BVET

**NSW Board of Vocational
Education and Training**

Towards a learning economy: The role of VET in supporting knowledge-based organizations and regions

Final report of the research project:

THE CHANGING NATURE OF WORK AND THE EMERGENCE OF THE KNOWLEDGE-BASED ECONOMY: THE IMPLICATIONS FOR VOCATIONAL EDUCATION AND TRAINING OF THE DEMANDS OF THE EMERGING KNOWLEDGE-BASED ECONOMY

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Towards a learning economy: The role of VET in supporting knowledge-based organizations and regions

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**Summary of the Final Report to NSW Board of
Vocational Education and Training**

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EXECUTIVE SUMMARY

The research project that is reported here was commissioned and funded by the NSW Board of Vocational Education and Training. It sought to extend understanding of the impact of the knowledge-based economy on the nature of work and training. The project set out to analyse the ways in which the emerging knowledge-based economy impacts on the content of work. In particular its concerns were with the knowledge and skill requirements of occupations and of work in different parts of various industries, and the extent to which the current VET system meets the requirements of the knowledge-based economy. The project was shaped by the following questions that were part of the original project brief from BVET:

> What is the extent and speed of changes in the type and level of knowledge and skill required in a range of industry sectors, occupational areas and organisational sizes?

> To what extent is work and the need for training being changed by the growth of the knowledge economy, and the employment implications of the knowledge-based economy?

> What impact have changes in the nature of work had on VET provision and its intersection with general education? How can it best meet the needs of individuals and organisations, and how well is the VET system adapting to and anticipating in these changes?

The project commenced with a review of key literature before embarking on a series of 3 stages designed to provide an emerging understanding of the way knowledge is used and privileged in industry and business. These three stages incorporated analysis of existing ABS data using proxies for knowledge and innovation, a major survey of organizations across 4 industry sectors, case studies of individuals, organizations and institutions, and systems analysis of knowledge-based organizations.

This research project has established that the nature of work is indeed changing. In fact, it appears that the very shape of industry is being altered as we witness a period of economic change that has emphasised new forms of knowledge as well as changed priorities for knowledge and skill acquisition and use. Technological innovation and access to knowledge and skills are key drivers of innovation in this 'new age', and their application has become central to the competitive strategy of firms. On the basis of our findings we argue that successful and self sustaining cities and regions in the 21st century will be those that are best at linking businesses to the global economy.

Our review of research also suggests that more than ever, business strategy, innovation, learning and training are closely integrated. What this requires is a training sector that leads instead of following. It also requires a VET sector that is characterised by innovative learning organisations networked regionally, nationally and globally. There are clearly special implications in this report for TAFE as it seeks to re-position itself within a training sector that has undergone great change. There appear to be three alternative pathways facing the TAFE sector. It could do nothing and watch its market

being increasingly eroded by private providers and industry-based training. It could become even better at responding to industry needs and reform existing programs to better reflect industry needs. Or finally, it could work in partnership with government, the broad VET system and industry to position itself as a key partner in industry-based reform, technology renewal, and regional and industry innovation.

While there is no doubt that Australia's VET sector is internationally competitive, our research findings point to a need change and re-positioning. The role of VET globally is under review as governments attempt to work out the best use of elaborate and expensive training systems. BVET has an opportunity to take the best of the current VET system and to reform it to take a leading role in working with other partners to position NSW business and industry in an even more competitive position.

Our study has highlighted the importance of an internationally competitive VET system to Australia's future and has identified 4 major challenges, each of which presents the sector with significant opportunities:

The VET sector has a key role to play in increasing the level of competitiveness and innovation in Australian industry.

The diversification of industry is creating the need for new forms of training provision.

Changes in technology are creating significant challenges and opportunities for the VET sector.

In the emerging knowledge-based economy there is an increased need for VET providers to explore new forms of industry collaboration and partnership.

Our findings are discussed in relation to the above challenges and present 14 key recommendations:

Recommendation 1 - There should be an ongoing strategic evaluation of existing mechanisms adopted by the VET system and industry in order to identify skill and knowledge requirements.

Recommendation 2 - DET should actively seek the involvement of TAFE in key Co-operative Research Centres as a major provider of training related to new technology developments.[1] To support this strategy BVET should commission a review of the role that TAFE might play in technology diffusion.

Recommendation 3 - BVET should initiate discussions with key bodies such as BVET and/or ANTA and NCVER to undertake research that considers the extent to which existing VET training is preparing graduates for lifelong learning.

Recommendation 4 - ITABs, DET and VET providers need to recognise the importance of encultured knowledge to innovative and competitive organisations.

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[1] The TAFE involvement in the Australian Centre for Advanced Computing and Communication (ac3) is one example of this type relationship.

As a result, BVET should convene a major forum between ITABS, their industry partners and VET providers to consider joint responsibilities in this area.

Recommendation 5 - BVET should investigate how informal learning might be more effectively recognised and how mechanisms could be established in association with industry groups to more fully integrate on-the-job learning with accredited training.

Recommendation 6 - BVET should conduct a broad-based strategic review of generic skills, that involves an initial review of the cross-disciplinary research into generic skills to arrive at conclusions as to their specific nature, as well as recommend the implications of these findings for the productivity of vocational learning.

Recommendation 7 - BVET should investigate the extent to which employers are requiring multi-skilling as part of work practices and what this means for specific areas of training.

Recommendation 8 - BVET should institute an immediate review in association with peak industry bodies to establish the extent to which TAFE institutes are able to meet industry requirements for technology

Recommendation 9 - BVET should investigate how TAFE can assume a far more high profile role as a training broker specifically for SMEs. BVET should investigate how Innovation Centres could be established in partnership with other key stakeholders.

Recommendation 10 - BVET has a major role to play in encouraging training providers such as TAFE to embrace workplace training and training for workplaces as a more fundamental part of all industry training programs.

Recommendation 11 - BVET should also work through the DET to establish a trial of innovative workplace options for training that articulate with existing TAFE initial and continuing VET.

Recommendation 12 - BVET should work in partnership with DET and industry associations to seek federal funding to support the establishment of 3-6 industry renewal centres. These centres would have the following characteristics and purposes.

Recommendation 13 - BVET should work in association with the Department of State and Regional Development (SARD) and DET to institute a review of how regional provision of VET matches regional skills gaps as well as opportunities.

Recommendation 14 - BVET should establish a partnership through DET to provide greater input into regional initiatives coordinated through the Premier's Department and State and SARD.

In conclusion, our research suggests that NSW's economic future is directly linked to the quality of its education and training. We have been well served by the VET sector in the past, but changes in the nature of work necessitate changes in the way VET is delivered.

It also requires changes in the ways training institutions work in partnership with others to meet the needs of individuals, organisations and industry groups. This project suggests that there is an opportunity at this time fror BVET to consider new directions in NSW VET and to work with other stakeholders to effect key reforms.

Introduction

The research project that is reported here was commissioned and funded by the NSW Board of Vocational Education and Training. It sought to extend understanding of the impact of the knowledge-based economy on the nature of work and training. The project set out to analyse the ways in which the emerging knowledge-based economy impacts on the content of work. In particular its concerns were with the knowledge and skill requirements of occupations and of work in different parts of various industries, and the extent to which the current VET system meets the requirements of the knowledge-based economy.

To do this the project commenced with a review of key literature before embarking on a series of 3 stages designed to provide an emerging understanding of the way knowledge is used and privileged in industry and business. The project also considered the impact these changes are having on work and the nature and relevance of training undertaken by organisations and individuals. This publication provides an overview of the project and a summary of the key findings and policy recommendations (see Appendix 2 for an outline of all reports from this project).

Background to the project

There is no universally accepted definition of the knowledge economy. As a concept, it is very loosely employed and embraces a number of quite different visions of the economy and society. One view, sees it as very much bound up with a high skills/high performance/high value added scenario as the only way for firms to compete in a globalised economy. Another view, found principally in the scientific and technical community, tends to view it more narrowly as applying to knowledge intensive industries where knowledge itself is the core competence. This scenario embraces software and internet companies, computer hardware and chip manufacturers, computer and electronic equipment sectors, health care technology[2].

A third view, the one that has influenced us most strongly, is that all sectors of industry are becoming more knowledge intensive in the very broad sense of the term. Knowledge is seen as a potential generator of productivity improvements, in areas as diverse as quality, customer service, variety, speed and technical improvement, as well as innovation in products, processes and organisational structure and behaviour. As companies alter the way they are structured and operate, so too workers need to obtain a more complex range of cognitive and intellectual resources.

Hence in this project a knowledge-based economy was defined as one that is increasingly dependent for its growth on the input of knowledge as a value-added input to the economic system. This is reflected in a change in the basis of 'competitiveness' for economies, organisations and individuals. This is realised in four interrelated ways.

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[2] For example refer June 1999 issue of Business Higher Education Round Table newsletter on The Knowledge Economy.

First, such economies experience a changing structure exemplified by new industries, occupations and organisational arrangements.

Second, there is a change in the types of skills and knowledge required with a rise in the importance of generic skills and highly transferable skills.

Third the economy requires new forms of knowledge and places increased importance on the creation and application of knowledge in networks or clusters of companies/enterprises, and within 'communities of practice' where workers are required to work together in new and more complex ways.

Fourth, innovation becomes more important as a means to increase economic competitiveness, and knowledge management becomes increasingly the key to sustainable competitive advantage, requiring individuals, firms, regions and indeed complete economies to acquire, create and use knowledge as the key productive resource.

If such a scenario is accepted, then inevitably, workers would not only have to be more highly skilled, they would also have to have the resources to engage in lifelong learning and in mastering new skills and behaviours in order to meet the ever changing needs of more dynamic product and labour markets. According to the Australian National Training Authority (ANTA, 1998a):

... knowledge based occupations and industries are the fastest growing and best remunerated. They call for new and different skill mixes in their workforce, and particularly proficiency in information and communication technologies. It is crucial that vocational education and training equips people with the knowledge and skills necessary to meet these demands (p.5).

Drucker (1993) and others have pointed out that in the late 20th and early 21st centuries new forms of knowledge are now becoming necessary and knowledge workers are growing in number. These workers are unlike previous generations of workers, not only in their high levels of education, but because for the first time they own the organisation's means of production - knowledge.

Drucker has further suggested that as a result, new models for organisations are required, and traditional ways of thinking about structures (e.g. hierarchies, decentralisation, matrices and so on) need to be discarded. In their place new ways are needed to view and construct organisations based around specialised workers, team-based work, flat management structures and flexible practices. In summary, what has been occurring in advanced economies in the last 2 decades has been a movement away from organisations needing routinised knowledge and low skills, towards those requiring knowledge workers able to manipulate symbolic knowledge.

The organisation was therefore seen as an important unit of analysis in this research. While it is important to understand the perspectives of individual workers and broad industry sectors and their associations, a clear understanding of the impact of the knowledge-based economy on organisations was seen as vital by the research team.

Another important consideration was the relationship between individual organisations, industry associations, and learning institutions. It has been suggested that regions and cities seeking to compete more effectively within a global economy need to develop 'soft structures' that support knowledge creation and learning and that enable firms to collectively strengthen a region's capacity for knowledge creation and innovation. Key institutions such as universities, VET providers, regional development organisations and business chambers are amongst the most important institutions within regions. Such organisations act as key knowledge creators and trainers, as well as a means to collect relevant knowledge in the international domain and vehicles for communicating this effectively through a variety of mechanisms and relationships.

The single most critical challenge for many regions is how to build high growth technology industries and to increase the proportion of the workforce with advanced skills and qualifications across all industry sectors. This requires the incubation of new companies and the progress of a number of local companies from small to medium status. The attraction of large technology based companies to regions also provides a major stimulus to technological development. Many regions within Australia are seeking to transform and re-invent themselves as they seek to become 'learning regions'.

