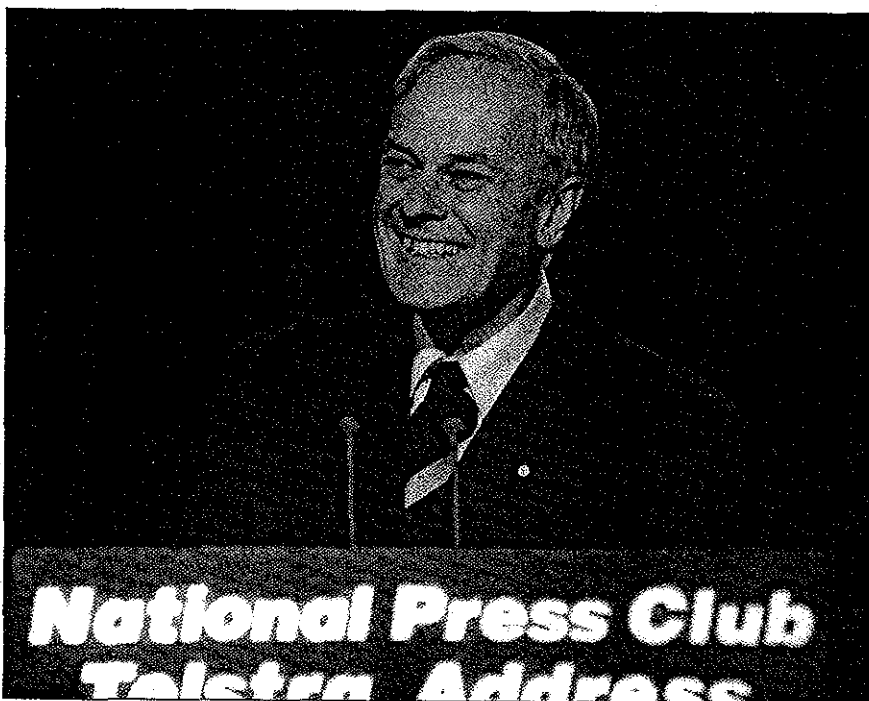


# Australia and the ICT revolution

We are living in the midst of one of the three great technical revolutions the world has seen. Number one was agriculture, number two the industrial or energy revolution, and number three the information revolution, spawned of the invention a hundred years or so ago of radio and electronics.



**Professor Brian D O Anderson,**  
President,  
Australian Academy of Science

**T**oday we have cochlear implants; vastly improved weather forecasting and General Motors shipping more computer power than any computer manufacturer (all in its cars, to control fuel efficiency, braking, temperature and so on).

It is possible to call an 1800 number and book a seat on an aeroplane flying

between Frankfurt and Paris. It is possible also to:-

■ access the entire timetable of the Star Alliance group of airlines on a Palm computer,

■ use an ATM or do Internet banking,

■ step off the plane in Frankfurt or wherever, and make a mobile phone call immediately,

■ read *The Australian* or *The Sydney Morning Herald* each morning in Frankfurt or Paris, if you have Internet access.

Internet access offers us vastly improved distance learning. ICT has enabled us to discover new ore bodies using new airborne scanning techniques. It enables the Argyle diamond mine to process hundreds of tonnes of ore an hour and to get a bucket load of diamonds after one week.

CAT scanners, ultrasound and modern drug design rely on ICT.

## SOCIAL AND OTHER ASPECTS

Of course there are social consequences of the technologies:

- the death of letter-writing;
- the loss of privacy inherent in switching on the mobile;
- Japanese forgetting their Kanji characters; and

- Australians who never learnt to spell because of the computer spell-checker.

In the future we can look forward to -

■ Internet access almost anywhere in the world, with a wireless connection

■ natural language processing by computers, something that will truly automate directory assistance or ATO interaction, and do away with call centres

■ online automatic translation as we talk on the phone to someone in Japan who can't speak English

■ inspecting a new house in three dimensions by using a computer;

■ lawyers possibly pleading a case in property law in front of a computer rather than a judge, a computer with a

knowledge base and some wisdom.

