ICT Research and Government Policy
Bridging the ICT Innovation Gap

Phil Robertson
Chief Operating Officer, NICTA
Outline

• ICT Innovation gap – some indicators
  – Input
  – Process
  – Output
  – Outcome

• NICTA’s role and model

• Have we got the right innovation model in Australia?
What Gap?
Indicators
Australian investment in R&D (2006/07)

- **Australia R&D expenditure: ~$21 B; 2.01% of GDP**
  - OECD average 2.26% of GDP (Australian gap ~$2.6B)
  - EU target 3% of GDP by 2010, likely to achieve 2.6%
  - Many countries invest over 3% (eg Sweden, Japan, …)
  - BERD: 59%, GOVERD: 14.5%, HERD: 26.5%

- **Australian ICT R&D expenditure: ~$2.3B (~11%)**
  - BERD: 84%, GOVERD: 5%, HERD: 11% (EU >20%)
  - We’re under-investing in ICT R&D

BERD: Business Expenditure on R&D
GOVERD: Government Expenditure on R&D
HERD: Higher education Expenditure on R&D
Collaboration

Firms collaborating on innovation with government research institutes by size, 2004-06

OECD Science, Technology and Industry Scoreboard 2009 - OECD © 2009
Collaboration

Firms collaborating on innovation with higher education institutions by size, 2004-06

<table>
<thead>
<tr>
<th>Country</th>
<th>SMEs</th>
<th>Large Firms</th>
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<tbody>
<tr>
<td>Finland</td>
<td>30</td>
<td>40</td>
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<tr>
<td>Slovenia</td>
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<td>Greece</td>
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<td>Hungary</td>
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<td>France</td>
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<td>Portugal</td>
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<td>Denmark</td>
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<td>Australia (2006-07)</td>
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<td>Turkey</td>
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<td>United Kingdom</td>
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<td>New Zealand (2006-07)</td>
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</table>
Collaboration - Firms

Firms collaborating on innovation activities by size, 2004-06

OECD Science, Technology and Industry Scoreboard 2009 - OECD © 2009
Australian patenting in US

2008 US Utility Patents


Average US patents per 1 million population 2004-2008

-10.00 -5.00 0.00 5.00 10.00 15.00 20.00 25.00 30.00

350.00 300.00 250.00 200.00 150.00 100.00 50.00 0.00 -50.00

Australia

China, People's Republic of

India

Italy

Japan

Korea, South

Netherlands

Norway

Spain

Singapore

Sweden

Taiwan

Turkey

United Kingdom

United States

Switzerland

Singapore

S. Korea

China
### US patents by Australians (by org’n)

<table>
<thead>
<tr>
<th>First-Named Assignee</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
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<td>SILVERBROOK RESEARCH PTY. LTD</td>
<td>247</td>
<td>510</td>
<td>533</td>
<td>608</td>
<td>474</td>
<td>2372</td>
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<td>~INDIVIDUALLY OWNED PATENT</td>
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<td>157</td>
<td>132</td>
<td>94</td>
<td>113</td>
<td>625</td>
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<td>CANON KABUSHIKI KAISHA (CiSRA)</td>
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<td>39</td>
<td>40</td>
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<td>24</td>
<td>151</td>
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<td>30</td>
<td>13</td>
<td>10</td>
<td>19</td>
<td>95</td>
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<tr>
<td>RESMED LIMITED, AN AUSTRALIAN COMPANY</td>
<td>21</td>
<td>27</td>
<td>17</td>
<td>10</td>
<td>19</td>
<td>94</td>
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<td>AVAYA TECHNOLOGY CORP.</td>
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<td>11</td>
<td>7</td>
<td>15</td>
<td>16</td>
<td>52</td>
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<td>COCHLEAR LIMITED</td>
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<td>10</td>
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<tr>
<td>TECHNOLOGICAL RESOURCES PTY, LTD</td>
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<td>1</td>
<td>1</td>
<td>3</td>
<td>15</td>
<td>21</td>
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<td>COMPUTER ASSOCIATES THINK, INC.</td>
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<td>2</td>
<td>3</td>
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<td>CISCO TECHNOLOGY, INC.</td>
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<td>6</td>
<td>14</td>
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<tr>
<td>QUALCOMM, INC.</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>14</td>
<td>9</td>
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<tr>
<td>UNIVERSITY OF QUEENSLAND</td>
<td>6</td>
<td>11</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>41</td>
</tr>
</tbody>
</table>

