GNSS Futures in the Asia Pacific Region

National Positioning Infrastructure:
a future built on Public Private Partnerships?

James Millner
7th July 2014
No challenge to the GDP figures as such – informative to revisit the original assumptions on technology, user adoption and governance – did we get that right? What can be tweaked? What will positioning infrastructure look like in the future?
CORS Models

- Hale et al (CRCSI)
  Validating a Model for CORS Network Management (2006)

- Rizos et al
  Making GNSS-RTK Services Pay (2006)

- Higgins et al
  An Organisational Model for a Unified GNSS Reference Station
  Network for Australia (2008)

- Hausler (CRCSI PhD)
  Research explores technical, commercial, and governance issues
  affecting the development of a National Positioning Infrastructure (NPI)
  in Australia (2013)
The future?
Public Private Partnerships (PPP)

For centuries, governments have used private contractors to provide a wide variety of public services.

PPP arrangements are distinguished from outsourcing or privatisation by a long-term relationship between the state and a private contractor for:

- Planning, construction, operation, service delivery and maintenance of infrastructure assets.
LINDA M ENGLISH University of New South Wales Law Journal

Common to all PPPs in Australia is an arrangement where a private consortium contracts with a public sector agency to finance, design and construct (or refurbish) infrastructure under a time and cost-specific contract.

A competitive neutrality adjustment, essentially involving the application of the National Competition Policy in order to remove any net competitive advantage of the public option (such as non-tax status) relative to the private option.

Not without criticism or controversy

So called “production of electric gold belongs to all Australians”
Source: The Australian Jan 2014
Drivers: Budget and Productivity

- Increased federal funding on infrastructure $12 billion over 5-6 years
- $5 billion “asset re-cycling” initiative
- Offer to sate governments 15% incentive to sell off businesses and use proceeds to build new infrastructure

(The Age Business Day May 24)

Total Commonwealth infrastructure investment 2003/04-2017/18 (actual/forecast %GDP)

Productivity or Bust
the need to work more efficiently

Source: IPA calculations based on Budget data

Source: The Australian and Deloitte Access Economics
Traditional roles of government at all levels are being challenged:
Commonwealth has the financial capacity and power under section 96 of the Constitution to provide financial assistance to the States and Territories in areas traditionally their responsibility such as roads, health, and education.

<table>
<thead>
<tr>
<th>Level of government</th>
<th>Economic infrastructure</th>
<th>Social infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commonwealth</td>
<td>Aviation services (air navigation etc)</td>
<td>Tertiary education, Public housing (shared)</td>
</tr>
<tr>
<td></td>
<td>Telecommunications, Postal services, National roads (shared), Local roads (shared), Railways (shared)</td>
<td>Health facilities (shared)</td>
</tr>
<tr>
<td>State</td>
<td>Roads (urban, rural, local) (shared)</td>
<td>Educational institutions (primary, secondary and technical) (shared)</td>
</tr>
<tr>
<td></td>
<td>Railways (shared), Ports and sea navigation</td>
<td>Childcare facilities, Community health services (base hospitals, small district hospitals, and nursing homes) (shared)</td>
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<tr>
<td></td>
<td>Aviation (some regional airports), Electricity supply</td>
<td>Public housing (shared), Sport, recreation and cultural facilities, Libraries, Public order and safety (courts, police stations, traffic signals etc)</td>
</tr>
<tr>
<td></td>
<td>Dams, water and sewerage systems, Public transport (train, bus)</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Roads (local) (shared)</td>
<td>Childcare centres, Libraries</td>
</tr>
<tr>
<td></td>
<td>Sewerage treatment, water and drainage supply</td>
<td>Community centres and nursing homes, Recreation facilities, parks and open spaces</td>
</tr>
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<td></td>
<td>Aviation (local airports), Electricity supply, Public transport (bus)</td>
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</table>

Source: “The Commonwealth Government’s Role in Infrastructure Provision Research paper”
Infrastructure Australia

- Total estimated infrastructure priority list contains $82 Billion in capital costs

- Expenditure on Engineering and Construction for public sector as % GDP

Source: Productivity Commission March 2014
PPP agreement offer the potential for efficiency gains compared with traditional public procurement.

For example, they can facilitate:

- access to private technology and innovation, including specialised contractors and operators
- enhanced private sector incentives to deliver projects on time and within budget
- opportunities for competition for the market in provision of infrastructure and its services
- long-term value for money through appropriate risk transfer.

Bundling together design, build, operate and financing may bring greater discipline and incentives to providers to reduce life-cycle costs for an infrastructure project.

The potential benefits of using such procurement methods, including private financing, are that they can lead to a lower overall cost of providing infrastructure services.

PPP might also offer a valuable means of encouraging better use of pricing and other efficiency-enhancing mechanisms associated with infrastructure.
Comparative costs

Total construction cost per Kilometre $m

$100m 16km new road and 2.5km rail

Productivity Commission - Source Ernst Young 2011
Success of Public Private Partnerships

National PPP Forum – Benchmarking Study (2008)

Report on the performance of PPP projects in Australia when compared with a representative sample of traditionally procured infrastructure Projects.

The resulting total sample of sixty seven (67) projects was subdivided into the following categories:

• Social infrastructure projects 32 projects
• Transport projects 23 projects
• Sustainability (water, energy & waste) 8 projects
• Information Technology (IT) 4 projects

Conclusion: Over all time periods considered in this study, PPPs delivered projects for a price that is far closer to the expected cost than if the project was procured in the Traditional manner. Based on the inter-quartile percentage for the period from initial project announcement to the actual final cost, PPPs were 31.5% better than traditional projects.
Investor ready?
How cities can create and deliver infrastructure value

New Urban Dynamic

Increasingly, cities and municipalities are the tier of government being tasked with providing essential services to their populations, and for formulating the means of funding them.

