THE UNIVERSITY OF MELBOURNE

Networked Society Institute

PROUD HISTORY AND CONNECTED FUTURE

Celebrating a decade of catalysing interdisciplinary research to understand and shape the networked society

Networked Society Institute
(formerly Institute for a Broadband-Enabled Society)
The University of Melbourne
Victoria 3010

WELCOME MESSAGES

Welcome from the Pro Vice-Chancellor

For the past decade the Networked Society Institute, and its predecessor the Institute for a Broadband-Enabled Society (IBES), have furthered the University's capacity to undertake innovative interdisciplinary research, partnerships and industry engagement.

During this time the Institute has delivered many positive impacts across society, particularly in the health and education domains. The Institute's interdisciplinary research model helped shape much of the University's current thinking on research collaboration.

The Institute leaves a wonderful legacy, one which has infused the broader University of Melbourne community who will pick up the key challenges and opportunities that arise from digital, networked and automated technologies. The networked society is taking shape before our eyes, and the challenges that this transition present are being tackled through new research connections across the University, as well through special projects such as the Melbourne Connect innovation precinct, expansion of digital and data capability, and new initiatives in digital equity and ethics and data science.

Over the past decade the University has received enormous benefit from the Institute and its ability to leverage our research strengths. On behalf of the University, I wish to acknowledge the important contribution made by the staff, researchers, students, and Executive Committee and Advisory Board members who have been central to the success of the Institute.

A special mention should be made of the outstanding leadership provided by Professor Thas Nirmalathas and his predecessor Professor Rod Tucker.

Mark Hargreaves
Pro Vice-Chancellor
(Research Collaboration & Partnerships)

Welcome from the Director

This report marks a special milestone for the Networked Society Institute as an interdisciplinary research institute. Usually the report is presented as an annual summary of the extraordinary array of interdisciplinary research activities of the Institute. As the Institute winds up its role as a catalyst since 2015, this report is presented as the celebration of the Institute's major achievements in activating interdisciplinary research, connecting researchers with the external world, demonstrating the impact of their research and cultivating the next generation of interdisciplinary researchers.

With its focus on shaping and creating innovative solutions for the networked society, the Institute has been fortunate to build rich engagement with the exceptional talent across the academy. The Institute also continued to build engagement with external thought leaders through the seminar program, as well as the Doctoral Academy and the annual Networked Society Symposium which showcased the exceptional array of interdisciplinary research projects.

From building a strategic partnership with NBN Co to activating key projects funded by a number of industry partners, the 2018/2019 year has once again shown the strength of the Institute and the strategic relevance of its activities to the University.

On behalf of the Executive Committee, the Advisory Board, the Institute staff team and the Doctoral Academy, as well as a large cohort of our academic champions, I am excited to present this special report marking the end of the Institute. The report also celebrates the resilience of our research scholars as they embark on their academic endeavours with great confidence to engage and further cultivate interdisciplinary collaboration that shapes and defines the networked society.

Thas Nirmalathas
Institute Director

Welcome from the Advisory Board Chairman

It was a pleasure to first work with the Institute for a Broadband-Enabled Society (IBES) in 2011 and then an honour to be asked to join the Networked Society Institute (NSI) Advisory Board in 2015. Meeting Thas, Adam, Ken, the rest of the staff and Advisory Board, and seeing their passion to improve connectivity between people, things and places, has been inspiring. The interdisciplinary research fostered by both iterations of the Institute has shaped many solutions to societal problems and improved quality of life, efficiency and sustainability.

The legacy of the Institute has certainly pervaded across the various disciplines of the University of Melbourne's community who are now better placed to leverage the opportunities that digital, networked and automated technologies offer to their research. I look forward to seeing how the Melbourne Connect innovation precinct, expansion of digital and data capability, and new initiatives in digital equity and ethics and data science benefit from the foundations the Institute has provided.

Brian Fitzpatrick
Chair of the Advisory Board

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NSI BACKGROUND

WHAT IS THE NETWORKED SOCIETY?

Networking technologies are enabling the greater interconnection of people, places and things

"The driving force of this transformation is the concurrence of digital, networking and automation technologies."

An ever-increasing number of people, places and things are being connected to each other via networks. This is driving transformative changes across the community, impacting the economy, society and culture. These connections are changing how people live, work, travel and socialise, how we manage the environment, and how services are delivered.

The driving force of this transformation is the concurrence of digital, networking and automation technologies. The shift from analogue to digital has impacted many different sectors, via the increased creation, processing and use of data. Automation is enabled through the application of data, computer processing power and robotics. Automation is moving beyond the Internet and is an emerging feature across industries, enabling new services, displacing workers and supporting new applications.

The use of digitisation, networking and automation technologies provides a lens to assess how the networked society is impacted in specific domains. Practical examples include the use of these technologies for autonomous vehicles which are altering the economics and logistics of moving people and goods, and which will have dramatic impacts on urban environments and supply chains. Another example is in health where increased access to data can improve the monitoring of health, but the impacts of the use of the same data in corporate and state surveillance is less certain. Finally, new technologies are enabling new ways of connecting with people, information and things. For example, virtual and augmented realities are changing service delivery and how people are able to experience the world.

An increasingly connected world has eliminated the traditional barriers of space, time, and exclusivity, through access to different networking platforms. Such dynamic interactions raise concerns about security, privacy and data protection. However, this must be balanced against the benefits of improved access to new and enhanced services, and the automated conversion of data into aggregated knowledge.

The provision of services, such as health, transport, government and education can now be customised to individual needs. Additionally, automation is altering the nature of work. This is having an impact upon future work place arrangements and practices, enabling productivity gains and transforming entire industries, providing significant benefits for the community. However, the potential negative impacts of these transformations also need careful consideration.

There are some fundamental questions about how society engages with these new technologies. In a world of multiple legal jurisdictions, regulatory regimes and ethical considerations, the nature of how data is obtained, stored, processed and used is a key challenge. This requires reconceptualising information security and integrity from social, political, legal, ethical and governance perspectives.

The University of Melbourne's **Networked Society Institute (NSI)** has been uniquely positioned to drive the essential interdisciplinary research required to further our understanding of the networked society and to address its many challenges. The Institute also sought to drive positive societal impacts via technology and mitigate the potential negative outcomes through better knowledge, good design and fundamental safeguards.

INSTITUTE JOURNEY TOWARDS A CONNECTED FUTURE

For ten years the Networked Society Institute has catalysed interdisciplinary research to better understand and create the connected future

"We provided an essential lens to further the understanding and shape the experience of the networked society."

The proliferation and interconnection of devices is having a transformative effect upon society, with networking now at its core. The connection of people, places and things provides a backbone for innovation. But these connections are also challenging existing practices.

The **Networked Society Institute (NSI)** (2014-2019), along with its predecessor the **Institute for a Broadband-Enabled Society (IBES)** (2009-2014), was established at the University of Melbourne to further interdisciplinary research in this key area.

Our mission

For a decade the Institute pursued its mission of enabling high quality, innovative interdisciplinary research. We provided a lens to further the understanding and shape the experience of the networked society. We grew the networked society research community by establishing new initiatives, hosting a diverse range of events, supporting collaboration between students and academics, and funding new research projects. We also enhanced our presence through an active program of engagement.

Our focus was facilitating new research projects that explore the impact and harness the potential of the increasing interconnection of people, places and things. Our aim has always been to ensure the networked society delivers a positive social impact to the whole community.

"It has been such a pleasure to be part of the Networked Society Institute. Everyone at NSI and the Executive has formed an incredible team, resulting in the Institute being so successful. Reflecting back over a number of years on the Executive, I feel that the Institute has been instrumental in promoting interdisciplinary research, forging new and ongoing relationships between researchers across the university, and in developing strong links with industry."

Lynda Ball – Executive Committee Member | Graduate School of Education

Our history

From the beginning, our research sought to both address the challenges and realise the opportunities of the networked society – a goal that requires a diversity of knowledge, practical expertise and experience. We achieved this by nurturing new collaborations and establishing interdisciplinary teams to work on innovative research projects.

Our people were drawn from the breadth of the research talent at the University of Melbourne and comprised a diverse community interested in realising the networked society. Our Lab was at the heart of the Institute providing technical leadership and research expertise to develop and apply new technologies to diverse domains.

We had an open approach to partnerships and collaborations. We actively engaged with researchers, industry, governments and not-for-profits across Victoria, Australia and the rest of the world.

The next chapter

The Networked Society Institute closes with ten years of achievements under its belt. It leaves a legacy of forging a new way to do research and is proud of the fact it truly fostered interdisciplinary engagement in a unique and meaningful way.

IBES Founding Director, Prof Rod Tucker and The Hon Julia Gillard

"At its heart, the Institute has focused on technology being applied for the good of society – developing collaboration across academia, industry and government policy in both a strategic and practical way. It has been my honour to be part of that process."

Carolyn Phiddian – Advisory Board Member | ex-NBN Co

THE INSTITUTE LAB: A CATALYST FOR INNOVATION

The ability to engage with diverse domains such as medicine, engineering, the humanities and social sciences provided an excellent foundation for innovation. The Institute took a hands-on role in creating innovative applications. Central to this was the Institute's Lab environment, which afforded researchers an opportunity to 'get their hands dirty' with the technology.

The Lab was the heart of our technical innovation and provided a physical manifestation of the Institute's ambitions and objectives. Filled with the latest technologies and knowledge, it offered the chance to see how a high-speed broadband connection (pre-NBN), virtual reality (VR) or 3D video worked. This ability to understand and engage with broadband-enabled and networked technologies was integral to the Institute's research focus.

On top of the hardware, the Lab developed a strong internship program, which allowed Masters of Information Technology students to work on practical real world problems and test out new ideas. This capability provided the foundation for many projects.

Finally, the Lab provided the ability to implement a unique methodology for interdisciplinary research. It was a flexible, dynamic and pragmatic way of working, inspired by the best of engineering methodologies and an innate curiosity towards solving problems and challenges.

This was the go-to space for research and development. The Lab also went through a few name changes over the years, reflecting on the nature of research capabilities needed to support research – the IBES Test-Bed, the Australian Broadband Applications Laboratory (ABAL), the C-Lab, and most recently the NSI Lab.

THE ROLE OF RESEARCH

AN INTERDISCIPLINARY FOCUS

Collaboration across discipline boundaries was critical to the success of Networked Society Institute research programs

"The Institute's Seed Funding program was designed to deliver resources to bring researchers together."

Contemporary challenges cut across multiple domains. In reality, however, universities tend to be somewhat siloed, with pockets of activity looking at complex problems from separate angles.

Consider a wirelessly connected device designed to improve health management. The patient outcome concerns of the medical professional will likely differ significantly from the optimisation concerns of the engineer. While a lawyer would look at rights and protections, a media studies scholar would explore how these technological objects exist within the world.

Alone these people can provide great insights and understanding. Yet through collaboration each of these perspectives can be integrated to positively influence the design and use of the tool. This approach, combining many perspectives to achieve one ultimate goal, sits at the heart of interdisciplinary research.

The Institute's mission was to build a community of scholars across the University of Melbourne dedicated to collaboration across discipline boundaries to further research on broadband and the networked society.

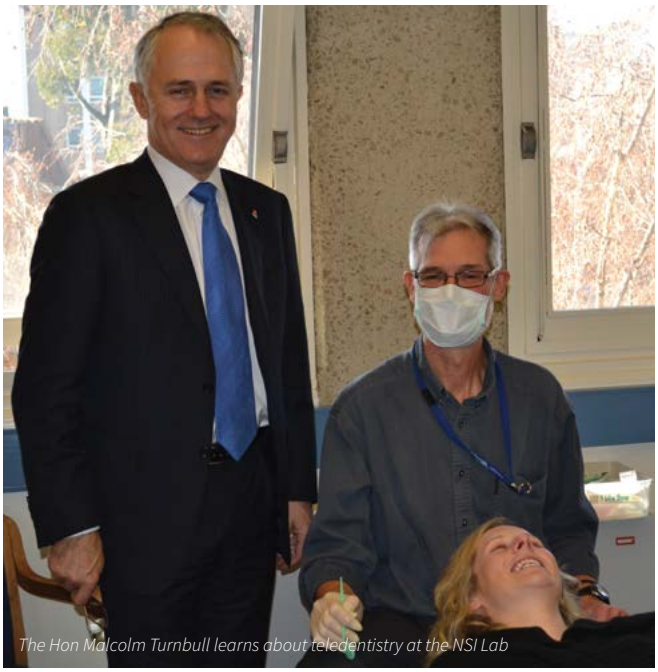
Success stories and seed funding

Over the life of the Institute there were many significant projects focusing on a broad domain of problems, including:

- Improving access to dentistry through telemedicine.
- Using drones to improve the quality of wine.
- Delivering music therapy to patients with quadriplegia in virtual reality (VR).
- Understanding how we commemorate death in the digital age.

Each of these projects was distinctly interdisciplinary. This was the foundation for their success and impact.

One of the key mechanisms for achieving positive outcomes through interdisciplinary research was seed funding. The Networked Society Institute's Seed Funding program was designed to deliver resources to bring researchers together. It provided the kernel to nurture new ideas.



The Hon Malcolm Turnbull learns about teledentistry at the NSI Lab

"I would like to say thank you for the opportunity to be involved with the Institute over the past few years. It is magnificent to see what can be achieved when industry and academia come together in a multidisciplinary way, each bringing unique skills, knowledge and insights – and this is exactly what the Institute does.

A personal highlight for me was having the pleasure of sponsoring the Automation Hackathon, seeing innovative and very creative ideas come to life and then sending a number of very talented and inspiring young individuals to Silicon Valley to further their development."

