 Sep 2012

Congress notes: more to life than the NBN, *Comms Day*, 11 Oct 2012

Interview with Scott McQuire about Australia-Korea Dance Battle, *RN Drive*, 11 Oct 2012

Interview with Scott McQuire about Australia-Korea Dance Battle, *ABC 774 Melbourne Breakfast*, 12 Oct 2012

Interview with Scott McQuire about Australia-Korea Dance Battle, *ABC 891 Adelaide Drive*, 12 Oct 2012

Government Sets Telework Target, *RN Drive*, 12 Nov 2012

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Telework delivers increases in productivity and wellbeing, *My Science*, 12 Nov 2012

Telework lifts productivity and wellbeing, *The Conversation*, 13 Nov 2012

From telework to cloud labour, *Technology Spectator*, 13 Nov 2012

Waiting for the teleworking revolution, *Technology Spectator*, 14 Nov 2012

Huge doubts cast over Coalition's 'cheaper' NBN alternative, *ABC Technology + Games*, 16 Nov 2012

Anne Hurley, Kate Cornick join NBN Co, *Comms Day*, 4 Dec 2012

Cisco investigating telework with IBES and AUT, *ARN*, 7 Dec 2012

The vast differences between the NBN and the Coalition's alternative, *ABC Technology + Games*, 21 Feb 2013

Home office produces hardest workers, *The Age*, 24 Feb 2013

Taking those nine-to-five office jobs home is working like a charm, *The Age*, 25 Feb 2013

Employers are being urged to consider flexible working conditions, *3AW*, 25 Feb 2013

NBN users report no hike in bills. Sydney Morning Herald, 3 Mar 2013

82% of early Stage residents back NBN, *Delimiter*, 4 Mar 2013

Most households not paying more for NBN internet, *Computerworld*, 4 Mar 2013

Households use more data with NBN: study, *ARN IT News*, 4 Mar 2013

Broadbanding Brunswick, *CommsWire*, 5 Mar 2013

Broadbanding Brunswick, *iWire*, 5 Mar 2013.

What reporting of the Brunswick NBN survey didn't tell you, *Comms Day*, 6 Mar 2013

NBN Speed Impresses, *SN Weekly*, 8 Mar 2013

Conroy advisor takes over as IBES executive director, *Comms Day*, 6 Mar 2013

Telework Research Needs Volunteers, *Pro Bono Australia News*, 7 Mar 2013



Teleworking: The New Way to Commute, *Business Review Australia*, 15 Mar 2013

Despite bumps in the rollout, households show strong support for the NBN, *The Conversation*, 19 Mar 2013

Tele-dentistry could (Video-) Feed Mouths in Need *Pulse + IT* 25 March 2013

SeeCare IPTV, *NITV News*, 25 Mar 2013

Researchers deliver diabetes education via television, *Transforming the Nation's Healthcare*, 26 Mar 2013

IPTV a Viable Health Literacy Channel, *Pulse + IT*, 28 Mar 2013

The NBN in March: Tide turns as delays, skill shortages plague NBN Co, *ABC Technology and Games*, 2 Apr 2013

NBN debate full of 'erroneous' information, *The Age*, 4 Apr 2013

Broadband Helps Older People Kinect for Exercise, *Pulse + IT*, 4 Apr 2013

Coalition NBN policy is a lemon: critics, *News.com.au*, 9 Apr 2013

Faster broadband for all from both parties, *Daily Telegraph*, 9 Apr 2013

Coalition NBN Policy: Short-Term Savings But No Long-Term Vision, *Lifehacker*, 10 Apr 2013

Old flaws mar Tony Abbott's NBN, *The Australian*, 10 Apr 2013

Rod Tucker interview on the NBN, *2SER Radio*, 10 April 2013

All smiles for new IPTV dental program, *ITWire*, 12 Apr 2013

NBN and IPTV trial for dental students launches, *Computerworld*, 12 Apr 2013

Pattison says Dental Education by Internet Protocol Television is being launched in Shepparton today, *ABC Goulburn Murray, Wodonga, Mornings*, 12 Apr 2013

Students to see 3D picture, *Shepparton News*, 13 Apr 2013

Victorian gov't launched IBES-run tele-education trial, *Comms Day*, 15 Apr 2013

UniTV, *Win News Shepparton*, 15 Apr 2013

Dental Students to Learn through Uni TV, *Victorian Government Health Information*, 1 May 2013

