

Melbourne Vice-Chancellors' Forum

Melbourne

Australia's knowledge capital

The contributions of Melbourne's universities to the
City's economic, cultural and community development

May 2007



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From the Lord Mayor

Local governments and universities have important roles to play in a city's future growth and sustainability. In Melbourne, the long-term success of our educational institutions is linked to the long-term success of our city. Melbourne has a large student population and many of our industries and cultural activities have strong connections to our universities.

In 2005, the first Melbourne Vice Chancellors' Forum was held to explore the possibility of closer collaboration between all Melbourne-based universities and the City of Melbourne.

The forum agreed to commission a study to identify the roles played by Melbourne's eight universities in Melbourne's economic, social and cultural life. This study, the *Metropolitan Melbourne Universities' Contributions Study* was conducted by Howard Partners and adopted by the Melbourne Vice Chancellors' Forum in March 2007.

The business and knowledge-sharing opportunities and the economic benefits that universities bring to a city are well known and initially the plan for this study was to focus on these economic impacts.

However, the study soon revealed that universities bring many other benefits for Melbourne.

While the university sector is important for employment, income and research-commercialisation in the city, this study also found that the social, cultural and community contributions of universities are significant. Universities in Melbourne are centres for the arts, for culture and for community services and universities themselves hold important places in Melbourne's urban landscape.

Melbourne's universities have a strong presence in the international tertiary education market. With international offices that nurture relationships and attract diverse international populations, metropolitan Melbourne hosts 25,000 international tertiary students, who are attracted by both the excellent educational institutions and

our reputation for a quality and affordable lifestyle.

Given the council's vision for Melbourne as an innovative and engaging city, this study highlights that universities and the City of Melbourne have the potential to become valuable partners.

The study also provides the basis for increased and sustained government and community support for Melbourne's universities and the benefits of helping universities work with business and all levels of government, to develop and promote Melbourne as a knowledge capital.

Thank you to all who contributed to the development of this study. I would like to particularly acknowledge the contributions made by members of the Vice Chancellors' Forum:

- Professor Gabrielle McMullen, PVC Academic Affairs, Australian Catholic University, Melbourne;
- Professor Sally Walker, Vice Chancellor, Deakin University;
- Professor Paul Johnson, Vice Chancellor, La Trobe University;
- Professor Richard Larkins, Vice Chancellor, Monash University;
- Professor Margaret Gardner, Vice Chancellor, RMIT University;
- Professor Ian Young, Vice Chancellor, Swinburne University of Technology;
- Professor Glyn Davis, Vice Chancellor, University of Melbourne; and
- Professor Elizabeth Harman, Vice Chancellor, Victoria University.

This study will now inform the Melbourne Vice Chancellors' Forum in its future activities.



Lord Mayor John So
Chair, Melbourne Vice Chancellors' Forum



Summary

Victoria's eight universities with a Melbourne metropolitan presence are an integral part of the urban economy and community and make a substantial contribution to Victoria as a whole. The City of Melbourne, in partnership with the Vice-Chancellors of the eight universities, recognises that the potential exists to strengthen further the synergies between these universities and the wider economic, social and urban context in which they operate.

The existence of these synergies is already recognised in the City's plans for the future: *City Plan 2010*. This plan stresses the importance of the tertiary education sector to the future of Melbourne as a *knowledge city* – as part of the growth and retention of priority business sectors.

The purpose of this Study has been to document the nature and extent of these impacts in as broad a manner as possible with a view to informing future strategies and plans.

These Victorian universities with Melbourne campuses are Australian Catholic University, Deakin University, La Trobe University, The University of Melbourne, Monash University, Swinburne University, RMIT University and Victoria University. Several of these institutions offer both university and vocational education and training courses and programs.

For many people, including parents, politicians and the press, a university is 'where people go to get an education'. Once seen as a privilege for the few who had the capacity to pay, higher education is now accessible by all sections of society who have the capacity, ability and motivation to learn. Over the past 50 years higher education has moved from an 'aspiration' to 'a right' for all qualified Victorians.

Victorian higher education is also accessible by an increasing number of international students.

Overseas students make an important contribution to the culture and lifestyle of Melbourne as well as to Victorian regional centres. International student spending on tuition, accommodation, and retail makes a further contribution to local economies and accounts for a very significant proportion of Australia's trade in services.

