Welcome to the SMART Update for Winter 2011. There has been significant progress in the forming and shaping of SMART as a national research organization.

Since starting in the role as Director and CEO some 12 months ago, I have been impressed with the University Of Wollongong’s strategic support and commitment to SMART. I believe that SMART’s achievements and milestones so far have been made possible through the collaboration of the Executive and the Faculties.

I want to note that the SMART Infrastructure Facility Advisory Council, especially Nick Greiner who as Chairman has been an important and valuable source of independent advice and assistance to me during this establishment phase. Recently Mr Greiner has stepped down as Chairman owing to his new appointment at Infrastructure NSW as its inaugural Chairman; however I am delighted to advise he has agreed to remain on the Council as a member.

During this first year of operation there have been many dimensions to the establishment and development of the SMART Infrastructure Facility. My priority has been to establish strong foundations upon which we can grow the calibre of our research and enhance our international reputation. These outcomes are discussed below under the following three broad objectives.

– Strategic Direction
– Building Capability, People, Processes and Governance
– Establishing Our Reputation and Relevance

**Strategic Direction**

The value proposition of SMART as a leader in applied infrastructure research concerned with integrated infrastructure planning and management has served us well as a descriptor of our intellectual intent. This has been well received in government and industry because it is seen as an important and largely untouched area of research.

The original commitment and direction of SMART, as set out in the Education Invest-
ment Fund (EIF) approval, has guided the team. We set up rigorous learning structures to identify the essential elements and research gaps that exist in Australia and elsewhere. It soon became apparent that there was a need to fine-tune the EIF plan and thereby incorporate a sharper focus on human interaction and behaviour with infrastructure networks rather than just focus on the biophysical aspects of infrastructure network.

SMART has now set up a group structure to operationalise our strategy and approach. The aim is to allow SMART to develop product, processes and frameworks that will enable a leadership position in Australia and abroad.

The group structure put in place is as follows:
- Modeling and simulation;
- Governance and economics; and
- Rail logistics.

This structure is designed to provide the platform for developing proprietary knowledge and analytical tools to synthesize across the traditional silos of activity and data that characterize the infrastructure domain.

My intention is for SMART to own this ‘space’ through intellectual leadership and the creation of ‘tools’ to enable insight and analysis into the dynamics of the infrastructure system. We are building tools in three areas.

- The first is to build a synthetic population data set for Australia, so that highly advanced simulation and modeling will enable decision makers to understand ‘livability’ and the impact on behaviour by policy and operational actions. This tool will provide a clear and wide lens for viewing the added dimensions of population density, transportation choice, congestion and land use.

Complementary to the synthetic population tool is the development of economic assessment tools, such as in cost benefit analysis and the measurement of externalities. These tools are indispensable to the increasingly complex and controversial realm of investment and project selection.

Thirdly, the establishment of a data centre will be designed to work in a complementary way with other institutions such as AURIN (Melbourne University) in the development of a national data portal for infrastructure data and research.

Building Capability – People, Processes and Governance

The integrity of the SMART value proposition and its ability to deliver to stakeholders will rely on the quality of its people, processes and governance.

It is essential that SMART has a clear and explicit knowledge creation mechanism and is supported with transparent reasoning capabilities to build complex and purposeful interdisciplinary models of infrastructure.

The culture of SMART will be the glue binding together our people, processes and structure. As a new organization I have seen this as an important and pivotal area of formation and consequently implemented a high level of accountability at all levels of the organization. Within a customer-centric framework we are focusing on high impact research that is relevant to our government, industry and academic stakeholders.

Significant new processes of knowledge management and collaboration are being implemented to ensure integrity and professionalism. In keeping with these considerations, I am developing a comprehensive peer review process to ensure that the quality of our research and advice can be validated and that the assumptions, logic and reasoning can be clearly identified and tested. In this way we will meet the exacting standards required of an international research leader.

Recruitment of key staff at professional level remains a focus. I have recruited scholars and practitioners that bring strong industry experience and intellectual leadership to enable rapid build up of the SMART research footprint.

We have successfully attracted to SMART a high calibre team (Peter Campbell, Henry Ergas, Pascal Perez, Matthew Berryman and Geoff Cohen) that was made possible through our ability to provide an exciting and credible vision of SMART’s potential.

SMART has successfully won and delivered on a number of exciting research mandates. These mandates include the following projects:
- Randwick Phase 1;
- Randwick & Green Square Phase 2;
- Port Kembla Port Corporation Rail Capacity Assessment;
- Pacific National Rail Simulation; and
- RTA Smartphone Development.