The concept of the learning region has emerged to describe those places that offer an institutional environment that encourages both private and social learning at four different levels: the individual workers, the individual firm, groups or clusters of related firms and government bodies. Learning regions are less dependent on the individual excellence of their educational institutions as they are on the extent to which their key institutions, organisations and industry are able to trade, support and jointly create knowledge and knowledge networks. The success of key regions throughout the world has been due in no small measure to social or collective learning processes, in which the role of the region is to animate the formation of 'interaction relationships' between individual firms and between firms and other regional institutions. Such regional organisations should also be thought of as learning organisations themselves in that they actively seek to emulate and learn from successful experiences of counterpart agencies in other regions and nations.

Marceau, Manley and Sichlem (1997) have argued that a learning economy is both knowledge and innovation intensive and is usually technology driven. Regions that will make economic progress are those that have high rates of innovation and learning that are greater than those of their competitors. Growth in real terms will be produced by activities based on knowledge generation through investment infrastructure, human capital, innovation, research and development and advanced training. The literature on economic growth regularly cites rates of investment in equipment, new education and training programs, and public investment in infrastructure as key factors in development.

There is also a significant body of evidence to support the importance of industry working together in clusters to support regional development. The European DELOS project has called for increased attention to the development of industry clusters and networks to support high technology growth. Localised strategies that bring together networks of like companies allow knowledge structures to develop, exchange of technology to take place, and enhanced collective capacity to be developed by SMEs working in related and at times unrelated industries. Such groups also provide a means to develop, track and test innovations and to provide a critical mass of knowledgeable people and structures.

Another important consideration in this study has been the way learning has been fostered within organisations. Nonaka and Takeuchi (1995) have shown how part of the success of Japanese firms flowed from the way they were able to make use of tacit or embodied knowledge. This was not by attempting to codify and formalise; it was by ensuring regular exchanges of personnel, ideas and practices between different sections and departments or firms ('communities of practice').

Work on high skill regions (software and internet-based enterprises, computer hardware and chips, computer and electronic equipment sectors, healthcare technology) indicates that the knowledge creation and diffusion process is at the heart of why firms cluster. It is the difficulty of transmitting tacit knowledge, particularly when it is new and changing rapidly, that encourages enterprises to be in direct and frequent contact with each other and the researchers creating the new knowledge. The primary vehicle for learning, and the key driver of knowledge and wealth creation in these high skill regions, is not company or VET provided formal training. Workers in innovative organisations continue to learn by seeking, and being given cutting edge technical challenges that often demand the combined talents of a multi-functional project team in order to develop solutions. The greater utility of informal over formal learning for these highly skilled individuals has been shown in recent research in organisations undergoing rapid change. Most useful learning experience was not formal courses, inside or outside the firm, but key interactions with customers, suppliers or partner companies.

This nexus between formal and informal training was a critical issue for this study and continues to be for VET more generally. While VET has been focussed on formal training issues, there is a need to consider whether there are alternative modes for learning, perhaps as yet inadequately explored. For example, could greater use be made of electronic delivery of training, are there additional options for flexible modes of delivery? Could use be made of action groups and problems based learning? What role might VET have in equipping workers to facilitate their own learning networks, discussion groups, skill workshops and so on? How might VET better equip workers for lifelong learning?

VET has an important role to play in the development of coherent learning and innovation strategies for developing cities and regions into active players in the knowledge based economy. The knowledge creation process is strongly influenced by a region, city or nation's specific human and natural resources, physical structures and institutional endowment. In order to create wealth in local and regional economies, state policy will need to acknowledge regions and industrial districts and focus on framework conditions that enhance knowledge creation in and among the region's firms. Evidence suggests that a certain degree of industrial specialisation and aggregation or clustering has favourable effects in this respect. This may take place in high tech as well as in low-tech industries. Ongoing research suggests that most firms learn from closer interaction with suppliers, customers and rivals in their country or region. These changes pose a significant challenge to VET to adapt and change to perhaps assume a different role in working in partnerships with others in this changing environment.

It is unlikely that the education and training of a new generation of knowledge workers can simply be delivered from within traditional educational and training institutions and courses without change. The significant changes that are occurring in the knowledge economy require education and training institutions to adapt to and lead this change. Vocational Education and Training is central to the development of more competitive regional economies and cities, and in turn national economies. But this will not be in isolation.

Rather, the next decade will see an increased need for VET to view its place in relationship to other avenues for learning at work.
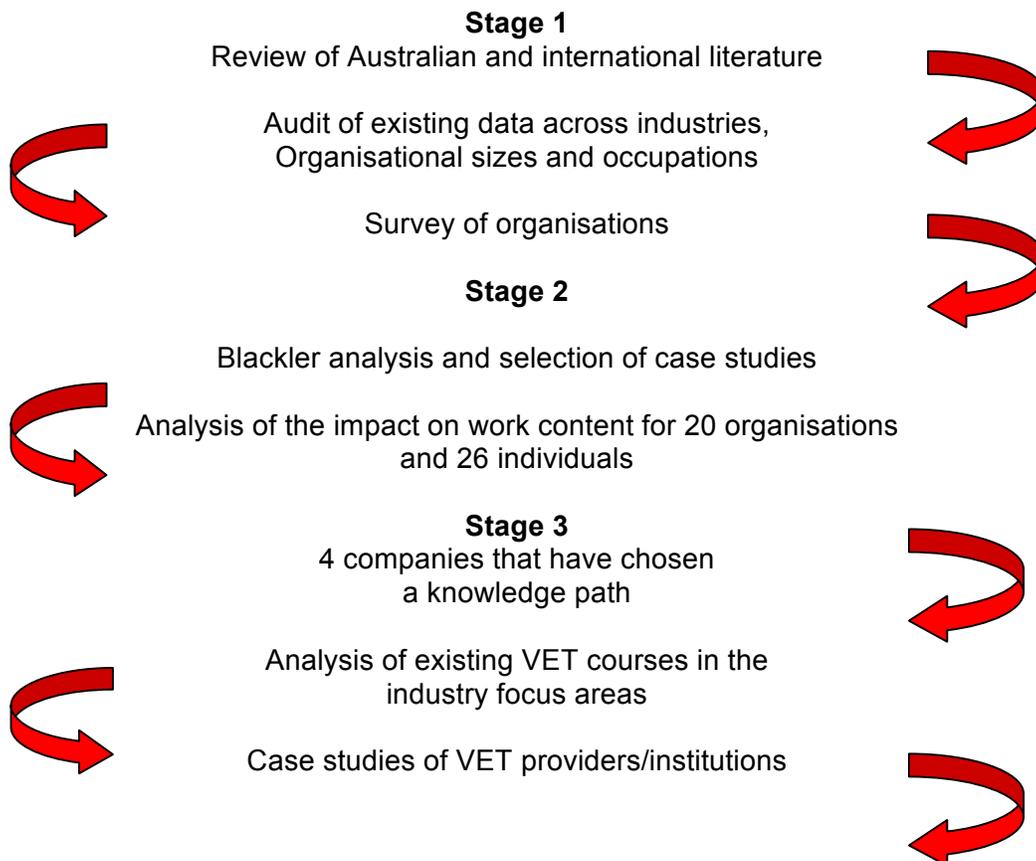
Conduct of the study

The research project described in this report was framed by the above key assumptions and was informed by a detailed review of existing literature, which is available as a separate publication (see Appendix 2). The project was also shaped by the following questions that were part of the original project brief from BVET:

- What is the extent and speed of changes in the type and level of knowledge and skill required in a range of industry sectors, occupational areas and organisational sizes?

- To what extent is work and the need for training being changed by the growth of the knowledge economy, and the employment implications of the knowledge-based economy?

- What impact have changes in the nature of work had on VET provision and its intersection with general education? How can it best meet the needs of individuals and organisations, and how well is the VET system adapting to and anticipating in these changes?

The project was undertaken in three separate stages. The flow diagram below provides an overview of the different data collection techniques and data analysis procedures used in each phase.

Figure 1: Cycle of Analysis

Stage 1
Review of Australian and international literature

Audit of existing data across industries,
Organisational sizes and occupations

Survey of organisations

Stage 2

Blackler analysis and selection of case studies

Analysis of the impact on work content for 20 organisations
and 26 individuals

Stage 3
4 companies that have chosen
a knowledge path

Analysis of existing VET courses in the
industry focus areas

Case studies of VET providers/institutions

Stage 1

Stage 1 of the project aimed to identify the forms of knowledge required in the emerging knowledge-based economy and the impact this is having on the nature of work. A detailed audit of existing data was conducted as a first step in examining the knowledge intensity of various sectors of the NSW economy. The chosen indicators were found to be the best available 'proxies' of knowledge intensity. Whilst presenting some general economy-wide findings, this data analysis mainly focused on the differences between industries, organisational sizes and occupations. The analysis of industry sectors and organisational size was performed under the following categories: Information Technology Utilisation and Investment, Innovation, Business Research and Development, Training and Skills, and Educational Attainment. Additionally, the size and growth of industries was analysed. Corresponding data for Occupations was not available, but data based on various employment classifications was analysed.

Specifically, the eight indicators of knowledge intensity used were:

- Ratio of PC users to total employment
- Ratio of expenditure on IT&T to employees
- Proportion of employees with higher degrees
- Proportion of employees with Bachelor degrees
- Expenditure on training per employee
- Proportion of employers providing unstructured training
- Proportion of businesses undertaking innovation
- Ratio of expenditure on R&D to employees

Four broad industry sectors were selected as 'focus areas' for the remainder of the project. The information about knowledge intensity and knowledge intensity advancement gained through the data analysis partially facilitated the selection process of these industries. The industries were chosen so as to span the rankings of knowledge intensity. This consideration was supplemented by many other important factors. These included the size and growth of the industries, the significance of VET to the industry sector, the significance to regional areas, the likelihood of future growth and change as well as other qualitative factors including advice from BVET. It was also ensured that the resulting industry selection would represent a diverse cross-section of the economy and that balance was established in relation to any gender biases evident in specific industry sectors.

The four main industry (and one supplementary) sectors, the sub-industries and the emerging industries chosen were:

- IT & T
    - Computer Services
    - Telecommunication Services
    - E-business development (emerging)
    - Visualization/ 3D animation (emerging)

- Manufacturing
    - Food, Beverage and Tobacco Manufacturing

        Metal Product Manufacturing
        Aquaculture (emerging)
        Medicinal and Pharmaceutical

·   Retail Trade
        Food Retailing
        Personal and Household Goods Retailing
        Retailers active in selling over the Internet (emerging)

·   Health and Community Services
        Health Services
        Community Services
        New Medical and Care Services for aged people (emerging)

·   Environmental management was selected as an additional emerging industry even though it did not fall into any of the 4 broad industry sectors.

A comprehensive industry survey was developed and distributed to a stratified random sample of organisations across these industry categories. The survey consisted of 27 questions, which were organized into three main areas covering: organisational change; staff/workforce skill and knowledge needs; general company information and priorities.

In all 679 organisations responded representing approximately 15% on the initial sample. The data were subjected to intensive qualitative and quantitative analysis.

Stage 2

Stage two was designed to take the analysis of the impact of the knowledge-based economy on the nature of work one step further. This stage had two key components, case studies of 20 organisations and 26 individual case studies of employees largely from within these organisations.

The initial focus question was explored using three sub questions to give shape to our investigation:

·   How has the nature of work changed for the companies and individuals identified?
·   How has the intensification of knowledge had an impact on business strategy and the need for individual and organisational learning?
·   What impact have these changes had on training for individuals and organisations?

The data analysis involved a detailed and rigorous procedure that occurred over a period of three months. The team devised different approaches and frameworks to analyse and display the interview data. The process was an iterative one and hence underwent several changes and modifications as the need arose. The overall approach to analysis was inductive and grounded and involved a series of successive steps to code and recode data using procedures developed by Miles and Huberman (1994). To aid analysis the interview data were processed using NUD*IST (Non Numerical Unstructured Data Indexing Searching and Theorising) by using text search, index search and intersections. The extracted data were helpful in mapping and theorising the findings.

Stage 3

Stage 3 was designed to provide an analysis of VET provision in the light of our findings from stages 1 and 2. This was to involve essentially two main steps:

· an audit of data on VET provision within the industry sectors forming a focus for this study;
· cases studies of 3 training providers identified as part of our organisational case studies.

