aiia
australian information industry association

House of Representative Standing Committee on Infrastructure and Communications: Inquiry into Smart ICT

AIIA response

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Introduction

About AIIA

The Australian Information Industry Association (AIIA) is the peak national body representing Australia's information communications and technology (ICT) industry. Since establishing 35 years ago, the AIIA has pursued activities aimed to stimulate and grow the ICT industry, to create a favourable business environment for our members and to contribute to the economic imperatives of our nation. *Our goal is to "create a world class information, communications and technology industry delivering productivity, innovation and leadership for Australia".*

We represent over 400 member organisations nationally including hardware, software, telecommunications, ICT service and professional services companies. Our membership includes global brands such as Apple, EMC, Google, HP, IBM, Intel, Microsoft, PWC, Deloitte, EY and Oracle; international companies including Telstra, Optus; national companies including Data#3, SMS Management and Technology, TechnologyOne and Oakton Limited; and a large number of ICT SME's.

Overview

The AIIA welcomes the opportunity to comment on this important issue.

For the purposes of this paper, Smart ICT[1] is used to describe a range of tools, techniques and capabilities which can be applied to the various stages of the public infrastructure investment process.

As an ICT advocacy group, AIIA is well placed to provide case studies on how innovative technologies and new capabilities of smart ICT has helped infrastructure planning and development. This paper will focus on case studies and outlines essential pre-conditions necessary to grow smart ICT infrastructure.

[1] A range of tools and techniques that include advanced (ICT) such as data analytics, optimisation, modelling & software systems, networked sensors, and integration with mobile devices and new ways of gathering data, such as social media and crowd-sourcing.

Case studies: innovative technologies and new capabilities of smart ICT in infrastructure

Internet of Things

Earlier this year, AIIA hosted the Internet of Things (IoT) summit, where industry leaders and leading researchers and academics presented case studies on the transformative impact of IoT on infrastructure, delivery of services and the economy.

Key insights emerging from the summit relevant to infrastructure is outlined below.

Speaking with experience from Asia and Europe, Steve Leonard (Infocomm Development Authority) and Lutz Heuser (Urban Software Institute) highlighted how IoT technology is being applied to addressing issues such as urban density, managing the impact of an ageing population and reducing energy consumption. From managing chronic traffic congestion and supporting patients at home as the alternative to hospital admission in Singapore, to managing energy consumption and reducing greenhouse emissions in Germany, the insights created by the data generated by IoT technology is contributing to a range of improved citizen, social, economic and environmental outcomes.

Leveraging existing infrastructure assets, 'starting small' and building scale were consistent themes throughout the day. The concept of a 'digital skin' - overlaying smart technology on existing infrastructure - highlighted the opportunity to use IoT technology to drive smart cities, transport, utility services, traffic management, civil safety, parking and asset management applications, to name a few.

Presentations from David Gambrill (NICTA), which showed how IoT sensors are used to maintain and coordinate repairs of Australia's iconic Sydney Harbour Bridge, and Suvendu Mukherjee's (Broadcast Australia) overview of the connected and smart New York subway system illustrated the extent to which IoT is already being applied specifically in support of infrastructure developments.

Planning and Design

The below case studies highlight how analytics from ICT can be used to maximise value for money on large infrastructure projects.

Port Botany Rail

Sydney's sea freight is forecast to more than triple its container capacity in the next 15 years. Currently 86% of containers move through the port area by road. This is unsustainable given Sydney's current road configuration.

NICTA has worked with all key participants in the Port Botany rail supply chain to develop a data-driven dynamic model of freight operations to understand capacity of the existing network and its bottlenecks, with a view to increasing performance. The results indicate that significant capacity is accessible through operational performance improvements, rather than requiring additional capital investment for constructing new infrastructure.

NICTA's analysis demonstrated that a potential rail track upgrade estimated to cost up to $200m could be delayed by 15-20 years through applying a new optimised freight movement schedule.