While education of Australian and international students is an important part of higher education in Victoria, this function comprises only one aspect of its activities. A very significant proportion of the attention, resources and faculty of a university is devoted to research, graduate and professional education, continuing education and service to society. These missions of teaching, research and industry and community engagement are commonly referred to as a 'triad' of university missions.

Through research, universities produce new knowledge essential for economic progress, social wellbeing and sustainability in the environment and natural resources. Through graduate and professional programs universities train the teachers, the scholars, the leaders, the managers and decision makers necessary to apply this knowledge. Through publications, information services and outreach, universities engage with industry and the community in a wide range of cooperative, collaborative and partnership arrangements.

This 'classic triad' of teaching, research and engagement has formed the basis of a long standing *social contract* between universities and society. With the emergence of the knowledge economy and the recognition of higher education as an industry, this social contract is being renegotiated and higher education is being expected to contribute more to economic and social progress, cultural enrichment and community development (Bjarnason and Coldstream 2003).

In the context of this broader social contract this study has generated a number of findings.

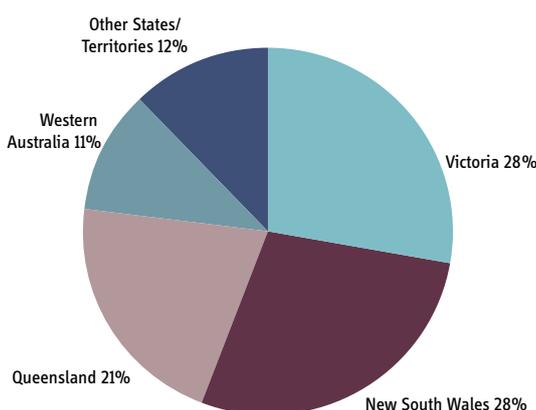
Melbourne's universities are major export earners

Exports of education services are becoming increasingly important to the Australian and Victorian economies. In 2004-05 exports of education services from Victoria exceeded \$2 billion. This puts higher education in the same league as tourism as an export earner.

In 2005 there were 69,700 overseas students studying in Victorian universities – 48,600 were attending Melbourne campuses of the eight universities included in the study. It is estimated that overseas students spend \$600 per week (more than \$30,000 per annum) on housing, food and other living expenses.

Victoria's universities with a Melbourne presence account for 28 per cent of Australia's international student enrolments. Studies indicate that international students have a preference for the safer living environment of Melbourne and the suburbs surrounding Melbourne's universities.

Figure 1: Overseas students – State of study, 2005



Victorian universities with Melbourne campuses are making substantial investments in facilities and resources for overseas students in the City. Overseas students are making a major contribution to the re-vitalisation of the social and cultural life of inner Melbourne. Overseas students now

represent a significant proportion of residents in new apartment buildings being constructed in and around the City.

Consistent with this export orientation, higher education is becoming globalised and Victorian universities are major players. All Victorian universities have agreements with Chinese universities as well as with universities in other South and South East Asian countries. In addition, they have investments in campuses around the world. Most Victorian universities are also members of an international partnership or alliance.

There is also a number of less tangible benefits to Melbourne that arise from a large number of international students moving through education programs – for example, through tourism associated with family members and alumni, business linkages and medium to long term visibility of Melbourne in the South East Asian region.

Given the global mobility of people and business, the fact that Melbourne is a 'port of call' for so many international students who may then assume positions of influence in their society is a plus.

Melbourne's universities are 'businesses' in a global higher education industry

Melbourne's eight universities with a Melbourne presence create and market a range of knowledge products and services for the knowledge economy.

In 2005 Victoria's universities with a Melbourne presence, together with one small regional university, generated revenues of \$4.0 billion. In this regard, universities are a very significant component of the overall services sector.

In addition, the eight universities paid their 22,500 employees \$2.3 billion in salaries and entitlements and made investments of \$1.6 billion. Total non-current assets of universities amount to \$9.2 billion. Universities are also substantial investors and purchasers of facilities, equipment and services. These purchases support and sustain a wide range of businesses in construction, technology and retail services sectors.

Previous studies have indicated that the economic 'multiplier' effect of university expenditure is in the region of 2:1.

The products and services of universities are represented in the knowledge and skills of graduates who work in business, industry and government as well as in scholarly publications, intellectual property (IP) rights, research contracts, academic consultancy services and knowledge based start-up companies.

The downstream economic and industry impact of these university knowledge outputs are difficult to measure with precision, but there is little doubt that business location decisions are strongly influenced by an ability to recruit high calibre university graduates as well as access the knowledge capacity and capability of university research centres.

