



## **“The Role of Polytechnics in the Innovation System”**

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My contribution covers the role of Institutes of Technology and Polytechnics (ITPs) in the science and innovation system.

Over the last 40 years New Zealand has gone from being the 8<sup>th</sup> to the 23<sup>rd</sup> in the OECD rankings of GDP per capita. Its rate of productivity growth has been low for at least 30 years. As a consequence, average annual wage rates are roughly 25% lower than Australia’s, and 20% lower than Denmark’s. Between 1983 and 2009 our share prices remained near static, while those of Australia and Denmark both rose by 500%. The situation has been recognised by Government, and there are a number of proposals underway to significantly boost public and private investment in research and development. Many of these will affect the roles of current and emerging players in the science and innovation field including tertiary education.

The 2010/2011 Budget created several interventions, many of them formulated on the back of the new Economic Growth Agenda, which is focussed on a better regulatory environment for business; a growth enhancing tax system; better infrastructure; better public services; improved skills and education; and improved science, innovation and trade.

As will be well known to this audience, the average OECD government invests 0.65% of its GDP in research and development. New Zealand invests 1/5<sup>th</sup> less than that, and our private sector invests 2/3rds less than the average OECD private sector. So it seems set for New Zealand to rectify its poor innovation performance, and my talk is about the emerging role of polytechnics and institutes of technology in the innovation system.

Who and what are our ITPs? What might they contribute to the innovation ecosystem?

First our system in NZ is unique and the envy of many other jurisdictions:

- We specialise in applied, practical learning outcomes at the high end of the qualifications spectrum.
- We offer our own degrees and post-graduate qualifications, and can apply to the Performance-Based Research Fund (PBRF) in our own right.
- We have strong and intimate links with industry at national and regional levels, but especially with Small/Medium Enterprises (SMEs).

Institutes of Technology and Polytechnics, as a feature of our tertiary education system, are first of all noticeable by their number and geographical dispersal all over New Zealand. The map shows how closely associated they are geographically not only with centres of population, but also with centres of economic interest including agriculture, aquaculture, and manufacturing and other industries.

The largest Institutes of Technology have combined to work together as the Metropolitan Group. The 6 Metropolitan Institutes work very closely together, and have initiated a web-based tool for identifying where business-based innovation resources are available in any one of our Institutes through a website called "*Innovating New Zealand*".

**(Fig 2)**

There are other (regional) ITPs that also have a strong track record in research and technology transfer, it is no accident that they are led by the Eastern Institute of Technology in Napier, and the Bay of Plenty Polytechnic in Tauranga. These are fully fledged tertiary institutions who devote a degree of time and effort to research. The research and development they do relate closely to the characteristics of their local economies, so for the EIT the focus is oenology and agriculture. The Bay of Plenty Polytechnic focuses on marine biology, aquaculture, and local environmental issues like the cause of lettuce bloom in the city of Tauranga harbour, and the impact of boat disturbance on sea grass.

The Metropolitan ITPs have similar patterns. While more broadly-based than regional polytechnics, they have particular strengths that relate directly to their local economies and interests of employers. So, for example, Wintec in Hamilton has a strong focus on agribusiness, WelTec, here in Wellington, has a strong focus on enhanced manufacturing; Christchurch Polytechnic Institute of Technology has a strong focus on IT and electronics.

So two features that I am stressing here are that the ITP sector within our tertiary education system is both geographically dispersed and reflects the geographical dispersment of communities and industry in New Zealand. It also has growing strength in research and development and technology transfer, itself, strongly linked to the needs and interests of the regional businesses many of whom are small and medium enterprises.

Let's now look at the size and saliency of, in particular, the Metropolitan ITPs within our tertiary education system. Together they offer joint qualifications and services, and make a sizeable contribution to New Zealand's education and intellectual landscape.

**(Fig 3)**

In 2009, the six metropolitan ITPs were responsible for delivering 50% of the entire (20-strong) ITP sector equivalent full-time students (38,000). They won \$500m 50% of the entire sector's total revenue. They awarded 15,000 under-graduate degrees, by far the largest majority of degrees within the sector, and another 1,200 post-graduate degrees. External research revenue earned in 2009 was \$2m. By contrast, the internal investment in research was around \$9m.