West Australian freeway expansion

Recent modelling by NICTA of a West Australian freeway expansion project indicated that existing peak congestion can be addressed either by a $300M addition of an extra lane for 4kms, or by the application of much less expensive smart sensors in the road surface connected to ramp meters (dynamically managed traffic light metering). The latter would see more than a 40% increase in

throughput. Melbourne's M1 is already using some of these technologies to optimise traffic flow and shows that the technique works in real systems.

Maintenance of infrastructure

The case studies below outline how smart ICT can identify preventative repairs to major infrastructure leading to significant cost savings.

Water Utilities

Developing more accurate preventative maintenance scheduling has the potential to save the Australian water industry up to $700M per annum. Each year, around 7,000 breaks occur, costing taxpayers roughly $1.4B in reactive repairs & maintenance and consequential damage.

NICTA, in collaboration with several water utilities, has developed a new approach to predict the likelihood of water pipe failure. The software creates a statistical model of each pipe within a network using multiple internal and external data sets including current and historic data related to the age, type, material, and size of a pipe, as well as soil composition, external pressure and other factors. Using all the available data enables a greater number of faulty pipes to be identified and repaired before they break, leading to significant cost savings.

Sydney Harbour Bridge

Sydney's Harbour Bridge has several thousand structural components each of which need to be monitored and maintained. Current practice requires bridge inspectors to visually inspect every one of the bridge components at least once every two years. As the structure ages, demands on inspectors increase and more frequent inspections may be required.

NICTA has developed instrumentation and data analysis systems that combine to provide detailed structural health monitoring of individual components on bridges. Advanced monitoring algorithms detect irregular movements in the structure, while allowing for inherent movements and the impact of the harsh environment. This information is distilled for the asset manager, who can then schedule targeted precautionary inspections that may result in maintenance work being undertaken. The primary benefits to government and taxpayers are greater efficiency, more productive bridge inspections and reduced disruption to bridge users as a result of more timely preventative maintenance.

Water

The below case studies demonstrate how smart ICT can generate advanced analytics to optimise use of assets and increase efficiencies for State water supply and management.

Townsville Water Pilot

Townsville City Council is able to deliver near real-time information about daily water usage from digital water meters to the Council and residents via a web portal. This may reduce overall consumption as well as offset future infrastructure investment. The results of the pilot showed:

- 50% of consumers changed their behavior after seeing both timely data and insight from their pattern of use on the portal.
- 98% faster notification time on water leaks, from three months to a day, potentially saving millions of litres of water, associated treatment and delivery costs, reduction in bill shocks and complaints to the call center.
- 10% reduction achieved in overall average household water consumption by residents accessing the portal.

Yarra Valley Water

To keep essential water and sewerage services flowing to more than 1.8 million customers, Yarra Valley Water wanted to gain better insight into its distribution network in order to reduce failures

and disruptions. Yarra Valley Water adopted a system that provides a comprehensive view of all its assets consolidated into a single platform. This enabled them to make insightful decisions about managing and maintaining its water and sewage network. The benefits include:

- Improved insight and control of assets;
- Easier asset optimization through prioritized and proactive maintenance; and
- A platform that enables them to layer analytics for the delivery of business insights

Energy

The case studies below outline how smart ICT can optimise energy supply, including a more consumer centric approach to services that can reduce energy consumption.

Texas: Smart Metering and Asset Optimisation

Oncor, the largest regulated transmission and distribution electricity service provider in Texas, USA, developed a smart meter solution that collects data at fifteen minute intervals from meters throughout the electric grid. Oncor gains greater visibility into power demand and service quality so it can pinpoint service problems and minimise service disruptions. Oncor's smart metering system also allows energy consumers to make informed decisions about their electricity usage, minimising energy costs.

Malta: Smart Metering and Asset optimisation

The Maltese National Electricity and Water Utilities—Enemalta, will replace 250,000 analog electricity meters with new smart devices that will monitor electricity usage in real time, set variable rates, and reward customers who consume less energy and water. Smart metering also enables restructuring of the billing process, improved customer relationship management and the introduction of e-services.

The project is the first step in establishing an end-to-end electricity and water smart utility system and allows remote management of electricity supply. When complete, the multi-phased engagement is expected to transform the relationship between Maltese consumers and utilities suppliers, while enabling more efficient consumption of energy and water.