NBN switch-on suffers tech glitch, *Sydney Morning Herald*, 5 May 2013

Impact of the NBN, *Weekend Sunrise*, 19 May 2013

Tuning into health TV, *Australian Ageing Agenda*, 1 June 2013

Remote Control, *Voyeur*, 1 Jun 2013

NBN Co signs up to Alcatel-Lucent innovation push, *Comms Day*, 13 Jun 2013

Fibre to the Mouth: Australians Sinking their Teeth into NBN Dentistry, *IDG Connect*, 20 Jun 2013



# Publications

## White Papers

J Kilby, K Gray, K Elliott, J Waycott, FM Sanchez, B Dave, *Interface, information & interaction: An exploration of Mobile Augmented Reality present and future*, Institute for a Broadband-Enabled Society, University of Melbourne, August 2012, ISBN 978 0 7340 4789 2

F Edmonds, C Rachinger, J Waycott, P Morrissey, O Kelada, R Nordlinger, *'Keeping Intouchable': A community report on the use of mobile phones and social networking by young Aboriginal people in Victoria*, Institute for a Broadband-Enabled Society, University of Melbourne, August 2012 ISBN 978 0 646 58297 9

R Bosua, M Gloet, S Kurnia, A Mendoza, J Yong, *Telework, productivity and wellbeing*, Institute for a Broadband-Enabled Society, University of Melbourne, November 2012, ISBN 978 0 7340 4801 1

M Almalki, F Martin-Sanchez, K Gray *Self-Quantification: The Informatics of Personal Data Management for Health and Fitness*, Institute for a Broadband-Enabled Society, University of Melbourne, May 2013, ISBN 978 0 7340 4831 8

C Gilbert, K Gray, F Martin-Sanchez, S Karunasekera, V Bhakoo, S Harrison, F Smolenaers, J Egan, *Health Provider Broadband Connectivity: A review of technical requirements*, Institute for a Broadband-Enabled Society, University of Melbourne, June 2013, ISBN 978 0 7340 4846 2

## Book Chapters

T Apperley, B Nansen, M Arnold, R Wilken, M Gibbs, 'The Australian National Broadband Network: Policy, infrastructure, spectrum politics and the digital home', in J Choudrie and C Middleton (eds.) *Management of Broadband Technology Innovation*. Routledge. (in press)

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*. Routledge. (in press)

## Journal Articles

R Bosua, M Gloet, S Kurnia, A Mendoza, J Yong 'Telework, productivity and wellbeing: an Australian perspective' *Telecommunications Journal of Australia* 63(1)

K Clarke, M McCullough, K Leins, G Tidhar, D Farmer, (2012) 'The role of IPTV in education' *Telecommunications Journal of Australia* 62(5)

MP Dias, (2012) 'A Machine to See With (and Reflect Upon): Interview with Blast Theory Artists Matt Adams and Nick Tandavanitj', *Liminalities: Journal of Performance Studies* 8(1) September 2012

J Kilby, K Gray, K Elliott, J Waycott, FM Sanchez, B Dave (2013) 'Designing a mobile augmented reality tool for the locative visualisation of biomedical knowledge.' *Studies in Health Technology and Informatics* 192, 652-6.

S McQuire, 2012. 'Urban screens, networked cultures and participatory public space', *Communication & Society* 21 (July) pp. 105-128 (Chinese language)

B Nansen, K Chakraborty, L Gibbs, F Vetere, C MacDougall, (2012) 'MyBus': Children's Mobile Health, Wellbeing and Digital Inclusion. *Journal of Community Informatics*.

B Nansen, R Wilken, M Arnold, M Gibbs, (2013) Digital Literacies and the National Broadband Network: Competency, Legibility, Context. *Media International Australia* 147: 18-28.

F Vetere, J Green, A Nisselle, XT Dang, T Zazryn, PP Deng, (2012) 'Inclusion during school absence: Using ambient technology to create a classroom presence for hospitalised children' *Telecommunications Journal of Australia* 62(5)

R Wilken, B Nansen, M Arnold, M Gibbs (2013) National, Local and Household Media Ecologies. The Case of Australia's National Broadband Network. *Communication Politics & Culture*.