Matt Vesperman – Advisory Board Member | Ciena

INTERDISCIPLINARY RESEARCH TEAMS

How is an interdisciplinary research team created and how is true interdisciplinarity achieved?

By Scott McQuire – School of Culture and Communication

"NSI was distinctive in putting interdisciplinary approaches to the networked society at the core of its mission."

What does it take to produce high quality interdisciplinary research teams? Shared space? Funding? Coffee? All of the above? To me, the most important achievement of NSI over the last five years was that it successfully provided a setting in which genuinely interdisciplinary research was able to flourish. As a HASS (Humanities and Social Sciences) researcher coming from the Arts Faculty, I found the opportunity to dialogue with and undertake research in collaboration with colleagues from Engineering, Law, MDHS (Medicine, Dentistry and Health Sciences), Education, MSD (Melbourne School of Design) and other Faculties both precious and stimulating.

Interdisciplinarity has become something of a buzz word today. It is regularly advocated as a way of developing innovative approaches to complex issues. In practice it is difficult to achieve. Even at a comprehensive university such as the University of Melbourne, with highly ranked Faculties right across the spectrum, interdisciplinarity between Faculties often proves elusive. Learning from its predecessor IBES, NSI was distinctive in putting interdisciplinary approaches to the networked society at the core of its mission.

In practice, there was no single method that always worked, but we definitely learnt over time. Interdisciplinary teams were rarely 'organic'. Researchers from different areas were often working on similar issues yet were unaware of each other. They had different languages and approaches which took time to 'translate' or had great ideas but lacked appropriate partners or expertise.

NSI developed various approaches to research incubation, from designating key areas in which we actively sought proposals to holding open 'match-making' sessions where researchers from across the University could introduce themselves and pitch a project. Food, drink, Lab technicians and a steady stream of interested industry partners looking for collaborators added necessary ingredients to this mix. The range and quality of ideas that came out of those sessions was truly astonishing. In making decisions about funding projects, we learnt to minimise the paperwork and become more active behind the scenes to curate teams and projects. All these techniques were effective in driving research outcomes.

There are many ways you can measure the success of a research institute. NSI operated in a space that was subject to rapid change and it supported a dynamic interdisciplinary research culture. The need for this remains today.

"The Institute can be very proud of what it has achieved over the years. I've certainly learnt a lot from working with Thas and other colleagues, and I hope the spirit of genuinely collaborative research that NSI established will continue."

Scott McQuire – Executive Committee Member | FAHA, Professor of Media and Communication

BUILDING EFFECTIVE RESEARCH CAPACITY

How did the Networked Society Institute develop its capacity for diverse interdisciplinary research projects and deliver meaningful outcomes?

"The concept of the 'networked society' was a lens through which we could examine a number of pressing social challenges."

The central role of the Networked Society Institute was to enable and support innovative interdisciplinary research. We helped shape the interdisciplinary culture at the University of Melbourne through enabling collaboration across all disciplines.

The concept of the 'networked society' was a lens through which we could examine a number of pressing social challenges and then help to create meaningful solutions using information and communications technology (ICT). The Institute provided a focal point for researchers to rally around and engage in unlocking the power of the increased connectivity between people, places and things. We achieved this through an active program of events, fostering communities, supporting the next generation of researchers, facilitating interactions and supporting new activities through research funding.

Diverse research projects

Over its lifetime, the Institute initiated, nurtured and hosted an incredibly diverse range of research projects. The common theme they shared was the potential for large positive societal impacts. Most came with the germ of a great idea that needed to be developed and shaped into a form that could produce practical future outcomes.

This would often entail the development of a prototype networked service that could be tested with a small number of selected users. Once this had proved to be effective, or sufficient evidence had been collected to provide basic validation of the concept, it could then be taken to the next level by some form of external funding. Many projects received subsequent funding via grants from funding bodies such as the Australian Research Council (ARC) and National Health and Medical Research Council (NHMRC), as well as philanthropic organisations, thanks to the helping hand of the Institute.

Engagement with researchers

The Institute had several possible levels of engagement with researchers. At its most basic level, the Institute acted rather like a 'match-maker' by facilitating connections and collaborations between people who had complementary skills and interests. This would occur during workshops and events hosted throughout the year that would generally bring up to 30 or 40 people from across the campus to discuss 'networked society' ideas.

The next level was supporting small-scale projects in the NSI Lab through in-kind time for software development and technical advice, as well as free access to the Institute's Lab equipment and facilities.

Next came our key investment vehicle – the seed funding process. A panel of judges would annually select five to ten worthwhile interdisciplinary project ideas from disciplines across the campus, which would typically receive $20,000-40,000 to put their ideas into action. These projects could also benefit from the Institute's resident software development team and access to the Lab facilities.

Doctoral Academy and Institute Fellows

The other two mechanisms that helped to build research capacity were the Doctoral Academy and our Institute Fellows. The Doctoral Academy provided a forum for a group of approximately ten new PhD students from all disciplines to gather together and learn from the experiences of someone who had recently completed their PhD, and to also learn from each other's diverse skills and experiences.

PhD students who had some focus on the networked society were invited to apply, and those who were successful joined this group to meet approximately monthly. They were compensated with a top-up scholarship of a few thousand dollars. By all accounts, the students involved derived great benefits from the Academy and they felt it was very worthwhile to share experiences with others from such diverse areas of specialisation.

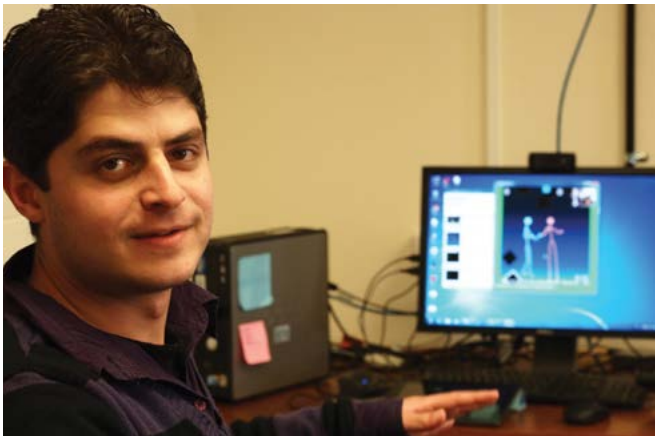
Our Institute Fellows were those people across the campus that we recognised as being 'champions' for the networked society in their area of expertise, and who would help the Institute promote its message and grow the community of interdisciplinary research.

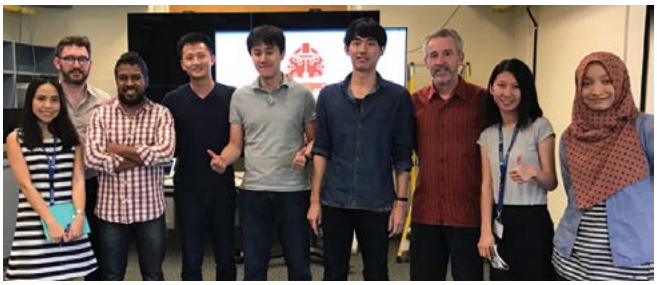
Internships

The NSI Lab has also helped train the next generation of interdisciplinary talent through its regular employment of Masters' interns on projects that had genuine social impact. Many of the interns were able to use this experience to gain their first job in industry, with NSI staff often acting as their referees.

"It's been a pleasure working with the NSI team, both recently on the Executive and over a longer period as chair of DSSRN (Data, Systems and Society Research Network), which NSI has generously hosted. I'm positive that the many interdisciplinary partnerships and initiatives stimulated by the Institute will continue to bear fruit as an ongoing legacy."

Jodie McVernon – Executive Committee Member | Professor and Deputy Director, Doherty Institute





INSIDE THE NSI DOCTORAL ACADEMY

Through the Doctoral Academy, NSI provided opportunities for doctoral students to meet and connect with fellow researchers from other disciplines

By Kate Mannell – Doctoral Academy Member

"It has helped me to understand different disciplinary perspectives, to appreciate the value of interdisciplinary approaches to research, and to build personal relationships that have enriched my experience as a doctoral student."

In 2017-2018 I was a member of NSI's Doctoral Academy. The Academy brought together doctoral students from across the university whose research engaged with the networked society. Seminars were focused on learning about interdisciplinary research and fostering ties between members of the academy.

Through the Doctoral Academy, NSI provided me with a valuable means of meeting and connecting with researchers from other disciplines. The doctoral student experience is usually quite contained within disciplinary silos, so this was a rare and important opportunity. It has helped me to understand different disciplinary perspectives, to appreciate the value of interdisciplinary approaches to research, and to build personal relationships that have enriched my experience as a doctoral student.

The Doctoral Academy also provided training in how to become an effective researcher after the PhD. We learnt about research funding pathways, strategies for engagement and impact, and how to work in research teams. These are critical aspects of research but are not typically part of PhD programs. By providing training in these areas, the Doctoral Academy has given me greater confidence in my ability to navigate academia and to be successful beyond my PhD.

Finally, I had the opportunity to engage with the Institute more broadly and to be part of the vibrant and supportive research community it fosters. I was able to meet visiting scholars, to sit in on seed-funding seminars, to attend panels and presentations, and to build relationships with NSI staff and researchers. I also attended the annual Networked Society Symposium, where Doctoral Academy students presented posters of our research. The sum total of these experiences was feeling that I was part of a larger academic community grappling with important issues about the role of technology in our lives.

EDUCATIONAL SUPPORT AND OPPORTUNITIES

Thanks to the availability of NSI grants, awards, scholarships, networking opportunities and collaborative experiences, selected University of Melbourne students have followed their dreams

By Robbie Fordyce – PhD Student, University of Melbourne

"These were seriously impressive experiences, and I'm extremely glad to have had them."

In 2013, I was fortunate to receive an award for a top-up Scholarship from IBES to support my doctoral research into how global internetworking technologies became a key part of political activism and reformation between 2009-11.

Through an extremely efficient use of this generous Scholarship, I was able to attend the Oxford Internet Institute's Summer Doctoral Program, travelling to the University of Toronto and attending a national conference in my field.

These experiences in themselves were formative for developing my capacities with research methods and gave me a chance to explore new tech labs around the world. These were seriously impressive experiences, and I'm extremely glad to have had them.

The unexpected benefit was that becoming a part of IBES as well as its later incarnation, NSI, meant inclusion in a sincerely interdisciplinary group of scholars from across the University of Melbourne. This meant meeting scholars from outside my discipline who showed enthusiasm in my topic as well as challenging me in ways that helped me to develop.

I also received support from NSI in the form of an internal grant for research investigating 3D printing usage around the Melbourne Library Service with a small team. This support enabled us to develop a successful research grant with Category 2 funding to push this research further.

By the time I had completed my thesis, NSI also offered me the opportunity to convene a series of workshops across 2017 and 2018 for two cohorts of PhD students with academic professionalisation training across grants, public communication, interdisciplinarity and building institutional knowledge.

These successes speak for themselves, but the continuing and dedicated support from IBES/NSI has been extremely influential for my educational experience throughout my time at the University of Melbourne, as well as acting as a platform from which I could conduct both my doctoral and extracurricular research.

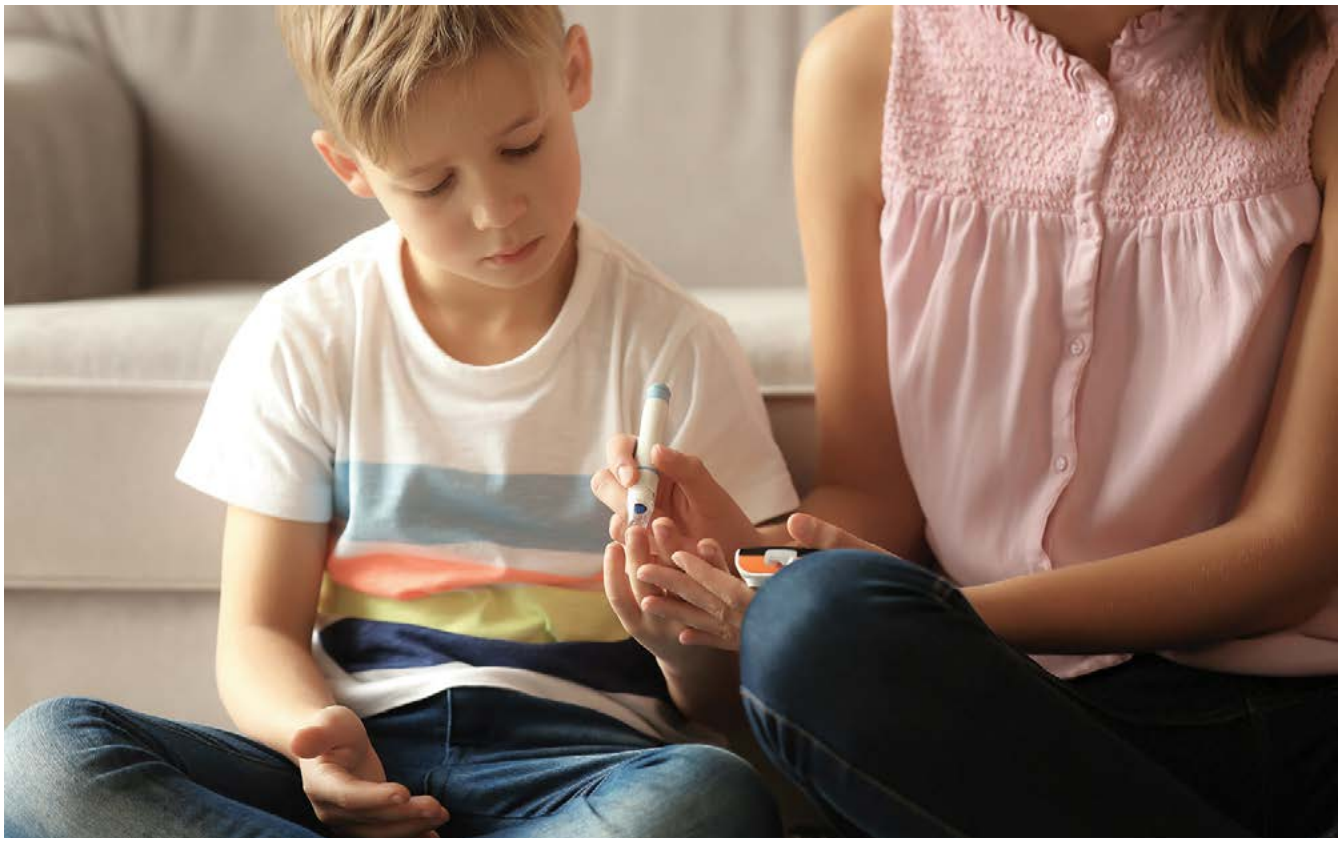
NSI in particular felt in many ways like it fulfilled the dream of what I had hoped University would be like as an undergrad: collegial, open, collaborative and intellectual. I have no doubt that the experiences and opportunities I have formed here have been key to my successful job seek and am pleased to announce that I have been employed as Lecturer in Big Data/Quantitative Analysis and Research Methods at Monash University, having commenced in 2018.