Those of us who are older, can perhaps look forward to robots reaming out our arteries. The infirm may be able to rent a robot to move a grand piano to the first floor. A visit to the GP may have our saliva sample instantly analysed to provide personalised therapies, based on our genetic deficiencies or adverse predispositions.

We will be migrating at some stage from dependence on silicon to dependence on biological material as basic building blocks in computers. Many of us will wear or have implanted computers as part of bionic devices.

### WHERE DOES AUSTRALIA STAND?

The information industry is in its infancy. Australia has not missed the bus; fleets are yet to arrive.

Can we catch them? Can we dare to seek to drive at least some of them?

An honest self-appraisal is part of answering these questions. I would like to give you some statistics. The most positive concerns Australian use of ICT products.

There is no doubt that by world standards we are a leading user, in terms of quantity measures.

What I am far less clear about is the extent to which this use derives from consumption, video recorders or DVDs in the home, or mobile phones as fashion statements for teenagers. This is opposed to use for productive purposes. Is our major use for robots to build cars more cheaply, computers to control automated warehouses, or software to take some of the pain out of the GST calculations for small businesses.

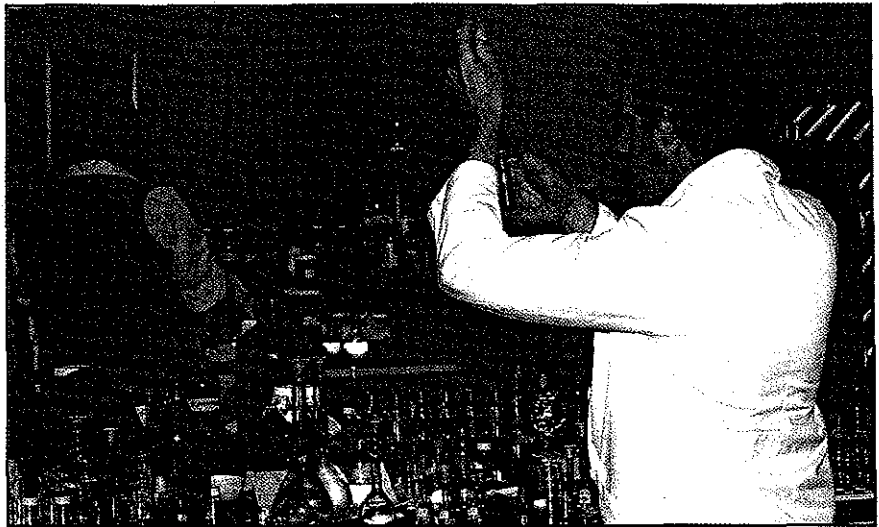
If you therefore move from "use" and look at other measures, the picture is much less attractive.

In 1997

- Ireland produced approximately \$2800 of ICT goods per capita, Australia was producing less than \$200 per capita.

- Our telecommunications patents over a recent 5-year period increased by 5 per cent, but in that same period, the US's patenting increased by 61 per cent.

- Our ICT patents per billion of GDP looks terrible in the OECD ratings. If you are seeking any comfort



*Our dollar is devalued because we are a great user of Technology but have little of our own Technology to export.*

in Australia's patenting figures, you will have to look in the low technology area. That's also where international trade is growing most slowly.

### OTHER COMPARISONS

If you turn to look at the strength of our ICT scientific R & D base, your first problem is to find adequate indicators. There are at best surrogates. One of them is called citation intensity.

It measures how much Australia's published work is seen as relevant by the rest of the world.

- In the computer science area, Australia's intellectual endeavour is rated by the world as having 28 per cent less relevance than the world average.

- What about our imports and exports? The knowledge intensity of world manufactured exports has been growing for about 25 years. High tech exports have been growing faster than low tech and medium tech exports.

- What has been happening with Australia? In 1997 the ICT share of our imports was 13 per cent. In the OECD league, that ratio puts us 24th out of 28. Since then we know there has been a big fall in ICT exports and a big rise in imports. Our ICT industry has been weakening!

- How do others think we are doing? Dr David Hale and Mr James

Wolfenson are two Australians who are significant on the world economic scene, Dr Hale being global chief economist of the Zurich Insurance Group and Mr Wolfenson president of the World Bank.