However, after conducting case studies of 20 organisations in Stage 2 of our project it became increasingly evident that there was greater diversity amongst organisations than previously expected. We found that this diversity was not simply related to the traditional variables used to make sense of differences across organisations (e.g. size, industry sector, stage of maturity, skills level and qualification), particularly as this related to training and learning within organisations.

In seeking to make sense of the diversity we observed we drew on the work of Lam (2000), Mintzberg (1979) and Nonaka and Takeuchi (1995). In doing this we tried to make sense of the relationship between organisations and broader social institutions. We decided to use a form of network analysis with 4 of the previous 20 case studies, but before doing so we used a modified version of a typology developed by Lam (2000) to test our emerging understanding of the organisations we had studied.   This led to the identification of eight variables that were used to assess each organisation on 4 major dimensions:

·*qualification* levels;
·opportunities and disposition towards *training* (accredited and non-accredited);
·importance given to *knowledge* creation, sharing etc (explicit and tacit knowledge); and,
·organisational disposition towards *innovation* and deliberative business strategy (business strategy, worker involvement in decisionmaking, technology use).

To help to further objectify the team ratings of each organisation we decided to apply a 5 point rating scale to recognise the subtle variations across organisations in relations to specific variables. To apply the rating scale we had three team members use the case study data to independently rate each organisation on the 8 variables using the 5 point scale (0, 1, 2, 3, 4) for each.

To allow further interpretation of the data we adopted a form of visual display of data that Charles and Benneworth (1998) had used originally when comparing the industry characteristics of regions. This "Radar Analysis" enabled us to allocate each organisation to a specific category within the typology.   Following the completion of the radar analysis 4 organisations were chosen for further study. Once selected each organisation was subjected to more detailed case study analysis. This was done using four major sources of data:

· the organisation's original survey response;
· the data from the stage 2 case study;
· additional documentation on the company obtained directly and from company home pages;
· face-to-face and phone interviews.

To facilitate our case studies we developed a framework for analysis based on the work of Van der Krogt & Warmerdam (which in turn was based on the work of Marsden & Lin, 1982). This framework served as the major tool for conducting a network analysis of each organisation. It was based on the assumption that the labour and training networks together contribute to an organisation's "learning network". However, our specific set of questions and focus moved beyond the work of Van der Krogt and Warmerdan to include insights from stages 1 and 2 of the current research project as well as the insights of other researchers.

This network approach assumes that key actors, continuously engaging in variable relationships, jointly shape the main processes of the training system; that there is a connection between training networks and labour networks; and finally that three characteristics of the labour network are of primary importance:

 - the content of work,
 - the relationships between the central actors in the work process,
 - and the dominant actors' conceptions of the relationship between work and learning.

A desk audit of VET data was also conducted using existing ABS, BVET and ANTA data sources. Initially, the team sought to provide a coherent over view of the VET system and its development over the last 20 years. Second, we examined data available on the 4 industry sectors which formed the basis of the study.

The final phase of this stage of the project involved the conduct of case studies of 3 training organisations. These organisations were identified using the following criteria: variation in the type of training organisation; the need for each to be linked with one of our 4 in-depth case study organisations; the institutions need for the institution to be providing some form or training to a case study organisation at the time of study. The training organisations examined included:

·   a TAFE institute providing training for sheet metal workers;
·   an RTO working in the human and community services sector;
·   a private training provider.

Each institution was studied using a variety of sources of data including: existing data from the organisational case studies; web based information on organisational structure etc; data obtained from key informants by phone (before and after interviews); face to face interviews with key staff by 2-3 members of the research team. Each of the interviews lasted for at least two hours and were recorded. Transcripts were prepared for each interview and sued as a major source of data for each case study.

Key findings and recommendations

In this section we provide an overview of the detailed findings of the complete report of this project and its various publications. A fuller description of the findings from each stage of the project can be found in specific publications available from BVET relating to each of the key stages.

As already stated, the study was structured in 3 major stages, and shaped by two major concerns, how has work changed and what does this mean for VET? Our research findings point to four major areas of necessary reform in the VET sector:

> The VET sector has a key role to play in increasing the level of competitiveness and innovation in Australian industry.

> The diversification of industry is creating the need for new forms of training provision.

> Changes in technology are creating significant challenges and opportunities for the VET sector.

> In the emerging knowledge-based economy there is an increased need for VET providers to explore new forms of industry collaboration and partnership.

The findings in each of these four areas will described and recommendations made for reform in the VET sector.

The VET sector has a key role to play in increasing the level of competitiveness and innovativeness of Australian industry

There have been a number of reports in recent years that use proxies, or indicators, in an attempt to quantify the extent to which the Australian economy has evolved into a 'knowledge based economy' (e.g. Marceau and Manley, 1999; DISR, 1999a). These various reports provide analysis of Australia's progress as a knowledge-based economy in terms of 'indicator'-type data that are reasonably consistent. In short, Australia's performance has been mixed. According to an analysis by the Department of Industry Science and Resources (1999a), Australia "performed comparatively well" against OECD countries in production and technology indicators, "performance was mixed" in human capital indicators, and Australia performed "exceptionally well" in information and communication technologies (ICT).

Our own analysis of existing data sought to identify how and where the emergence of the knowledge-based economy has been most significant and where it could develop in the future. However, the primary focus of our analysis was on differences between industries. These findings suggest that NSW industry has varied performance in terms of knowledge and innovation:

· NSW industry is performing badly on a range of specific innovation indicators, and the data suggest a need for greater investment in training, research and development and

technology upgrades. For example, the proportion of manufacturers undertaking technological innovation fell from 34% in 1994 to 26% in 1997; expenditure on technology by manufacturers fell by $1.2 billion in this period. Similarly, business expenditure on R&D decreased across all industries for which it was measured.

· The number of hours of training per employee fell by 17% from 1990 to 1996 (a trend that has continued). Conversely, there have been increases in worker qualification levels across the board, including higher degrees (a rise from 1.8% to 2.6%), bachelors degrees (from 10.1% to 13.7%), basic vocational training (from 8.0% to 9.4%). The juxtaposition of these two findings suggests that increasingly, responsibility for training may have been shifted to individuals rather than to organisations.

· On the positive side, information technology has had a significant impact on virtually all industries. By February 2000 84% of small businesses (1-19 employees) and 100% of medium and large businesses owned at least one computer. However, there is some evidence to suggest that many firms have been slow to adopt more advanced IT applications (see Cairney & Speak, 2000).

The performance of industry of course varies across and within sectors. However, as yet, there is still relatively limited analysis that has been done on specific sectors. The Department of Industry, Science and Resources Action Agendas are the best source of existing data, but they do not cover all industries. The existing reports and data available suggest that the industry story in NSW is far from uniform, providing good grounds for caution when making claims about training or knowledge intensification for industry generally. We found for example, that when specific industry sectors were examined, knowledge intensity varied in significant ways across industry sectors. Using a varied set of indicators (see more detailed analysis in other reports listed in Appendix 2), our analysis suggested that the most knowledge intensive industry sectors are:

· Electricity
· Gas and Water
· Finance and Insurance
· Government
· Mining
· Property and Business
· Education

The least knowledge intensive industries were found to be:

· Cultural and Recreational Services
· Construction
· Retail Trade
· Accommodation, Cafes & Restaurants
· Agriculture, Forestry and Fishing
· Transport and Storage

There are significant challenges and opportunities for the VET sector as a result of this situation. How can the system cater for the diverse technology needs of industry? How can VET play a role in developing a more enterprising nation? What needs to be done to build the types of partnerships that will be necessary to adapt the VET system to a changing economy which is experiencing change in workplace practices, in occupational forms and in industry needs?

Training is a central component in any attempt to reform industry and increase its efficiency, innovativeness and competitiveness. However, one of the challenges in setting policy directions for VET in light of this is our finding of conflict between organisational expectations for training and the actual levels of commitment to training and technology advancement. A comparison of our survey results and data on organisational commitment of budget to training indicates that while organisations see training as important, they are not necessarily prepared to contribute a large proportion of their budgets to this area. This presents an important policy dilemma for governments.

In our survey of industry we found that when asked to nominate expenditure on accredited and non-accredited training, 59% and 50% respectively had expenditure below .5% of payroll. Roughly a third of organisations spent between .5% and 2.5% (34% and 33% respectively), and even less spent more than 2.5% of the payroll budget (8% and 17% respectively). This finding is consistent with the regular reduction in expenditure on training reported by the Australian Bureau of Statistics in recent years (see Buchanan et al, 2001 for a detailed discussion). However, caution needs to be exercised in reading these figures at face value, as the ABS data are likely to be excluding many legitimate forms of support from their calculations. These might include release from work for private study, commitment of staff time in mentoring programs, provision of time for employees to research specific aspects of their work during company time and so on. The ongoing conflict between individual and organisational agendas for training is also of concern. While the current VET system (particularly TAFE) is designed to meet the needs of individual students, organisations want to increasingly control the training agendas of their staff without necessarily making a significant contribution to the cost of this training.

It needs to be stressed that some organisations may spend relatively little on training (less than 0.5 per cent) for a variety of reasons. In case of the aquaculture industries that were examined in this study, the companies are very small, virtually managed by the innovators themselves. The firms depend more on networking and knowledge sharing than training. Firms of this type do not have the need (or the means) to formally train their staff. Similarly, the boutique food supplier studied as part of this study largely employed unskilled workers and added great value to these workers at minimal cost. From our case study it appears that because of the small family nature of the business the company was not utilising formal training at this point in time. Hence, a low allocation in budget to training may not necessarily suggest low commitment to training. Rather, it perhaps indicates the type of training or support of learning provided. Some of these companies also have 'on-the-job training', which does not usually require the firms to set aside large amounts of budget. In some cases it is quite apparent that recruitment strategies are also developed to minimise the budget on training. Other organisations in our sample were seeking to improve staff skill and knowledge with minimal budget allocation. Though these companies conducted training and used other training providers, the budget allocated for training was quite low.

One of the most encouraging findings from our stage 1 survey was that respondent answers in relation to business strategy showed a priority being placed on innovation and learning. When asked what changes had been made in organisations as part of business strategies, the three most frequently cited changes were commitment to continuous improvement (82%), improving the skills of the workforce (79%), and a closer interaction with customers, suppliers and distributors (73%). Each of these represents a commitment to continuous learning and an emphasis on new knowledge. Organisational commitment to the introduction of new technology (93%) and developing a learning organisation (67%) also suggest a valuing of learning and new knowledge as drivers of competitiveness in the

market. Furthermore, when asked what was the most important reason to increase accredited training, 58% nominated competitiveness and efficiency and 51% suggested innovation brought by new technology.

Each of the training provider case studies also demonstrated how some organisations are increasingly seeking to integrate training as an important part of their business strategies. When training and staff development are a central part of business strategy, organisations are more demanding in their requirements and the relationship they seek with training providers. In an Australian Industry Group (2001) study of Australia's move to a more competitive industry base, it was found that over 25% of firms surveyed had developed business strategies which emphasised international competitiveness supported by knowledge building activities including R&D and the development of their staff through training. At the very least, this valuing of training by employers suggests a significant opportunity may exist for the VET sector to meet new needs.

Each of the providers studied as part of this research had a close working relationship with one of our knowledge-base case studies. In each instance, the organisation had sought their services in order to upgrade the knowledge and skill of workers. For MM while the primary relationship with a local TAFE college was based on a traditional apprenticeship training model and workers were enrolled in trade courses, it was seeking a range of other partnerships designed to upgrade worker knowledge and skill.

The role that a private training provider played with TC (telocommunication campany) was even more fundamental to the business strategy of the organisation. This small consulting company was supporting management to position the company in the market place. It was also assisting TC to establish effective training practices and foster the development of a learning organisation.