Together these projects have provided valuable insights into the formation of our
value proposition and the resources needed to support longer-term growth.

Apart from the intellectual formation of SMART, our skills in project management are fundamental to focused and timely research that meets the needs of stakeholders. As part of developing the culture of SMART we are focusing on both intellectual excellence and administrative rigour to ensure that our value proposition is fulfilled.

These activities enable us to gain a better understanding of our requirements for administrative staff and appropriate strategic resourcing for academic researchers in sourcing and delivering major research mandates.

**Establishing Our Reputation and Relevance**

An important advance for SMART’s reputation was the organizing and holding of the National SMART Infrastructure Research Summit held at Parliament House, Canberra in March. The event was co-hosted with the Department of Infrastructure and Transport, and facilitated the participation of more than 160 Australian infrastructure sector leaders and highly eminent guest speakers such as the Chief Scientific Adviser to UK Department of Transport.

Contributing to our profile has been the speaking engagements I have undertaken at numerous conferences, summits and roundtables both in Australia and abroad. In addition, I have accepted an invitation from the US Treasury to speak in Washington DC, in June, on infrastructure financing challenges. This will provide SMART with a unique opportunity to profile our work and vision regarding infrastructure planning and management. I believe that the profile and national relevance of SMART achieved in the last 12 months has been strong, but there is plenty more to do.

As an interdisciplinary research entity with a strong external orientation, my goal has been to promote both internal and external collaboration. SMART’s collaboration across both international and national arenas has been matched with a strong focus on internal stakeholders. Our work has resulted in several strategic new relationships and appointments that will serve the Facility and UOW well. For example, UK Infrastructure Transitions Research Consortium at Oxford University has appointed me to its Panel of Expert Advisors (governing board) and AURIN at Melbourne University have appointed me to its Board.

**Federating the Advisory Council**

SMART is a research Facility at the University of Wollongong with a national focused outlook and role. It is therefore important that the nation’s perspectives be reflected on the Advisory Council. To facilitate this national dialogue new members have joined the Advisory Council from around the Australian States. A warm welcome to all our new Council members.

- **New Members**
  - Shirley In’t Veld: CEO, Verve Energy (WA)
  - Yvonne von Hartel AM: Principal, peckvonhartel (VIC)
  - David Gray: Deputy Chair, Civil Aviation Safety Authority (QLD)
  - Dr Richard Sharp: Principal, ARUP
  - Rod Hook: Deputy CEO, Department of Transport, Energy & Infrastructure, South Australia

- **Current Members**
  - Mike Mrdak: Secretary, Dept of Infrastructure and Transport
  - Hon Nick Greiner AC: Chairman, Infrastructure NSW
  - Les Wielinga: Director General, Transport NSW
  - Mark Johnson AO: Chairman, Alinta Energy
  - Dr Alex Zelinksy: Group Executive, CSIRO ICT
  - Dr Thomas G Parry AM: Chairman, Sydney Water
  - Sonja Lyneham: Strategy & Approvals Director, WorleyParsons
  - Paul Oppenheimer: Managing Director, Plenary Group
  - Tony Shepherd: Chairman, Transfield Services
  - Rod Pears OAM: Director, O’Connell Street Associates Pty Ltd

**Attorney General’s Department and SMART in dialogue**

- **In May**, senior representatives from the Federal Attorney-General’s Department visited SMART to gain a better understanding of SMART’s work and cement relationships across the two organisations.
- The A-G’s sent representatives from the National Security Capability Development Division and their National Critical Infrastructure Capability Branch. A key activity of this area is the Critical Infrastructure Program for Modelling and Analysis (CIPMA), which is responsible for critical infrastructure protection, counter terrorism and emergency management.

Part of the day’s agenda included a teleconference from London with Professor Brian Collins discussing how planning in this area is being approached in the UK.

The meeting allowed SMART to enhance awareness of its capabilities with key government infrastructure stakeholders and to correspondingly gain a better appreciation of Commonwealth government policy and priorities.
Infrastructure governance is concerned with the structures of accountability and management, and a broad interest in governance requires encompassing many different perspectives, views and voices. This is a relatively new area of endeavour and SMART’s formation of the Professor of Infrastructure Governance position is the first of its kind in Australia.

Taking up the appointment of this new and challenging position is Professor Geoff Cohen. Geoff has extensive experience as a senior development and project manager across all facets of major property development in the public and private sectors, as well as several stints at Stanford University (USA). His background covers a cross-disciplines research focus on behavioural information processing and decision-making, leading to a better understanding of organisational and project structure and change.