The Metros, the "research polytechnics", as the Minister has dubbed us, are marked by very close connectedness with industry, large and small companies around New Zealand. By close connectedness I mean a number of key characteristics. First of all, these 850-plus companies form part of the decision-making and advisory apparatus of each of the ITPs. They form advisory committees, they give guidance on the content of qualifications, they are often involved in decisions about appointing staff or else they second their own staff to act as guest lecturers within their local institute of technology. They are frequent visitors, some of them are actual industry partners in residence, they give time and space for students of those institutes, and very frequently, employ the graduates. They often co-fund equipment,

or at the very least, they are constant users of equipment that has been bought with public funds for education and research.

**(Fig 4)**

The emerging role of ITPs within the growth companies' ability to innovate and commercialise is the product of the sector's own developing understanding of what it exists for. Over the past 10 years, ITPs' contribution to the economy has undergone an evolution, as has industry itself.

Traditionally, ITPs delivered graduates with pre-employment training in the skills needed to service the core, commodity-based industries, and to keep the basics of the domestic economy ticking over – we trained builders, farmers, foresters, meat workers, office staff, cooks, nurses.

And that phase pretty well reflected the stage of development of much of the New Zealand economy.

The second phase is where many of those same industries/companies started to build value add into their products, and differentiated on the basis of value for money.

The third phase is where industries and companies take decisive steps into international markets with highly developed and differentiated products, where imitation becomes difficult because of the cluster of skills and ways of working that are bundled up in it. There are a number of key characteristics:

1. These companies earn big money
2. R&D is integral to their success
3. Because of the bespoke nature of their skill and knowledge requirements, they are learning companies, and for those who find an education provider they can partner with, the relationship is a genuine partnership.

Phase 4 belongs to industries and companies that are not the evolution of any phase that has gone before, but that are created to meet an entirely new need.

They need the highest level of partnership intensity, and have the highest requirement for fully infused R&D. It is that combination of focussed skills development and participation in the company's own R&D goals that is likely to deliver the greatest economic value. The most advanced ITPs are now able to meet the needs of Phase 4 companies.

**(Fig 5)**

Innovation has, at its core, the combination of discovery and practical application, and here are a couple of definitions. **(Fig 6)**

Neither the ability to innovate consistently and with sufficient 'newness'; nor the ability to deliver economic value through innovation, is easy. It requires high levels of achievement in research, and a business strategy that encompasses both capital development and organisation-wide skills. It is in reconciling that tension, and in the journey between these poles that New Zealand's ITPs can play a unique role.

The New Zealand Institute in its NZ Ahead Report (September 2010) draws on both OECD surveys and the World Competitiveness reports to dig into New Zealand's business innovation and business sophistication track record to see how we are doing against others on a raft of measures.

In summary:

- There are important things going right, but they are somewhat fragmented and isolated from one another.
- There are many important things not going so well. What they have in common is that they spring from an unwillingness by companies to invest their own money; and they are often the product of too few of the players joining the dots and working together.

**(Figs 7 & 8)**

How can ITPs or the research polytechnics contribute to enhancing New Zealand's innovation scores?

It's summed up in the acronym RDTTT or "R&D plus T to the power of 3".

1. Strong applied research capability:

- Degree programmes are applied and students spend significant time in industry and workplaces.
- We have formed a cluster utilising the Innovating New Zealand brand and a website which takes clients to whichever of the Metros staff or student research groups can assist.
- ITPs house sophisticated technologies that are there for use, with staff and student resources to assist. Much of this resource enables the creation of prototypes and ad hoc devices which companies can requisition or make for themselves.

**(Fig 9)**

2. Technology Transfer

- This means that applications developed elsewhere are adapted to New Zealand or company-specific conditions, and the problems of implementing them in specific companies are solved.
- While ITPs conduct blue sky and development research as well, technology transfer is peculiarly appropriate territory for them.
- Some of the skills needed for successful technology transfer within firms and industry are those of problem-solving in a multi-disciplinary setting, and systems thinking. We prepare adept graduates through workplace projects, problem-based learning and mechanisms such as internships, cadetships, and outplacement which are integral and compulsory parts of our courses of learning.
- Technology transfer is often as much about skilling the new users as it is about the technology itself. Because of our vocational and technical training mandate, ITPs are the right research partner for this work.

**(Fig 10)**

### 3. Training

- Training, up-skilling, company-wide skill development are the core business of the 'research polytechnics' – of course, they are the core business of all ITPs, but in the context of today's conference theme, we need to isolate the training role that will help to build the highest-performing innovators and companies.
- This function is much broader than training for use of new technologies. It is also cultural, strategic management training so that, for example, a new technology can be embedded into a newly "lean" environment and work processes. Typically, it can also involve raising technical literacy and computational skills to high levels.
- Training should not be discounted as a contributor to innovation. *"The .... current focus on fostering productivity growth via exciting high-tech breakthroughs misses a big part of what really drives innovation, the diffusion of better business processes and management methods"* (p22 'A Special Report on the world economy', The Economist 9/10/10)

#### **(Fig 11)**

To summarise, ITPs, and especially the "research polytechnics", have a particular and important role to play in science and innovation. You might say we're supporting the next TIN100 and the next after that.