Understanding this close link between organisational competitiveness and training is important for the VET sector and offers a valuable opportunity for major providers to position themselves to at least partially meet the need for training to support organisational development. Our case studies suggest that organisational and training needs are often closely linked to the innovation process for successful organisations. While this is related to the impact of technology, it is not restricted to it. In the 4 knowledge-based organisations studied in Stage 3, training was identified as a key driver and outcome of innovation. For example, HCSC (health care organisation) had used training to drive restructuring and reform across the entire organisation as it was forced to grapple with new regulatory requirements and the need to move beyond its beginnings as a voluntary organisation. This led the organisation to develop its own RTO. On the other hand, TC had sought to embrace an innovative approach to product development and marketing by instituting a program of formal and informal training for all workers. A metal manufacturer (MM) had also recognised that new technology was just one key to success, and saw that increasingly upgrading the skills and knowledge of staff was vital. Finally, an animation company (AC) illustrated how emerging industries are often heavily dependant not just on the entry skills of their workers, but also on the organisation's ability to foster ongoing learning as a central plank of the company's innovative strategy.

In each case the need to recruit the best staff, involve them actively in decision-making, and constantly assist them to extend their learning on and off the job, was seen as vital to organisational competitiveness. In particular, TC and AC illustrate how an organisational priority on training and on-the-job learning is critical to differentiation in the market place.

Even in MM and HCSC there is a strong awareness within management that all staff must understand their place within the overall organisation's strategic directions and play their part in increasing the organisation's competitiveness.

These findings are consistent with Rogers' (1998) finding that workplaces with higher levels of training undergo more change. We'd also stress that the reverse relationship also exists, the connection between change and training is reciprocal. Our findings also give support to the view that there are significant differences across industry in the propensity to change

Our data also suggest support for the view that skills and knowledge are simply one element (granted, a very important element) within a much wider matrix of factors that help to support higher economic performance, innovation and industry change.

The above suggests the need for action on a number of fronts by the VET sector. The enhancement of the role of VET in assisting NSW industry to embrace higher levels of innovation and stronger commitment to technology and R&D requires efforts by relevant agencies at state and federal levels (e.g. ANTA, NCVER, BVET) as well as key industry groups (e.g. AIG) to identify skill and knowledge gaps in specific industry sectors that have not been the subject of previous study.

Recommendation 1

There should be an ongoing strategic evaluation of existing mechanisms adopted by the VET system and industry in order to identify skill and knowledge requirements. This review should consider:

· existing VET practices;
· international examples of demand driven monitoring of VET training needs;
· recommendations for the development of improved assessment practices for VET demand;
· an assessment of the knowledge and skill needs of the un- and under-employed and the role that this group might play in filling some skill gaps.

What our findings also demonstrate is the need for the VET sector to give greater attention to organisational needs and for ANTA to increasingly align its training agenda with national innovation and industry reform. This requires more than a tokenistic addressing of innovation as a concept, it must move beyond credit transfer, joint teaching programs etc. This will require the sector to embrace innovation and enterprise at every level and will need to be demonstrated in policy, training institutions, training packages, course delivery and so on.

There is also a need for major NSW training providers such as TAFE to key knowledge creators. They must develop greater connectedness to key R&D producers such as universities, university research centres and major research organisations and relationships with other institutions must. This might well be achieved by seeking the involvement of TAFE in key Co-operative Research Centres as a major provider of training related to new technology developments.[3]

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[3] The TAFE involvement in the Australian Centre for Advanced Computing and Communication (ac3) is one example of this type relationship.

Recommendation 2

DET should actively seek the involvement of TAFE in key Co-operative Research Centres as a major provider of training related to new technology developments.[4] To support this strategy BVET should commission a review of the role that TAFE might play in technology diffusion. Such a review should be conducted in association with major industry associations such as the Australian Industry Group (AIG) and the State Chamber of Commerce.

The increasing diversification of industry is creating the need for changes in the form, content and outcomes of training

All three stages of our project have provided evidence of the increasing diversification of industry and, as a consequence, the diversification of training needs. This is occurring in a number of ways:

· First, new industries are emerging requiring different knowledge and skills. Our stage 2 case studies demonstrated how new industries such as aquaculture had knowledge and skill requirements not readily available.
· Second, existing industries are diversifying to such an extent that workers are under increasing pressure to embrace multi-skilling. For example, our case studies included a fitness company that had diversified by moving into software development for similar organizations, and a food wholesaler that began to sell gourmet food via the internet were two examples of organisations that placed new demands on staff as a result of diversification.
· Third, the introduction of diverse new technology places additional demands on staff and makes it more difficult for training providers to meet the needs of students.

The observations from our study are consistent with Finegold's (1999) contention that economies are diverse and that rather than being simply high or low skills in character, they can be characterised by diversity across regions or industries.

The changes we observed in this study are also consistent with Drucker's (1993) contention that new forms of knowledge are now becoming necessary and that specialised knowledge workers are growing in number and importance. While we observed some sectors of industry that are remarkably unchanged (e.g. parts of retail trade) by an increasingly knowledge-based economy, we also found evidence of emerging groups of workers who are unlike previous generations of workers. Not only in their higher levels of education and training, but also in the way they exercise greater control over the organisation's means of production - knowledge. For example, all workers at a metal recycling company (MRC) were required to become part of teams, and workers were required to undertake every role across the company's production process. In all companies with the exception of a food processing company (FWP) we found evidence that workers were increasingly being required to:

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[4] The TAFE involvement in the Australian Centre for Advanced Computing and Communication (ac3) is one example of this type relationship.

- understand how their work and roles fit into the total business;
- take on new tasks and acquire new knowledge and skills;
- constantly upgrade information technology skills;
- acquire knowledge in relationship to other workers as they undertook the daily work of the organisation;
- engage in a variety of forms of training that are both organisationally and individually driven;
- work more autonomously;
- monitor their own output, behaviour, progress and need for training;
- adapt to change;
- think creatively in order to arrive at solutions that enable their organisations to perform more effectively, and as a result, meet more fully customer expectations.

Associated with the changes in the organisations themselves was our finding that organisations are increasingly adopting more varied training practices and using a greater number and variety of providers. Our survey in Stage 1 showed that organisations are increasingly using varied options for accredited and non-accredited training. When commenting on new accredited training initiatives, organisations cited TAFE (28%), private providers (22%), and professional institutes (21%) as major sources of training. Within each of these types there also appears considerable internal diversity. For example, the training delivered by TAFE varied from accredited courses delivered on campus, workplace training in collaboration with the industry, online programs, short courses and so on.

Our data suggest that what the above changes in the content of work and work practices have done is to create a number of key changes (or need for change) in training provision.

a) The growing importance of Lifelong Learning

Across virtually all organisations studied, there was evidence of increasing importance being placed on lifelong learning. This is consistent with the findings of several other studies that suggest Australian workers see the importance of lifelong learning. For example, in a major ANTA (1999) survey of almost 4,000 community members it was found that generally the sample was "passionate about learning" but that this was not synonymous with education and training. The study identified four attitudinal groups: those who love to learn (23%), those who learn to earn (31%), those who value learning but have experienced barriers to learning (22%), and those who don't see learning as important (15%). We were able to identify all 4 groups within our individual case studies conducted in Stage 2.

The enormous variation in organisational, industry and individual needs provides significant challenges for the VET sector. As well, there is a need for TAFE and Community Colleges to continue to consider and foster their respective roles in stimulating and supporting lifelong learning. In light of the significant diversity in industry and the ongoing changes occurring, it is increasingly important for workers to consider their employability. Hence workers need to develop and maintain competencies, knowledge and skills necessary to stay in employment throughout their lives. In a recent report on European vocational education issues, Descy and Tessaring (2001) suggested that a platform for lifelong learning needs to be established through VET and that it has some central elements:

- Initial education and training must ensure that a minimum learning platform is guaranteed that provides basic skills and competencies that equip them to learn and adapt throughout their lives.
- Organisations and individuals must each invest in lifelong learning.
- Non-formal learning needs to be recognised, evaluated and considered alongside formal learning.
- Learning should be structured in programs with processes that contextualise content and facilitate problem solving.
- Information and communication technologies should be taught as part of all programs.
- Bridges and pathways should be built horizontally between different education and training routes and vertically between initial and continuing education and training.
- Links should be made between labour market and training systems to increase cooperation between the various parties.

What is not clear from our research, since it was outside the scope of the project, is just how the existing VET system contributes to the development of employees who value and pursue lifelong learning.

Recommendation 3

BVET should initiate discussions with key bodies such as BVET and/or ANTA and NCVER to undertake research that considers the extent to which existing VET training is preparing graduates for lifelong learning. Such a study should track graduates from their final year of training to their 5th year of work. Such an analysis would consider the contribution that the workplace learning, continuing education and industry bodies play in supporting lifelong learning. Such funding should be made available following a competitive process and would require industry to provide matching financial support.

b) The importance of social capital, teamwork and networking

Social and intellectual capital have come into use as terms which describe the particular capabilities of organisations for creating and sharing knowledge that derives from relationships with others (Nahapiet and Ghoshal, 1998). Social capital inheres in the relations between persons and among persons. Intellectual capital refers to the knowledge and capacity to produce new knowledge within collectivities such as the organisation, a community of practice or work groups, or professional practice networks. Within our study we have observed the importance of the social construction of knowledge in two forms. First, we have observed the importance of encultured knowledge for individual workers and organisations as workers learn from each other and acquire new knowledge as they relate to and work with others. Second, we have seen within our case studies the increasing importance of networks of organisations that learn from and support each other.

What was occurring in each organisation was a deliberate effort by senior management to ensure that staff knowledge and skills were being shared so that the organisation and its workers gained from the collective resources of all workers. In 2 of the organisations, one an animation company (AC) and the other a telecommunication company (TC) this had lead management to carefully select staff with knowledge and skills that enabled the building of cohesive teams of workers with varying abilities. At TC these teams were linked to customer needs, with each team being carefully formed to ensure that quality service and products were delivered. At a health care organisation (HCSC) a deliberate effort had been made to group field staff into small teams linked to one supervisor to enable the facilitation

of learning and knowledge sharing about client services, new company policies, OH&S practices and so on.

Blackler (1995) links this move towards collaborative team-based practices to what he calls 'encultured knowledge'. Individuals acquire this form of knowledge in groups. Individuals benefit from teamwork, in developing 'encultured knowledge', that is, communal understanding shared between a group of people. Waterhouse, Wilson and Ewer (1999) have suggested that in the knowledge-based economy those individual competencies may not be the most important outcomes of vocational training. They further suggest that given the increasing importance of individuals being able to work together in teams and groups that more attention should be given to "collective competence". Our findings would support this suggestion.

Our individual interviews with 26 workers provided evidence that learning within work groups or with others is very important in the knowledge economy. With the rapid growth of technology and flow of information, individuals find the need for interdependence, the sharing of information, and networking, as essential to being at the competitive edge in their industry. Nearly half of the respondents (11) claimed that networking was beneficial for learning.

It was interesting to note that of the 26 individuals interviewed in Stage 2, 17 stated that their organisations used team-based learning and had an effective working environment. Most of them also found teamwork to be one of the most useful ways of learning. For example, Sue a pharmacy store manager at a public hospital, commented on the team based culture in pharmacy, and the respect for the different contributions that people can make. She described it as a kind of 'reciprocity in learning'. "We really work together well as a team." Felino commented that he had been working in different team environment in his company, a large food manufacturer, which had helped him to gain a lot of inter-personal or social skills. He believed he would not have been able to learn or gain such skill by other means. Geoff, as an area manager in an IT&T firm, valued the input of fellow sales people and the interdependence of team that gave him the confidence to make good decisions at work. Finally, Belinda, who worked in a bush regeneration environment consultancy, was a team supervisor. She suggested that while being part of the team and leading it, she has also been able to acquire new knowledge in identifying flora and fauna as part of her interaction with others.

Drawing on data from the Stage 1 survey as well as the organisational and individual case studies, we found evidence of varied organisational restructuring and new work arrangements in the following forms:

- The introduction of new team based structures (6 companies).
- Reduced levels of hierarchy, with more devolution to team leaders and supervisors (3 companies).
- Employee involvement practices (3 companies).
- The introduction of multi-skilling of workers, enabling more flexible deployment of staff (8 companies), as well as examples of job rotation and other forms of multi-tasking.

