Innovation and Vocational Education and Training Policy in Australia

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Abstract:
Recent innovation policy in Australia has been based on assumptions of increasing R&D effort. In this, there has been an emphasis on encouraging large-scale industry and university investment in technology development. However, the current and potential role of the VET sector has been largely ignored. The paper argues that the concept of innovation underpinning current policy in Australia is flawed. In practice, most 'innovation' is incremental and mundane, and may occur at any point on the value chain. The VET system has the potential to contribute to the processes and practices that underpin most 'real-world' innovation in Australia.

Introduction

In Australia in recent times there has been an increasing focus on the strong links between the creation and use of knowledge and economic growth. Internationally innovation is seen as playing a crucial role in what has been termed the 'new economy', 'knowledge economy', 'knowledge-based economy' or 'learning economy' (eg OECD, 1992; 1999; Reich, 1991; European Commission, 1995; Marceau and Manley, 2001:81). In fact, innovation is now promoted as a panacea to a nation's economic problems and the key to international competitiveness (Trood, 2002b:1). Currently, it is argued that 'knowledge will be the new international currency and our success in creating and using that currency will determine our future economic and social well-being' (Veenker, 2001:2).

The paper begins with an overview of innovation where the conventional wisdom is rejected as narrow and misleading. It then discusses the important area of study, a country's National Innovation System (NIS). We ask the question, is vocational education and training (VET) the missing link in the NIS? The Federal government's innovation action plan, Backing Australia's Ability (Commonwealth of Australia, 2001a) is reviewed and analysed. The paper then looks at the relationship of VET to the innovation action plan. The critical question here is why VET has not been included in the plan. Finally, the arguments are summarised and the paper offers some policy suggestions.

Innovation

This paper argues that 'innovation' cannot be defined as 'invention plus commercialisation' as the Federal Government's innovation action plan, Backing Australia's Ability (Commonwealth of Australia, 2001a) implies. Like Carnegie et al (1993:3) we reject as too 'narrow and misleading' the:
Conventional wisdom...that innovation equals invention plus commercialisation... Innovation is not science. Nor is it technology or the ownership of invention.

Innovation needs to be conceptualised in a way that is meaningful and inclusive of all sectors of society. To do so requires a conceptualisation that extends beyond simplistic assumptions about invention and market exploitation of technological artefacts and processes. We argue that innovation is best conceptualised as the outcome of continuous historically specific processes, not as a product of an activity, even state subsidised research and development (R&D) activity. It is the result of processes that are, in practice, supported by a range of social institutions that lie outside of individual firms' research activities. This more 'systemic' (and more generally European) understanding of innovation considers innovation to be 'born out of complex interactions between many individuals, organisations and environmental factors' rather than a 'linear trajectory from new knowledge to new product' (European Commission, 2001: 1.5). In this view the development of 'human resources' is critical, first for the creation of new knowledge (essentially basic science) and second for the diffusion of knowledge throughout society (European Commission, 2000: 29). A skilled workforce is the key vector by which such diffusion occurs and the development of this skilled workforce is broadly the domain of VET institutions rather than the university sector.

The assumptions that underpin the current Australian policy on innovation, that it is dependant on creating 'knowledge' and an 'ideas' and 'entrepreneurial culture', is simplistic. It ignores the substantial body of theory on innovation, and is contrary to direct empirical and historical evidence of innovation in Australia (Pickersgill, 2001). 'Creating knowledge' is a necessary condition for innovation to occur. However, the creation of 'knowledge' is not itself a sufficient condition for innovation to occur.

At the level of a firm, in so far as it contributes to organisational and national competitiveness, innovation should be conceived as able to occur at any and all points in the value chain. At industry, regional or national level the key drivers (in the modern era) are institutional government support combined with an emphasis on Human Resource Development (HRD). HRD in this context it is stressed, encompasses instrumental firm based training and development practices, but should emphasise the original 'classic' post-WW2 concept of the development of the whole of human society (Kelly 2000). It should not be equated with the restricted sense of firm level personnel policies advocated in contemporary US Management, Human Resource Management (HRM) and HRD textbooks.