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### **Bibliography**

The New Zealand Institute NZ Ahead, September 2010

World Economic Forum, Network of Global Agenda Councils (2008)

Metro Group Presentation to FRST (2010)

The Economist How To Grow: A special report on World Economy October 9, 2010

# ROLE OF POLYTECHNICS IN THE INNOVATION SYSTEM

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# Institutes of Technology & Polytechnics

What and where are they?

- The Metro Group
- Eastern Institute of Technology (EIT)
- Bay of Plenty Polytechnic (BOPP)

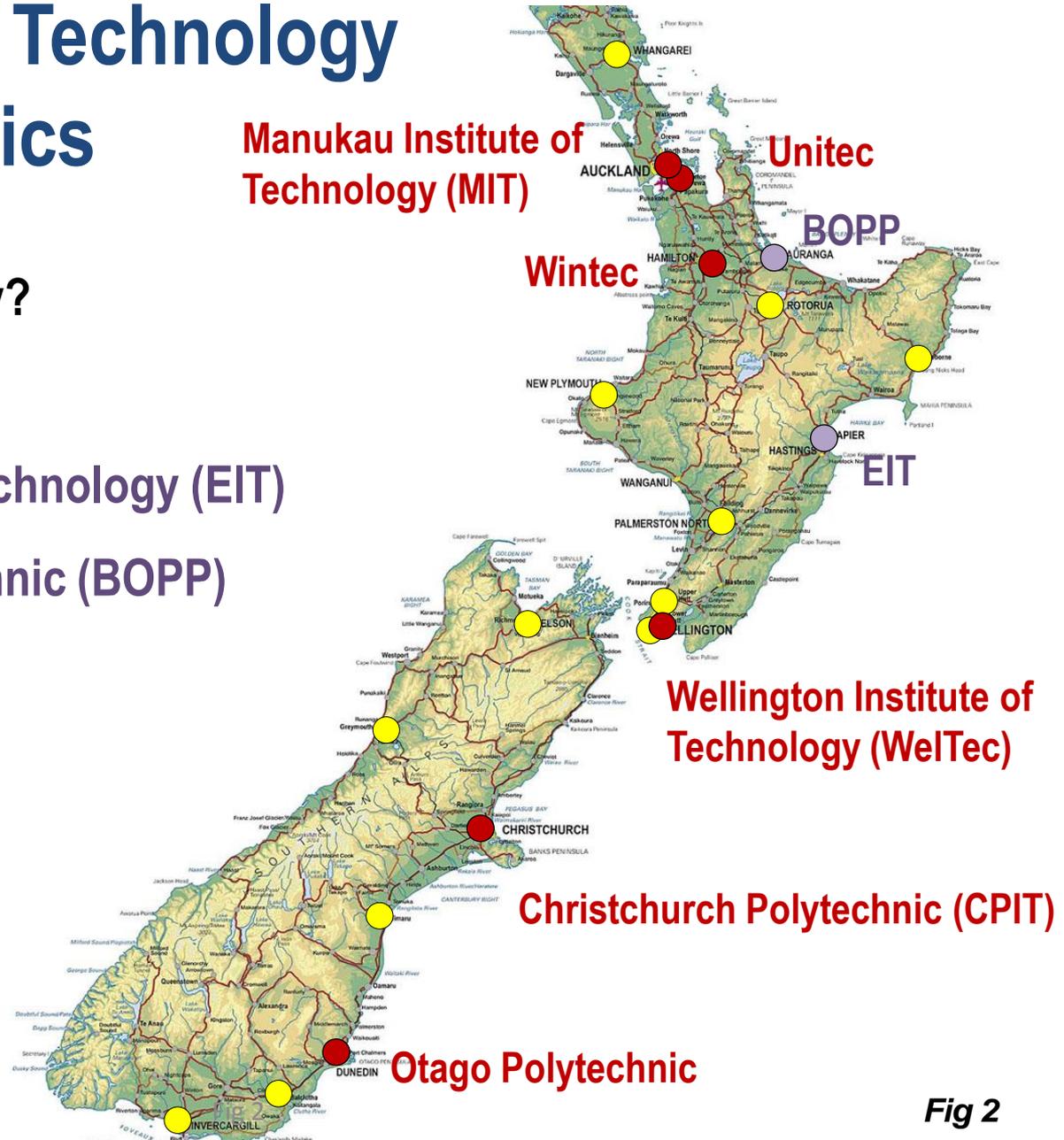


Fig 2

## ■ Metro ITPs (2009)

- **Delivered:** 38000 EFTS (50% of sector total)
- **Revenue:** \$500m (50% of sector total)
- **Degrees:** 15000 undergraduate degrees awarded (14% of total sector)  
1200 post graduate degrees
  