I can only hope that universities in future will find the space to support academics with interdisciplinary research centres, particularly those that seek to map across technology and its social and political impacts, because without these curated and dedicated scholarly spaces our chances for those productive encounters that produce good scholarship are so much rarer.

PROJECT INSIGHTS

1. DIVERSE INNOVATIONS IN DIGITAL HEALTH

The Networked Society Institute has supported many important technology-based health projects throughout its existence



"Technological advancements, or combinations of existing technologies, can offer the prospect of new treatment options or mechanisms for their delivery via a network."

NSI was often approached by clinicians and other healthcare providers who wanted to reach out to patients in the community with both new and improved services. In many cases their patients or clients had found it very difficult to access health services due to personal, logistical or geographical circumstances; ill health obviously makes travel stressful, if not impossible, or there simply may not be specialist health services on offer in rural and remote communities, for example.

In addition, technological advancements, or combinations of existing technologies, can offer the prospect of new treatment options or mechanisms for their delivery via a network. When designed well, these innovations also provide time and cost benefits for both patient and doctor. In such scenarios, a win-win situation is more likely to occur; the patient is more likely to receive a health intervention whenever it is required, while the practitioner can reach out to more patients or use their time more efficiently.

NSI has supported many health projects throughout its existence, helping interdisciplinary teams to create novel solutions to problems where the use of information and communications technology (ICT) can overcome barriers to existing treatment pathways. In collaboration with interdisciplinary clinical teams, NSI has provided service design and software development, as well as help with secure network implementations, novel hardware design and integrations, and user-centric design workshops held in the Institute Lab.

DIGITAL HEALTH PROJECTS

Music therapy in virtual environments

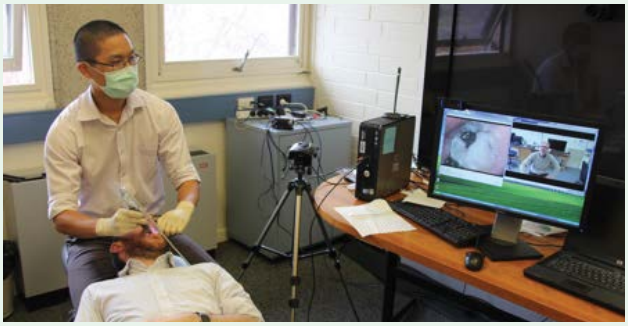
Led by Dr Jeanette Tamplin, this project was a finalist in the 2017 National Disability Awards thanks to its creative blending of virtual reality (VR) with low delay audio. It allows quadriplegic patients to attend group singing rehabilitation classes, directed by a music therapist, from their home. The additional advantages of VR are the distraction from everyday existence, gaze selection of menu items and choice of avatars to protect privacy if desired.

Tele-rehabilitation for COPD

Chronic obstructive pulmonary disease (COPD) is a major problem affecting large numbers of typically elderly people in the community. Led by Dr Anne Holland, this project has now transitioned into a clinical trial stage to compare the cost and efficacy of face-to-face day clinic rehabilitation with an online, at-home exercise regime where patients wear pulse oximeters while using an exercise bike. A central clinician can monitor them all in real time via teleconferencing and provide feedback, while also viewing heart-rate and blood oxygen data relayed via an iPad app.

Teledentistry

Led by Prof Rodrigo Marino, there have been two main teledentistry projects. One looked at the impact of teledentistry services for residents of aged care facilities, the other for paediatric patients with cleft-palate living far from central Melbourne. The techniques and technology for remotely monitored intra-oral examinations were refined in the NSI Lab before being used in the community. Results showed patients and local staff were very happy and comfortable with the pilot programs, and the outcomes were as good as, or even better than, existing options which generally involve much travel, cost and inconvenience.

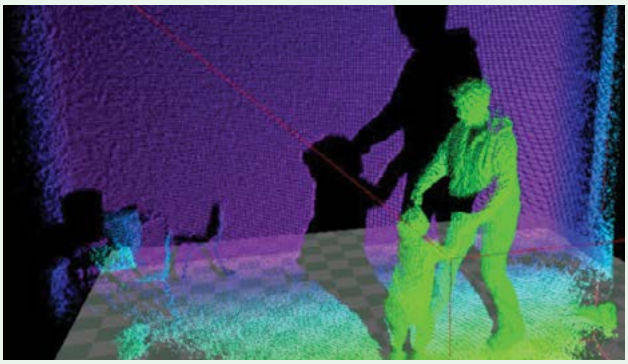


Virtual reality therapy for youth mental health

Youth depression and suicide are major issues in our community. Dr Mario Alvarez-Jiminez is based at the Orygen Centre of Excellence in Youth Mental Health and was keen to examine VR as a way of treating this target demographic. Various VR prototypes have now been tested, which are designed to teach participants how to cope with the negative thoughts they can experience in social situations; this might be in a classroom or on public transport, for example. Work continues to refine the VR scenarios further with clinical experts prior to clinical trials.

Kinect technology for young children with autism

Robyn Garnett of Clear Messages Speech Pathology in Ballarat was interested in reaching out to the parents of children with autism in her local community, helping them share experiences and receive training online. As part of this project, NSI also installed a prototype system in her clinic to automatically track and rate the quality of interactions between parent and child in real time using a Kinect sensor from a PlayStation. Such systems had only been employed previously to track individuals e.g. for golf swing analysis.



VR limb rehabilitation

Led by Dr David Ackland, this project is looking at blending VR and joint motion sensor technology to provide gamification of rehabilitation. A prototype wearable sleeve and VR game have been produced as part of the journey to a fully ruggedized system suitable for deployment in patients' homes with remote support from a health professional. The intention is to make rehab more enjoyable, convenient and frequent, thus facilitating recovery from stroke or injury.

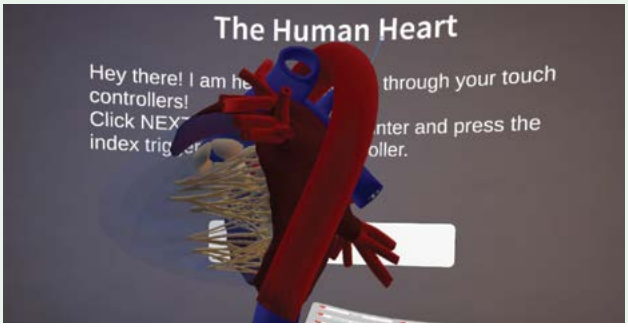
More information on these initiatives and NSI projects in other domains can be found on our website:
networkedsociety.unimelb.edu.au

Personalised care for type 2 diabetes

The NSI Lab has worked very closely with the University of Melbourne's School of General Practice over the years. One of these projects, led by Dr John Furler, makes use of the GP clinic simulator hosted within the NSI Lab to conduct more realistic GP-patient interactions and workshops. The evidence gathered allows improvements to the design and workflow of a new online tool to be used in GP clinics. The tool will aid the selection of the most appropriate drug treatment options for type 2 diabetes patients based on their clinical indicators as well as their personal preferences.

Virtual reality heart

Clinical educators Dr Charles Sevigny and Jairus Bowne from the Department of Physiology in the School of Biomedical Sciences have collaborated with the NSI Lab to create a virtual reality (VR) experience that will help educate the next generation of cardiac specialists and surgeons. This joint initiative has created a highly-detailed virtual beating heart that can be manipulated (grab, rotation, magnification, pulse rate, etc.) with VR hand controllers. This allows close examination of individual components of the heart, which can also be individually turned off and on. Using the VR Heart, students can quickly and accurately understand how each part of the overall anatomical structure fits and works together. Traditional 2D textbook figures simply cannot convey this complex 3D structural and motion information.



2. URBAN GREEN SPACES

Three research projects worked in unison to monitor and map the values of green spaces in an urban environment

"Connectivity can play an important role in optimising the management, use and maintenance of urban green spaces."

Urban Green Spaces was a research initiative comprising three projects – Sensor Networks, Monitoring, and Social Networks – working in unison to better understand the values of urban green spaces.

As more and more people live in cities that are increasing in density, the green heart of the city becomes its essential lifeblood. Green spaces are a valuable asset to the cities and their inhabitants. Green spaces help to regulate the urban heat island effect, provide habitat for animals and open recreation spaces for the community. In short, green spaces are essential for healthy and happy cities.

Connectivity can play an important role in optimising the management, use and maintenance of urban green spaces. To this end, the Institute supported three interrelated projects that aimed to develop a framework to support our urban green spaces.

Sensor networks for urban green spaces

Communicating the benefits of intangible things is inherently challenging, in the same way that quantifying benefits is inherently challenging in complex systems such as an urban landscape. Although the cooling benefits of trees and parks exist, there is difficulty in measuring these benefits.

New connected devices and sensors have enabled the establishment of an intelligent network of environmental sensors throughout the grey and green space matrix of the urban landscape. These sensors gather and capture data, providing a means to shape understanding of the less tangible benefits that trees and green space provide to the community.

This project established and trialled a sensor network to demonstrate the potential of a distributed sensor network to measure and monitor the conditions in the urban environment. The sensors continuously monitored air temperature, relative humidity, noise levels and light levels, as well as carbon monoxide and nitric oxide concentrations. This data provided a unique layer to be included with numerous other data sets (traffic, population profile, building footprints) and the data was linked to spatially discrete indicators of environmental benefit on the City of Melbourne's 'Urban Forest Visual Map'.

Monitoring urban green spaces

This project focused on maintaining the health of the central part of urban green spaces – trees. Trees are an essential component within city environments; they regulate the atmosphere and provide shade. However, global warming means some established trees are coming under increased climate pressure.

Gathering data about trees supports their maintenance and reduces the likelihood of their stress or decay. A number of vehicles readily traverse streets, including trams, buses and council vehicles. This project developed a novel way to harness this existing mobile infrastructure to turn everyday transport into green space monitors.

The team developed a remote monitoring and decision-making system built upon cameras that captured infrared and visible light installed on vehicles. The system obtained geo-referenced upward-looking images of the trees and captured and analysed this data through the use of models to map and monitor the condition of the green infrastructure.

Social networks and urban green spaces

Urban green space plays a critical role in shaping and promoting community health and wellbeing. However, measuring its benefits can be difficult.

Relevant research has often been conducted within disciplinary silos, at small-scales in the laboratory, at neighbourhood levels using intrusive measures such as surveys, or with coarse spatial scales. Such findings do not provide a detailed picture of the association between green space and mood or social connectedness within the broader population.

The emergence of new technologies is providing tools to support measuring when, what, how and for whom urban green spaces provide benefits. This project conducted a human dynamics study of urban green space and wellbeing by examining social media to better understand users' mood and social connectedness. This provided important information about how to effectively incorporate green space as a health promotion tool across cities around the world.

3. 'DISCOVERY INDIGENOUS': SUPPORTING TECHNOLOGY INVESTIGATIONS

The Networked Society Institute has supported seed technology funds for the Australian Research Council 'Discovery Indigenous' scheme

By Dr Lyndon Ormond-Parker – Indigenous Studies Unit, University of Melbourne

"This ARC Discovery Indigenous project has brought together an exceptional team of researchers in the fields of indigenous knowledge and digital curatorship of cultural heritage materials."

The Networked Society Institute has provided seed funding to support technology investigations that are important to Aboriginal and Torres Strait Islander projects funded by the Australia Research Council Discovery Indigenous program.

Local Aboriginal community archives: The use of information technology and the National Broadband Network in disaster preparedness and recovery

This project collaborated with NSI technology developers to explore solutions for community access to digitally archived audiovisual heritage materials held at the Kanamkek-Yile Ngala Museum in Wadeye (Port Keats). Wadeye (pronounced *Wad-air*), also known as Port Keats, is a remote Aboriginal community in Australia's Northern Territory.

In a report to the Institute, the team outlined how audiovisual materials have been produced and stored by remote Aboriginal media and cultural organisations in Australia for over 30 years, representing a distributed national collection of high cultural, linguistic and national significance. However, technical obsolescence of analogue materials, harsh environmental conditions and limited access to technological and financial resources in many remote communities present serious risk of information and knowledge being lost forever.

The research team used NSI's test bed to explore technologies that would support protecting at-risk Aboriginal and Torres Strait Islander audiovisual archive so they could be effectively preserved and shared with families across generations.

