Introduction

In recent years, the so-called ‘new growth theory’ has highlighted how increases in human capital can contribute to economic growth. Greater investment in training can stimulate growth by increasing labour productivity through the provision of greater skill levels and by giving employees the skills needed to complement new technologies. It can also contribute to growth through so called ‘positive externalities’, such as when knowledge spills over to...

1 In human capital theory, workers are defined as vehicles for the economic progress of the nation.
others who have not undertaken training. Other benefits include greater levels of social cohesion and tolerance which underpins social capital.  

A recent Organisation for Economic Co-operation and Development (OECD) study examining the drivers of economic growth in OECD countries during the 1990s highlighted the importance of investment in human capital. According to this report, the availability of a large pool of qualified personnel aided growth, while shortages of skilled labour acted as a constraint (OECD 2001, p.55). In Australia, the link between education and innovation, and economic growth has been examined by Dowrick (2002, p.21). He estimated that greater investment in the Australian ‘knowledge economy’, through education, training and innovation, has the potential to raise the annual rate of economic growth by approximately half a percentage point.

It is important to note that it is not just those aspects of education that better equip the community with the skills and knowledge base which stimulate ideas formation and the associated innovations vital to economic growth. Also of critical importance is a workforce that is positively disposed to change, and which can be quickly re-skilled in order to effectively implement new innovations. This is particularly important for major innovations of a technological nature, such as those associated with information and communication technologies.

Having established that training is important for economic growth, it must also be recognised that changes in the labour market can affect the way training contributes to this growth. In the coming decades, significant changes are expected in both the supply of and demand for labour. Therefore, in addition to examining the relationship between innovation, economic growth and human capital on a broad scale, this chapter also looks at some major demographic-based changes expected to take place in the labour market, and how innovations within the vocational education and training and other related sectors of the economy will be vital to enable effective and rapid response to these changes.

The Australian Government’s ‘Intergenerational report’ (Australian Government 2002) provides a useful framework for considering the impact of demographic-based change on the labour market and for speculating on the implications of these changes for the VET system. Inherent to the Australian VET sector are features that provide it with the capacity to respond to impending changes in the labour market. This system has the capacity to tailor its products in a way that focuses more closely on particular problem areas than is possible in other sectors of education and training. For example, the VET sector is able to provide courses to people of almost any age and level of

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2 Social capital is defined as the cumulative benefit accruing to individuals and communities as a result of their engagement in community and civic activities.
educational attainment, while also having the flexibility to do so in innovative ways which meet the needs of these people. This flexibility ensures that it is ideally placed to play a central role in meeting many of the challenges that seem likely to arise from future changes in the labour market. Having said that, it is almost certainly the case that a successful outcome will depend on a creative and coordinated response from all relevant sectors of the economy, not just the VET sector itself.

This chapter discusses the question of innovation and the challenges facing the education and training sector in Australia from two perspectives. Discussed first of all is the role of innovation as a key driver of economic growth, and the important role education and training has in providing the necessary platform to enable innovation to take place, and for its effective implementation within the economy. A number of developing challenges within the labour force, and the consequent need for innovative initiatives within the education and workforce support infrastructure to address these impending challenges are also discussed.

Innovation and economic growth

There are three primary sources of economic growth. The first two arise from growth in the primary inputs of capital and labour—increases in capital and labour inputs lead to increases in gross domestic product as shown in figure 1. With relatively free and efficient global capital markets, there is no immediate constraint on increasing the level of capital stock in a small economy like that of Australia. However, there is a significant constraint on achieving more than relatively small and gradual sustained increases in aggregate labour input as measured by hours worked.

The third source of economic growth is multifactor productivity. Multifactor productivity growth is defined as the growth in ‘value added’ which is not explained by contemporaneous growth in capital and labour. Multifactor productivity growth can arise from a number of sources including:

- improvements in the economy’s operating environment; for example, government policies which facilitate greater competition and trade
- adopting best-practice management and business production processes, many of which are imported from overseas
- the discovery and implementation of new production technologies and processes.