Cities are now more reliant than ever before on private sector support to scope, finance and deliver projects.

With public-private sector collaboration being one of the most effective approaches to major infrastructure delivery today
Global Examples: Investor ready Cities

Financing & funding of city infrastructure: case examples for utility, transport, smart grid and social mobility

Investment basics:

- The rule of law and political stability are recognised and respected
- Property rights are clearly identifiable, transferable, recognised and enforceable

“Delivering effective, efficient and sustainable urban infrastructure is essential to provide the city backbone”
Cisco – Internet of Things to Everything..

Internet of “Things” to Internet of Everything..

from devices to people, places, data and 50 Billion connected devices

Source: Cisco 2013
Global Examples: Bringing Global Innovations to U.S. Highways

Public-Private Partnerships for Highway Infrastructure: Capitalizing on International Experience

Sponsored by:
United States Department of Transportation
Federal Highway Administration

In cooperation with:
American Association of State Highway and Transportation Officials
National Cooperative Highway Research Program

Position Partners
Shaping New Dimensions
• Synthesise: CORS models: Hale, Rizos, Higgins, Hausler,
• Definition: a long-term relationship for the construction, maintenance and operation of infrastructure assets
• Productivity commission report key benefits: access to private technology and innovation, specialised contractors and service delivery
Traditional roles of government

- Infrastructure
- Processing
- Delivery

CORS Reference Stations

Network Processing

Deliver By Cloud

Framework

Policy and strategy

Standards and specifications

Core infrastructure

Generally good for traditional roles for datum and survey
Traditional roles of government

Infrastruture focus GOVERNMENT

Industry focus Customer focus
Public Private Partnership - Innovation

Infrastructure → Processing → Delivery

CORS Reference Stations → Network Processing → Deliver By Cloud

Deliver By Cloud

Public Private Partnerships

Infrastructure Asset

Planning

Construction

Operations

Service

Support

Shaping New Dimensions
Case example - Innovation

- Text messaging
- File Transfer
- Visibility / tracking
- Alarms
- RTK correction distribution
- Remote access to machines
- Topcon platform
- Real time cut/fill mapping
- Database query

Key to enable these applications using secure VPN connections
Case example – Customer Support

Traditional engagement with Survey processionals
Logical to provide support for this industry sector

- Best practice – survey practice regulations
- Infrastructure – ground marks, datum, calibration etc
Case example Customer Support Model

Online support model – live demo

Key to enable these applications using secure VPN connections

http://portal.alldayrtk.com.au
Policy and governance

For example:

- **Strategic Policy and Projects** – actively promote innovative projects
- **Governance and Risk** – concerned about the risk to government
- **Business and Finance** – what is our return on investment?
- **Open data policy** – confusing and mixed messages about what is “Free” data and what are “Fee for Service”

Response by government is often framed by the bureaucratic structure
Conceptual adoption model for precision GNSS

Economic benefits of high resolution positioning services

The Allen Consulting Group

The difference between the two curves represents the uptake that is attributable to the provision of a national network.

November 2008
Prepared for Victorian Department of Sustainability and Environment and the Cooperative Research Centre for Spatial Information
Everett Rogers’s Diffusion of Innovation Model

- Innovators: 2.5%
- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%

Market share %
Expectations and “Chasm”

Hype Cycle and Technology Adoption Lifecycle Plotted together

Technology Trigger

Peak of Inflated Expectation

Trough of Disillusionment

Slope of Enlightenment

Plateau of Productivity

Innovators

Early Adopters

Early Majority

Late Majority

Laggards

"The Chasm"

Adoption Rate

Time
Complexity associated with human behaviour?
The economic value of productivity ‘shocks’, in terms of dollar changes in GDP, were modelled using the Monash Multi-Regional Forecasting (MMRF) model — a generalised equilibrium model of the national economy.

Assumed national network would “spark” interest in new applications like autonomous haul trucks (not used in 2008).

Slower uptake for established applications like survey.
Rogers Bell Curve

Rogers' bell curve

- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
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Profit Opportunity

Mass Market
Actual adoption model for national GNSS
Controlled Traffic Farming

System 350
Complete Control System for Row Cropping
Growing demand for food
- By 2030, food demand is predicted to increase by 50% and increase 70% by 2050
- The increase is the strongest in Asia - doubling between 2007 and 2050
- 50% increase in food production needed by 2030

Australian Farm Sector:
- Agriculture contributes about 3% to Australia’s GDP
- The broader agribusiness sector contributes about 12% to Australia’s GDP
- Over 60% of Australia’s agricultural output is exported.

Source: The Australian National Food Plan 2013
PlantScan brings together a number of imaging tools in order to record detailed images and measurements of plant growth and function:

- Light Detection and Ranging Sensors (LiDAR) for 3D plant canopy architecture measurement
- Two far-infrared imaging cameras for canopy temperature measurements
- Multi-wavelength imaging for pigment or chemical composition spanning both visible and near-infrared
- CORS and other positioning technology

Phenomics: study of how the genetic makeup of an organism determines its appearance, function and performance

Source: http://www.csiro.au/Outcomes/Food-and-Agriculture
Australia’s goal is to meet the projected demand and to increase the value of agriculture and food related exports by **45% in 2025**

Source: The Australian National Food Plan 2013