The team's priority was to also keep costs of the technology to a minimum. One low-cost delivery system of digital audiovisual heritage was using a Raspberry Pi with open-source hardware. The NSI team used Linux to provide access of digitised footage that would be suitable for digital or non-digital TVs. The idea was to ensure that all people in Wadeye, both senior and youth, could access the digital material using the RPi device.

Aboriginal remote narrowcast TV and the audiovisual archive

This project has drawn upon NSI expertise to investigate the world's best practices in community narrowcast digital TV and contemporary methods for the long-term storage of both digital and analogue audiovisual cultural heritage materials for remote Aboriginal communities. The project expects to generate new knowledge related to the technical and cultural requirements for digital narrowcast TV and to advance audiovisual preservation and conservation for at-risk collections.

Research conducted will investigate whether health promotion and other messages in language has beneficial impact on family and community health and wellbeing. The impact of this project will be transferable knowledge and skills for individuals and families who are working toward preserving important heritage material held within their analogue and digital audiovisual collections. This research will inform public policy on local community digital narrowcast TV in remote Australia.

This ARC Discovery Indigenous project has brought together an exceptional team of researchers in the fields of Indigenous knowledge and digital curatorship of cultural heritage materials. Ongoing archival protection and preservation of invaluable Aboriginal and Torres Strait Islander audiovisual materials as well as repatriation of heritage materials to families and communities relies upon exploring and testing digital technologies and systems that are suitable to the requirements of remote community living.

The project is a partnership with the Kimberley Aboriginal Law and Culture Centre (KALACC) in Fitzroy Crossing, Buku-Larrŋgay Mulka Inc. in Yirrkala and the Kanamkek-Yile Ngala Museum in Wadeye.

RESEARCHERS

Dr Lyndon Ormond-Parker, Indigenous Studies Unit, MSPGH, CHE, University of Melbourne

Professor Aaron Corn, Director, Centre for Aboriginal Studies, The University of Adelaide

Dr Dominique Sweeney, School of Communication and Creative Industries, Charles Sturt University

Dr Sharon Huebner, Indigenous Studies Unit, MSPGH, CHE, University of Melbourne

4. BRIDGING THE GAP IN ABORIGINAL HISTORY EDUCATION WITH AUGMENTED REALITY

The NSI Seed Funding program supported Moondani Balluk Academic Centre's augmented reality project based on the 1972 Embassy protest in Canberra

By Dr Sharon Huebner – eScholarship, University of Melbourne

"The first phase of the project was to focus on creating a teaching tool to help bring the history of the 1972 Embassy protest to life."

The aim of creating a pilot augmented reality (AR) project in collaboration with experts from the Networked Society Institute was to use innovative technology to engage students and wider audiences in the political history of the 1972 Embassy protest in Canberra, and for this experience to act as an entry point into the heritage materials of the Aboriginal History Archive (AHA).

The AHA is a leading digital collection of records relating to Aboriginal self-determination, the land rights movement and the development of Aboriginal community survival programs. The AHA makes primary source materials about Aboriginal political history widely accessible to scholars, policymakers, students and broader community as a way of delivering an informed evidence base for understanding Australia's contemporary history. The collection includes approximately 500,000 items that documents nearly a century of Aboriginal political agency.

Seed funding from the Networked Society Institute allowed testing of AR technologies for the purpose of developing a pilot project. The first phase of the project was to focus on creating a teaching tool to help bring the history of the 1972 Embassy protest to life.

Vuforia image targets activated by a smartphone allowed users to experience the protest through historical audiovisual footage recorded by activists, current affairs journalists and filmmakers. Users experienced the tents where protestors camped and the effects of political paraphernalia and newspaper articles from the period reporting the protest within these spaces.

The AR users also experienced political speeches and audience commentary at the rallies and police activity, particularly the dismantling of tents and the removal of protestors. Professor Gary Foley, who was part of the Embassy political movement in 1972, is part of the AR experience and provides context of the protest from the perspective of a long-standing Aboriginal activist in Australia. Bridging the gap in Aboriginal History education is the main objective of the AR pilot project.

RESEARCHERS

Professor Gary Foley, Moondani Balluk Academic Centre, Victoria University

Associate Professor Gavan McCarthy, eScholarship University of Melbourne

Dr Sharon Huebner, eScholarship University of Melbourne

Dr Edwina Howell, Moondani Balluk Academic Centre, Victoria University

Yunhan Li, Networked Society Institute, University of Melbourne

IMPACT AND ENGAGEMENT

COLLABORATION AND KEY OUTCOMES

Why did the Networked Society Institute embrace collaboration and what were the key outcomes for stakeholders?

"We have delivered strong returns on investment, providing an overall return of 3.37 to the University – $38.1M returned for $11.3M invested."

Through the spirit of collaboration and a commitment to building effective partnerships, the Networked Society Institute generated a strong return on investment and made a powerful impact on the local and global research landscape.

Collaborating with others

The Institute was outwardly facing, actively collaborating with industry and the community. Originally, the Institute established the Industry Partner Program, with leading technology companies who provided funding, expertise and equipment. The Industry Partner Program allowed for deep collaboration with leading technology companies. It enabled access to the latest and greatest rolling off the production line to ensure that innovation occurred at the bleeding, as opposed to just the leading edge.

How did the Institute achieve its objectives? Through an active program of engagement, both internal and external to the University. The Institute was a meeting place for innovation and the networked society.

Return on investment

A central aspect of the NSI was the need to generate a return on investment to the University based on the funds provided to the Institute to further interdisciplinary research. This occurred in part through the facilitation and enablement of new and innovative research projects. Since our establishment as the Institute for a Broadband-Enabled Society (IBES) we have delivered strong returns on investment, providing an overall return of 3.37 to the University – $38.1M returned for $11.3M invested.

Wider impact

The Institute nurtured research to ensure that outcomes created a tangible benefit. Our impact was evidenced through the way our seed funding proved the catalyst for continuing bodies of research that explored the essential elements of what the networked society means to humanity. This can be seen in the fact many projects obtained further external funding to continue their research, while we also ensured our projects shared their stories across a range of mediums.

"I've thoroughly enjoyed my time with NSI, and I've benefited both intellectually and personally from its many and varied activities over several years. NSI is a wonderful example of what a collaborative research institute can become with a really interesting focus and the right people and resources."

Megan Richardson – Executive Committee Member | Professor of Law, Graduate School of Law

NOTABLE VISITORS TO THE LAB

Over the years the NSI Lab has had the good fortune to welcome many visitors from across the globe to see and even experience first-hand our work, its role and impact on the networked society. These visitors included many academics, business people and industry representatives, as well as both foreign and domestic politicians – some of whom you are probably quite familiar with…

The Hon Julia Gillard

The Hon Malcolm Turnbull

OTHER PARTNERSHIPS

Affiliated Research Centres

The Microsoft Research Centre for Social Natural User Interfaces (SocialNUI) is a place of collaborative research for creating and understanding innovative Natural User Interfaces (NUI) that facilitate human communication, collaboration and social interaction.

SocialNUI is an academic–industry research centre located within the Department of Computing and Information Systems at the University of Melbourne. In December 2013 Microsoft Australia, Microsoft Research, the University of Melbourne and the Victorian State Government launched SocialNUI in Melbourne. Through the Centre, academics and students have had an opportunity to collaborate with world-leading Microsoft Researchers.

Centre for Energy-Efficient Telecommunications

The Centre for Energy-Efficient Telecommunications (CEET) was formed in mid-2011 as a partnership between Alcatel-Lucent, the State Government of Victoria and the University of Melbourne. CEET became a leader in researching the energy consumption of the Internet and contributed to the wider discussion on the energy efficiency and sustainability of the information and communications technology (ICT) industry.

A major trend in ICT is the massive take-up of mobile devices for data services and the update of personal cloud services. More recently, the growth of the Internet of Things (IoT) will add more equipment to the ever-increasing pool of telecommunications devices. All of these require electrical power. CEET turned its research focus to cloud and content delivery services, the IoT, energy efficient wireless and low energy access technologies.

Australia's first Academic Centres of Cyber Security Excellence

As connectivity is increasing exponentially and an ever-increasing proportion of daily life is being carried out via networks, ensuring the safety and security of our networked infrastructure is a major concern. For an effective networked society, cybersecurity is essential.

In 2017, the Commonwealth Government selected the University of Melbourne and Edith Cowan University to share $1.9 million in Federal Government funding as Australia's first Academic Centres of Cyber Security Excellence. The Centres are a key pillar in leading Commonwealth efforts to build the cybersecurity expertise and job-ready skills needed by Australian industries. The Centre will provide a focal point to further research relating to cybersecurity.

Hallmark Disability Research Initiative

The Hallmark Disability Research Initiative was established to support interdisciplinary research on disability across the University of Melbourne. The Initiative's aim is to help coordinate interdisciplinary projects with the involvement of community partners and those with personal experiences of disability. The Initiative will develop high-quality applied research, policy and education programs.

STEM Education Resource

Science, Technology, Engineering and Mathematics (STEM) education is integral in preparing current students with the essential skills and knowledge for building the networked society. STEM underpins the future economy, as recognised by the Australian Government's National Innovation and Science Agenda.

This project involved the development and evaluation of an online open-source stem educational resource (SER) to support the teaching and learning of STEM education at Years 9 and 10. The resource supports secondary students in the development of high-level knowledge and skills for solving real-life multidisciplinary STEM problems. The SER has been tested with three pilot high schools and is on track for commercialisation with an industry partner in the education space. This project is supported by Google Australia.

FACILITATING POSITIVE ENGAGEMENT

How did the Networked Society Institute successfully engage with the public and communicate to a broad audience?

"A central aspect of the Institute's activity was the capacity to develop and establish itself as a thought leader focused upon the networked society."

"It was a great pleasure to be on the NSI Executive Committee. It opened many opportunities for me and many others in the Medical School. I am hoping we can continue to build successful collaborations. Thank you for everything."

Jane Gunn – Executive Committee Member | Professor of Medicine, Deputy Dean of Medicine

Throughout the life of the Institute, everyone involved took a proactive approach to engagement and relationship building. The Institute collaborated with a diverse range of people from other research organisations, industry, government, the not-for-profit sector and the public. An essential mission of the Institute was to increase awareness of the issues and opportunities of the networked society and to do this in a manner that facilitated collaborative engagement.

To achieve this end, we met with a diverse pool of stakeholders to explore opportunities. We hosted delegations in the NSI Lab to share knowledge, ideas and demonstrate our research. We ran a comprehensive program of events from research seminars, to collaborative workshops through to large scale public forums and our flagship Networked Society Symposium.

The Institute had an active engagement program of marketing, events and communications to support the development of a research community at the University of Melbourne dedicated towards the networked society. A central aspect of the Institute's activity was the capacity to develop and establish itself as a thought leader focused upon the networked society. Additionally, Institute researchers and staff undertook engagement activities locally and internationally.

Events

Institute research did not only happen in a vacuum. NSI sought to disseminate its findings through a large programs of events.

NSI researchers presented their findings at the annual Networked Society Symposium. The event showcased the breadth of Institute research and provided an anchor for our community. In recent years, the Institute was fortunate to attract leading international figures to the event including: Prof William Dutton, Prof Luciano Floridi and Dr Leila Takayama.

The Institute hosted a range of seminars, workshops and public lectures. This reflected the Institute's role in driving debate and building a committed community engaged with both the problems and opportunities of the networked society.

Visiting delegations

The NSI Lab provided an opportunity to showcase our research to a wide audience. Visitors and delegations came into the Lab to see our demonstrations and engage with our research projects.

Communications

The Institute became the central source for both internal and external media when talking about the networked society and related issues.

Over the years the Institute saw a boost in content production and a rise in its visibility within the University. Our research projects have featured in University-wide promotional campaigns, and our researchers have appeared on television, radio and in print both locally and in international media. Our online community has grown through Twitter, live-streamed events, and the Networked Society Institute website. The Institute became an active leader in the emerging podcasting arm of the University's media team, and we collaborated with fellow MRIs to deliver stimulating events that inspired the academic community.

In June 2016 the Institute launched the NSI Public Lectures podcast. Here, people could tune in to public lectures presented by the Institute and listen to big ideas, get inspired, and get involved with the networked society. In 2017 the Institute launched Networked Society Radio. This podcast included our public lectures plus interviews with our researchers and stories of research shared in a stylised audio adventure.

Social media

The @MelbNSI Twitter account was used to live-stream events so people could watch from anywhere in the world. Likewise, we engaged a broader audience by live-tweeting events and including questions from Twitter in the Q&A section of our events. Twitter allowed the Institute to connect with the broader University community and to share its events, publications and research with media and the general public.

Newsletter

The Institute produced a monthly online newsletter that was delivered to a growing mailing list and shared through social media networks. Over 1,700 subscribers enjoyed the Institute News each month with a 38% click-through rate. While other communication mediums target a broad audience, the newsletter was written for key stakeholders such as University staff, academics, industry and government.

Prof Luciano Floridi, Networked Society Symposium Keynote Speaker

NETWORKED SOCIETY SYMPOSIUM

The annual Networked Society Symposium was always a fascinating day showcasing the breadth of interdisciplinary research from the Institute and exploring big ideas and issues surrounding the networked society.

Typically, 300-400 attendees enjoyed discussions on a broad range of subjects such as the philosophy of technology, presentations on urban green spaces, futuristic healthcare and how the networked society is evolving, while 20-30 researchers would present their work across interdisciplinary projects funded by the Institute. Key themes included such topics as digital ethics, future healthcare, and legal and regulatory impacts of digital technology on society.