They talk about the need for Australia to catch up,

- have more R & D,
- get big high tech investments,
- develop the universities.

When you get comments from the likes of Bill Gates, or Jack Welch (CEO of General Electric), or Carla Fiorina (CEO of Hewlett Packard), you hear similar things, perhaps with more focus on ICT.

You also hear comments from people who were previously mired in a state of complacency. My namesake Paul Anderson says that until he met Bill Gates, he thought BHP was doing pretty well in the ICT area. The meeting with Bill Gates showed him that in BHP it was a case of (to quote Paul Anderson) 'the blind leading the blind'.

### WHAT OF OUR FUTURE?

Do we really have a problem though? We have some fine figures for GDP growth. Shouldn't we believe that things are going fine?

Well, if you were to express our national balance sheet in US dollars, the trend looks shocking. If you were



*Is our main use of Information Technology to use robots to build more cars more cheaply?*

to re-express it by our trade-weighted exchange rate rather than the US dollar exchange rate, you would still not see a pretty picture.

That's because Australia Inc. is a stock that has been marked down, for the same reason many stocks are marked down: our future prospects look so unexciting to the rest of the world.

***“The easy finds on the Australian continent may now be largely exhausted; and if and when political stability develops in South America, Central Asia and Africa the competition will be devastating”***

We have done marvellously out of minerals, but mineral prices have been trending downwards for 150 years in real terms. The easy finds on the Australian continent may now be largely exhausted; and if and when political stability develops in South America, Central Asia and Africa the competition will be devastating.

The world thinks Plan A looks in poor shape and we are not seen to have a Plan B.

In my work with Cochlear Limited, I have had to visit a number of countries, and in more than one I have heard a comment along the lines “isn't it surprising that Australia of all countries can produce a product as sophisticated as a cochlear implant.”

That sums up the world's view of Australia, in the same way as does our exchange rate: a technological backwater and thus a future economic backwater.

#### THE FIRST CHALLENGES

Well; is there a prize for Australia for doing ICT better? Yes, there are a number of prizes.

**First:** ICT is a tool to enable us to differentiate our low technology and medium technology products from those of our competitors. We might be able to produce iron ore of more uniform particle size than our competitors if we use ICT.

**Second:** ICT, if we did it better or did more of it, would enable us to export more high tech products, both pure ICT ones, and those containing significant ICT; and remember, the high tech end is where the growth lies for international trade. World trade in high tech goods has been growing 50 per cent faster than trade generally.

**Third:** If we were more ICT literate, not blind, to use Paul Anderson's words, we would also be able to make much more intelligent purchases of ICT products from abroad. Not only would we be taken advantage of less

often, but we could also probably exploit the opportunities that ICT offers to improve industries in Australia much more effectively.

**Fourth:** If we were doing ICT better, and if we were doing more of it, we would certainly create jobs, many with high intellectual content and low adverse environmental impact, and the world might start to think of the Australian dollar or Australia Inc. as an attractive growth stock.

The prize is effectively an industrial one, an industrial one affecting all industries but especially high tech ones.

Of the US economic output in the year 2000, about 8 per cent was due to ICT. However, of the real growth between 1995 and 1999, one-third came from ICT.

In the Netherlands, ICT is about 4 per cent of economic output, but 17 per cent of the growth over the 1996-1998 period was attributable to ICT.

#### PROBLEM AREAS

Well if there is a prize to be gained -

- **WHAT** are the blockers that we need to clear?

- How do we do it?

First, the blockers to research and development performance. We have had-

- unfriendly taxation structures,

- aversion to risk-taking,

- shortage of venture capital,

- a UK inherited culture sustaining a gulf between much of the R&D community and industry,

- a low level of technological literacy in Parliament and sometimes company managements,

- a lack of will, skills and incentives to commercialise on the side of our public sector institutions.

Governments of both political persuasions started some years ago to address these problems. The commitment by the coalition government in January of \$2.9 billion to 'Backing Australia's Ability' is quite properly focused on the goals of wealth generation or other improvements in our lives through innovation.