In order to achieve higher output levels or quality using the same amounts of primary inputs, something has to be done differently. This could be:

- better economic policies
an improvement in the method of production; for example, the
development of more efficient plant and equipment or the discovery and
implementation of more efficient ways of using new capital, embodying
technological advances

better skills embodied within individual units of labour.

That is, innovation of one sort or another has to occur.

Figure 1: The components of gross domestic product per capita growth

Note: ‘Productivity’ refers here to labour productivity.
Source: Adapted from Department of the Treasury (2003, p.97)

In the past, the term ‘innovation’ has been most commonly identified
exclusively with scientifically based discoveries which led to new production
technologies and products. While this most certainly constitutes innovation, the
term ‘innovation’ is now generally interpreted in a much wider context.

The notion of innovation encompasses the entire process, which ultimately
results in the provision of new goods and services, and/or the provision of the
same goods and services but in a more efficient way. It includes the processes
whereby new ideas are generated, proved and adjusted through prototype
work, integrated with existing products and processes, tested in markets, and
fully commercialised. It also includes the complex feedbacks of information, and
additional ideas generated during the process itself. That is, it is typically a
complex non-linear process.

It is important to emphasise that innovation also includes the discovery and
application of better management techniques and business practices, and new
and improved ways of using and adapting existing production technologies to
more effectively capitalise on their economic potential.

Innovation is thus the major driver of multifactor productivity growth,
which itself is fundamental to economic growth. Estimates indicate that
multifactor productivity growth has generally accounted for between 30 and 40% of gross domestic product growth in Australia’s market sector (Parham, Roberts & Sun 2001). Table 1 provides a breakdown of the contribution of capital, hours worked and multifactor productivity growth to market sector growth over the 35-year period, 1964–65 to 1999–00, and over the most recent 10 years of that period.

Table 1: Contributions to Australia’s output growth in the market sector

<table>
<thead>
<tr>
<th>Component</th>
<th>Contribution</th>
<th>1964–65 to 1999–00 % per year</th>
<th>1989–91 to 1999–00 % per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>1.8</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Labour</td>
<td>0.6</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>MFP</td>
<td>1.1</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Output growth</td>
<td>3.4</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>MFP as % of output</td>
<td>32.0</td>
<td>41.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Parham, Roberts and Sun (2001)

With multifactor productivity growth accounting for almost half of gross domestic product growth, and innovation being so critical to multifactor productivity growth, it is clear that a general environment conducive to the fundamental drivers of innovation is vital to Australia’s future wellbeing.

In order to pursue this analysis further, we need to look behind the notion of innovation to reveal its key drivers. The key drivers are many and varied but include: competition, which drives entrepreneurs to seek out competitive advantage through innovation; appropriate intellectual property policy, which allows for private appropriation of returns to innovation; and an innovation culture, supported by a critical mass of education and knowledge, upon which the generation of new ideas and the realisation of their associated potential through effective commercialisation can be achieved. It is in the development and maintenance of an innovation culture, and in the enhancement of the education and knowledge platform so critical to innovation, that the VET sector has a vital role to play.

Human capital and innovation

What then are the critical human capital factors necessary to support an effective innovation culture, and what is the role for the VET sector in assisting in their realisation?

The most obvious innovation-related human capital issue, and the one which receives the most attention, relates to the provision of sufficient numbers of technological specialists, such as scientists and engineers. While this is indeed
an area of critical importance, especially in relation to what might be termed ‘technological innovation’, there are, as discussed above, many vital aspects to the innovation process. For new ideas and discoveries to confer broad benefits on society, they have to be appropriately designed and presented to the commercial marketplace, and, generally speaking, scientists and engineers are not the people to undertake this role. In addition, business management and production process innovations are also not commonly the realm of such specialists.