The establishment of this role comes at a time when many of the political, media and community debates involving infrastructure in many ways take root from the seeds of doubt promulgated by issues directly related to governance. Knowing the keys to excellence in governance and understanding the barriers to good governance are obvious areas of interest for Geoff to drive an agenda for better infrastructure procurement and management.

He will take a particular interest in Public Private Partnerships and how they will need to adapt and evolve to the changing needs of their stakeholders. He will drive a strong evidence based approach to assessing efficacy and efficiency of private sector involvement in infrastructure.

After securing a US Government-funded National Science Foundation Grant in management science in 1991, Geoff’s work led him through several successful trajectories of applied research in project management.

During the 1990s Geoff managed teams on township and urban renewal projects for the NSW Government, Lend Lease and Bradcorp, all joint ventures closely associated with all levels of government. They included the formulation and delivery of a national operations and funding model in the Affordable Housing Program in Ultimo/Pyrmont, Sydney as part of the national Building Better Cities Program; and establishment of the Australian Technology Park (Sydney) Ltd in association with NSW Treasury and State Development.

As Development Manager, Geoff led the successful tender and scaling back of Lend Lease’s involvement in the Multi Function Polis. He then played a pivotal role in revising the Olympic Village consortium, tender and commercial plan for the successful bid by the Mirvac/Lend Lease Consortium.

Over the past decade Geoff has focused on his investments in manufacturing, building, property and software, which have been in partnership with companies including BHP as well as P&O/Bovis and contracting with the Olympic Coordination Authority. During this time he has consulted to NSW Government’s Environmental Planning Authority, Department of Planning and Treasury as well as the ACT Government.

Geoff has degrees in Computer Science (1977) and Civil Engineering with Honours (1979) from the University of Sydney, and an MSc (1982) focused on project management, finance and sociology and a PhD (1992) focused on behavioural decision-making from Stanford University.

Garry Bowditch has been appointed to the Board of the Australian Urban Research Infrastructure Network (AURIN) at the University of Melbourne. AURIN is a $20M four-year project funded from the Australian Government’s Super Science initiative.

AURIN aims to develop a national research infrastructure to increase the understanding of urban resources, their use and management, to enable better analysis of urban issues and policy development. There is significant opportunities for AURIN and SMART to drive a strong national agenda with respect to providing the nation with important infrastructure data to support better planning and infrastructure provision.

The key role of the Board is to provide strategic oversight and guidance for the capability of the project to the University of Melbourne and the Project Director. SMART Advisory Council member David Gray is the independent Chair of the Board.
UK’s Chief Scientist links up with SMART

Professor Brian Collins the Chief Scientific Advisor for two major United Kingdom Government agencies, The Department of Transport and The Department of Business, Innovation and Skills, was the National SMART Infrastructure Research Summit’s well received International Keynote Speaker.

During his visit Professor Collins had a busy schedule meeting researchers and decision makers in Wollongong, Brisbane, Sydney, and Canberra. His expertise in infrastructure planning, evaluation, and management, was eagerly welcomed and a number of positive dialogues have continued since his departure back to the UK.

In response Professor Collins has been keen to extend his new found contacts in Australia to other UK based researchers and decision makers, fostering collaboration between institutions and people.

To ensure this activity is supported and encouraged SMART has announced that Professor Collins has been appointed a Visiting Professor to the SMART Infrastructure Facility.

Professor Collins received a doctorate in Astrophysics from Oxford and is Professor of Information Systems at Cranfield University. He is an elected Fellow of the Royal Academy of Engineering and was conferred the honour by Her Majesty the Queen of election to Companion of the Bath in the 2011 New Years Honours List.

View Professor Collins' keynote address given at the SMART Infrastructure Research Summit on the SMART YouTube Channel.

(Note that due to the size limit on YouTube videos his presentation has been compiled into four parts.)

Fostering connections with institutions and organisations undertaking infrastructure research will deliver both short and long term benefits to SMART. Recently the fledgling work already undertaken by SMART has started to attract attention internationally.

An example of this advancement has been the recent appointment of Garry Bowditch as an International member of the Expert Advisory Group of the UK Infrastructure Transitions Research Consortium (ITRC). The ITRC is a major collaborative UK research programme, which was launched in January 2011, with the aim of developing and demonstrating a new generation of system simulation models and tools to inform analysis, planning and design of national infrastructure.

The ITRC intends to enable a revolution in the strategic analysis of national infrastructure in the UK, whilst at the same time becoming an international landmark programme recognised for its novelty, research excellence and impact.