In the ICT area, there are some particular aspects of the situation which have to be flagged.

**First**, there is the industrial structure.

With the exception of Telstra and perhaps News Ltd, we have no really large players in the ICT area that are Australian owned.

The problem with the non-Australian owned multinationals operating in Australia is that all too frequently they just see Australia as a sales target, apart from a few conspicuous exceptions.

We have many indigenous small players, and very few medium ones of the size of, say, the smart card company ERG or of Cochlear.

What the small enterprises desperately need is help to go global. They need access also to infrastructure they cannot afford, such as supercomputers and micro-electronic design facilities.

### **MORE PROBLEM AREAS**

Blockers on the public sector side.

This sector is responsible for education and basic research, which we hope will produce some ideas for commercialism.

**The first issue** is one of balance.

Approximately one-third of research and development workers in industry are working on ICT. On the other side, the Government is spending only 5.5 per cent of its R & D budget on ICT.

The Government is spending no more on ALL the CRCs (Cyclic Redundancy Checks) per annum than it is spending in grants to firms in the Textile, Clothing and Footwear areas.

Figures now a few years old showed CSIRO was spending more on textiles, clothing and footwear than ICT. Also, the Australian Research Council, according to their website, awarded only one post-doctoral fellowship in the ICT area last year (classification problems may make this an underestimate).

**Next**, there is the issue of the quality and resourcing of universities, especially in the computer science area.

According to one quality measure, computer science is the weakest area of science in Australia, despite our having a limited number of very high performers.

### **UNIVERSITY PROBLEMS**

You might think that universities

should go out and hire some high performers.

But where is the money? The price for the universities' principal product - a trained Australian student - is not theirs to set. Instead it is set by the Commonwealth Department of Education, Training and Youth Affairs (DETYA).

Economists call this a monopsony and they are about as keen on monopsonies as they are on monopolies.

Not surprisingly, the monopsony

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**“Not surprisingly, universities are not keen on taking more Australian computer science students, despite everything you read in the newspapers about there being a shortage of trained individuals”**

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power has led to a situation where staff members are leaving computer science departments in droves, especially the better ones, and the departments cannot replace them.

When they leave, the load on everybody else goes up. The problem is accentuated by the quaint view of DETYA that it should be cheaper to teach computer science than electrical engineering, or chemistry. And so the official price paid per student is lower.

Not surprisingly, universities are not keen on taking more Australian computer science students, despite everything you read in the newspapers about there being a shortage of trained individuals.

And this is the greatest problem of all in the public sector: its inability to supply the human capital that the private sector so desperately needs.

Even worse, not only is there a **quantity** problem, reinforced by DETYA policies, but there is a **quality**

problem among the trainers. This is why the decision by the Government in January to fund a world class ICT centre, outside the funding parameters of the Department of Education, Training and Youth Affairs, has been so welcome.

**Aiming to do for ICT what the AIS did for sport, is there no initiative more important in the public sector than this.**

Such a centre will need to:-

- create significant human capital,
- train many trainers, and
- be staffed to a significant degree by people imported to this country.

It is simply not practical to imagine that one could assemble such a centre from existing talent in Australia and create a world class enterprise in the process.

### **THE MAIN CHALLENGES**

■ Australia must find a new path to ensure the GDP statistics continue to look great, a path which ensures they will look good too when denominated in dollars, euros or yen.

■ Intelligent use of ICT across our society will be critical, but at the moment the amount of ICT intelligence we have is too small.

■ ICT production itself can play a major role in securing growth. Such domestic ICT production has the potential to underpin trade growth, as mineral prices and Australia's terms of trade fall off the bottom of the graph.

■ We need to focus on growing our own Australian domiciled companies, rather than hoping for favourable board room decisions taken in Tokyo, Helsinki or Silicon Valley.

### **FINALLY**

I hope there can be bipartisan acknowledgement of the problem and the measures taken to address it. Many of the measures are for governments to take.

With WTO-friendly industrial support, and with policy and financial repair of our over-stressed education system, all Australians can share in the winnings.

There must be, above all, acknowledgement of the priority of ICT. ■