The organisations we studied in stages 2 and 3 also expected the individuals to develop good networking in order to be informed of the latest developments, particularly in technology based industries such as telecommunication, animation and pharmaceutical organisations. However, this was not confined to high technology workplaces and was as

important for a scuba retail firm (SR) as it was for an emerging aquaculture companies. For example one worker, suggested that if employees cannot keep up to date, they are left behind, and pointed out that "it is taken for granted that you have a network not just within the organisation but outside, and you are aware of developments, what's going on outside the organisation, who's doing what."

Networks and partnerships between organisations were also seen as increasingly important within the management and organisational literature. It has also been demonstrated that the nature of the networks in which companies are involved influences the kinds of interactions which occur, the flow of knowledge and the nature of the knowledge which is generated and diffused. The companies in our study participated in networks of many different kinds. These included customers and suppliers, parent companies, competitors and other leading companies, partners in strategic alliances and joint ventures, trade and industry associations, scientific organisations and a host of other more informal kinds of networks.   The knowledge resources acquired through such networking related to advances in scientific knowledge, emergent technologies, new ideas and concepts in customer service, market intelligence, benchmarking and standards, new ways of doing business, and new products, services and processes.

No firm operated in isolation and all participated in some kind of networking activity, with only three amongst our twenty case study companies not viewing their inter-organisational relationships as a significant means of learning or of tapping into knowledge that had economic value for the firm. Several firms (in manufacturing and pharmaceauticals) were reluctant to network locally with competitor companies for fear of losing competitive edge. This sentiment was shared by other companies that considered themselves to be the most advanced in their industry sector, with little to gain from similar plants.

Strong connections across porous boundaries have been found to be associated with knowledge intensive companies in other studies (e.g. Bickerdyke, 1996), and we found some evidence of this in our companies.   The telecommunications company, the most knowledge intensive of all the companies we investigated, incorporated its corporate customers into its organisational framing. In fact, knowledge of customers, technology and markets was a priority for this and other companies and one of the core strategies for achieving it was connectedness in and outside the organisation. This again is consistent with literature (see our review of literature listed in Appendix 2) that suggests that innovation is a process of continuous, day to day dialogue between producers, suppliers and customers.

One of the greatest challenges of any VET training provider, in preparing workers for the type of changing work environment described above, is the need to demonstrate in their own practices the very environment for which they are preparing students. These findings suggest three major forms of action that are needed by BVET.

Recommendation 4

First, ITABs and VET providers need to recognise the importance of encultured knowledge to innovative and competitive organisations. BVET should convene a major forum between ITABS, their industry partners and VET providers to consider joint responsibilities in this area.

Second, BVET should assist the DET and other providers to introduce more effective promotion of networks amongst students and evaluate the extent to which this key knowledge form is present within existing programs.

Third, BVET should work with the Department of Education and Training to establish new practices and evaluations designed to turn major training providers into learning organisations. This process would begin with TAFE but would be designed to demonstrate to all providers how such organisations can be created. There would be 3 key elements to the process:

· a review of Departmental cultural and Institute practices designed to assess the extent to which it is a learning organisation;
· the development of strategies designed to support TAFE institutes as they begin to reform internal practices at all levels of the organisation;
· the development of new benchmarks to enable ongoing evaluation of each institute's success in transforming itself.

c) The Growing Importance of Informal Learning

An important finding across all three stages of this project has been the consistent valuing of informal learning. Our stage 1 survey indicated that on-the-job training was the most popular form of non-accredited training and learning (77% of all organisations selecting it). As well, our case studies of 4 knowledge intensive organisations in stage 3 indicated that informal learning was very important. Each of these organisations placed a high value on the learning that occurs on the job as part of team-based work or as a result of mentoring. In the three larger organisations senior management was increasingly expecting middle management to foster learning amongst workers for whom they were responsible. In all organisations there was also an expectation that learning was required on-the-job and that all workers had a responsibility to share their knowledge with other members of work groups or teams. Whilst this priority was driven by management, all managers were keen to create work cultures that valued learning and facilitated the sharing of ideas, skills and new knowledge. This was particularly the case in relation to technical skills and knowledge but there was also an increased priority being placed on the need for workers to help each other to develop key generic skills such as the ability to work in teams, solve problems, take initiative and assume responsibility.

A related finding from our survey of industry was that organisational growth is positively related to the need for non-accredited on-the-job learning. We found that the proportion of organisations providing such learning opportunities increased by 33% when comparing low growth and high growth organisations. Interestingly, there was no relationship between growth and the use of accredited formal training. This suggests that companies looking to expand, which includes many of the most innovative organisations, are relying less on formal accredited training and more on in-house on-the-job learning and training.

Perhaps surprisingly, the magnitude of change in work organisation is not a powerful predictor of the provision of non-accredited training/learning. It is marginally significant only in the provision of non-accredited on-the-job training (see more detailed discussion in other reports outlined in Appendix 2). This suggests that the changes in work organisation made by our sample may not have been changes designed simply to improve flexibility and the utilisation of worker's diverse skills and tacit knowledge as found in much of the literature on organisational change in the knowledge-based economy (e.g. Drucker, 1993). Indeed,

some of the changes in work organisation may be a result of a move towards standardisation rather than flexibility. This would explain the association of changes in work organisation with accredited formal training. These findings support Mehaut and Delcourt (1994), who found that many reorganised firms were success stories in terms of increased productivity but not in workforce skill development.

In view of the increased importance being given to informal learning in organisations, action within the VET sector is necessary, particularly if it proves to be the case that this is at the expense of formal learning.   A major OECD report has argued that the identification, evaluation and recognition of informal learning is a vital first step in supporting its development, and outcomes which build a process of lifelong learning (OECD, 2001).

Recommendation 5

BVET should investigate how informal learning might be more effectively recognised and how mechanisms could be established in association with industry groups to more fully integrate on-the-job learning with accredited training. As part of this process, BVET should investigate:

- what forms the informal learning takes;
- how these forms of learning contribute to the productivity of the workplace learning communities;
- mechanisms for supporting these forms of learning in workplaces to improve productivity;
- how to improve employer access to existing recognition of prior learning services;
- expand the variety of pathways into apprenticeships in association with industry groups that recognise prior learning.

d) The Valuing of Generic Skills and Tacit Knowledge

A consistent finding throughout this study has been the valuing of generic skills and tacit knowledge. However, like Statz (1997) we find that while the importance of this issue to organisations cannot be questioned, exactly what is meant by generic skills varies across different contexts. Our survey found that generic skills were valued highly by the majority of respondents with high value being placed on interacting with fellow workers, customers and management (73%), taking initiatives (72%), and taking responsibility for their own work (69%).

This finding is consistent with the work of Green, Ashton, Burchell, Davies and Felstead (1997) in Britain who found an increase in the need for problem solving skills from 1993 to 1997. Using a combination of existing qualitative and quantitative data, Wolff (1996) was able to use time series sampling to conclude that from 1950 to 1990 there had been a significant increase in the use of cognitive and interactive skill in the USA, and a decrease in the use of motor skills.

However, there is great uncertainty concerning just what employers mean by each of these skills. It also appears that the exercise of such generic skills can vary greatly across industry contexts. This was confirmed by our case study work within knowledge-based organisations. For example, when the management of a telecommunication company (TC) talked of staff solving problems, they were referring to staff seeking technical solutions to

customer problems. This involved using the knowledge the company possessed of customers to assess and meet their needs and as well, seeking software and technology solutions for organisational problems. On the other hand, a heath and community service company (HCSC) was requiring staff to monitor client health and satisfaction and to seek ways to improve organisational services. In an animation company (AC) staff were primarily seeking better ways to produce more complex 3D animations in as quick a way as possible. Finally, a metal manufacturer (MM) wanted staff to monitor the production processes and using their knowledge and know how to bring about product and process improvements.

Whilst our research project is not the first to identify that such skills are seen as important (see for example Kearns, 2001 for a detailed review conducted for NCVER), we would caution against overstating their importance. Whilst respondents might suggest that they are important, it is interesting to note that our analysis of data indicates that generic skills are not good predictors of training and learning provision. Our analysis suggested that placing importance on generic skills did not have a significant relationship to the provision of accredited or non-accredited formal training, nor accredited or non-accredited on-the-job training. Our findings also indicate that employer attitudes to generic skills and their actual practices in relation to skill creation are not strong. However, this needs to be tested further in the Australian context. In a recent study in the UK (Skills Task Force: Research Paper 8, 1999) there was some evidence that employers were prepared to pay extra for some generic skills. It found that employers would pay more for workers with higher computing skills, professional communication and problem solving. This study tested the value of supposed key skills in the market place and found that while employers were prepared to pay a premium for some skills, not all were valued enough to pay workers more for them.

The perceived importance of generic skills also needs to be considered in the light of the importance of other skills. For example, there is also evidence of the need for skill upgrades in other areas. For some organisations there is increasing need for technical skills, while for others the needs are more closely related to changes in government or professional standards and the introduction of new regulations, and technological changes. Over half of all respondents indicated that there had been a need for their staff to increase their job-related skills (52%) and to adapt to new Occupational Health and Safety (OH&S) regulations (55%). An even greater number of organisations suggested that technology changes had an impact on the need for training (71%).

As one would expect, emerging industries such as e-business (87%), 3D animation (68%) and new media (74%) had the highest reported rates of increases in the need for new skills.

What the above discussion suggests is some evidence that generic skills are seen as increasingly important. However, there appears to be variability across and even within industry sectors. Mulcahy and James (2000) have gone as far as suggesting that distinctly different discourses of competency are developing in different industry sectors and between different workforce groups. They conclude that two broad models of VET are emerging – a training model that emphasises competence in specific practices and a developmental model that emphasises competence in generic practices.

The role that Competency Based Training (CBT) plays in the development of generic skills is an important issue for VET. CBT was introduced in response to a perceived weakness in Australia's skill formation system to meet industry's needs. As such, the call by industry to give greater consideration to generic skills must be taken seriously. One of the regular

criticisms of CBT has been a perception of educational narrowness (Smith, 1999). However, given that a number of training packages directly address generic skills, that less than half courses use CBT, and that CBT reforms were accompanied by a strong call for the development of such skills, it seems unfair to point blame simply at CBT. In essence there appear to be several issues that require further research and attention:

- There appears to have been an over-reliance on technical competence and an under representation on generic skills (Mulcahy & James, 1999).
- The impact of CBT on learning and pedagogy needs to be assessed – just what impact does it have on the teaching and learning processes that teachers implement, and how do these build or impede the development of generic skills such as (for example) problem solving?
- What role does curriculum development play in the fostering of generic skills amongst students?
- How well does CBT match the learning styles of all students – are some students disadvantaged by competency based approaches?

Related to this discussion is the call by some training leaders, industry groups and researchers to examine how enterprise skills can be encouraged as a means to increase industry's innovativeness and competitiveness (e.g. Karpin, 1995). Karpin concluded that Australia does not have an enterprise-based culture and that one needs to be stimulated, particularly at the school to work transition. More recently, Kearns (2001) has made a similar call for enterprise skills to be fostered in order to build a different culture in Australia that values attributes such as creativity, adaptability and innovation.

Recommendation 6

BVET should conduct a broad-based strategic review of generic skills, that involves an initial review of the cross-disciplinary research into generic skills to arrive at conclusions as to their specific nature, as well as recommend the implications of these findings for the productivity of vocational learning.

BVET should also work with all ITABs to revisit the issue of generic skills in order to assess the extent to which existing training packages recognise their importance. As well, it should collaborate with the Department of Education and Training (DET) to conduct an internal review of selected TAFE delivered courses to assess the extent to which existing curriculum and pedagogy recognises and stresses the importance of generic skills. Finally, BVET should work with industry to devise methods for supporting the development of specific generic skills through on-the-job learning.

e) An Increased Need for Multi-skilling and Multi-tasking

The rapidly changing nature of some industries and workplaces is also leading to an increased demand for workers to utilise multi-skilling and multi-tasking. A majority of organisations surveyed in Stage 1 suggested that key changes in work organisation had been made in recent years. A large number (70%) had seen an increased demand for multi-skilling and multi-tasking, many had seen the need for greater staff involvement in decision making (60%) and a majority had introduced more flexible work practices (52%). This is consistent with the findings of Green et al (1997) that identified a significant rise in the need for such skills in Britain between 1986 and 1997. Half of the rise was due to occupational changes, and the other half was due to skill upgrading within occupations.