The ITRC is funded from the UK Engineering and Physical Science Research Council’s (EPSRC) prestigious Programme Grant funding mechanisms. The programme is being conducted in close collaboration with key government and industry stakeholders in the UK and has excellent support from high levels within these organisations. The Expert Advisory Group membership combines a small group of high-level UK practitioners, together with six international appointments.
Chief Operating Officer Tania Brown manages an array of important projects, and the most critical over the last 12 months was overseeing as the client, the new SMART building. Following is a short report on the project.

The new SMART Infrastructure Facility building at the University of Wollongong campus opened its doors to staff in February allowing a short month of activity to finalise the fit out for students arriving in March. Arrangements for a formal opening of the building are still being actively pursued and the VIP event should be occurring in the middle of the year.

Work on the four storey building designed by Graham Bell and Bowman Architects commenced in April 2009 with Cockram Construction as the lead contractor. The project had its challenges as it was situated in a tight and compact site and had to be connected with pedestrian bridges to the existing Engineering, Science, and Information Technology faculties.

The design of the building is based on a simple circulation pattern comprising of a central atrium and open stairway linking three floors encouraging staff, student and interfaculty collaboration. The building marries different program requirements to offer 30 labs and teaching spaces coupled with heavy engineering workshops.

The incorporation of environmental and sustainable design elements such as rainwater harvesting for toilet flushing and a mixed mode ventilation system ensured that the Facility is in the process of being assessed as a 4 Star Green Star rating under the Green Star Education rating tool. Energy efficient lighting, photovoltaic panel power generation to supplement the conventional power supply and low volatile organic compounds (VOC) carpets, paints and sealants have also been used.

This transformative building is now home to 24 staff, 11 casuals and 140 PhD students working everyday on infrastructure related tasks, subjects, projects and research.

Albert Munoz
Albert Munoz is currently in the final stages of completing a PhD in Supply Chain Management at the University of Wollongong. His previous accomplishments include a Bachelor of Chemical Engineering, as well as Masters in Business Administration and Environmental Engineering. Albert has extensive experience in discrete event and system dynamics simulations of manufacturing systems and supply chains.

Dr Matthew Berryman
Dr Matthew Berryman completed his PhD in complex systems modelling and analysis at the University of Adelaide in 2007. From 2007 to 2009, he worked for the Australian Defence Science and Technology Organisation before joining the University of South Australia in 2009.

Matthew has extensive experience in systems engineering and agent-based modeling of complex systems. At the SMART Infrastructure Facility, he applies these skills to model Australia’s future infrastructure needs and to make existing infrastructure smarter through the use of technology.
Shaping Sydney’s tomorrow

SMART’s success with a prototype to enhance transport and urban development planning decisions has been green lighted for the next stage of development. The complexity of global cities such as Sydney makes transport and urban planning challenging. There is an urgent need for new and evolving tools to improve the process of policy and project decision-making. Increasingly planners require sophisticated insights on the interdependencies of systems.

SMART’s Professor Pascal Perez and Senior Research Fellow Matthew Berryman have been working on the development of a ground breaking decision making assistance tool for the Department of Transport NSW based on the south eastern Sydney precinct of Randwick. Earlier this year SMART demonstrated and verified a prototype simulation platform that was interactive, visually intuitive and highly flexible.

Due to the success of the prototype a contract for a second phase has now been green lighted. This will expand the simulation’s geographic area to include Green Square, which is to the immediate west of Randwick and a designated growth corridor. The new version of the model will enhance the features of the platform by facilitating the interplay and movement of people between locations.

This project will extend and bring evolution to present modelling standards. The project delivers a simulation and modelling platform that enhances flexibility by offering a large range of future scenarios to be tested, including social responses to specific land-use or transport policies.

Interestingly the model could be used like a ‘flight simulator’, where planners learn how to react to the unexpected – and often unpredictable – social or environmental responses to a given policy implementation, leading to more strategic and adaptive planning skills.

This prototype has been developed using data that incorporated the following components about Randwick: street network, public transport lines and timetables, traffic flow, land rates, population growth, individual travel routines and a limited set of individual liveability factors.

Importantly the simulation platform uses agent-based modelling technology to represent individuals and households living in and travelling around the urban precinct.

Agent based modelling can be used to simulate the actions and interactions of autonomous agents (that is individuals or collective entities such as organizations or groups) with a view to assessing their effects on the system as a whole. The aim is to have a simulation that can create real world-like complexity, showing emerging patterns of behaviour, or moments in time, in which interventions have consequences.

In the SMART developed prototype individuals can follow pre-defined daily routines and perceive environmental queues (traffic congestion or land rates) in order to assess the ‘liveability’ of their current situation.