In the current debate in Australia about the contribution of innovation to national development, there has been a strong emphasis on R&D and university related funding. However, contemporary literature suggests that innovation needs to be considered along the entire value chain and that it is underpinned by a range of educational institutions operating at all levels. Thurow has concisely summarised the point:

*While technology creates man-made comparative advantage, seizing that man-made comparative advantage requires a work force skilled from top to bottom. The skills of the labour force are going to be the key competitive
weapon in the twenty-first century. Brainpower will create new technologies, but skilled labour will be the arms and legs that allow one to employ – to be the low-cost masters of – the new product and process technologies that are being generated. In the century ahead natural resources, capital, and new-product technologies are going to rapidly move around the world. People will move – but more slowly than anything else. Skilled people become the only sustainable competitive advantage (Thurow, 1992:51-52).

Knowledge creation and knowledge diffusion/distribution/deployment/dissemination are inextricably linked and should be regarded as part of the same process. Marceau, Manly and Sicklen (1997:69) contend that the OECD’s focus on knowledge distribution suggests that useful knowledge cannot be really said to be created unless it is part of a broader process of knowledge diffusion/distribution. Knowledge creation and diffusion should thus be understood as part of the same process.

The creation of new ideas and knowledge does not in itself produce an economic gain. It is not until they are transformed into products, services or processes that an economic benefit is provided. A knowledge economy requires both knowledge creation and diffusion and therefore a workforce that is skilled from the top to the bottom. As described by Thurow:

> A knowledge economy requires two interlocking but very different skill sets. Knowledge creation requires highly educated creative skills at the very top of the skill distribution. Knowledge deployment requires widespread high-quality skills and education in the middle and bottom of the skill distribution (Thurow, 1999:135).

**National Systems of Innovation**

A significant question, as Porter (1990; pp. 20-21) notes, is to explain the role of the nation in innovation, and why some nations provide an environment more conducive to innovation than others. The literature on National Innovation Systems is extensive, and Porter’s (1990) own detailed investigations in *The Competitive Advantage of Nations* is an attempt to provide an explanatory framework. The early literature is extensively discussed in Porter (1990: see esp. Part 3), Marceau et al (1997), the OECD and an interesting discussion of the role of institutional frameworks in development/innovation in new technologies, with particular reference to Asia is provided by Mathews and Cho (1999).

Broadly, answers to Porter’s question have been provided by two different approaches. The first is neo-classical, in which various comparative factor advantages are analysed. The second, and more productive, is an ‘evolutionary’ approach which looks at dynamic relationships within particular economic and social environments. As Schumpeter (1934) argued, there is no ‘equilibrium’ in a competitive capitalist environment. Models that assume there is are fatally flawed irrespective of any mathematical elegance. Whatever particular national arrangements contribute to innovation, it is certain that the production and reproduction of skills and knowledge is essential. In this, the role of VET is crucial. Unfortunately, as we argue below, VET has been neglected by Australian policy approaches that have been too
influenced by neoclassical models, or alternatively overawed by visions of ‘hi-tech’ industries and futures. As noted by Porter:

*Much innovation, in practice, is rather mundane and incremental rather than radical. It depends more on a cumulation of small insights and advances than major technological breakthroughs...It results from organisational learning as much as from formal R&D. It always involves investment in developing skills and knowledge, and usually in physical assets and marketing effort. (1990: 45)*

That is to say, much innovation is mundane, incremental, continuous and dependent on explicit and tacit knowledge of processes and products. VET, rather than the universities and research centres, has the most to offer in these areas.

In the search to find why some countries have higher levels of innovation than others there has been a shift towards looking at systems of innovation rather than examining traditional indicators of innovation, such as the amount invested in R&D, the number of patent applications or the number of scientists, technicians and engineers (Marceau and Manley, 2001:82). It has also been recognised that innovation does not occur randomly and that ‘a country’s innovation rates are affected by the institutional arrangements in which innovative activities take place’ (Marceau and Manley, 2001:82)

The System of Innovation that has received the most attention National Innovation System (NIS). Marceau, Manley and Sicklen (1997:51) argue that a national innovation system is constituted by a country’s institutions, organisations and the resulting inter-relationships which come into play in the production, diffusion and use of new and existing economically useful knowledge.