What is less clear from our survey is what was meant when respondents referred to multi-skilling and multi-tasking. They may have been referring to new technical skills and tasks, or simply a broadening of the range of previously required skills or tasks. However, there is no reason to doubt that the changes being referred to are consistent with the trends reported in other research indicating that vocational skills are fading in importance relative to multi-skills.

One interesting issue to consider is that such changes are associated with changes in what we refer to as 'skill'. In their assessment of skill changes in the Australian economy, Tegart, Johnston and Sheehan (1998) observed that using the traditional understanding of 'skill', the employed workforce is not necessarily becoming more skilled. They found that employment is growing rapidly in many person-based or information-intensive occupations not previously regarded as skilled, but which clearly involve skills of value to modern employers. Tegart and his colleagues suggest that this continuing change in the nature of the skills in demand, is a major challenge both for policy and for educational and training institutions.

Recommendation 7

BVET should investigate the extent to which employers are requiring multi-skilling as part of work practices and what this means for specific areas of training. Such a review should be done in association with peak industry groups, as well as ACOS, ACAL and others who represent the un- and under-employed potential working population, and should seek to investigate any skills and attributes that existing training programs fail to address that are important for flexible work practices of the kind described above.

Changes in technology are creating significant problems and opportunities for the VET sector

One of the most consistent findings in this study across all stages was the influence of technology on the nature of work and training. Technological advances had affected all 20 case studies undertaken in stage 2. The impact of technology can take a number of major forms.   First, in some cases it has reduced the need for workers to rely on embodied knowledge and increased dependence on encoded and embrained knowledge[5] (see our review of literature listed in Appendix 2 for more details on these forms of knowledge). This was seen most clearly at a metal manufacturing factory where operators who once carried out simple procedures (e.g. removing waste, cleaning machines etc) were monitoring the operation of increasingly sophisticated technology. Second, technological changes have led to changes in basic work practices increasing the importance of team-based work, and requiring workers to exercise greater responsibility for expensive plant. Third, most workers have been affected by the increased use of IT in the workplace and the need to constantly upgrade skills.   These findings are consistent with those of Zuboff (1988) who argued that new technology brings about changes in organisations not always expected. She found

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[5] Blackler (1995) has outlined a typology that suggests 5 majore forms of knowledge exist: Embedded knowledge (i.e. that which is embedded in technologies, rules, procedures and routines)**;** Encoded knowledge (i.e. that form of knowledge conveyed by signs and symbols); Encultured knowledge (i.e. communal understanding shared between a group of people); Embodied knowledge (i.e. that which is action oriented - 'know-how'); Embrained knowledge (i.e. that which is abstract and dependent on conceptual skills and cognitive abilities 'know-what').

that "action oriented" skills (i.e. embodied knowledge) are often displaced by computer technologies (i.e. encoded and embrained) leading to increased demands for workers to interpret decontextualised and abstract symbols, use new (or higher levels of) cognitive abilities including deduction and the use of new knowledge systems.   Such changes in knowledge use and demands obviously have implications for training.

The impact of technology was also confirmed by our Stage 1 survey. This identified a significant positive relationship between technology utilisation and accredited and non-accredited formal training as well as to non-accredited on-the-job learning. This confirms what intuitively we would expect, that organisations utilising increased levels of technology, also increase training and on-the-job learning to cope.

Technology has also had a significant impact on training needs across all industry sectors. In particular, computing skills were cited widely as an area of high need (60% of respondents) and included the need to learn to use new software programs, upgrade skills in using databases, access new management programs etc. However, technology is not restricted to information technology and organisations within manufacturing and human services and health cited technology changes as key influences on training needs. Because of the complexity and speed of technological change there have been associated training consequences. Increasingly, technology suppliers provide training for their equipment and staff are required to frequently upgrade their skills.

Of course the impact of technology on training provision varies across industry sectors. Three of the four organisations reviewed in the Stage 3 knowledge-based case studies suggested that it has a significant influence on training needs. The fourth, (HCSC), saw less impact, but even in the aged care industry not noted for technology advances, IT&T was having an increasing impact on the way field workers did their work.   More significantly, technology needs were creating serious issues of training relevance for organisations and individuals associated with two of the training providers examined - Maxwell TAFE and Synergy. In particular, our case study of Maxwell TAFE's sheet metal unit highlighted the challenges for such providers in maintaining the latest technology, as well as offering training with technology of relevance to the students' current or future workplace. The Head Teacher admitted that it wasn't possible any more for the college to keep up to date with the technology available in industry, nor the diverse range of technologies even in similar manufacturers. Instead, he argued for an emphasis on more generic forms of knowledge and technical skill and the development of graduates able to transfer core skills and knowledge to different work contexts. This response may be acceptable to larger organisations with a capacity to provide significant on-the-job learning, but SMEs are more resistant to such views and argue for training more closely aligned to their technology requirements.

The inability of the TAFE sector, in particular, to keep up with technological advances has important implications for Australia's industrial competitiveness. In particular, there is a real danger that if a technology gap emerges between innovative industry and training providers, that the VET system might well reinforce what Finegold and Soskice (1988) referred to as the low skills equilibrium. We need to avoid the possibility of some industry sectors becoming trapped in a self-reinforcing network of institutions, organisations and practices that interact to stifle the demand for skills and knowledge improvement.

These findings are consistent with a recent report from the Australian Industry Group (2001, p. iv), *Training to Compete*, which found that technology was "one of the integral factors changing the nature of work".

We believe there are three key technology issues. First, as we have established in the earlier stages of this project, technology is an important driver of changes in the nature of work. Second, it is a key issue shaping training in all its forms. Third, it is a factor that is creating greater pressures on the institutions providing training for industry as they struggle to keep up with the latest technological advances.

Technology needs are a critical issue with clear implications for the VET sector: Of prime importance will be action by major providers such as DET to foster industry partnerships as a matter of daily practice by TAFE staff. All providers will need to achieve partnerships with industry and industry associations for the provision and refreshing of technology on a regular basis.

One of the key challenges for VET providers, particularly TAFE institutes is how they will be able to keep up with the rapidly changing demands for technology across most industry sectors. Access to the latest technology and the ability to refresh it regularly has significant resource implications for the VET sector.

Recommendation 8

BVET should institute an immediate review in association with peak industry bodies to establish the extent to which TAFE institutes are able to meet industry requirements for technology. Such a review would seek to identify mechanisms for facilitating:

· partnerships with major technology manufacturers for training facilities and curriculum input;
· the creation of key training facilities across all industry sectors that are funded as a partnership between industry and training providers;
· consortia comprising VET providers (private and public), industry associations and industry representatives to facilitate leading technology based training.

In the emerging knowledge-based economy there is an increased need for VET providers to explore new forms of industry collaboration and partnership

The research literature has highlighted the importance of collaboration and partnerships as key strategies to increase organisational competitiveness (Roelandt & Hertog, 1999). Our Stage 2 and Stage 3 case studies both illustrated just how important partnerships are for the most innovative of organisations. However, there was less evidence of collaboration between organisations in relation to training than would have been expected. It is obvious from our three provider case studies that collaboration is a key for the provision of effective training for industry. The dominance of TAFE as the major VET provider will inevitably undergo further change as industry seeks what it sees as more relevant and cost effective ways to meet their training needs. The VET system has already undergone considerable change in the last 10 years. However, increasingly creative new forms of collaboration will be needed to meet industry needs in the future as the impact of the knowledge-based

economy becomes more marked. Nowhere is this seen more clearly than in the case of emerging industry sectors.

Our 3 provider case studies provide pointers to some of the reforms that are still needed. The sheer range of providers sought by each of the knowledge-base case studies is instructive. The telecommunication company (TC) had entered into collaborative partnerships with 4 companies to provide technical training and a further 5 companies for non-technical training. This company demonstrated how one innovative company was seeking to create training solutions that matched their business agendas. They were not happy with generic training solutions, instead they wanted options that related specifically to their own organisational agendas.

Maxwell TAFE also demonstrated that within the TAFE sector collaborative partnerships are not only possible but are becoming more critical to the provision of training to meet both industry and individual needs. However, the case study also demonstrated that the VET sector is currently under-resourced for the task.

BVET should explore how new forms of collaboration can be fostered, particularly as these relate to technology provisions. The options include:

·   The development of training Centres of excellence in all major industry training areas. Such Centres should ideally have a range of external partnerships including the involvement of university, industry and government partners.
·   The pro-active involvement of TAFE in the establishment of clusters or regional networks of companies in specific areas of regional strength.
·   The development of more collaborative approaches for the delivery of workplace components of training using industry based trainers and assessors, including TAFE involvement in-group training companies established in association with specific industry associations.

In considering an enhanced set of new partnerships with industry the VET sector also needs to consider a number of specific needs that might be addressed.

a) Catering for the needs of Small to Medium Enterprises

The difficulties experienced in meeting the constantly changing technology needs of industry highlights yet another critical issue, the different training demands for small to medium enterprises (SMEs). Three of the four knowledge-based case studies in stage 3 demonstrated how each of the organisations had been able to shape (at least to some extent) their own training agendas. The fourth organisation (AC) was unable to do this. They neither had the human resource or training manager, or the knowledge necessary within management to do more than simply respond in ad-hoc ways to perceived staff training needs.   This is consistent with research by Balzary (1998) which suggests that while large organisations have gained much from market reform, small to medium enterprises have not fared as well and as a results there is some evidence that SMEs are not as happy with the VET system (Gibb, 1997). Similarly, other studies have suggested that SMEs do not participate as actively in the VET system, but instead rely more on informal on-the-job learning (Kilpatrick & Crowley, 1999; Field, 1997; Gibb, 1997). The latter is consistent with the findings from our stage 1 survey and the case studies of some small organisations. Larger organisations also tended to have a healthier understanding of what the VET system can and cannot do.

The key issues are not simply human resource deficiencies in smaller organisations, nor that because training programs need to cater for industry diversity that they are better suited to larger organisations than to widely varying SMEs. The Maxwell TAFE case study demonstrates the many ways in which SMEs do not have available to them the same range of training options as MM. Unlike MM, many SMEs will have just one new apprentice or a single worker to undertake training. For this company, the specificity of training, particularly in relation to technology was a critical issue. While larger organisations like MM can provide rotation of staff around the workplace and a structured mentoring program, this is not as easy for an organisation with 3 workers.

The Maxwell TAFE case study also provided useful insights into the increased demands placed on SMEs simply in terms of workplace assessment relating to training packages. The college's initiative in developing skills logbooks is a good example of how large training providers can work to meet the specific needs of small organisations.

The case study of an animation company (AC) also highlighted the special needs of many operational adhocracies, particularly in emerging industry sectors. The difficulties that AC had in having their training needs met indicates that there are gaps in training provision that are yet to be filled. There are of course solutions for such small organisations, some of which have been highlighted above. Other options include the development of more industry sector clusters and networks that could aid training provision. There is also a continuing need for industry associations to take more responsibility for the provision of training solutions in association with other training providers.

Recommendation 9

BVET should investigate how TAFE can assume a far more high profile role as a training broker specifically for SMEs. This service would move beyond that currently offered by Industry Service centres with their focus on the apprenticeship and traineeship schemes. BVET should investigate how Innovation Centres could be established in partnership with other key stakeholders. These Centres should be established as intermediary organisations in large urban or rural centres and should operate as incorporated entities with a combination of industry partners, business or industry associations, TAFE and perhaps universities. Their function would be to support SMEs at three levels:

· business support;
· technology sourcing;
· training provision.

b) Considering new options for workplace training

All three stages of this project have suggested that the relationship between the workplace and training is an important one. However, rather than suggesting that the workplace is the best place for training to occur, our study points to the importance of the relationship between external training and workplace learning and training. Once again, industry diversity would suggest that there is not a single best way to integrate workplace learning and VET training.