- **External research revenue earnings:** \$2.1m
- **Internal research investment:** \$8.9m
- **Research-only FTEs:** >170

# ■ Key strength of research ITPs

- Industry connectedness
- 850 plus companies
- 350 SMEs
- 150 large companies

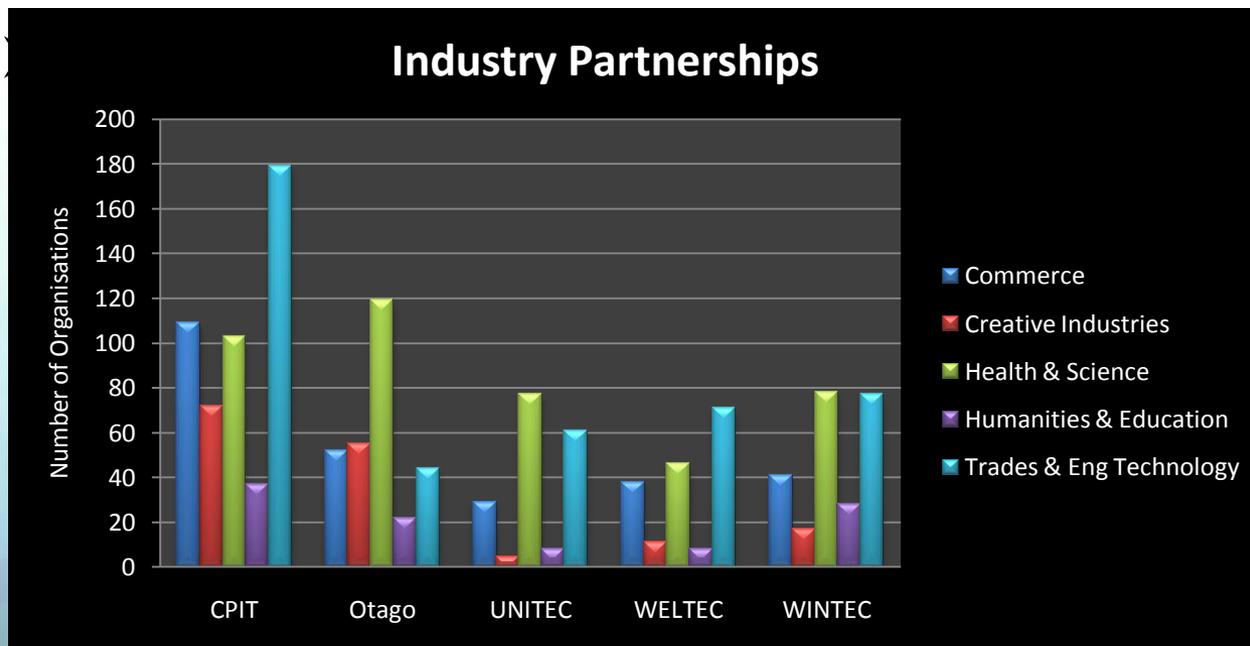


Fig 4

# ■ How did we get here?

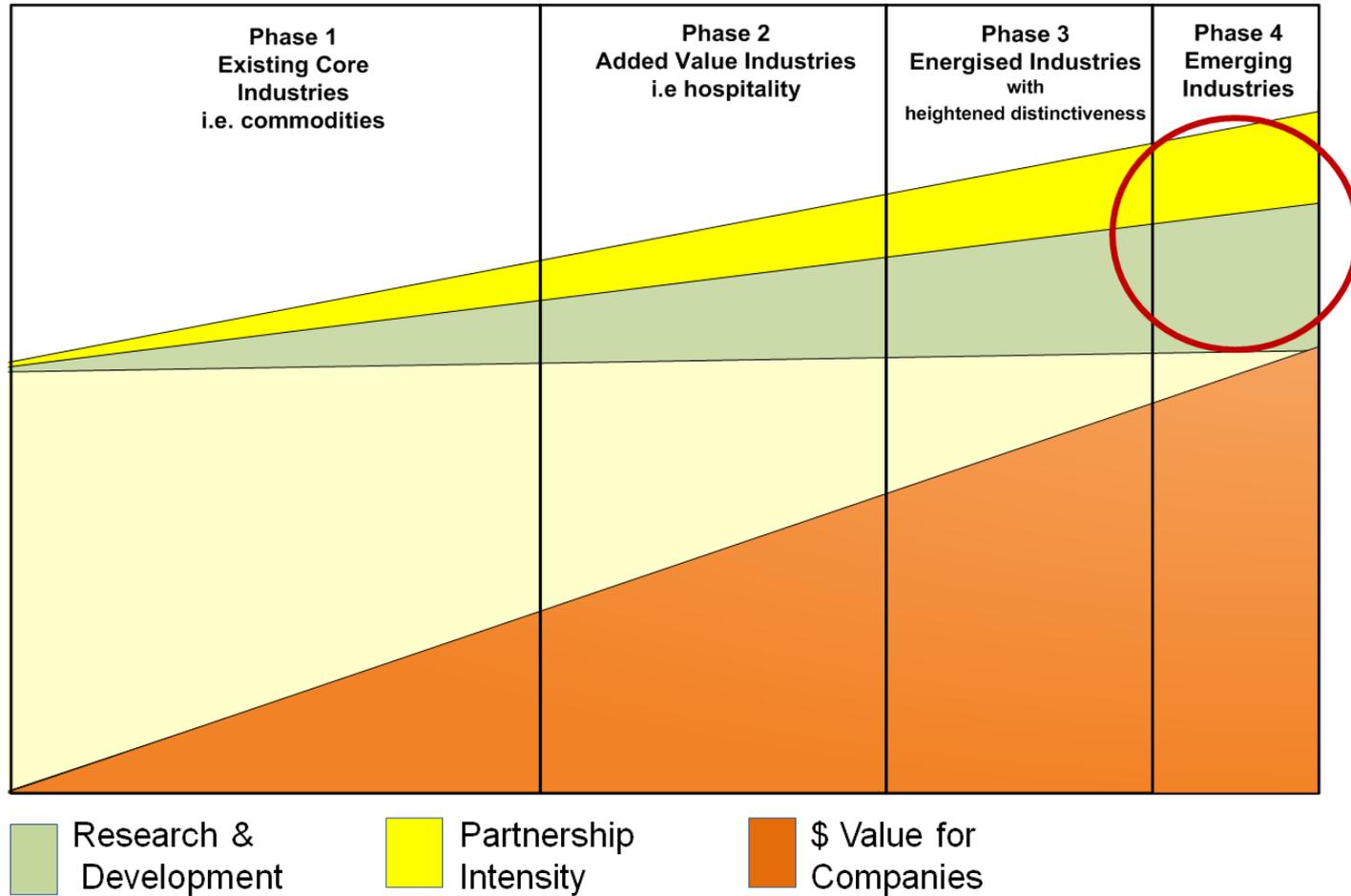


Fig 5

# ■ Innovation

- **Definitions:**

Elements of newness/discovery and successful application, the combination creating economic value

***“Ideas applied successfully in practice”***

- Product innovation
- Process innovation

# Innovation

## What NZ does well

- Quality of scientific research institutions (14th of 139 countries)
- Sophisticated production process (26/139)
- Local supplier and quality (16/139)
- Willingness to delegate authority (10/139)

Source: The New Zealand Institute NZ Ahead Report (Sept 2010)

# Innovation

## What NZ doesn't do so well

- Ranked 20/31 OECD countries in innovation
- Low innovation score a key determinant of low GDP per capita
- 95% of OECD average value since 2006
- Competitive advantage through unique products/processes (74/139)
- Availability of scientists and engineers (67/139)
- State of cluster development (56/139)
- Company spend on R&D (38/139)
- Private sector invests two-thirds less than 'average' OECD country private sector in R&D

# ■ What can ITPs contribute?

## RDT<sup>3</sup>

- R&D: Applied research capability
- Networked resources (Innovating NZ)
- Quality equipment, students, staff



[www.innovatingnz.org.nz](http://www.innovatingnz.org.nz)

# ■ What can ITPs contribute?

## **TT: Technology Transfer**

- Graduates with real workplace experience and trained in systems thinking and multidisciplinary problem solving.

# ■ What can ITPs contribute?

## **T: Training for companies**

- Lean
- EnviroSmart
- Organisational development