A panel of thought leaders would discuss and explore ideas around how increasing connectivity has changed us as people and how we think and live our lives. The panel would include both local and internationally recognised thought leaders and researchers.

Another highlight of the day was the poster presentations from the NSI Doctoral Academy. The posters always generated enthusiastic discussion in between sessions, along with scope to widen professional horizons.

The Symposium brought together multiple elements of the Institute into one energetic and engaging event.

INSTITUTE BY THE NUMBERS

A snapshot of key numbers

115 Seed Funded projects

35 Doctoral Academy

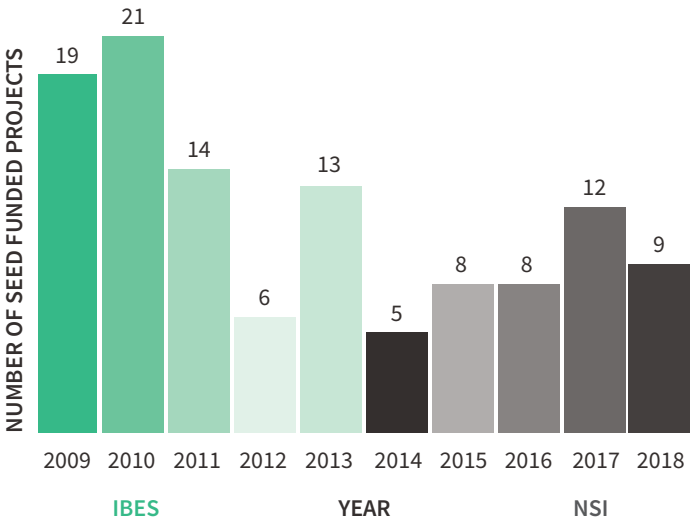
39 Interns

594 Internal researchers

142 External researchers

736 Total researchers

Timeline of Seed Funded projects



The Institute's cumulative funding mix

$11,283,754
Total University income

$38,078,884
Total external funds

Number of media mentions

YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Internet (mentions on external sites)	3	3	21	31	79	16	11	45	37	69
Print	1	8	10	8	12	5	2	8	5	22
Radio	0	2	2	2	8	4	1	4	7	13
TV	1	2	3	0	4	1	0	5	2	3
TOTAL	**5**	**15**	**36**	**41**	**103**	**26**	**14**	**62**	**51**	**107**

Number of public events sponsored / facilitated / supported / attended as speaker

YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Presentations	14	40	39	15	14	3	9	11	13	19
Symposia	2	1	2	8	2	3	0	2	4	5
Seminars / workshops	18	11	5	10	4	6	7	11	16	13
International conferences	5	12	19	8	1	5	5	8	17	5
National conferences	4	11	10	3	5	1	2	4	3	13
Pubic lectures	3	1	4	1	4	3	5	7	13	2
TOTAL	**46**	**76**	**79**	**45**	**30**	**21**	**28**	**43**	**66**	**57**

Number of publications generated by Institute initiatives

YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Conference papers	19	34	21	15	2	18	22	18	27	30
Journal articles	10	29	50	18	6	16	8	27	30	46
Book chapters	0	10	9	4	0	5	0	3	5	7
Books	0	0	0	0	0	0	0	2	2	6
TOTAL	**29**	**73**	**80**	**37**	**8**	**39**	**30**	**50**	**64**	**89**

Number of external partnerships initiated / actively engaged

YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Philanthropy	0	0	0	0	0	0	0	1	2	1
Community	0	3	4	0	1	4	1	1	3	2
Higher education	3	6	16	2	0	1	3	8	8	3
Industry	5	15	19	5	8	16	15	13	23	14
Government	1	5	4	6	6	2	3	7	11	6
TOTAL	**9**	**29**	**43**	**13**	**15**	**23**	**22**	**30**	**47**	**26**

INSTITUTE RESEARCH PROJECTS

Institute for a Broadband-Enabled Society (IBES) | 2009-14

Funding Source	Project Title	IBES Theme	Dept/School	CI	CI Email	Total Funding Amount
IBES 2014	Culturally and Linguistically Diverse Ethics and Research resources (The CALDER Pilot Study)		Melbourne Medical School	Prof David Story	dastory@unimelb.edu.au	$31,554
	Colourimetric sensor chips for lab-on-a-smartphone		EEE/Physics	Kenneth Crozier	kcrozier@unimelb.edu.au	$34,621
	Domestic 3D Printing Research Initiative – domestic and commercial models of use for additive manufacture		Culture & Communication	Dr Bjorn Nansen	nansenb@unimelb.edu.au	$33,360
	"Super-Participation" and Everyday Political Talk Online: A Comparative Analysis		Culture & Communication	Scott Wright	scott.wright@unimelb.edu.au	$45,109
	New Generation EEG Devices for Regional and Remote Health Care		Electrical & Electronic Engineering	Stan Skafidas	sskaf@unimelb.edu.au	$49,420
IBES 2013	Kinect Technology for remote assessment of interventions for young children with Autism Spectrum Disorders		Audio & Speech Pathology, MDHS	Patricia Eadie	peadie@unimelb.edu.au	$28,974
	Telerehabilitation for Chronic Obstructive Pulmonary Disease: Optimising the Model	Health and Wellbeing	Faculty of Medicine, Dental and Health Sciences	Prof Christine McDonald	Christine.mcdonald@austin.org.au	$22,302
	WADEYE IPTV: Delivering significant and at risk audiovisual archives to remote Aboriginal communities via IPTV and the NBN	Culture and community	"Centre for Health and Society, Melbourne School of Population and Global Health"	Lyndon Ormond-Parker	Lyndonop@unimelb.edu.au	$69,446
	Non-Contact 3D Falls Detection, Prevention, and Behavioural Monitoring in Aged Residential & Home Environments: Developing A Clinical Evaluation and Application Framework	Health and Wellbeing	Health and Biomedical Informatics Centre (HABIC)	Prof Fernando J. Martin-Sanchez	fjms@unimelb.edu.au	$61,000
	Creating musical futures via the NBN through iMCM for students in rural and remote communities	Culture and community	Melbourne Conservatorium of Music	Prof Gary McPherson	g.mcpherson@unimelb.edu.au	$32,250
	Open Food Network (OFN) System: Connecting and Supporting the Sustainability of Regional Food Supply Chain Communities	Culture and community	Computing and Information Systems	Sherah Kurnia	sherahk@unimelb.edu.au	$70,000
	Making the invisible visible: Digital storytelling for neighbourhood social cohesion	Culture and community	Computing & Information Systems	Dr Jenny Waycott	jwaycott@unimelb.edu.au	$34,906
	Telework and Disability: exploring barriers and opportunities	Health and Wellbeing	Computing & Information Systems	Dr Rachelle Bosua	rachelle.bosua@unimelb.edu.au	$54,003
	A holistic approach to improving the language learning and technology connection -	Education and learning	School of Languages & Linguistics	Prof John Hajek	j.hajek@unimelb.edu.au	$30,000
	Cultural Respect Encompassing Simulation Training (CREST) –	Health and Wellbeing	General Practice and Primary Health Care Academic Centre	Dr Phyllis Lau	plau@unimelb.edu.au	$29,958
	The Dialogic Democracy Project: Widgets for Enhanced Citizen-Government Dialogue	Culture and community	Computing & Information Systems	Dr Craig Bellamy	cbellamy@unimelb.edu.au	$30,042
GOOGLE - 2013	Blended Learning Across the Secondary - Tertiary Divide	Education and learning	Computing & Information Systems	A/Prof Steven Bird	sbird@unimelb.edu.au	$98,865
IBES 2014 out of round	From information kiosks to community hubs: information provision in indigenous communities in an NBN environment	Culture and community	Population Health. MDHS	Richard Chenhall	chenhall@unimelb.edu.au	$50,214
MRO 2013	An Open Research Initiative to Improve the Evaluation of Australian Telehealth Implementations	Health and Wellbeing	Health and Biomedical Informatics Research Unit	Kathleen Gray	kgray@unimelb.edu.au	$40,000
	Working in the Cloud - Developing Identity Resources for Care leavers	Social Infrastructure and Communication	Department of Social Work	Cathy Humphreys	cfhu@unimelb.edu.au	$40,000
IBES 2012 out of round	Developing reusable 3D, simulation-based learning environments	Education	"Centre for the Study of Higher Education, University of Melbourne"	Gregor Kennedy	gek@unimelb.edu.au	$43,000
ECR 2012	Non-User and the National Broadband Network	Social Infrastructure and Communication	School of Historical & Philosophical Studies, Faculty of Arts	Michael Arnold	mvarnold@unimelb.edu.au	$51,197
	The post-convergence regulatory environment	Social Infrastructure and Communication	"School of Culture & Communication, Faculty of Arts"	Scott McQuire	mcquire@unimelb.edu.au	$61,574

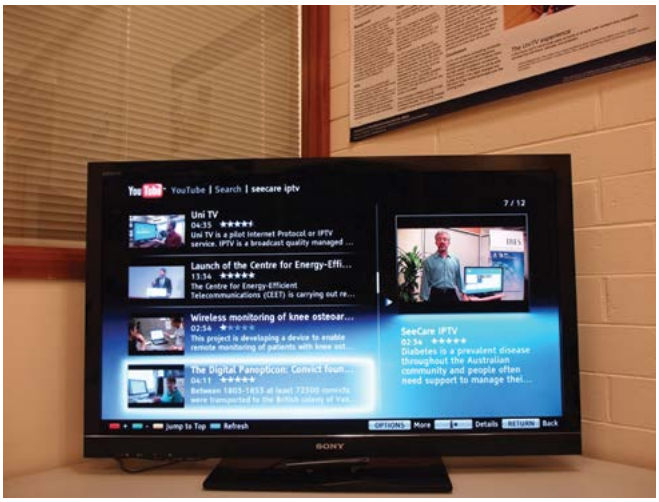
INSTITUTE RESEARCH PROJECTS

Funding Source	Project Title	IBES Theme	Dept/School	CI	CI Email	Total Funding Amount
	Enabling social connection for long-term hospital patients	Health and Wellbeing	Computing and Information Systems	Frank Vetere	f.vetere@unimelb.edu.au	$109,414
IBES 2012	Framing the NBN: Consumer Attitudes and Perceptions	Social Infrastructure and Communication	Computing and Information Systems	Martin Gibbs	martin.gibbs@unimelb.edu.au	$49,931
	"Hear me out" - developing an online peer support program for deaf and hearing impaired teens	Social Infrastructure and Communication	School of Performing Arts	Geraldine Cook	gcook@unimelb.edu.au	$39,810
	Health service provider data connectivity requirements: mapping a path for a broadband enabled healthcare future.	Health and Wellbeing	Health and Biomedical Informatics Research Unit	Kathleen Gray	kgray@unimelb.edu.au	$50,000
	SELF-- OMICS: addressing the information and communication needs of the quantified individual for enabling participatory and personalised medicine.	Health and Wellbeing	Health and Biomedical Informatics Research Unit	Fernando J. Martin-Sanchez	fjms@unimelb.edu.au	$61,970
	Smart Companion: RFID and Broadband Technologies for Medication Management for Patients and Older People with Chronic Illness.	Health and Wellbeing	Computing and Information Systems	Udaya Parampalli	udaya@unimelb.edu.au	$70,000
	Participatory sensing - enabling interactive local governance	Social Infrastructure and Communication	Electrical Engineering MSE	Slaven Marusic	slaven@unimelb.edu.au	$50,000
IBES Indigenous 2011	Telling Our Stories: Aboriginal youth and digital storytelling, embracing the creative capacity of new technology for educational pathways	Social Infrastructure and Communication	"School of Culture & Communication, Faculty of Arts"	Dr Fran Edmonds	edmondsf@unimelb.edu.au	$99,000
MRO 2011	Getting Well and Being Present: Connecting Hospitalised Children to their School and Family	Health and Wellbeing	"Department of Information Systems"	A/Prof Frank Vetere	f.vetere@unimelb.edu.au	$70,000
	Exploring teacher professional learning in a virtual environment	Education and learning	MGSE	Lynda Ball	lball@unimelb.edu.au	$55,590
	SeeCare IPTV: Personalized Health Literacy Demonstrator	Health and Wellbeing	MSE	Ken Clarke	clak@unimelb.edu.au	$44,000
IBES 2011	Mobile Augmented Reality: Exploring Information, Interface and Interaction in Blended Environments.	Health and Wellbeing	Medicine	Kathleen Gray	kgray@unimelb.edu.au	$67,988
	Investigation of 3D v 2D for improved learning outcomes	Education	MDHS	Stephen O'Leary	sjoleary@unimelb.edu.au	$54,380
	Using video-conferencing to pilot an education and clinical support package for rural GPs in Mildura.	Health and Wellbeing	Medicine	Beverley-Ann Biggs	babiggs@unimelb.edu.au	$20,000
	Interpreter mediated cognitive assessments - using video conferencing software	Health and Wellbeing	NARI	Dr Dina LoGiudice	Dina.Logiudice@mh.org.au	$10,000
	"i-Ageing: Promoting Health and Wellbeing of Older Australians Living at Home"	Health and Wellbeing	Melbourne School of Health Sciences	Meg Morris Elizabeth Ozanne	m.morris@unimelb.edu.au	$12,000
	Exploring the effect of Telework on individual employee productivity	Service and Business Transformation	Dept of Computing and Information Systems	Dr Rachelle Bosua	rachelle.bosua@unimelb.edu.au	$39,954
BEIP - 2011	Broadband 3D telehealth applications for the empowerment of patients in health care facilities and the home	Teledentistry	University of Ballarat	A/Prof Andrew Stranieri	a.stranieri@ballarat.edu.au	$0
	Ageing Well at Home with Broadband	Health and Wellbeing	Moreland City Council	Rebecca Haack	rhaack@moreland.vic.gov.au	$20,000
	"Refugee Health Clinical Hub – a Model for Integrated Clinical Care using NBN"	Health and Wellbeing	Melbourne Health	Dr Marienne Hibbert	Marienne.Hibbert@mh.org.au	$20,000
	UniTV: Proof of Concept	Social Infrastructure and Communication	MSE	Ken Clarke	clak@unimelb.edu.au	$82,000
	UniTV: Proof of Concept					$12,545
ARC Supported - 2011	Participatory public space: a right to the networked city	Social Infrastructure and Communication	Arts	Scott McQuire	mcquire@unimelb.edu.au	$30,000
	Growing Old and Staying Connected: Touch Screen Technology for Ameliorating Older People's Experience of Social Isolation	Health and Wellbeing	MSE	Frank Vetere	f.vetere@unimelb.edu.au	$30,000
Google - 2011	"MUGLE: A Collaborative and Interactive Game-based Learning Platform for Distance Learning - GOOGLE"	Education	MSE	A/Prof Shanika Karunasekera	karus@unimelb.edu.au	$51,480