## Conference Papers

CM Dissanayake, K Ramamohanarao, MN Halgamuge, B Moran, P Farrell, 'Propagation Constrains in Elephant Localization Using an Acoustic Sensor Network', IEEE 6th International Conference on Information and Automation for Sustainability, Beijing China, 27-29 September 2012

G Kennedy, I Ioannou, Y Zhou, J Bailey, S O'Leary, 'Data mining interactions in a 3D immersive environment for real-time feedback during simulated surgery.' *Australasian Society for Computers in Learning in Tertiary Education*, Wellington New Zealand, 2012.

S McQuire, 'The right to the networked city' Crossroads 2012 Association of Cultural Studies Conference, Nouvelle Sorbonne, Paris, July 2012.

S McQuire, 'Screen/City: Screen culture in public', Otago University, Dunedin, New Zealand, 19 October 2012

J Mori, M Gibbs, M Arnold, B Nansen, 'Design Considerations for After Death: Comparing the Affordances of Three Online Platforms' OzCHI, Swinburne University, November 26-30, 2012.

B Nansen, L Gibbs, C MacDougall, F Vetere, I Danic, J McKendrick, T LaMontagne, 'Stepping Out: Children Negotiating Independent Travel.' Population Health Congress 2012. Adelaide, September 2012

B Nansen, B Wilken, R Arnold, M Gibbs 'Household Device Things and the Immateriality of Technology Hardware.' *Materialities Conference*, Cultural Studies Association of Australasia (CSAA), University of Sydney, November 2012.

B Nansen, M Gibbs, M Arnold, T Kohn, 'Digital Memorialisation and the Posthumous Biography', on Panel: Distributed Biographies: Narratives of life and death on distributed networks. Framing Lives, the 8th Biennial Conference of the International Auto/Biography Association, ANU, Canberra, July 2012.

B Nansen, M Gibbs, M Arnold, T Kohn, 'Digital death and resurrection software'. *CODE conference*, Swinburne University, November, 2012.

JM Pearce, S Chang, G Kennedy, RBW Ely, M Ainley, 'Search and Explore: more than one way to find what you want.' Proceedings from 2012 *Australasian Computer Human Interaction Conference*, OzCHI 2012, Melbourne.



## Presentations by executives on behalf of IBES

### Rod Tucker

Conference on Communications & Electronics  
2012 (ICCE)

1-3 August 2012, Hue, Vietnam.

IEEE-ICCC12 Conference on Communications  
14-18 August 2012, Beijing, China.

Bendigo and Adelaide Bank  
3 September 2012, Melbourne.

Photonics in Switching Conference  
10-14 September 2012 Ajaccio, Corsica, France.

38th European Conference on Optical  
Communication  
17-21 September 2012, Amsterdam, the  
Netherlands.

GreenTouch Members Meeting  
5-9 November 2012, Stuttgart, Germany.

Hanoi University of Technology  
9 October 2012, Hanoi, Vietnam.

ANZAAS Victoria  
21 November, 2012, GTAC Melbourne.

Innovation and Technology in Health and  
Community Services Seminar  
27 November 2012, Yarra Ranges Council, Lilydale.

Internet of Things World Forum  
20-21 February 2013, San Jose, California, USA.

OFC/NFOEC 2013  
17-21 March 2013, Anaheim, California, USA.

GreenTouch Members Meeting  
13-16 May 2013, Shanghai, China.

GreenTouch Media Meeting  
21-22 May 2013, Sydney.

ICC Budapest  
10-13 June 2013, Budapest, Hungary.

Fraunhofer Heinrich Hertz Institute  
18 June 2013, Berlin, Germany.

Deutsche Telekom AG, T-Labs (Research &  
Innovation)  
19 June 2013, Berlin, Germany.

### Emma Dawson

ATSE/DBI Innovation Workshop  
26 March 2013, Eastern Metropolitan Victorian  
Government Business Office, Ringwood.

AmCham luncheon (with Dr Rachele Bousa)  
4 April 2013, Melbourne.

CommsDay Summit 2013  
9-10 April 2013, Sydney.

Boardroom Luncheon with Federal Attorney-  
General, the Hon Mark Dreyfus QC MP.  
11 April 2013, Sydney.

Brotherhood of St Laurence Symposium  
29 April 2013, Melbourne.

Digital Productivity Conference  
11-13 June 2013, Brisbane.