To understand the process of innovation it has been argued that not only do the actors and institutions in a NIS need to combine competitively and collaboratively (especially the latter), but that the importance of social institutions and values need to be taken into account (Marceau and Manly, 2001:89). This has led to the study of ‘chains’, ‘clusters’ and ‘complexes’. These ‘networked relationships’ are ‘analytical tools for viewing the functioning of linkages in an economy’ but the ‘linkages themselves are part of the institutional arrangements of national innovation systems’ (Marceau et al, 1997:50). They are critical elements of a successful NIS. Therefore, the OECD believes that:

*the overall innovation performance of an economy depends not so much on how specific formal institutions ... perform but on how they interact with each other as elements of a collective system of knowledge creation and use, and on their interplay with social institutions* (Marceau and Manley, 2001:84)

Australia’s NIS includes Federal and State governments and their advisory bodies and policy and program development departments; a legal and regulatory framework; promoting and supporting organisations; public and private education/training and research organisations; linkages and technology diffusion; venture capital programs (Ferrier, Trood and Whittingham, 2002:14-15). Although the Australian NIS has some
strengths it also has weaknesses, including the fact that it is highly fragmented, there are few linkages, little active coordination across players, industry self-funded R&D is relatively low, a significant proportion of firms do not innovate and the small average enterprise size translates into a lower propensity to innovate (Ferrier et al, 2002:15). The last three weaknesses highlight the significance of the uniquely government funded CSIRO.

Ferrier et al (2002:17) also claim that failure to formally include VET in the NIS is another weakness of the system. They argue ‘VET is the missing link’ in the NIS and that this:

...is a tragedy because it could provide a sophisticated and nationally structured mechanism for the rapid introduction of new products, new knowledge and innovative practices into Australian industry (Ferrier et al, 2002:74).

The Government Innovation Action Plan

The significance of ‘innovation’ and in particular ‘innovation’ as a key component in national economic development, has been most recently raised in the Federal government’s innovation action plan Backing Australia’s Ability (Commonwealth of Australia, 2001a) published in January 2001. The action plan is an innovation strategy for the next five years and was developed after consultation with the science, business and education communities. The Government has committed $2.9 billion in extra funding over the period. It builds on other government innovation initiatives including:

- Investing for Growth (Commonwealth of Australia, 1997) industry statement.
- Government’s response to the Virtuous Cycle, report of the Health and Medical Research Strategic Review (Wills Report) (Commonwealth of Australia, 1998) and the implementation by the National Health and Medical Research Council of the Government’s response (NHMRC, 2000).
- Knowledge and Innovation (Kemp, 1999) research and research training statement.
- Establishment of Biotechnology Australia in 1999. (Commonwealth of Australia, 2001a:4)

The action plan argues that innovation-developing skills, generating new ideas through research, and turning them into commercial success is key to Australia’s future prosperity (Commonwealth of Australia, 2001a:7).

In order to achieve this goal the plan proposes three key elements. These are:

**Strengthening the ability to generate ideas and undertake research**: to ensure the strength and international competitiveness of Australia’s research base it is intended to provide ‘significant new investment’ to produce ‘critical mass in leading research fields’, and in particular Information and Communications Technologies, (ICT) and Biotechnology (Commonwealth of Australia, 2001a:15).
**Accelerating the commercial application of these ideas:** through increasing the capacity to build and manage innovative enterprises, encourage spin-offs, strengthening intellectual property management processes and emphasising ‘the greater commercial application of [primarily university & CSIRO] research ... by strengthening the commercial linkages with industry and making it easier to take promising research to the stage of commercial viability’ (Commonwealth of Australia, 2001a:18).

**Developing and retaining Australian skills:** which acknowledges that ‘Our well-educated and culturally diverse society provides a rich environment for generating original and ground breaking ideas’, but that this should be built on further ‘by strengthening our skills base, and encouraging a wider interest in science, mathematics and technology’ (Commonwealth of Australia, 2001a:20).

Notwithstanding the extensive international debate over innovation briefly noted above, the current action plan was developed from two main sources. The first was the Australian Science Capability Review, commenced in September 1999 by the Chief Scientist. This was a review of the capabilities of our science, engineering and technology base. It addressed the following significant issues:

- level of expenditure and effort on basic and applied research
- business investment in R&D
- vision for Australian science, engineering and technology (SET)
- linkages and infrastructure

Two Discussion Papers were produced by the Chief Scientist, *Investing In Knowledge Generation For the Twenty First Century* (Batterham, 2000a) in February 2000 and *The Chance to Change: Discussion Paper* (Batterham, 2000b) in August 2000. The Discussion Papers resulted in a final report *The Chance to Change* (Batterham, 2000c) released in November 2000, which took into account submissions to the Australian Science Capability Review, letters of support, public consultations and advice from the Group of Strategic Advisers. This Report strongly stressed the importance of science and technology in supporting R&D and argued for significant new investment. Some (related) changes in the levels and basis of Commonwealth Government funding for ARC and NHMRC research grants, were also announced separately.