The three provider case studies in stage 3 demonstrate the essential relationship between workplace learning and formal training. All three case studies demonstrate that any initial

VET training course cannot hope to teach students everything. Increasingly, initial training simply prepares workers for lifelong learning as part of professional practice, with subsequent training continuing the process. With the increasing diversity of organisations, and the rapid changes in individual career trajectories, there is a need for training providers and course developers to look for greater natural synergy between training and workplace learning.

HCSC provides an interesting case in point. This former government department that had been incorporated needed to retrain all of its field staff. The national training reforms provided the possibility for the new company to create its own training company that now works with a range of other providers to meet the company's needs. The RTO created (HCTC) by the organisation offers a range of existing accredited programs, individually developed units of study and short courses from varied providers, embedded within a structured approach to training that seeks to develop every worker in the organisation. In many senses HCTC is more of a facilitator and broker of training than a provider. What it is able to do that TAFE colleges do not do, is more closely serve the needs of the organisation and work to align individual training agendas with their business strategies. The company is concerned as much with the parent organisation's development and efficiency as it is with training.

Similarly, TC enters into training partnerships under the leadership of its HR division in order to shape the development of each worker as a significant part of its competitive and innovative business strategies. The organisation does not expect an external training provider to simply be able to meet their staff training needs. Rather, they seek to use available training that supports structured and informal learning within the workplace.

There are special challenges within the specific industry sectors that we studied. For example, the aquaculture industry requires new programs that reflect the varied needs of an emerging industry. The manufacturing industry on the other hand requires training that will fill skill gaps and equip the workforce to cope with increased automation. The latter, provides an interesting challenge for the VET sector as it struggles to equip workers to take their place in sub sectors of the industry with widely varying technology demands and levels of innovativeness. Training needs vary even within industry sectors, and reflect organisational and industry levels of technology commitment, the entry qualifications of staff, workplace practices and so on.

Onstenk (1997) argues that in any workplace learning takes place as a consequence of a chain of planned and unplanned learning events. As such the potential for workers to learn will vary across job contexts. Hence, there is great merit in looking for innovative ways to combine formal training with on-the-job learning. Similarly, the Australian Industry Group (2001) suggests that learning and work should be more closely integrated, with a range of ways for people to combine study and work being developed. The starting point for such efforts are clearly apprenticeship training and the further development of VET in High Schools.

One final issue that needs to be addressed is the growing number of workers who do not work for a single organisation, or who work only part-time for an organisation. The growth in outsourcing and part-time work is a significant issue in relation to training (see Buchanan et al 2001 for a full discussion of these issues). Consideration needs to be given to how this rapidly growing sector of the labour market gains equal access to VET with an increasing emphasis on workplace learning. It needs to be stressed that the term

'workplace learning' in this report and its recommendations is as much about training *for* workplaces as about training *in* workplaces.

Recommendation 10

BVET has a major role to play in encouraging training providers such as TAFE to embrace workplace training and training for workplaces as a more fundamental part of all industry training programs. This should involve work with major providers to support them in establishing internal mechanisms for identifying, developing and monitoring a range of partnerships that involve workplace delivery. This role might encompass:

·   development of additional training packages to meet industry needs;
·   a more active role in developing TAFE's role in support of SMEs in workplace assessment;
·   the capacity for individual TAFE institutes to establish direct links with industry in forming innovative training partnerships;
·   a longer term view of how initial training and continuing professional training are linked and support each other;
·   consideration of how the needs of casual and outsourced staff might be met.

Recommendation 11

BVET should also work through the DET to establish a trial of innovative workplace options for training that articulate with existing TAFE initial and continuing VET. Such a trial should:

·   ensure partnerships between the workplace and the provider;
·   involve both workplace and provider based training;
·   should articulate a continuous plan that shows how initial and continuing VET as well as on-the-job learning relate to each other;
·   trial a variety of innovative learning strategies including work groups (see Onstenck, 1997), job rotation, quality circles, online education, self directed learning, problem-based learning, mentoring etc (see for example OECD, 2001).

c) Supporting organisations as they seek to become 'learning organisations'

As our findings have demonstrated, on-the-job learning and workplace training is seen as increasingly important for most organisations (77% rating it as important). This is consistent with other major reviews of industry, which also favour a "blurring or porousness", between formal institutional and workplace training, including a rethink of the way resources for training and learning are allocated. For example, the AIG (2001) commissioned a report, found that 62% of organisations preferred the enterprise as the site for training.

Closely related to the above observation that training is related to business strategy, is the role that each training provider plays in supporting companies to become learning organisations. This role is best demonstrated by Synergy's role with TC and that of the registered RTO of the care organisation (HCSC) with its parent organisation. In each case, while the training companies deliver programs they also act as brokers sourcing appropriate training on behalf of their client. To a lesser extent it could be claimed that this same type of relationship is developing between Maxwell TAFE and MM. The key difference is that in the case of Maxwell, it is MM that is seeking the relationship, and Maxwell that is responding to the need. The latter is symptomatic of a larger problem across parts of the

TAFE sector of a responsive mindset, whereas a more pro-active role is required by industry. Unlike the other training providers, Maxwell TAFE demonstrates less involvement in the initiation of the relationship. In the case of Synergy and HCTC the training provider plays a key and equal role in attempting to transform the organisations.

In each case there are several keys to the success of the training relationship. First, there is trust between the training provider and the organisation. Second, there is frequent contact between the partners and a strong involvement by the training provider in attempts to change the work context. Third, the training provider takes a pro-active rather than simply a reactive role.

The building of a learning organisation in each case involves the training provider:

· working closely with management to set training and learning agendas;
· setting aside staff to be involved in strategic planning processes with the organisation
· working with the organisation to devise systems that support staff to monitor their own learning and make training decisions;
· assisting organisations to support their staff training agendas so that they are married as much as possible with organisational needs.

Recommendation 12

BVET should work in partnership with DET and industry associations to seek federal funding to support the establishment of 3-6 industry renewal centres. These centres would have the following characteristics and purposes:

· they would be established after joint consultation and research with relevant industry associations into the skill and knowledge needs of existing or emerging industries;
· they would have a special focus on SMEs;
· they would emphasise training *for* workplaces as being about training *in* workplaces based on innovative inclusive models of mentoring each of these groups of people;
· they would provide business support and advice on training options;
  their purpose would be to help industry fill skills gaps and to work with organisations to transfer themselves into learning organisations; to create opportunities for new jobs.

d) Exploring new opportunities to work with industry clusters, networks and regional economies

The innovation literature talks a great deal about the development of learning regions as an important part of economic and industry development. It is a concept that is used to describe geographically co-located organisations involved in clusters of economic activity supporting individual organisational competitiveness and innovation. The concept reflects our growing understanding that the proximity of organisations facilitates frequent, close, face-to-face interaction, that firms in the same region often share a common regional culture, and that such arrangements help to build trust and "grease the wheels" of the social learning process (Gertler, 1999).

While our case studies suggest a high level of networking by workers and management, there is less evidence within the Australian context of the development of industry clusters as a vital part of industry strategy. Marceau (2000) has examined this issue and warns that such networks are vital especially for SMEs as a means to connect organisations to leading

R&D. While we identified some evidence for emerging clusters and networks, most were poorly developed. For example, the gourmet food producer (GFP) had established a network of producers and retailers as part of a strategy to introduce a regular regional growers market. Our metal manufacturer was also part of a loosely coupled technology network of manufacturers, engineering companies and toolmakers. However, none of these networks of organisations approach the level of integration and networking that characterises many of the industry clusters discussed in the innovation literature.

Internationally, clusters and networks as sites of innovative activity have been a central focus of policy makers, particularly in Europe. This reflects a growing understanding of the relationship between knowledge creation and diffusion, innovation and education, learning and training.

One issue of concern in the NSW context is the observation from our case studies of a growing disconnection between the strategic planning processes of major education and training providers and key regionally based organisations such as business groups, industry associations and governments at all levels. With this comes a divergence in policy development and promulgation that does not aid the innovation process. Having said this, it needs to be stressed that major VET providers do attempt to build relationships with regional industry, however, this needs to be more strategically driven to meet regional as well as institutional agendas. A related issue is the finding in a major study for ANTA that examined the role of VET in regional Australia (CRLRA, 2000) that VET plays a significant role in regional communities. This highlights the significance of other findings that some smaller centres lack the variety of VET provision of larger centres (Kilpatrick & Bell, 1998). It would seem even more critical for the regional provision of VET to match specific strengths, gaps and opportunities in regional communities.

Amongst a range of recent research findings is the work of the OECD (2001) "Cities and regions in the new learning economy: Education and Skills". This research claims that '...innovation by firms is the cornerstone of regional growth (p. 97). However, it cautions that '...new, alien work cultures can fail to take hold if they do not engage all actors' (p. 105). As such, collaboration between educational institutions, government and industry is essential to progress regional agendas. VET education is vital to regional development because. The OECD suggests that "attention to higher learning can help attract knowledge intensive firms" (p.106). Hence, strong links between industry and educational institutions is essential so that education and training can be better coordinated with regional economic development.

One significant way forward for NSW industry may be the introduction of more sectoral training initiatives that attempt to meet the needs of clusters of organisations. In Norway such training initiatives have been used as one mechanism for building more explicit linkages between organisations. Specialist schools have emerged that also provide access to collective infrastructure and greater access to research facilities and outcomes.

Recommendation 13

BVET should work in association with the Department of State and Regional Development (SARD) and DET to institute a review of how regional provision of VET matches regional skills gaps as well as opportunities. This should commence initially with a trial in 3 regions in partnership with local government, SARD and key industry and business associations.

Recommendation 14

BVET should establish a partnership through DET to provide greater input into regional initiatives coordinated through the Premier's Department and State and SARD. Ideally, a cross sectoral regional renewal team should be established that:

· offers complete knowledge of existing programs for community and regional renewal;
· can provide a diagnostic service to local governments and industry groups designed to identify regional or community industry strengths, weaknesses and opportunities;
· develops a packaged process for identifying key regional training needs in VET and training reform strategies in association with existing secondary schools, community colleges and TAFE institutes;
· introduces new key 'lighthouse' strategies for industry reform in collaboration with universities, industry groups and associations;
· facilitates regional collaboration between key partners leading to the creation of key initaitives such as graduate start-up companies, technology upgrade programs, industry cluster support centres, industry training renewal centres.

Conclusion

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This research project has established that the nature of work is changing. Indeed, the very shape of industry is being altered as we witness a period of economic change that has emphasised new forms of knowledge as well as changed priorities for knowledge and skill acquisition and use. As we argued in Section 1, technological innovation and access to knowledge and skills are key drivers of innovation in this 'new age', and their application has become central to the competitive strategy of firms. As Kanter (1995) has argued, future success will come to companies that can meet global standards and tap into global networks. Similarly, we have argued that the successful and self sustaining cities and regions in the 21st century will be those that are best at linking businesses to the global economy. As well, our work has shown that more than ever, business strategy, innovation, learning and training are closely integrated. What this requires is a training sector that leads instead of following. It also requires a VET sector that is characterised by innovative learning organisations networked regionally, nationally and globally. There are clearly special implications in this report for TAFE as it seeks to re-position itself within a training sector that has undergone great change. There appear to be three alternative pathways facing the TAFE sector. It could do nothing and watch its market being increasingly eroded by private providers and industry-based training. It could become even better at responding to industry needs and reform existing programs to better reflect industry needs. Or finally, it could work in partnership with government, the broad VET system and industry to position itself as a key partner in industry-based reform, technology renewal, and regional and industry innovation.

Our study has highlighted the importance of an internationally competitive VET system to Australia's future and has identified 4 major challenges, each of which presents the sector with significant opportunities:

> The VET sector has a key role to play in increasing the level of competitiveness and innovation in Australian industry.