Denmark: Smarter Renewable Energy and Analytics

Danish company, Vestas, is the largest global energy manufacturer dedicated exclusively to wind energy. By using big data and analytics they plotted optimal turbine placement. This means greater business case certainty with customers, increased predictability and reliability in wind generation. This resulted in:

- Reduced response time for wind forecasting by approximately 97% - from weeks to hours; and
- Reduced IT footprint and costs.

Transport

The below case studies highlight how policy makers can use ICT to improve decision making around traffic congestion and management.

Sydney Light Rail

The NSW Government's light rail public transport project is looking to improve Sydney's traffic congestion between Circular Quay and Randwick.

NICTA has developed a program that predicts, where and when congestion will occur when a major thoroughfare like George Street is closed, such as for a special event. Data modelling enables transport system managers to evaluate the impact of a range of interventions, such as using variable message signs (VMS) to alert drivers of alternative routes, or simulating new routes by diverting bus traffic.

Generation Multi-Model Transport Management

Similarly, the City of Lyon, France, has deployed a new multi-modal predictive traffic management solution for the entire network of roads, buses and trams. The solution uses new technology to combine incident detection, incident impact prediction and propagation, traffic prediction and control plan optimisation. The system is used to estimate drive times and traffic patterns more accurately and in real-time by combining advanced analytics and algorithms. Over time, the algorithms "learn" by incorporating best practices and outcomes from successful plans to fine-tune future recommendations. The system also develops traffic contingency plans for major events.

Sydney Airport Congestion Management

Sydney Airport looked into the massive volumes of data collected by baggage, customs, carriers, retailers and numerous other systems to gain insights that would allow it to better plan its operations. The airport tested an advanced analytics and reporting platform that allows it to more accurately predict passenger volumes and movements. For example, an analysis of vehicle traffic patterns outside the airport revealed that drop-off zones experienced heavy congestion whenever major airlines ran low-fare promotions. Airport managers are using the new insights to redesign the airport's parking and traffic management systems.

Car2go Smartphone app

The moovel Car2go smart app analyses the offerings of transportation services such as railroad, bike rental, taxis and car sharing to find the best way to travel and offers users different suggested routes depending on their preferences of speed, cost and comfort. This is a new model that uses data and customer-focused services to fundamentally change how people and communities experience transportation.

Emergency management

Advanced data analysis enabled by smart ICT is particularly useful in anticipating risk and advising on appropriate action in unexpected scenarios such as disaster management. The case studies below provide examples of how it's being used.

Dam-wall overflow flood event

NICTA modelled the flow of water from a potential spill at Warragamba Dam in Western Sydney. This enables authorities to make informed decisions on the optimal evacuation paths of 70,000 residents in flood-affected regions – potentially saving lives.

Data comes from multiple sources and is fused together to give an accurate height-based picture of flows, indicating over time which roads become impassable – providing better information for the state emergency services (SES), police, transport managers and other authorities. The modelling specifically informs which residents should be evacuated in which order, with frequently counter-intuitive insights that could mean the difference between residents being safely evacuated or not.

Rio de Janeiro: Natural Disaster Preparedness

As a result of experiencing natural disasters, Rio De Janeiro needed a centralized operations centre for the city that enables them to better respond to natural disasters, threats and at the same time ensure public safety through disaster prevention. The system integrates data from 30 agencies, enabling personnel to analyse weather, energy, building, transportation and water data in real time. It draws on information collected from multiple sensors integrated into infrastructure such as traffic surveillance, rain meters, and provides near real-time situational awareness in a single view.

They have found an 80% success rate in predicting downpours and floods 48 hours before they occur. It also means the city can marshal its resources within hours, instead of days.