IMPACT AND ENGAGEMENT

Funding Source	Project Title	IBES Theme	Dept/School	CI	CI Email	Total Funding Amount
	Field testing of remote teledentistry technology - GOOGLE	Teledentistry	Dental Science	A/Prof Rodrigo Marino	rmarino@unimelb.edu.au	$39,317
MRO2010	The HORYZONS project: Online Recovery for Youth Onset Psychosis	Health and Wellbeing	Centre for Youth Mental Health	Dr Mario Alvarez-Jimenez	malvarez@unimelb.edu.au	$45,000
	TELIA: Technology for Endangered Languages in Australasia	Social Infrastructure and Communication	Computer Science and Software Engineering	Steven Bird	sbird@unimelb.edu.au	$40,000
	Overcoming geographical barriers for community health - remote access to clinical diagnosis & treatment	Social Infrastructure and Communication	Department of Psychiatry, MDHS	Prof Ian Everall	ieverall@unimelb.edu.au	$45,000
	High resolution monitoring of atmospheric pollutants to identify their impact on population health	Health and Wellbeing	Computer Science and Software Engineering	Shanika Karunasekera	karus@unimelb.edu.au	$40,000
	Digital China: a qualitative assessment of innovative broadband narrative construction and on-line research-reporting models in key mainland Chinese media universities and research centers.	Service and Business Transformation	Victorian College of the Arts	Prof Ian Lang	iwlang@unimelb.edu.au	$20,000
	Victorian Aboriginal youth and their use of new technologies: Exploring online social networks to enhance educational outcomes	Education	Culture and Communication	Philip Morrissey	philipjm@unimelb.edu.au	$45,000
	Migrant Youth and the Cultural Dynamics of Transnational Connectivity	Social Infrastructure and Communication	Melbourne Graduate School of Education	Fazal Rizvi	frizvi@unimelb.edue.edu	$20,000
IBES 2010	Early Detection and Mitigation of Disastrous Events with Broadband-Enabled Social Interaction Technologies	Social Infrastructure and Communication	MSE	Dr Shanika Karunasekera	karus@unimelb.edu.au	$30,214.00
	Death, Grieving and Memorialisation	Social Infrastructure and Communication	DIS	Dr Martin Gibbs	martin.gibbs@unimelb.edu.au	$28,314
	Death, Grieving and Memorialisation - Extended Project	Social Infrastructure and Communication	DIS	Dr Martin Gibbs	martin.gibbs@unimelb.edu.au	$1,074.00
	NBN Deployment Techno-economic Model	Service and Business Transformation	MSE	Dr Kerry Hinton	k.hinton@unimelb.edu.au	$9,054
	3D VR Training	Education	Medicine	A/Prof Gregor Kennedy	gek@unimelb.edu.au	$6,887
	3D VR Training	Education	Medicine	A/Prof Gregor Kennedy	gek@unimelb.edu.au	$22,206
	Scalable and Energy-Efficient Deployment of Video-Rich Services over Next Generation Networks	Service and Business Transformation	MSE	Dr Elaine Wong	ewon@unimelb.edu.au	$45,000
	The role of high speed broadband in telecommunications between people with limited speech and the health workforce	Social Infrastructure and Communication	Medicine, Dentistry and Health Sciences	Dr Louise Greenstock	lgreens@unimelb.edu.au	$20,000
	Telestroke Study	Health and Wellbeing	RMH	Bernard Yan	bernardy@unimelb.edu.au	$35,083
	Concordance between real-time teledentistry assessments and face-to-face examination	Teledentistry	Dental Science	A/Prof Rodrigo Mariño	rmarino@unimelb.edu.au	$20,398
	Political Issue Analysis System	Social Infrastructure and Communication	Information Technology Services	Dr Craig Bellamy	craig.bellamy@versi.edu.au	$19,175
	Political Issue Analysis System	Social Infrastructure and Communication	Information Technology Services	Dr Craig Bellamy	craig.bellamy@unimelb.edu.au	$8,892.00
	Wireless broadband monitoring of knee osteoarthritis	Health and Wellbeing	Anatomy and Cell Biology	Tim V. Wrigley	timw@unimelb.edu.au	$50,000
	'UniTV': a platform for converged services & applications	Social Infrastructure and Communication	MSE	Ken Clarke	clak@unimelb.edu.au	$64,000
	Building a Digital User Guardian		MSE	Julien Ridoux	jridoux@unimelb.edu.au	$19,860
	Connecting learners for collaboration across diverse communities	Education	DIS	Dr Jon Pearce	j.pearce@unimelb.edu.au	$58,000
	Connecting learners for collaboration across diverse communities	Education	ABP	Lindy Joubert	lindyaj@unimelb.edu.au	$12,000.00
MRO 2009	Screen Stories and Community Connections		MSPH	Dr Lisa Gibbs	lgibbs@unimelb.edu.au	$28,875
	Mobile and Broadband Technologies for Ameliorating Social Isolation in Older People		SCIENCE	Dr Frank Vetere	f.vetere@unimelb.edu.au	$50,000
	Making Pathology Reports Smarter by Incorporating User Characteristics in Design		SCIENCE	Dr Reeva Lederman	reeva.lederman@unimelb.edu.au	$48,185
IBES 2009	Towards a distributed international ethnographic museum		ARTS	Nick Thieberger	thien@unimelb.edu.au	$30,000
	Convict Founders & Survivors of Tasmania		MSPH	Prof Janet McCalman	j.mccalman@unimelb.edu.au	$36,150
	NBN cost benefit analysis methodology		MBS	Dr Richard Hayes	r.hayes@mbs.edu	$59,000

Funding Source	Project Title	IBES Theme	Dept/School	CI	CI Email	Total Funding Amount
	Crowd-Sourcing Human Knowledge on Spatial Semantics of Placenames		MSE	Stephan Winter	winter@unimelb.edu.au	$48,123
	Returns on ICT Investment in the Third Sector		ARTS	Michael Arnold	mvarnold@unimelb.edu.au	$27,147
	Multi-site immigrant health database -Personal Patient (patient controlled) Record		MDHS/RMWH	Marienne Hibbert/ Beverley-Ann Biggs	Marienne.Hibbert@mh.org.au / babiggs@unimelb.edu.au	$50,000
	Assessing the Potential Barriers to the Adoption of High-Speed Broadband by Australian Business		SCIENCE	A/Prof Rens Scheepers	r.scheepers@unimelb.edu.au; rens.scheepers@deakin.edu.au	$30,328
	Haptic Tele-Rehabilitation: Latency implications for system stability and clinical communication		MSE	Dr Denny Oetomo	doetomo@unimelb.edu.au	$31,994
	Using broadband-enabled technology to create a presence in classrooms for children who are absent due to health conditions		MDHS	Dr Julie Green	julie.green@rch.org.au	$30,774
	Gardens of tomorrow in broadband-enabled neighbourhoods		SCIENCE	Jon Pearce	j.pearce@unimelb.edu.au	$30,590
	Broadband-enabled public screens: from display to interaction		ARTS	Scott McQuire	mcquire@unimelb.edu.au	$35,011
	Demand Response in Smart Grids		MSE	Prof Marimuthu Palaniswami	palani@unimelb.edu.au	$69,609
	Broadband in the Home: A Longitudinal Study	Social Infrastructure and Communication	ARTS	Michael Arnold	mvarnold@unimelb.edu.au	$45,000
	Data Assimilation and Bushfire Modelling for Early and Rapid Bushfire Detection using Broadband Technology		MSE	Prof William Moran	b.moran@ee.unimelb.edu.au	$60,000
	Online Decision Support for Crop Irrigation		MSE	Prof William Moran	b.moran@ee.unimelb.edu.au	$60,000
	Broadband-Enabled Society and Youth Mental Well Being		SCIENCE	Dr Shanton Chang	shanton.chang@unimelb.edu.au	$88,000
	IBES Electronic Health Records - Ethical and Social Issues Project		ARTS	A/Prof Craig Fry	cfry@unimelb.edu.au	$40,684



INSTITUTE RESEARCH PROJECTS

Networked Society Institute (NSI) | 2014-19

Project Title	Dept / School	CI	CI Email	Research Team	Project Completion Date	Total Funding Amount
Music Therapy in Virtual Environments: Transforming the lives of people with quadriplegia using immersive environments for online group singing	MCM/VCA	Jeanette Tamplin	jeanette.tamplin@unimelb.edu.au	Ken Clarke Ben Loveridge David Berlowitz	31-Jul-16	$55,900.00
A Framework for Remote Sensing and Data Analysis Using Fixed and Mobile Sensors in a Combined Sensor Network	CIS	Edmund Kazmierczak	edmundak@unimelb.edu.au	Donryeol Ryu Sigfredo Fuentes	29-Jul-16	$58,440.00
Active Defence: A Novel Risk Management Approach to Network Infrastructure Protection.	CIS	Benjamin Rubinstein	benjamin.rubinstein@unimelb.edu.au	Chris Leckie Andre Gygax Tansu Alpcan Atif Ahmad	1-Oct-16	$48,720.00
"I want to feel like I'm not the only one": Development of an online interactive repository of survivor stories for women experiencing domestic violence	General Practice, MDHS	Laura Tarzia	laura.tarzia@unimelb.edu.au	Kelsey Hegarty Margaret Simons Hilary Davis Victoria Palmer Cathy Humphreys Danielle Fuller Kirsty Forsdike	1-Feb-16	$15,000.00
Mapping the Melbourne Sharing Economy	SHAPS, Arts	"Michael Arnold Martin Gibbs"	mvarnold@unimelb.edu.au	Martin Gibbs Tamara Kohn Bjorn Nansen Rowan Wilken James Meese Jenny Kennedy	1-Jun	$29,650.00
Driving for Change: A Video game to Reduce Depression in Taxi Drivers	General Practice, MDHS	Sandra Davidson	sdav@unimelb.edu.au	Greg Wadley Nicola Reavley Penni Russon Jane Gunn	16-Dec-16	$59,993.00
Crowdsourcing of Mobility Hazards to Enhance the safety and Independence of the Vision-impaired	EEE	Elaine Wong	ewon@unimelb.edu.au	M Palaniswami J Gubbi A Rao Nicola Misso Sandro Ciriani	30-Apr-16 extended to 31-Dec-16	$19,931.00
Protecting Personal Data: Do the Australian Privacy Principles work with the Internet of Things?	CIS	Rachelle Bosua	rachelle.bosua@unimelb.edu.au	"Megan Richardson Sean Maynard Atif Ahmad Karin Clark	1-Apr-16	$25,000.00
Topographical community accessibility modelling for people with mobility impairments	MSD	Marcus White	mrwhite@unimelb.edu.au	Geoff Kimm Nano Langenheim		$8,997.30
Aboriginal Young People in Victoria and Digital Storytelling	Culture and Comms (ARTS)	Scott McQuire			2016	$22,500.00
Virtual Reality Therapy for Youth Mental Health	CIS	Greg Wadley	greg.wadley@unimelb.edu.au	Maria Alvarez-Jimenez Sarah Bendall Ben Loveridge Reeva Lederman John Gleeson	1-Sep-17	$28,150.00
Mapping Urban Mobility for Flu Forecasting	IE	Martin Tomko	tomkom@unimelb.edu.au	Rob Moss Nicholas Geard	1-Sep-17	$45,404.10
Sensor Networks for Urban Green Spaces	Ecosystems and Forest Sciences (Science)	Stephen Livesley	sjlive@unimelb.edu.au	Peter Rayner Richard Sinnott Michelle Fitzgerald Ian Shears Steve Perumal	1-Aug-17	$27,750.00
Monitoring Urban Green Spaces	Vet and Agricultural Sciences	Sigfredo Fuentes	sfuentes@unimelb.edu.au	Pangzhen Zhang Andrew Nolan Patrick Robles	1-Sep-17	$35,000.00
Social Networks and Urban Green Spaces	Ecosystems and Forest Sciences (Science)	Kate lee	Kate.lee@unimelb.edu.au	Dave Kendall Elham Naghizade Lida Rashidi Stephan Winter	1-Sep-17	$36,191.00
Automated Online Legal Service Provision in Australia	Law	Julian Webb	Julian.webb@unimelb.edu.au	Tim Miller Rachelle Bosua Scott Chamberlain Adam Lodders	1-Oct-17	$21,455.20
mapmyHIV.org	Population Health (MDHS)	Christopher Lawrence or Greg Wadley		Steven Bird Brian Oldenburg Greg Wadley	1-Sep-17	$5,000.00
The Implications of Open Data for Planning and Policy…	MSD	Gideon Aschwanden	gideon.aschwanden@unimelb.edu.au	Dale Leorke Luke Heemsbergen Jake Goldenfein Andrea Carson Kate Macdonald	1-Dec-17	$38,671.50