> The diversification of industry is creating the need for new forms of training provision.

> Changes in technology are creating significant challenges and opportunities for the VET sector.

> In the emerging knowledge-based economy there is an increased need for VET providers to explore new forms of industry collaboration and partnership.

There is no doubt that Australia's VET sector is internationally competitive. However, the role of VET globally is under review as governments attempt to work out the best use of elaborate and expensive training systems. BVET has an opportunity to take the best of the current VET system and to reform it to take a leading role in working with other partners to position NSW business and industry in an even more competitive position.

Australia's human resources lie across the entirety of its population, not with one particular segment. Economic flexibility and corporate agility depend on these same qualities in their existing and potential workforce. Two principles have emerged from the research that

underlie future agility and innovation. One of these is the principle of inclusivity in potential workforce entrants. The other is the development of communities of practice that form learning communities beyond the walls of the business or workplace. Only by utilising these two principles will the full measure of the national skills potential be able to be drawn on for socio-economic growth, stability and resourcefulness.

A key priority for BVET must be to consider the interface between training provision and regional development. Our review of the literature confirms that many researchers and key government agencies believe that regions seeking to compete more effectively within a world economy will need to develop 'soft structures' that support knowledge creation and learning in the local context. Key institutions such as universities, VET providers, regional development organisations and business chambers are amongst the most important institutions within regions. These organisations act increasingly as key knowledge creators and trainers, as well as a means to collect relevant knowledge in the international domain and vehicles for communicating this effectively through a variety of mechanisms and relationships.

The concept of the learning region has emerged to describe those places that offer an institutional environment that encourages both private and social learning at four different scales: the individual workers, the individual firm, groups or clusters of related firms and government bodies. As we stated in section 1, learning regions are less dependent on the individual excellence of their educational institutions as they are on the extent to which their key institutions, organisations and industry are able to trade, support and jointly create knowledge and knowledge networks. Many of the recommendations provided in this report recognise this key need. The success of regions and communities in creating employment and enhanced social infrastructure is due in no small measure to social or collective learning processes, in which the role of the region is to animate the formation of 'interaction relationships' between individual firms and between firms and other regional institutions. Such regional organisations should also be thought of as learning organisations themselves in that they actively seek to emulate and learn from successful experiences of counterpart agencies in other regions and nations.   It is imperative that major VET providers such as TAFE demonstrate themselves that they are learning organisations before positioning themselves as a key player in the ongoing reform of industry and business.

There are wider issues not addressed fully by this report that are taken as givens:

· there must be a shift from a supply driven to a demand driven VET sector;
· there must be an increase in the funding that TAFE receives and a rethink of how the sector is funded generally;
· there must be state and federal collaboration on key VET training issues;
· the VET system has an important lifelong learning function that is unrelated to the needs of specific organisations.

In short, Australia's economic future is directly linked to the quality of its education and training. We have been well served by the VET sector in the past but changes in the nature of work necessitate changes in the way VET is delivered as well as in the institutions that endeavour to meet the needs of individuals, organisations and industry groups. This project has provided BVET with an opportunity to consider new directions in NSW VET education, we commend it for commissioning work in this area and encourage it to implement the recommendations that we have outlined.

References

ANTA (Australian Training National Authority) (1998b) *A Bridge to the Future: Australia's National Strategy for Vocational Education and Training 1998 –2003*, Australia.

ANTA Australian Training National Authority (1999) *Directions and Resource Allocations for 2000*, ANTA, Brisbane

Australian Industry Group (2001). *Training to Compete.* Sydney: AIG.

Balzary, S (1998) '*Employer perspective on the market for VET'*. The Market for Vocational Education and Training, Robinson, C and Kenyon, R, NCVER, Adelaide.

Bickerdyke, I. (1996) *'Australia: The evolving structure and strategies of business networks'*, Networks Enterprises and Local Development. Paris: OECD.

Blackler, F. (1995) *'Knowledge, knowledge work and organisations: an overview and interpretation'* Organization Studie*s, 16(6).*

Buchanan, J. Schofield, K., Briggs, C., Considine, G., Hager, P., Hawke, G., Kitay, J., Meagher, G., McIntyre, J., Mounier, A. & Ryan, S. (2001). *Beyond flexibility: Skills and work in the future*. Report to the NSW Board of Vocational Education and Training.

Cairney, T.H. & Speak, G. (2000). *Developing a 'Smart City': Understanding Information Technology Capacity and Establishing an Agenda for Change.* Sydney: Department of Employment, Workplace Relations & Small Business.

Charles, D. & Benneworth, P. (1998). *The competitiveness project: Regional benchmarking tool.* Unpublished report, Centre for Urban & Regional Development Studies.

Centre for Research & Learning in Regional Australia (2000). *The role of VET in regional Australia.* Unpublished Report, Australian National Training Authority.

Department of Industry, Science and Resources (DISR) 1999a, *Measuring the Knowledge-Based Economy*, Canberra: Report to DISR, p5-6.

Descy & Tessaring, (2001) Training and Learning for Competence, Luxembourg Office for Official Publications of the EC 2001.

Drucker, R. (1993) *Post-capitalist Society.* Oxford: Butterworth-Heinemann.

Field (1997) *Training and learning in small business: Issues for research*. Sydney: Research Centre for Vocational Educational Training.

Gertler, M. (1999) *'Globalisation, regional economic transition and learning: restructuring, renewal and the role of culture'.* In OECD Economic and Cultural Transition Towards a Learning City. Paris: OECD

Gibb, A (1997) *'Small firms' training and competitiveness. Building upon small businesses as a learning organisation*,' International Small Business Journal, vol. no. 3, pp. 13-29

Gibb, J. (1997) *VET and Small Business*, NCVER, Adelaide

Green, F, Ashton, D., Burchell, B. Davies, B. and Felstead, A. (1997) *An Analysis of Changing Work Skills in Britain*. Paper presented to the Low Wage Employment Conference of the European Low-Wage Employment Research network. London: Centre for Economic Performance, London School of Economics.

Kanter, R. (1995) *World Class. Thriving Locally in the Global Community.* New York: Simon and Schuster.

Karpin, (1995) Enterprising Nations: Renewing Australia's Managers to meet the Callenge of the Asia-Pacific Century. Report of the industry Task Force and Leadership Management Skills. Australian Government Publishing Service, Canberra.

Kearns, P. (2001), *Generic skills the economy: A review research relating to generic skills*, Peter Kearns and Associates

Kilpatrick, S and Bell, R. (1998) *Vocational Education and training in Rural and remote* . NCVER Adelaide Australia

Kilpatrick, S. and Crowley, S.(1999) *Learning in Small Business*. Quality and Diversity in VET Research, Melbourne, Australian Vocational Education and Training Research Association.

Lam, A. (2000), *'Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework',* Organization Studies, 21(3), Berlin.

Marceau J., Manley K. and Sichlem D. (1997) *The High Road or the Low Road - Alternatives for Australia's Future.* Australian Business Foundation Ltd.

Marceau J. and Manley K. (1999), *Innovation Checkpoint 1999*, p8.

Marceau, J. (2000) *Innovation and Industry Development: A Policy-relevant Analytical Framework*. Unpublished paper presented to the Third 'Triple Helix' Conference, Rio de Janeiro, 26-29 April 2000.

Marsden, P.V and Lin, N (1982) *Social Structure Network Analysis* Beverly Hills, CA Sage

Mehaut, P. and Delcourt, J. (1994) *The Role of the Enterprise in Generating Qualifications. The Training Impact of Work Organisations* Synthesis of National Reports.

Miles & Huberman (1994), *Qualitative Data Analysis: An Expanded Sourcebook*, Newburry Park, CA, Sage.

Mintzberg, H. (1979) *The Structure of Organisations* Englewood Cliffs, NJ: Prentice Hall

Mulcahy, D. & James, P. (2000) *What skill? Whose Knowing? Futures for CBT.* Paper presented at the third conference of the Australian Vocational Education and Training Research Association (AVETRA), Future research , research futures, 23-24 March, 2000, Canberra

Nahapiet, J. and Ghoshal, S. (1998) *'Social Capital, Intellectual Capital and Organisational Advantage',* Academy of Management Review, 23 (2): 242:266.

Nonaka, I. and Takeuchi, H. (1995) *The Knowledge Creating Company: How Japanese Countries Create the Dynamics of Innovation.* Oxford: Oxford University Press.

OECD (2001) *'Cities and Regions in the New Learning Economy'*. Paris: OECD.

Onstenk (1997), *Core Problems: ICT and Innovation in the Workplace*, Amsterdam: SCO-KI Report.

Roelandt, T and den Hertog P (1999) in OECD *Boasting Innovation: The Cluster Approach.* Paris: OECD

Rogers, M (1998) *Assessing the Characteristics of Innovative Workplaces: Evidence from AWIRS 1990 and 1995.* Paper presented to conference on Changes at Work. Insights from the 1995 Australian Workplace Industrial Relations Survey Data 13 November Victoria University Melbourne

Skills Task Force (1999) Research paper no 4 *Intermediate Level Skills - How are they Changing?* Sheffield : UK Skills Task Force Department for Education and Employment

Smith, A. (1999) New Management Practices and Enterprise Training, Changing Practice through Research: Changing Research through Practice*. Annual international conference on post-compulsory education and training, 6-8 December 1999, Vol 4, Griffith University, Faculty of Education, Centre for Learning and Work Research, pp 109-115.*

Statz, C. (1997). *Do employers need the skills they want? Evidence from technical work.* Journal of Education and Work, Vol. 10, No. 3, pp 205-223.

van der Krogt, F. and Warmerdam J. (1997) *Training indifferent types of organisations: differences and dynamics in the organisation of learning at work.* The International Journal of Human Resources Management 8:1 Feb 1997.

Waterhouse P., Wilson B, and Ewer P (1999), The Changing Nature and Patterns of Work and Implications for VET, NCVER, Adelaide.

Zuboff, S. (1988) *In the Age of the Smart Machine.* New York: Basic Books.

Appendix 1

Details of the Research team

Team Member	Institution	Role
Professor Trevor Cairney	Centre for Regional Research & Innovation	Project Manager
Dr Mona Shrestha	Centre for Regional Research & Innovation	Postdoctoral Fellow
Dr Elizabeth Sommerlad	Centre for Regional Research & Innovation	Research Fellow
Eira Sproats	Centre for Regional Research & Innovation	Research Assistant
Peter Siminski	Centre for Regional Research & Innovation	Research Assistant
Associate Prof Ian Falk	Centre for Research & Learning in Regional Australia (CRLRA)	Research Associate
Dr Christine Owen	Centre for Research & Learning in Regional Australia (CRLRA)	Research Associate
Dr Sue Kilpatrick	Centre for Research & Learning in Regional Australia (CRLRA)	Research Associate
Karen Whittingham	TAFE NSW Industry Partnership Centre	Research Adviser

Appendix 2

Full List of Project Working Papers
(NB: These are yet to be finalised but will be based on the full report submitted in December)

1. *The Changing Nature of Work and the Emergence of the Knowledge-based economy: The Implications for Vocational Education and Training of the Demands of the Emerging Knowledge-based Economy: A Review of the Literature.* Available from the BVET website: www.bvet.nsw.gov.au

2. *The growing knowledge intensity of NSW Industry: An analysis of existing data.*

This paper is to be based on Chapter 4 of the complete report. It highlights the curent state of NSW industry in relation to key knowledge indicators.

3. *Understanding changes in the nature of work and training: A survey of 4 industry sectors in NSW*

This paper would be based on Chapter 5 of the major report and would present the findings of the Stage 1 survey.

4. *The inter-relationship of knowledge, innovation and learning*

This paper would present the key findings from our 20 case studies across 4 industry sectors. It would be based on Chapter 8 of the major report.

5. *Examining the training needs of four knowledge-based organisations: A story of complexity and diversity*

This paper would be based on Chapter 9 of our major report

Possible Publication

Understanding the training needs of 3 knowledge-based organisations

This would be based on Chapter 11 of the major report.