It is arguable that a major component, although certainly not the entirety of the creative aspects of innovation, is likely to arise within that part of the workforce having its human capital largely developed through the higher education system. That said, there will be many micro and small business innovations that are not derived from, or dependent upon, higher education. For example, many small businesses are owned and operated by people who have developed their human capital outside the higher education system, and whether it be a trade-related business, a café or restaurant, or any other small business, innovation at some level will be critical to the ongoing success of the business.

As competition becomes more intense, entrepreneurs in particular need to become aware of the importance of innovation, and of the need to invest time, effort and resources into enhancing their ‘innovation capital’. The VET sector provides a vehicle for those needing to enhance their understanding of the innovation process and their innovation-related skills.

Another key human capital challenge associated with major innovations, particularly those of a technological nature, arises not in the development of innovations per se, but rather in the successful implementation or application of innovations. The quintessential example of this is to be found in the adoption and implementation of information and communication technologies.

In the context of just one manifestation of this, the successful dissemination and implementation of the desktop computer, together with the associated user-friendly software and technological innovations such as the internet, have required very significant complementary investments in human capital on a universal front. A rudimentary understanding of how to use a desktop computer and the most common software applications is now a fundamental requirement in nearly all service-based industries, while much more sophisticated information and communication technology skills are required in a growing number of careers. Other examples are to be found right across the economy; for example, how to use computer-based technologies in diagnostic motor mechanical work. Technology-using skills such as these are learned either in or directly through the workplace, in schools or in the VET sector.

The importance of the appropriate complementary environment for innovation, and hence productivity and economic growth, is now well documented in the economic literature, most particularly in relation to major
innovations such as those associated with information and communication technology (see for example Bresnahan, Brynjolfson & Hitt 2002, pp.339–76).

Despite this clear link between information and communication technology skills and productivity, the OECD has found that the large increase in labour productivity in Australia over the 1990s was achieved without any measurable contribution from overall ‘enhancements to human capital’, that is, skill upgrading of the workforce. This contrasts with the situation in some European countries, most notably the United Kingdom, Finland, Italy and France, where skill upgrading was responsible for up to one-third of the labour productivity improvement (OECD 2003, p.38).

These results for Australia have been confirmed by the Productivity Commission, which found that increased skills in the workforce did not have a major effect on Australia’s 1990s productivity surge (Barnes & Kennard 2002, p.xix). Although the measurement of changes in human capital is at an early stage of development in Australia, the results as they stand do suggest the possibility of considerable scope for additional economic gains from enhancement of Australia’s human capital through additional training.

To summarise, the sections above have identified two distinct human capital aspects of innovation, the first being the creative human capital necessary to discover or identify potential innovations and to drive their adoption and implementation. The second aspect is concerned with enhanced complementary human capital necessary for successful adoption and implementation of the innovation. The VET sector has a role to play in supporting the development of both types of human capital enhancement.

Responding to the changing human capital challenge

The rate of introduction of new technologies, together with a much more dynamic and innovative global business environment means that the skill sets required of the broader labour force are growing and changing with ever-greater rapidity. This in turn means that an increasing number of the skills learned at school and early in one’s career become obsolete, or at least in some way insufficient for the new demands arising from the introduction of new technologies and innovations.

Information and communication technologies and their various applications once more provide a good example. While children at school are now all exposed to the fundamentals of this technology and its use, there is a large section of the workforce which either has no such skills or has had to acquire these skills since leaving school. Thus, as technologies and innovations which are implemented within the workplace are developed, the need to skill-up the existing workforce arises. This is particularly the case where the innovation is becoming an integral part of the production process, and where the associated skills had not commonly been part of the school curriculum.
Another human capital challenge arising from the increasing rate of innovation in the economy derives from businesses’ need for a workforce which readily accepts, and is able to respond quickly to, the changing workplace demands being driven by these innovations. Increased flexibility in this respect reduces the adjustment costs faced by the economy in implementing new technologies and other innovations, and brings forward the benefits that such innovations offer, adding to the rate of productivity and economic growth in the economy.

It is important to recognise that these issues are not simply an education and training supply-side problem. Resolution of the challenge requires the efficient functioning of a cooperative network which includes the VET sector, the business sector, and institutional components of the labour force, such as the trade unions.