Briefing to the Labor Digital Economy Group  
19 June 2013, Parliament House, Canberra.

### Kate Cornick

Broadband Today Alliance  
11 July 2012, NBN Co Docklands Discovery  
Centre, Melbourne.

2012 ACCAN Annual Conference,  
6 September 2012, Sydney.

CommsDay Melbourne Congress  
10 October 2012, Melbourne.

Williamson Community Leadership Program at  
Leadership Victoria  
19 October 2012, Melbourne.

Department of Broadband, Communications & the  
Digital Economy  
7 November 2012, Canberra.

NBN Realised Forum  
13 November 2012, Melbourne.

Australia Beyond Broadband  
15 November 2012, Melbourne.

Telstra Corporate Sustainability Office (CSO) Academy  
20 November 2012, Melbourne.

### Kate Cornick, Scott McQuire & Tom Apperley

Australian Communications and Media Authority  
(ACMA)  
11 December 2012, Melbourne.



## Events

### IBES Planning Day

12 July 2012

IBES annual planning and strategy meeting.

### Disruptions and Dividends: A Fast Broadband Australia, Mark Scott, ABC

20 September 2012

Public Lecture at the University of Melbourne

### Microsoft Research Executive Visit

24 September 2012

A delegation of Microsoft research Executives including Dr Stuart Tansley (Director, Natural User Interface) and Dr Dan Fay (Earth, Energy and the Environment) visited IBES to explore stronger research collaborations.

### Open Data for Open Science: Workshop for Environmental Research" and "What's next with Natural User Interaction?"

25-26 September 2012

IBES with Microsoft hosted two workshops at the University of Melbourne.

### The Hon Greg Combet, Minister for Climate Change and Energy Efficiency, Minister for Industry and Innovation

8 August 2012

Minister Combet visited IBES and CEET to attend discussions on energy efficiency technologies.

### NBN + Cloud Forum

8 August 2012

IBES demonstrated technology at the NBN+Cloud Forum, Sydney.

### Melbourne City Council

21 August 2012

Melbourne City Council staff toured IBES.

### Argentinean University Delegation

22 August 2012

IBES hosted a delegation from an Argentinean University.

### IBES Annual Symposium

30 October 2012

### Oral Health meets e-health symposium

9 November 2012

IBES was a partner in the symposium hosted by the Oral Health CRC.

### Telework Congress

12 November 2012

IBES hosted the Telework Congress in partnership with Cisco, Ai Group, AIIA, the Department of Broadband, Communications & the Digital Economy, and Telstra.

### Chi Onwurah MP (House of Commons, UK), Shadow Minister for ICT.

20 December 2012

Chi Onwurah visited IBES and discussed:

- Broadband rollouts
- Broadband applications
- New markets/digital economy
- Energy efficiency

### Jens Myrup Pedersen, Aalborg University, Denmark

17 December 2012

Rod Tucker hosted a visit from Jens Myrup Pedersen to discuss potential collaboration.

### Cisco Education Summit 2013

6 March 2013

Under the umbrella of Cisco Live 2013 the Cisco Education Summit 2013 was held at the University of Melbourne co-hosted by CISCO and IBES.

### Workshop on Urban Connectedness

31 May 2013

Academics from the University and industry representatives explored the available expertise in urban connectedness research within the university and the interests of industry.



Ken Clarke at the NBN+Cloud Forum, Sydney



## Finance

Contributions (cash and in-kind)	
University of Melbourne	4,173,202
Industry	143,599
Victorian Government	1,090,001
External grants	2,972,841
<b>Total contributions</b>	<b>8,379,643</b>

Cash expenditure	
IBES staff salaries	1,334,680
Research seed funding	701,021
Visitors expenses	9,895
PhD top-up scholarships	66,250
ABAL operations	49,810
Office operating	8,010
Marketing and events	38,841
Travel	20,743
<b>Total expenses</b>	<b>2,229,252</b>







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Alcatel-Lucent 

  
CISCO™

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ERICSSON

 aarnet

 anue

 Allied Telesis

 Clarity

 HUAWEI

JUNIPER  
NETWORKS

Microsoft

 yes  
OPTUS

 COMMFORCE

 Haliplex

 NEC

 NETGEAR

 NICTA

 OptiComm

 PBN

 TIS

 V8