Total 1221
# 2005 US Patents – Top 10 US Universities

<table>
<thead>
<tr>
<th>Rank</th>
<th>University</th>
</tr>
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<tbody>
<tr>
<td>390</td>
<td>University of California</td>
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<tr>
<td>136</td>
<td>Massachusetts Institute of Technology</td>
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<tr>
<td>101</td>
<td>California Institute of Technology</td>
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<tr>
<td>90</td>
<td>Stanford University **</td>
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<td>90</td>
<td>University of Texas **</td>
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<tr>
<td>77</td>
<td>University of Wisconsin</td>
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<tr>
<td>71</td>
<td>Johns Hopkins University **</td>
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<tr>
<td>71</td>
<td>University of Michigan **</td>
</tr>
<tr>
<td>64</td>
<td>University of Florida</td>
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<tr>
<td>57</td>
<td>Columbia University</td>
</tr>
</tbody>
</table>

20 US Universities had 30 or more US patents granted in 2005
And note that software can be patented ....

A high proportion of these are ICT companies ....
ICT R&D FDI Trends

Australia's Share of ICT R&D FDI Projects

Australia’s ICT Trade Deficit

Figure 13: Australia’s ICT Trade Balance, 1998 to 2008 (AUDm)

~2% of GDP

Sources: ABS and TradeData (www.tradedata.net), CSES Analysis.
The Cost of Australia’s ICT Trade Deficit

Figure 7.3 ICT Equipment Surplus/Deficit as a Percentage of GDP, 2007 (per cent)

Source: OECD, CSES Analysis.
OECD findings on Productivity

• **Strong relationship between R&D and productivity (16 countries, ~20 yrs)**
  - 1% increase in business R&D corresponds to 0.13% increase in productivity
  - 1% increase in public R&D corresponds to 0.17% increase in productivity
  (av increase in MFP over study period = 0.8%)

• **Australian relationship #**
  - 1% increase in business R&D corresponds to a 0.11% increase in productivity
  - 1% increase in public R&D corresponds to a 0.28% increase in productivity

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*Gullec & Van Pottelsberghe, From R&D to productivity growth: Do the Institutional Settings and Source of Funds Matter?, OECD 2001
# Sources of Knowledge and Productivity: How Robust is the Relationship, OECD 2006*
Australian ICT sector profile

• ICT industry structure
  – 95% of all ICT companies have less than 20 staff
  – <1% of ICT companies have over 100 staff (265 companies)
  – Few multinational companies have R&D groups in Australia
  – Low SME global engagement

• ICT public sector research scale
  – University research is fragmented, with few groups achieving globally competitive critical mass
  – NICTA, CSIRO and DSTO together are a major part of ICT research in Australia
  – Few local opportunities for researcher / industry cross-flow

• Publishing and patenting
  – Publishing on par internationally
  – Global patenting ~1/3rd rate of countries with similar capabilities
  – ICT sector patenting below pro-rata
The (ICT) Innovation Gap

We’re not leveraging enough of our public sector R&D
NICTA’s role and model
About NICTA

Recruit commercial and research staff from Australian and global communities

NICTA

- National ICT Research Centre of Excellence
- Not-for-profit Company
- 5 Labs
- ~$80m pa cash and in-kind