The demands on and interactions among the members of this coalition are complex and can be expected to become even more so. For example, the client base for vocational education and training is, in a sense, bilateral. On the one hand, business is the key client as it seeks the provision of certain labour force skills, and on the other, it is the individuals who make up the existing and prospective workforce which forms the client base. The requirement for ongoing clear communication of the needs of the demand side of the ‘equation’ is obvious, but may not always be satisfied. Moreover, the views and interpretation of detailed aspects of these demand-side needs as held by employers, and employees and their representatives, may well, from time to time, not be in complete harmony.

It also needs to be recognised that the challenges faced by the workforce in responding to the changing demands in the workplace are not homogenous. Some parts of the workforce may already be experienced in handling the introduction of disruptive technologies3, while others may have been employed in an industry using relatively long-term stable production technology and processes, and having little or no experience in coping with disruptive change. The latter group can be expected to face more significant challenges in dealing with these changes, and will, in all probability, need greater support and understanding from the VET sector and employers.

Faced with complex and rapidly changing client requirements, the VET system needs to be flexible and innovative, both in helping to ensure that the evolving needs of its clients are communicated to and disseminated within the sector, and also in addressing those needs through the innovative design and delivery of training programs.

There are many arms to an effective system of support for a more responsive, better skilled and more flexible workforce. The obvious key players

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3 The term ‘disruptive technology’ was coined by Clayton M Christensen (1997) to describe a new, low-cost, often simpler technology which displaces an existing sustaining technology.
in such a network include the existing employed workforce, the existing unemployed portion of the workforce, employers, and the VET sector. Other players who may be less immediate in some sense, but who are also critical to the dynamic efficiency of such a network, include schools, cohorts of impending school leavers, the higher education system, and parents. All of these agents have a role to play, but can only do so effectively if supported by a well-coordinated network with an efficient and comprehensive information and communication system.

Contributing to economic growth

As noted earlier, economic growth is derived from growth in the stock of capital, growth in labour inputs, and multifactor productivity growth. While innovation is the key to multifactor productivity growth, population growth and labour force participation are the keys to growth in labour input (human capital quality enhancement aside). Declining fertility rates, and the ageing and impending retirement of the so-called ‘baby boomer’ generation raise the prospect of lower population growth and a future reduction in the participation rate. This will ultimately detract from growth in future labour input, and consequently also from economic growth.

The ‘Intergenerational report’ examined projections of the possible impacts of demographic change over coming decades in a scenario involving no changes to government policy (Australian Government 2002). It found that under these conditions economic growth would be likely to slow considerably. This report also examined the reasons for this slowdown by looking at the labour market supply-side components of gross domestic product per capita—population, participation and (labour) productivity—and the factors affecting these components (see figure 1).

The ‘Intergenerational report’ projections suggest that gross domestic product growth over the next four decades will average only 2.25%, 1.5 percentage points lower than the average for the previous four decades. Population growth is expected to make a significantly lower contribution to gross domestic product growth, whereas labour productivity will be the key driver (Henry 2002). This reinforces the claims made in previous sections, given that labour productivity growth is the sum of capital deepening (the increase in the capital/labour ratio) and multifactor productivity growth, which depends so critically on innovation. Participation is expected to have a much greater negative impact (Henry 2002).

While there is little that can be done to reverse the decline in population growth, it is arguable that, by better targeting training investment, participation could be increased with a positive impact on economic growth. Of course, it needs to be recognised that issues impacting on the supply of labour are only part of the bigger picture, which includes the employers on the demand side.
Employers need to play an active part in establishing and maintaining communication networks with key parts of the labour market, the education and training sectors, and other crucial areas of support infrastructure. For example, those who recognise new technologies or developments that will impact on potential economic growth need to communicate the anticipated labour force requirements in order to ensure that the VET and other sectors are directing their resources to the emerging human capital needs of business. In addition, government policies need to place greater emphasis in the community on lifelong learning and active participation in the workforce and the community. However, this chapter will restrict its consideration to supply-side issues.