The second source was a National Innovation Summit held in February 2000, supported by the Business Council of Australia (BCA) and the Commonwealth Government, to assess the strengths and weaknesses of our NIS and to formulate ways to enhance it. The aim of the Summit was to achieve a broad consensus on strategies to improve Australia’s competitiveness through innovation and therefore encourage economic growth. Prior to the Summit an independent group of senior academic economists (the ‘Learned Group’) were brought together and produced a framework paper entitled *Shaping Australia’s Future* (Commonwealth of Australia, 1999). It was released in October 1999 and its purpose was to provide background information in the form of a summary overview of our national innovation system and to stimulate debate at the Summit. The first discussion paper on the Australian Science Capability Review by the Chief Scientist (Batterham, 2000a) had been circulated in early February 2000 and was also intended to contribute to debate at the Summit.
The Innovation Summit Steering Committee (formed to oversee the planning and preparation for the Summit) commissioned a number of expert working parties which undertook preliminary investigations (e.g. literature reviews and case studies) of various aspects of the innovation process during the eight months preceding the Summit. There were six working parties: Human Dimension Working Group; Industrial Innovation Working Group; Innovation and Incentives Working Group; Institutional Structures and Interfaces Working Group; Managing Intellectual Property Working Group; Resource and Infrastructure Consolidation and Cooperation Working Group. In addition to the reports from the Working Groups there were more than seventy general submissions and eight commissioned sectoral submissions. Thirteen breakout sessions were set up to discuss the reports and the submissions under three core themes:

- creating a competitive environment
- investing in new ideas
- building industry-research linkages.

The Innovation Summit Implementation Group was established and subsequently synthesised and prioritised the recommendations and outcomes of the Summit in a final report *Innovation: Unlocking the Future* (Miles, 2000) released in August 2000. In this Report some 140 recommendations were distilled to 24 (See Innovation Summit Implementation Group, 2000:Tables B and A). The general thrust stressed the importance of developing a ‘culture of innovation’ and an ‘entrepreneurial culture’, to link business more closely with education (particularly higher education) and other national (primarily government) institutions with a threefold aim of:

- **Creating an ideas culture** - the need to engender ‘a broad understanding of, and support for, the value of innovation, research and development’ (culture of innovation).
- **Generating ideas** - the need to have ‘a world-class research base that will sustain long-term generation of ideas’ (supporting research).
- **Acting on ideas** - the need to be ‘internationally competitive by translating our ideas into tradeable products, processes and services’ (commercialisation of research). (Miles, 2000)

**Analysis of the Innovation Action Plan**

The strategy outlined in *Backing Australia’s Ability* incorporates the main proposals of the two reports noted above (*The Chance to Change* and *Innovation: Unlocking the Future*). In general the innovation action plan reflects a fairly conventional view of the relationship between basic science and technology and the development and marketing of innovative products and services. That is, one that assumes national economic progress and competitiveness to be (largely) dependent on new technology developed from basic science in order to develop innovative products or processes. This general view implies significant R&D investment over product cycles by both the public and private sectors and (implicitly) assumes the existence of extensive

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1 There was also background material to the final report of the Innovation Summit Implementation Group, *Background Material: Innovation - Unlocking the Future* (Innovation Summit Implementation Group, 2000). The material was used by the Group to ‘refine, assess and prioritise’ the Summit findings.
educational, scientific and technological institutional arrangements and linkages to underpin R&D investment.

The innovation action plan also assumes a traditional, idealised linear approach to the diffusion of technological knowledge (technology transfer). That is, Research to Development to Commercialisation and/or dissemination. Ferrier, et al (2002:93) argues that this is a narrow view of the technology transfer process and that 'experience suggests reality is much more messy and complex' and that the traditional notion of technology transfer is 'fundamentally flawed and misrepresents real world experiences.' In the real world the 'transfer of new technology is not a clean and easy process and that many factors can influence its success or failure'.

Given the extensive involvement of CEOs of major corporations in the development of the innovation action plan the overall response by senior business executives has been positive, with some minor caveats expressed by some industry groups (e.g., AiG, 2001), concerned that the R&D tax concessions announced do not provide sufficient incentive for significant additional business R&D investment and the stop/start nature of funding for the R&D Start Program.