Seven university “joint venture” partners contribute researchers and students

Advanced ICT skills

- Research for globally competitive products & services
- R&D partnerships

IP licensed to industry, including spinouts
About NICTA

• **NICTA**
  – Australia’s National Centre of Excellence in Information and Communication Technology (ICT) Research
  – The largest organisation dedicated to ICT research in Australia

• **Our role in Australia is**
  – Helping to build a sustainable, globally competitive Australian ICT sector
  – Developing advanced ICT systems to address major national priorities
  – Training ICT researchers to build national capability
NICTA’s model

- **Balance between “Lab research” and Projects**
  - ~35% / 65%
- **Projects target impact from the outset**
  - Commercial and/or national benefit
- **Support processes**
  - Research theme and project reviews
  - Commercialisation “lifecycle” and $$ support
  - IP strategies and patenting support
Examples of projects
Smart Roads

- **NSW RTA is a world pioneer in ITS**
  - SCATS used in over 140 cities
  - Reduces trip times 20%, start-stop up to 40%

- **NICTA working with RTA**
  - Improvements in throughput (>10%)
  - New sensors, traffic lights that “see”
  - New control algorithms

- **Next generation active safety**
  - Vehicle ↔ vehicle real-time cooperation
  - Vehicle ↔ infrastructure

In practice at Albion Park…
• NICTA collaboration with LIXI to achieve on-line loan applications, etc
  – Schema by LIXI
  – Processes and architectures by NICTA
• Digitalisation lead to Lending Industry Structure Change
  – Innovative aggregators are emerging
• Industry changes lead to Cost Savings
  – Savings estimate is approx $120 million savings a year
Spinouts: eg

- **OKL Inc and OKL Pty Ltd**
  - Spun-out of NICTA January 2007
  - VC investment from Neo Technology Ventures, Chrysalis Ventures, Citrix® Systems, Inc. in 2008/2009
  - Currently ~40 staff in Sydney and growing
  - Contracts with several multi-nationals (Qualcomm, Motorola, Toshiba + Ericsson)

- **On-going research Collaboration with NICTA**
  - World first proof that the operating system is implemented as specified (L4 verified)

- **Collaboration with local SME - Fluffy S**

- >900 million devices worldwide
  - Android, HTC, Toshiba, Motorola
Have we got the right Innovation Model in Australia?
Traditional Innovation “Funnel”

- Diversity
- Early stage research
- Development (proof of concept, etc)
- Business

Gating points

Market understanding

Research → IP / Technology development → Products / Services

Scale
Target Innovation Model

Diversity

Scale

Inputs from partnerships

Market/IP knowledge

Strategic IP

IP development

Market positioning

Business products / Services

Market engagement

Competitive positioning

Business relationships

IP strengthening

Research

By-products

Technology / IP development

By-products

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From imagination to impact
Building competitive advantage

Collaboration and contract engagements to build partnering

Protection as a barrier to entry by others

Deep systems level know-how that is difficult to replicate

Technology / IP development
The importance of R&D Services

• Study of Cambridge region development - “Exploding the myths of UK Innovation Policy”:
  – …that university research is the key source of technology and innovation
    • It is more often “soft” R&D services companies started by scientists and engineers
  – …that VC funding is the primary financial resource for technology based start-ups
    • Most successful companies had a “soft” start, undertaking R&D contracts directly or via incubation
  – …that co-funding collaborative research is the best way to support technology development
    • Successful companies made little or no use of collaborative R&D grants

Exploding the Myths of UK Innovation Policy: How ‘Soft Companies’ and R&D contracts for Customers Drive the Growth of the Hi-Tech Economy, David Connell and Jocelyn Probert, Centre for Business Research, University of Cambridge, Jan 2010
Summary

• Invest more in ICT R&D
  – (Input indicator)

• Collaborate for greater innovation
  – (Process indicator)

• Take a strategic approach to IP
  – (Output indicator)

• Put more emphasis on R&D Services
  – (Outcome indicator)
Thank you
For further information on NICTA…
phil.robertson@nicta.com.au
www.nicta.com.au