Participation

The major components of participation, as shown in figure 1, are the labour force participation rate (the proportion of the population over 15 years old who is either employed or actively seeking employment), the unemployment rate, and average hours worked. The ‘Intergenerational report’ estimates that participation will have a negative impact on gross domestic product growth over the next four decades, reducing average annual gross domestic product growth by 0.38 percentage points (Henry 2002). Declining participation rates have been attributed to a number of factors, including an inflexible labour market contributing to mismatched skills, the retirement of older workers, and the preference by some welfare recipients for welfare payments instead of uncertain applications for work (Department of Treasury 2002, pp.104–5). Furthermore, punitive effective marginal tax rates for those moving into the workforce or increasing their current hours of work do not encourage greater participation.

The social and economic costs associated with reductions in labour force participation include lost productive capacity and depreciation of the skills base. For individuals no longer participating in the workforce, it can mean reduced self-confidence and an overall reduction in the individual’s contribution to society. Two factors that can potentially slow the impact of these costs are encouraging older workers to defer retirement or encouraging them to return to the workforce, and increasing the labour force participation of those of working age.

Increasing participation of those of working age

The ‘Intergenerational report’ projections in figure 2 show a decline in the population share of the 0 to 14 and 15 to 64 (the working age) cohorts in 2022 and 2042, and an increase in the proportion of the population in the 65 to 84 and 85+ cohorts. While the projection is that the working-age population will rise in absolute terms by 14% over the next two decades, this will be overshadowed by a 50% absolute rise in the 55 to 64-year-old cohort over the same period (Australian Government 2002).
These impending developments, together with the improving health and longevity of older members of society, suggest that past notions of an appropriate retirement age might need to be reviewed.

Figures 3 and 4 present past, present, and projected labour force participation rates for males and females. These projections are based on an assumption that the present trends in participation continue. The male participation rate shows a downward trend in the 15 to 54-age cohort and little movement in the 55 to 64-age cohort. Male labour force participation declines most markedly beyond the age of 40, apparently as a result of difficulties associated with middle-aged men finding employment after being out of work for some time (Ball 2003, p.3). The female population displays upwards trends in participation for all cohorts, most significantly in the 55 to 64-age group, although female participation rates are still well below those of males.

These trends suggest that there may be some scope, especially as future demographic pressures begin to impact on labour supply, for increased male participation by those of working age, particularly men over 40, as well as higher levels of female participation at all ages. But responding to these opportunities efficiently will mean appropriately gearing up the necessary training in advance of the emerging shortage, and ensuring that training is focused on the specific skills associated with the developing labour shortage.
Why the VET sector needs to be more innovative

The VET system has the potential not only to support a more flexible workforce, but also to help those not in the formal labour market to participate in the workforce, and older workers to stay in the workforce for considerably longer than in the past. Training need not necessarily be directly related to existing occupations. New skills have the potential to enable those workers nearing retirement age or under-employed in ‘casual’ or ‘part-time’ work, as well as younger people not yet in the workforce, to undertake new work opportunities.
The VET sector needs to look towards the ‘informal’ labour market; for example, there has been a large growth in microbusinesses in the last five years (Australian Government 2002), and so those who might wish to retire, or who are not in the formal labour market, could be trained to start their own businesses. The VET sector needs more innovative marketing and ways of making contact with potential clients who would benefit from the acquisition of business skills in their self-employment ventures.

Entrepreneurship training for older workers, or those who have retired, could, of course, be extended to younger workers and the unemployed seeking to explore opportunities provided through small business creation.

Such training could benefit from innovative approaches designed to minimise the incidence of failure of new entrepreneurial ventures. These might include, for example, experimenting with some form of small business joint ventures between vocational education and training and retired entrepreneurs to provide a real hands-on component to the training, complementary to the more traditional components, such as bookkeeping and other theoretical aspects of running a small business. Such joint ventures could even provide the basis for continuity of association with the VET sector and improved network opportunities among participants following their hands-on entrepreneurial experience and subsequent graduation. This has the potential to further reduce the incidence of small business failure.