Victorian Bushfire Warning System

Country Fire Authority (CFA), in Victoria, a volunteer and community based fire and emergency services organisation has developed a One Source One Message (OSOM) warning system for writing and sending bushfire emergency messages. The IMB built OSOM system allows the CFA to send timely and accurate alerts that can help save lives and property. This means:

- Increased speed of command
- Improved coordination in incident planning and response

Major Events: Crowd Tracker

IBM helped Tennis Australia create a utility for the fans who visit Melbourne and Olympic Parks over the Australian Open tournament. Available through the Australian Open website and official apps, the CrowdTracker gave fans a birds-eye view of the precinct to see what crowds were doing on site and on line. This gave fans real time insight into:

- Where they are: using the GPS enabled on their mobile device, fans could see where they were on site and what was going on nearby
- Where the crowds are: using data obtained via Wi-Fi enabled device signals, fans could see where the biggest crowds were and quickly find the most popular spots or avoid them
- Social buzz - the same map also provided a view on popular Instagram spots, Twitter stats and sample photos shared via social media.
- Court by court insights - the map included glowing courts to indicate where matches were currently underway so fans can decide where to go. More importantly, they could click on each court to see real time court data such as scores and stats, social sentiment about that match as well as player bios.

By using social media and GPS enabled devices, this solution is very relevant to dealing with crime spots (eg Kings Cross) or major security threats or catastrophes.

Four essential pre-conditions necessary to grow smart ICT infrastructure

According to the United Nations, more than half of the global population now live in urban areas. Modern cities face many challenges and opportunities because of this. The challenges range from providing a good quality of life for citizens to ensuring appropriate socio-economic development year on year, while the opportunities can be seen in businesses becoming more efficient and innovative, to the reduction of crime through the use of ICTs in policing.

Information and Communication Technology is changing the evolution of cities. The notion of "growing" cities based on implementing correct urban planning is being replaced with the concept of making a city "smart". The Internet is changing the traditional urban planning model and compelling planners to not only consider the physical planning of a city but also to consider the use of ICT to make the economy, environment, mobility and governance of a city more efficient and effective.

The AIIA outlines four essential pre-conditions required to grow smart infrastructure in our cities.

1. Government to lead by example

In considering the best way of spending public money on infrastructure, decision makers should be required to consider innovative ICT solutions that can be leveraged to deliver more effective end user benefits and assist and reduce the cost of ongoing infrastructure maintenance.

This should occur particularly in project selection and the procurement process. Case studies such as the Port Botany Rail and Western Australian freeway expansion demonstrate significant cost savings through innovative ICT solutions.

2. Improve the roll out of effective broadband networks

Policymakers need to foster the development of a rich environment of broadband networks that support digital applications, ensuring that these networks are available throughout the city and to all citizens.

In the absence of a statement that clearly sets out the national objectives of a ubiquitous high speed broadband capability (jobs creation, industry development, growth target, infrastructure investment etc), the conversation in Australia primarily reverts back to the 'how' rather than the possibility of the 'what'.

Case studies outlined above show the efficiency gains that can be achieved from adopting smart ICT, such as from the use of sensors and the IoT – which can only be achieved through a high speed and reliable broadband network. AIIA is concerned that the delay in rolling out high speed broadband capability is compromising the development of these capabilities.

3. Support the use of smart devices and agents in physical spaces and infrastructure

Any smart ICT plan for infrastructure requires the physical space and infrastructures of a city to be enriched with embedded systems, smart devices, sensors, and actuators, offering real-time data management, alerts, and information processing for the city administration.

Most of the case studies outlined above are trialling the use of such devices and agents with very positive results - whether it is for traffic management, emergency response, or energy and water services. This is not to mention the extensive and ubiquitous use of ICT in infrastructure to empower the development of essential services for health, security, police and fire departments, and delivery of public services.

4. Smart ICT infrastructure reforms should be done in the context of an innovation system reform

In our response to the review of Australia's innovation system, AIIA argues that the future of innovation in Australia critically depends on an effective and cohesive ecosystem which incorporates:

- Infrastructure and Knowledge
- Collaboration
- Education and Skills
- Funding
- Regulation and Policy and
- Culture

It is AIIA's contention that retaining the integrity of Australia's innovation system is undermined by individual, piecemeal policy changes such as the proposed cuts to the R&D tax incentive and short-sighted decisions that fail to incorporate the important role of ICT in optimising the return on investment in, for example, significant infrastructure initiatives.