INSTITUTE RESEARCH PROJECTS

Project Title	Dept / School	CI	CI Email	Research Team	Project Completion Date	Total Funding Amount
Detection of Smoke Contamination…	School of Agriculture and Food	Sigfredo Fuentes	sfuentes@unimelb.edu.au	Pangzhen Zhang Andrew Nolan Patrick Robles	1-Sep-17	$25,000.00
MNSI contribution to Games Engines Project	Culture and Comms (ARTS)	Ben Nicoll	b.nicoll@unimelb.edu.au	Bjorn Nansen Megan Richardson Andrew Kenyon Yunhan Li Adam Lodders	1-Aug-17	$5,000.00
A real-time virtual reality system for self-directed upper limb rehabilitation.	Biomedical Engineering	David Ackland	dackland@unimelb.edu.au	Wen Wu Dr Vijay Rajagopal Prof Peter Lee Prof Mary Galea Dr Eduardo Cofre Lizama	1-Oct-18	$33,000.00
Virtual Reality (VR) engagement with the national Aboriginal History Archive	e-scholarship centre	Gavan McCarthy	gavan.mccarthy@unimelb.edu.au	Prof Gary Foley Dr Edwina Howell Dr Sharon Huebner Prof John Maynard Prof Larissa Behrendt	30-Sep-18	$45,000.00
AI Smartphone solution to predict and prevent clinical relapse in bipolar disorder	Psychiatry	Mahesh Jayaram	mahesh.jayaram@unimelb.edu.au	Prof Christos Pantellis Dr Andrew Zalesky Luke A Perry Prof James Bailey Dr Elham Naghizade Prof Clive Adams	1-Mar-19	$41,273.00
Project MyCampus - A crowdsourcing Platform for Social Apps and Ubiquitous computing	MSD	Tom Kvan	tkvan@unimelb.edu.au	Fernando Koch Michael Kirley Jan Dethiefs Eduardo Oliveira	1-Feb-19	$40,000.00
Social Robots for Older People: Identifying Technological, Social and Ethical Challenges.	CIS	Jenny Waycott	jwaycott@unimelb.edu.au	Frank Vetere Barbara Neves Sami Alkhatib Simon Coghlan	1-Mar-19	$33,166.00
Coworking ecologies and the future of work	Culture and Comms (ARTS)	Scott McQuire	mcquire@unimelb.edu.au	David Bissell Rachelle Bosua Dale Leorke Danielle Wyatt Bree Trevena Sarah Slade	31-Dec-18	$34,245.00
Personalised care for people with type 2 diabetes (T2D): An integrated shared decision making tool embedded in the electronic medical record in general practice.	MDHS	John Furler	j.furler@unimelb.edu.au	John Furler Dougie Boyle Jo-Anne Manski-Nankervis Gary Kilov Ken Clarke Jane Speight	31-Dec-18	$45,014.00
A Sensor-Enabled Campus	Infrastructure Engineering	Mohsen Kalantari	mohsen.kalantari@unimelb.edu.au	Fernando Koch Mark Morris Behzad Rismanchi Soheil Sabri Tanzu Alpcan	28-Feb-19	$37,900.00
#misCOURAGE Down Under	General Practice, MDHS	Meredith temple-Smith			31-Mar-18	$9,169.00
Combating Fake News	Centre for Higher Education	Daniel Little	daniel.little@unimelb.edu.au	Rachel Searston Fiona Fidler James bailey Daniel little David Nolan	17-Dec-18	$37,368.00
Staying Safe Online	Media and Comms (Arts)	Monica Whitty			31-Dec-18	$58,000.00
Regulation of personalised digital closed loop systems to manage diabetes in children	Law	Carolyn Johnston			31-Aug-18	$29,212.00
Game Engines: Design, labour and legality	Culture and Comms (Arts)	Bjorn Nansen			31-Jul-19	$26,695.80
Developing an ethics for health data curation, customisation and consumption using participatory design	General Practice, MDHS	Victoria Palmer			28-Feb-20	$32,652.00
The 'Living Archive' of Aboriginal Art.	Centre for Health Equity MDHS	Richard Chenhall			31-Oct-19	$39,780.00
Intelligent Lighting Networks	MSD	Stanislav Roudavski			1-Dec-19	$38,588.00
Aligning consent with privacy promises of data sharing platforms.	CIS	Vanessa Teague			30-Sep-19	$28,000.00
Enabling a living lab for urban mobility and adaptive space (LUMAS)		Stephan Winter			31-Jul-19	$38,090.00
Reducing the Urban Rural Divide using the Dookie Farm	Melbourne Veterinary School	Stuart Barber			31-Jul-19	$39,450.00

REFLECTIONS

1. DIGITAL MEDIA IN THE NETWORKED SOCIETY

Looking back on ten years of collaboration with and through the Institute - particularly the role of digital media in a changing approach to death and memorialisation

By Bjorn Nansen – Institute Fellow (Digital Media)

"The research infrastructure and support provided by NSI was critical in the successful awarding of an Australian Research Council (ARC) grant."

Almost a decade ago, a fledgling research institute at the University of Melbourne, the Institute for a Broadband-Enabled Society (IBES) – later to become the Networked Society Institute (NSI) – advertised seed funding grants for interdisciplinary research projects focused on how the bandwidth capacities of broadband Internet were impacting across different spheres of society, economy, and culture. As part of their seed funding, they hosted a forum for researchers across the University to discover and connect around shared areas of interest, and to pursue a collaborative interdisciplinary project.

From this original call for projects, a team of social science researchers from fields including anthropology, science and technology studies, media studies, and human-computer interaction formed, with the idea of investigating how death and memorialisation were changing through the Internet and digital technologies.

The original application stated, "This analysis of online practices associated with death will provide unique insights into current and emerging social infrastructures and communities within broadband-enabled societies. Our particular moment in history is an opportune one for studying shifts in the practices, rituals and cultural values associated with death and dying as our social life is increasingly played out through digital media that are still seen to be novel and strange rather than familiar and taken-for-granted."

This seeding project was used to build the research track record of the team, as a team, in the domain of death and memorialising in a broadband-enabled society. This early research was particularly focused on questions around online death, profiles, memorials and data in the contexts of emerging social networking platforms, and amongst a number of publications included a special issue of *The Information Society on Death, Afterlife, and Immortality of Bodies and Data.*

Beyond seeding

The value of IBES/NSI in this early interdisciplinary research collaboration was not limited to seeding such projects. It went beyond this through putting researchers in touch with a range of potential industry partners, who might be interested in the economic outcomes and social benefits of particular research projects. In our case, a relationship with the Australian Communications Consumer Action Network (ACCAN), a peak body representing consumers in the communications market, was brokered and fostered, to study social and consumer issues in managing digital legacies. This led to further research funding and a consumer-focused piece of research and report on the question of digital legacy: *Your Digital Legacy: What will happen to your digital assets after you die?*

Over the last eight years, I have continued to work with this interdisciplinary team of scholars – including Michael Arnold, Tamara Kohn, Martin Gibbs, Hannah Gould, and Elizabeth Hallam – at the forefront of research investigating the intersection of digital technologies and changing social and cultural practices of memorialisation.

The research infrastructure and support provided by NSI was critical in the successful awarding of an Australian Research Council (ARC) grant to study 'Digital Commemoration' in 2013. This research continued our previous work on digital memorialisation and the mediation of death online, with the research agenda producing numerous academic outputs publications, including dozens of co-authored scholarly publications and peer-reviewed conference papers (a model of collaboration still not widely seen in the humanities and social sciences), and ultimately culminated in a co-authored book, titled *Death and Digital Media* (Routledge, 2018), the first monograph that critically overviews how people mourn, commemorate and interact with the dead through digital media.

Whilst IBES transitioned into NSI, and a focus on interdisciplinary analysis of digital connectivity in our society, the Institute nevertheless continued to foster research teams and collaborations, not just through seed funding and networking, but also through hosting various events and forums, from workshops to symposia. Our team participated in a number of such events, providing an opportunity to both present our research findings to a public audience and receive valuable feedback on its development from other scholars and interested stakeholders.

Events and public engagement

From such events, we were able to engage with and make significant contributions to connecting our research with wider publics and stakeholders through a range of public and industry engagement activities. Much of the research we produce has a public-facing dimension and highlights our commitment to contributing to public knowledge and benefits.

Our team has made research findings available to public audiences through a number of publicly-available research reports produced for various industry funding bodies and organisations. In addition to research on digital assets and legacies, including the Death and Internet report for ACCAN, issues of digital legacies have been discussed at presentations given by our team at the *International Internet Governance Forum* (Brazil, 2016), and the *Australian Internet Governance Forum* (Melbourne, 2016). From these events, our research has been presented by Standards Australia to develop and deliver a resolution on the first international standards for managing digital legacies at the International Standards Organisation Consumer Policy Committee (ISO COPOLCO) meeting held in 2018.

We have hosted a roundtable leadership discussion at the *International Cemetery, Cremation and Funeral Association* expo (ICCFA, New Orleans, 2016). And our work has been recognised with an invitation from the Greater Metropolitan Cemeteries Trust (GMCT) for our team to sit on their Community Advisory Committee (CAC), which we took up in 2017 for a three-year term. The contribution we make as part of the CAC is to provide advice to the GMCT on community considerations of its cemetery policies and operations.

Other public engagement from this program of research included numerous popular media publications and interviews (e.g. *The Conversation*, ABC radio's *Life Matters* and television's *7.30*), as well as presentations at public events such as a panel discussion at the Ian Potter Museum screening of *A Will for the Woods*, and a panel at the Wheeler Centre, hosted by Radio National's Hilary Harper as part of a series called *Dead Calm* exploring ideas about death – how we die, how we grieve, and how we commemorate our dead in Australia.

Such contributions and commitments have in turn led to further development of our research agenda, with the recent awarding of two nationally competitive ARC grants: an ARC Discovery grant focused on 'Disposal of the dead: beyond burning and cremation' (2018); and an ARC Linkage grant, with GMCT as an industry partner, on 'The Future Cemetery'.

The DeathTech Research Network is now an active team of anthropologists, social scientists and human-computer interaction specialists based at the University of Melbourne working to understand the intersection of death, technology, and society in the 21st century. Our programs of research and their associated publications not only demonstrate significant contributions to academic knowledge, but also and importantly evidence a strong commitment to interdisciplinary and industry collaborations, approaches and outcomes – something that would not have been achievable without the initial and ongoing support of the Networked Society Institute.

2. ETHICS IN THE DIGITAL AGE

There might have been a digital revolution, but did ethics evolve in the process?

By Victoria Palmer – Associate Professor, Department of General Practice, University of Melbourne

"The legacy of the Institute's contribution to developing a digital ethics agenda will be the platform it built that acknowledged the interconnected nature of digital matters and how these collectively shape our identities."

When we think about digital ethics, our concerns typically turn to ones of privacy, consent, ownership, security, autonomy and choice.

We want to know that data collected about us by governments is protected. We want to trust that information shared between friends is not being sold on to marketing firms or companies with other private interests, or that information collected about us is not going to be used as a surveillance measure.

We've become oblivious to personalised advertisements based on our latest search engine entries appearing in our social media feeds. We presume that everyone has equality of opportunity in the digital landscape to engage and set the limits of data use. Those of us whose lives have seen the transition from analogue to digital have witnessed a revolution in the way people can contribute to collection and use of their own data.

But the ethical frameworks and theories have not evolved to the same extent. We continuously fail to recognise that these questions of ethics are deeply interconnected with who we are as humans. We need more than a set of principles to guide how to make decisions and judge what the consequences of actions might be.

Social media platforms have increased our public visibility and a substantial proportion of our social activity is conducted online. Simultaneous with greater connectivity are reports of increased levels of social isolation and loneliness, and higher rates of depression.

Tracing the networked society's evolution within this digital sphere highlights the interdisciplinary and interconnected nature of these issues. The legacy of the Institute's contribution to developing a digital ethics agenda will be the platform it built that acknowledged the interconnected nature of digital matters and how these collectively shape our identities.

3. NETWORKED SPACES AND RESEARCH IN SMART CITIES

Exploring the role of technology in making cities better from an engineering research perspective

By Mohsen Kalantari, PhD – Senior Lecturer in Geomatics Eng. | Associate Director, Centre for Spatial Data Infrastructures and Land Administration

"Research and development in the engineering discipline play an important role in making cities smarter."

Cities are complex systems that involve an interplay of people and other habitats, infrastructure, environment, mobility, governance and economy. In such a complex environment, the role of technology is imperative in making cities better places to live.

Research and development in the engineering discipline play an important role in making cities smarter by inventing technology and cyber-physical infrastructures such as next generation of communication systems, intelligent mobility, resilient buildings and infrastructures, energy efficient systems, digital economy, environmentally friendly practices, predictive schemes and many more.

Despite the enormous contribution to knowledge made by the engineering research, the reductionist approach taken in this discipline can impede with the scalable adoption of the knowledge. In addressing research problems, in most engineering methodologies, the subject of the study is broken into simpler or more fundamental phenomena. While an in-depth understanding of the subject is achieved, the influence of larger scales of organisation in which the subject resides is not studied and often ignored.

My personal experience in undertaking research on location-based sensors is a good illustration of the limitation of the reductionist approach. My first seed funding application with the NSI in 2016 solely focused on geospatial complexity of sensors, ignoring the broader connection of the research to societal issues.