Given the projected demographic change, it is all the more important that the participation rates of younger people be significantly higher than today. As education levels are highly correlated with employment prospects and participation, it is critical that future cohorts entering the workforce be appropriately educated.

In this regard, studies by the Centre for Community Child Health (Waters, Goldfield & Hopkins 2002, p.64) and The Smith Family (The Smith Family 2003, p.56) suggest that higher education levels among parents flow on to higher educational and academic outcomes for their children. Therefore it may be an important strategy to encourage parents with low-level education attainment to further their education through appropriately targeted vocational education and training in order to help improve the participation prospects of future cohorts. An initiative such as this could be addressed through policy initiatives which support innovative marketing schemes, or other more direct incentive mechanisms.

The unique features of vocational education and training—its ability to provide all types of training for people of all ages and levels of educational achievement, and its ability to provide short courses and specially designed courses to meet specific needs—differentiates this sector from other education and training sectors. These unique features provide VET with the ability to take advantage of opportunities to trial new initiatives which might positively address future participation concerns.

114x85 Vocational education and training and innovation: Research readings
Conclusions

Innovation is the process by which new ideas and discoveries are made and turned into valuable new goods and services, or more efficient ways of producing the same goods and services. Innovation encompasses the entire complex process from ideas through to the realisation of additional value to the economy. It is characterised by feedback loops and other complex interactions with the existing economic and social infrastructure, and it covers technological innovation (typically based in scientific and related research), product innovation (both goods and services), and process innovation.

Innovation is also the key driver of productivity growth. If additional output or enhanced output quality is to be had from the same quantity of capital and labour input, then something has to be done differently—some innovation has to occur.

The important role of knowledge and education in innovation, productivity and economic growth is well established both in theory and in empirical studies. However, it is not just the advanced and specialised knowledge and creative drive of scientists and engineers or business managers and chief executive officers which provide the necessary facilitating medium for effective innovation and productivity growth. To be effective, new processes and technologies need to be efficiently applied in the production process, and this can entail significant investment in the development of complementary human capital. Furthermore, the adoption of new processes and technologies can be quite disruptive, in which case, efficient adoption of such processes and technologies is likely to require a very flexible workforce.

In an ever-competitive global economy, business will constantly be seeking out competitive advantage through innovation. As this culture permeates all aspects of the business sector, existing and new entrepreneurs will need to have well-honed innovation skills, and adequately appreciate the demands which innovation places upon the workforce in general. It is therefore important that the education and training sector is able to provide the support necessary to ensure that new and aspiring entrepreneurs have the appropriate innovation-related skills. In addition, it is equally important for the sector to address the broader workforce re-skilling and flexibility which effective implementation of innovation often requires.

While the VET sector is well placed to play a key role in addressing these demands, it cannot be fully effective alone. To be fully effective will require the close cooperation of employers and other key players to ensure optimal uptake of its services in a timely fashion. For example, employers and others who anticipate certain technological and other developments need to communicate their potential labour force requirements before the need arises.

Looking forward, demographic developments associated with the ageing of the population and declining fertility are likely to bring significant and
sustained pressure to bear on the supply of labour. This will make innovation even more important as a source of economic growth. It will also mean that it will be increasingly important to raise participation rates in the 20 to 65-year age group as well as encouraging retention of older workers beyond typical retirement ages of today.

Increased participation rates are at least partly dependent upon higher levels of education and work-related skills. The myriad influences on education levels and academic achievement include levels of parental education, employer attitudes to training and ageing within the workforce, and the priority given to innovation and entrepreneurship awareness within the school curriculum.

The complex and diverse range of influences on participation rates means that significant progress in this area will require creative and innovative solutions to be sought within a broad coalition of key players, central to which will be the VET sector. A close cooperative network within this coalition, supported by an efficient and effective communication and information system, will be critical to the success of any response to these labour market challenges.

References