Relationship of VET to the Summit and Innovation Action Plan

As a number of commentators from the VET sector have noted, the innovation action plan is silent about the potential contributions of VET, and the role that VET currently plays in developing skills in the workforce and broader community. A possible minor exception, (although not specifically focused on VET), was the reference to the need to develop 'innovative teaching'. In the VET sector at least, it is arguable that this has already been extensively addressed through research and application of flexible delivery modes and 'workplace learning'.

In response, Scollay (2001a) for example, noted that there was no acknowledgment 'VET is already a key contributor to creating workplaces that are capable of change, adaptation and innovation.' She also drew attention to a submission to the Federal Government by Ericsson which argued that R&D tax concessions were 'no substitute for competence' which was required at all levels (schools, VET, universities and research institutes). Boston (2001) made a plea 'to promote technological innovation at all levels of our economy and involving all sectors of our education and training system' and even called for a second, MkII, 'Technology Innovation Strategy' 'to unleash the potential of technology outside the laboratories and the sandstones' (he claimed that the innovation action plan, which addressed university and R&D investment, was Innovation Strategy Mark1). Like many commentators (including all those mentioned here), Foley (cited in Elson-Green, 2001) has argued for additional investment in VET and claims that the Federal Government's innovation strategy 'ignores the fact that vocational education and training can help build skills levels, including the ability to innovate, in the Australian workforce.' FitzGerald (2001) stated that VET is 'the key unfinished business... [in] the Federal Government's series of Innovation Statements'.

Interestingly, Backing Australia's Ability noted that innovation, in its Australian context, was not to be seen as purely the province of 'high tech' and/or heavily capital intensive R&D. Innovation was seen as including:
not only the province of new or high tech industries, but also essential to the future of many of our traditional sectors such as agriculture, manufacturing and mining (Commonwealth of Australia, 2001a:7).

It would appear that the problem for VET is not that it has been specifically excluded, but rather as FitzGerald (2001) implies, that it has not been explicitly included.

**Conclusion**

Based on the discussion above, we argue that the 'creation of knowledge' is a necessary but not a sufficient condition for innovation to occur. We also argue that innovation should be conceptualised in a way that necessarily includes VET, by noting that it takes many forms, that it can occur anywhere along the 'value chain' and that it is normally incremental.

It is therefore a tragedy that VET has not been included in the Federal Government’s innovation action plan. Developing existing VET institutions is the obvious vehicle for diffusing/transferring knowledge due to its historical connections with industry and pre-eminent role in industry training. The VET sector can also be seen as an important contributor to knowledge creation as:

Many of the advances made in the way we do things and improvements in products and services come from the knowledge and skills of people directly involved in the workplace. If Australia's innovative capacity is really to be maximised, there needs to be a much greater investment in developing vocational skills and not just in research (Fanning, 2000: 1).

Industry needs to develop and maintain, and government support, practices that recognise that innovative value chains encompass both knowledge creation and knowledge diffusion/deployment. As Boston (2001: 3) argues TAFE 'must be the linchpin' between knowledge creation and knowledge diffusion and that it:

*can become the central location for creating the strategies that will knit together economic development and skill creation, new technologies and the creativity to make them work* (Boston, 2001: 5).

Innovation policy should recognise that firms are dynamic, and that they operate within a dynamic labour market. Enterprises are not isolated from the environment in which they operate. They therefore not only rely on 'financial capital' and 'human capital' but are also dependent to a large extent on the existence and production of 'social capital' (e.g., Fountain, 1989; Giddens 2000; Latham, 2001). International comparisons of 'output', however massaged, of dollars per module hour of training do not amount to much in the real world. Policy in Australia must recognise that most innovation occurs incrementally. VET has a critical role in supporting the development and extension of innovative practices and procedures at all levels in organisations.
References
Boston, K. (2001) *Successful Nation: TAFE and Innovation*, Director-General’s Address to the TAFE Directors Australia Annual Conference, Typescript, TAFE NSW, Sydney, 5 March (An edited version of the address, which does not include references and other details, can be found in *Campus Review*, Vol. 11, No. 9, March 14-20, p.9. The *Campus Review* version was also published in *Training Agenda*, Vol. 9, No. 2, May, pp. 5-8).


There is also a Summary Report.


Available at http://www.tda.edu.au/speech/veenker.htm