While the application was unsuccessful for seed funding, NSI offered in-kind support by providing networking and leadership opportunity, experts and interns, and equipment enabling me to explore the broader implication of my research idea. This support helped me in many ways.

First, I extended my network of collaborators to include colleagues in science, law, design and health disciplines and appreciate the collective views of a city as a complex system. Second, I was able to add new facets to my research securing several internal and external grants that are more relevant to broader societal and environmental problems in cities.

Last but not least, the experience of working with NSI, a network of colleagues and success in grant applications enabled me to take university-wide leadership roles and be a bridge between the collective expertise of the University and external parties dealing with cities such as communities, industry and government.

4. A RESEARCHER'S PERSPECTIVE

For one dedicated researcher, engagement with the Networked Society Institute has directly contributed to a successful career path

By Jenny Waycott - Researcher, Early Career | Computing and Information Systems, University of Melbourne

"One of the real strengths of the Networked Society Institute is the effort that has gone into fostering and developing these interdisciplinary collaborations."

I remember, many years ago when I was working as a junior researcher in educational technology, hearing my colleagues talk about a new research Institute that would soon be opening at the University of Melbourne. It would focus on multidisciplinary research, investigating the societal impact and benefit of new broadband and networked technologies. This was very exciting for those of us working at the intersection of technology and society. There was a real buzz among my colleagues as we attended early discussions facilitated by Rod Tucker about the plans for the Institute for a Broadband-Enabled Society (IBES).

Looking back ten years later, I can see that Institute-funded research had a significant impact on my career trajectory. I joined the School of Computing and Information Systems in early 2012 as a Research Fellow working on an ARC Linkage project, *Growing Old and Staying Connected: Touch-Screen Technologies for Ameliorating Older People's Experience of Social Isolation*. That project evolved directly from one of the earliest projects funded by a seed grant from IBES, *Mobile and Broadband Technologies for Ameliorating Social Isolation in Older People,* led by Frank Vetere.

For me, this job provided a fortuitous opportunity to join a growing research community investigating the design and use of new communication technologies to provide social support in later life. I continue to work in this area today. Building on that early IBES-funded work, my current research is examining the use of new technologies, such as virtual reality and social robots, for social enrichment in aged care.

I have also benefited directly as lead and co-investigator on seed grants funded by IBES, and later the Networked Society Institute. In my experience, IBES and NSI differed from other funding schemes because of the hands-on role the Institute staff played in supporting researchers to achieve their outcomes.

More recently, I have had the opportunity to develop and strengthen new interdisciplinary collaborations, supported by funding from the Networked Society Institute. My latest NSI-funded project is ***Social Robots for Older People: Identifying Technological, Social and Ethical Challenges.*** In this project, I am collaborating with new colleagues: Barbara Barbosa Neves, in the School of Social and Political Sciences, and Simon Coghlan, a veterinarian and ethicist with an interest in the role pets play in providing companionship in later life. One of the real strengths of the Networked Society Institute (and its earlier incarnations) was the effort that went into fostering and developing these interdisciplinary collaborations.

I benefited greatly from the support IBES and NSI provided – especially support from Adam Lodders, Ken Clarke, and Julien Ridoux before them. It has been a fantastic resource to have an Institute that fostered interdisciplinary research focusing on designing and using new technologies to provide social benefit.

5. A VIEW FROM THE INDUSTRY ADVISORY BOARD

Members of the Advisory Board were significantly involved in the Institute's activities

By Tim Fawcett – Advisory Board Member | Head of Government Affairs, Cisco Australia and New Zealand

"The highlight of my time with the Institute was the opening of Australia's first ever National Telework Week at the University of Melbourne by the Prime Minister of Australia, the Hon Julia Gillard AC."

Although it was seven years ago, it seems like yesterday when I felt the thrill of being asked by Cisco to be part of the industry Advisory Board for the Institute for a Broadband-Enabled Society (IBES) – the name which the Networked Society Institute began life with.

Apart from the opportunity to be involved with Australia's highest ranked University, the excitement I felt stemmed from being able to contribute to an Institute which was undertaking multi-disciplinary research that would help solve real-world problems emerging from Australia's rapid embrace of high speed Internet through a nation-building infrastructure project, the National Broadband Network (NBN).

While the early days saw IBES-NSI involved in the controversy about NBN technologies, it quickly became a leading research Institute on broadband applications and attracted talented people from across industry and varied academic disciplines that thrived in the ability to undertake new research.

The highlight of my time with the Institute was the opening of Australia's first ever National Telework Week at the University of Melbourne by the Prime Minister of Australia, the Hon Julia Gillard AC, who attended live and in real time directly from Parliament House Canberra via telepresence technologies. The Prime Minister was also joined at the conference by the Minister for Communications, Hon Stephen Conroy, and the Minister for Workplace Relations, Hon Bill Shorten along with the United States Ambassador to Australia, Jeffrey Bleich. This was hard evidence that the Institute was on the right track and was a place where amazing things could happen.

I would like to thank the former Vice Chancellor of the University of Melbourne, Glyn Davis, for supporting NSI and the Institute's Directors, Kate Cornick and Thas Nirmalathas, along with the loyal team of Institute staff including Adam Lodders and Fiorella Chiodo who were critical to the success of the Institute.

"The Institute has given me a far greater appreciation and awareness of the value and imperative nature of interdisciplinary thinking and perspective. It's all well and good to have a laser-like and profound knowledge in one area of expertise, however to get the greatest benefit from the application of that knowledge requires cross-functional or interdisciplinary thinking and engagement.

This focus on interdisciplinary thinking was the masterstroke and engine room of the success of NSI across the University of Melbourne and into wider industry, and this was no better illustrated to me than when I sat on the selection board for seed grants issued from the Institute. To see cross-functional teams come together and pitch their ideas was a highlight of my time being involved with the Institute and I thank you for that opportunity."

Lewis Fricker – Advisory Board Member | Ericsson Australia

6. CHALLENGES OF THE NETWORKED SOCIETY TO 2030

The emergence of the networked society raises many social, professional, economic and political issues

Thas A Nirmalathas – NSI Director

"The development of systems enabled through the rapid convergence of digitisation, networking and automation has created significant disruptions to how we live, work, shop, interact, commute, manufacture, conduct businesses, and govern our cities, regions and nations."

A fully networked society

With the worldwide deployments of 5G mobile, fibre broadband, satellite and satellite activated mobile broadband networks, the world's entire population could now be fully connected, potentially extending access to the Internet to everyone. Many things in our lives are being connected to the Internet as our ambient environment and built objects are being increasingly embedded with digital objects that measure and control the environment. Our world has become hyper-connected. Our social, professional, economic and political lives are predominantly through the digital connectivity between people, places and things, resulting in our lives being dominated by 'virtual' interactions.

Hyper-connectivity and the need for creating actionable insights from data from our embedded digital sensors means computing must be deployed close to the edge of the Internet, a rapid departure from the cloud computing of the past decade. This requires rapidly scalable computing power and algorithms that autonomously learn and adapt in time scales that can facilitate our interactions.

Rapid adoption of autonomous algorithms generates insights to improve our collective understanding of different aspects of our lives. The development of systems enabled through the rapid convergence of digitisation, networking and automation has created significant disruptions to how we live, work, shop, interact, commute, manufacture, conduct businesses, and govern our cities, regions, and nations. The emergence of the networked society raises very deep and fundamental dilemmas due to the virtualisation of life enabled through digital technologies, the role of effectively managing explosive growth of data in society and the opportunities and challenges of the prevalence of autonomous decision making.

Fragmentation of Internet

The Internet we know today has become fragmented across three key domains – Public Internet, Private Internet and Secure Internet. Public Internet will continue to be the main part of the network where everyone and every service is treated in a similar way. The Internet in the core will now be separated into private networks, with major digital companies building their own network to form their global Internet as a collection of Private Internets, to drive their own digital services and platforms. Persistent cyber threats against the critical infrastructure and services have resulted in the creation of highly-protected islands of Secure Internet closely representing the geopolitical interests and the need for control.

Identity and social interactions

At a personal level, biometric and other unique digital identifiers become the foundation of new digital identity. Personal particulars once part of the identification process have now become fully transparent and freely shared. The privacy debate is shifting to protection and security of these digital identifiers for critical transactions. The prevalence of social networking and digital interactions extend the open sharing of personal information in the virtual interactions as part of building trust and identity in the virtual life.

New and emerging social networking platforms are now designed with the intent to enable more user control on dynamic customisation of how we respond to stories, how we consume information and misinformation, and how we react to stories of others. Fake news, inappropriate content, psychological profiling and nudging can now be managed easily through customisation of these new platforms. Digital sophistication returns the control back to the users.

Virtual selves and augmentation of skills

Integration of our communication devices with embedded devices (cameras, microphones and sensors) in our environment enable the autonomous recognition of faces, gestures and speech. Such capabilities are combined with new user interfaces through augmented and virtual reality interfaces and 3D projections. This has led to the increased adoption of virtual assistant technologies that help us to overcome limitations of space and time in our communications – enabling an era of digital ever-presence and virtual selves. Augmentation of skills and automation of our virtual interactions present interesting ethical and etiquette challenges in our personal interactions.

Virtualisation of work

With the rapid adoption of automation across sectors, jobs are starting to change with more work becoming virtual, enhancing people's ability to gain access to new international job opportunities regardless of location. This creates significant challenges to individuals about security of jobs, while also creating challenges to governments around creation of jobs and education systems to face rapid changes in employment.

On the other hand, new digital engagements made possible through smart contracts and other technologies are making it easier to create new opportunities for the development of marketplaces for jobs with an international reach. With the automation of unsafe and manual tasks, new opportunities exist for people to participate in jobs built on attributes that humans excel at – fostering relationships, creativity and dealing with unpredictability.

Disruption and transformation of business

Industry and business faces disruption through the rapid convergence of digitisation, networking and automation technologies. Many sectors are embracing the transformation and realising the benefits through process improvements in logistics and information management, productivity gains in mining and healthcare, and new commercial opportunities through a platform economy approach to shared infrastructure, services and skills.

An ability to capture and process data is at the heart of these developments, with businesses gaining improved access to autonomous capabilities to collect, capture and combine data to improve accuracy in insights. Through a process of reorganisation of traditional jobs, the industry experiences significant productivity gains while also facing significant challenges in gaining access to the right talent as the nature of employment changes.

Governments

Government itself is able to use the data-driven approaches to decision making and policy design, thus reaping significant efficiency gains. From healthcare to responding to climate change, governments seek to embrace the data-driven decision making to improve their ability to respond. Bringing together multiple datasets across the entire economy can provide improved capability for governments and agencies, for example, to effectively plan cities and regions, design a better system of social welfare and healthcare, and aid responses to events and disasters.

With the fragmentation of Internet and growing use of Private Internet by industry, governments are increasingly forced to evaluate the use of Secure Internet to regulate the control and management of critical services and infrastructure, as well as to create suitable geopolitical boundaries to the digital economy. This adds further pressure to rethink the different layers of governments, and it becomes a challenge to engage with citizens.

Balancing responsibility and accountability

With increasing adoption and prevalence of automated decision making, society is faced with significant challenges in managing responsibility, accountability, transparency and social obligations. The process of decision making is conducted within a framework of accountability for the decision-maker, with the individual, who is the subject of the decision, able to exercise a right of administrative review. However, when that decision occurs via an automated process there is a shift in accountability and social responsibility away from decision makers (be they government or corporate) to computer platforms.

This adds pressure to build new ethical codes of conduct and accountability frameworks suitable for autonomous decision making by systems and software, as well as audit capacity for individuals and organisations to seek verifiable information on the use of data and the rationale embedded in the autonomous decision making from those who are providing such services.

The rapid transition to a *networked society* has offered strong social and environmental benefits. Yet, transformation of governance frameworks to tackle the challenges posed by digitalisation of economy, employment and government has been slow. In particular, society is facing significant challenges in dealing with disruptions to employment and fair distribution of wealth.

NSI CLOSURE ACKNOWLEDGEMENTS

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THANK YOU MESSAGE

The Networked Society Institute, as part of the broader portfolio of Melbourne Interdisciplinary Research Institutes, represents the University's aspiration to build a highly collaborative community that tackles societal challenges by linking up its exceptional disciplinary strengths.

The success of NSI as a virtual Institute in catalysing the interdisciplinary collaboration to understand and create the networked society is entirely due to the extraordinary talent and leadership of the academy – a constellation of 100-plus scholars comprising our leading researchers from Institute Fellows to early career researchers of our Doctoral Academy. The immediate impact of our research would not have been possible without the exceptional collaborations between thought leaders and change agents from other academic institutions, hospitals, non-governmental and community organisations, government as well as industry partners. In particular, I wish to personally acknowledge the sponsorship of a number of industry partners as well as the State Government of Victoria's funding, which significantly boosted the capacity of the Institute to support our activities.

The breadth and depth of programs you see here was supported by a small team of staff and I am greatly indebted to the commitment, passion and professionalism they have brought to the Institute.

The Networked Society Institute is extremely grateful for the experience, wisdom and leadership of a rich network of extraordinary and selfless individuals who served on our Executive Committee and Advisory Board.

I also wish to express my sincere appreciation of the confidence demonstrated by Deputy Vice Chancellor (Research) James McCluskey, Pro Vice Chancellors for Collaboration and Partnership Mark Hargreaves and Liz Sonenberg, Deans of Engineering Mark Cassidy (Current) and Iven Mareels (Past) in giving me an opportunity to provide leadership to the Institute over the past five years. I also wish to thank Emeritus Laureate Professor Rod Tucker for his foundation and exceptional leadership of the Institute for a Broadband-Enabled Society – predecessor to the Networked Society Institute.

Thank you,
Thas A Nirmalathas – Institute Director

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