In the second stage of the project the ‘perceived liveability’ component will be refined to include factors such as: housing costs, population density, socio-cultural diversity, available amenities and transportation options.

Beside individuals and households living in a given area, the model will also include virtual land-use planners, transport planners, land developers and transport operators whose decisions will shape the transformations of the urban landscape.

Existing traditional transport models consider individual attributes such as age, education or income, as well as household-level characteristics to take into account the social diversity. This new SMART model will take this approach a step further by allowing agents to incorporate information about present and future availability of housing stock type, parking facilities, recreational amenities or convenience shopping.

For example, users will be able to explore the dynamical relationship between transportation needs and individually perceived liveability factors in a given area.

An exciting aspect to this further development of the simulation is the ability to allow direct interaction between residents and the model. This can be used to socially validate the content and outcomes of the simulations.

Associate Research Fellows Dr Nam Huynh

Nam Huynh received his Bachelor of Engineering degree in Aeronautical Engineering from the Vietnam National University, Ho Chi Minh City, Vietnam in 2004. He received his Master of Engineering Practice degree in Mechatronics in 2005, and a PhD degree in Mechanical Engineering in 2010 from the University of Wollongong. His research interests include modelling of engineering systems, logistics and supply chain systems, and agent based simulation.

Guillaume Michal

Guillaume Michal received his Master of Engineering degree from the French Institute for Advanced Mechanics (IFMA), Clermont-Ferrand, France in 2004 and he is receiving a PhD degree in Mechanical Engineering in 2011 from the University of Wollongong. Guillaume is passionate about inter-disciplinary engineering problems and their modelling plus he actively engages in high performance computers and clustering.

SMART YOUNG TURKS
SMART is using online social media tools to build up the infrastructure community and informal collaboration. The aim is to provide easy to use and convenient tools for engaging people, activating conversations and building networks.

Important aspects to SMART’s purpose are to generate and disseminate ideas plus promote dialogue with industry and government. SMART is harnessing social media, such as Facebook and Twitter because they provide an emerging and increasingly powerful array of operational tools.

SMART has established a Twitter, Facebook, YouTube and Flickr presence to connect and extend the infrastructure research community. Further extensions into sites such as LinkedIn are also planned.

Readers are encouraged to have their organizations and their interested staff engage and link up to SMART with their respective organisational digital platforms.

A quick summary to SMART’s social media presence follows:
- **YouTube** – Videos of presentations and interviews from the National Summit plus interviews with industry experts;
- **Join the Twitter conversation and engage the global community**: SMART is highlighting key media articles, events & debates on infrastructure from Australia and overseas;
- **Facebook** is an easy and inviting platform for networking, exchanging information, images, and thoughts; and
- **Flickr** – More than 90 photos from the National Summit can be downloaded and used by interested parties.

SMART is now setting up its next stage of engagement with these platforms by offering short seminars to its staff and students on how social media can be used as a professional tool as well as a personal one. The aim is to increase SMART’s network through the aggregation of its own audience’s networks – a classic social media benefit.

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**Multi-utility model workshop**

In February SMART convened a workshop, in conjunction with consultants from Deloitte, to investigate and debate the issues concerning multi-utility models generally and specifically determine whether a regional Illawarra based multi-utility model could be a compelling area of research for SMART.

Following an overview of the multi-utility concept from Deloitte, it was apparent that any assessment of this concept required an understanding of the value of production of utility services and cost of consumption with respect to the Illawarra region and relative to other regions and the State overall.

The availability of such data is highly fragmented and therefore limited. Accordingly, before SMART could sensibly begin to develop a multi-utility model it would need to identify, acquire, manage and mine appropriate data sets to determine relative efficiency and inefficiency with respect to production, distribution and consumption of utility services at a regional level.

It was identified and agreed that SMART, through its National Data Centre, should develop a plan and business case for the collection and analysis of utility data. The collection and analysis of utility data would enable research into the interdependencies of these networks and the economics underlying the utilities in the Illawarra and other regions.

SMART is investigating how a pilot study can be developed looking at a limited data set in order to better understand the process for the identification, acquisition and management of Illawarra regional utility data pertaining initially to water and electricity. The pilot will help inform the outline of costs and benefits of holding such a database.

SMART has met with Sydney Water to commence the data acquisition and aggregation process for the Illawarra and metropolitan region. In the first instance, we will be looking at the relationship between energy and waste water. Electricity and gas data sets for the Illawarra region will be also developed in due course.

Once SMART has a demonstration data set available it will investigate options to secure funding to build out the data sets to a state-wide basis.