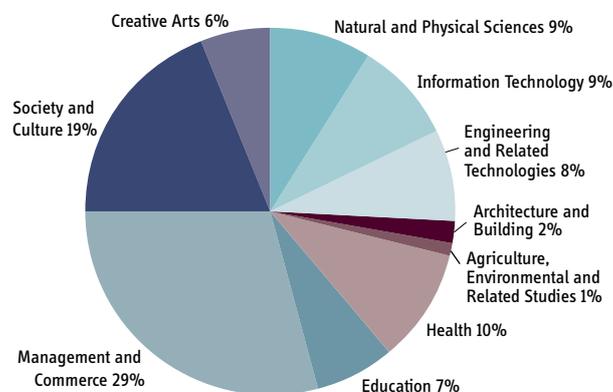
At the end of 2004, 91 start-up companies that had been spun out of Victorian universities between 2000 and 2004 were still operational. The estimated value of the universities' equity stake in these companies is \$43 million – the eventual realised value of equity holdings could be substantially higher than this estimate.

In 2004, 56,000 students graduated from Victorian universities. Researchers generated 194 books, 1,005 book chapters, 5,763 articles in scholarly journals and 2,738 refereed papers presented at conferences.

Melbourne's universities are diverse

Victoria's eight universities with a Melbourne metropolitan presence provide a broad range of teaching, research, outreach and engagement services. Student enrolments in the disciplines of science, technology, engineering and architecture amount to 28 per cent of total enrolments and enrolments in management and commerce (covering business, economics, finance and the law) amount to 29 per cent. Enrolments in studies of society, culture and the creative arts amount to 25 per cent. The distribution of enrolments are indicated in Figure 2.

Figure 2: Enrolments by broad field of education at Victoria's universities with a Melbourne metropolitan presence – 2005 (per cent)



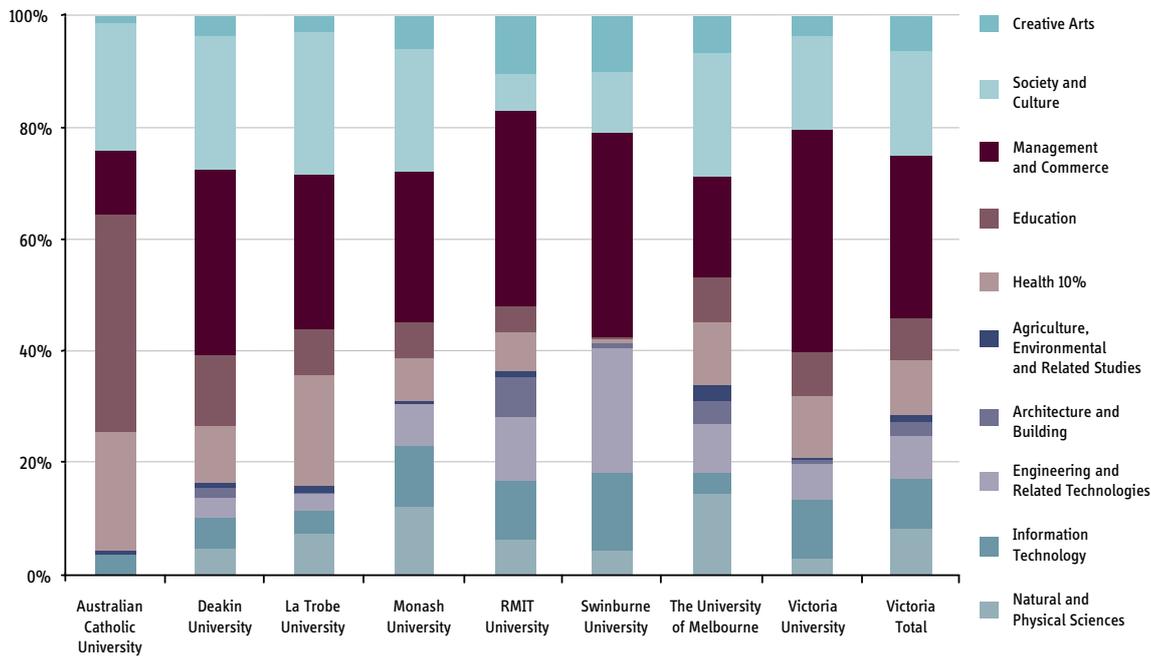
Among universities the combination of teaching and learning profiles differs greatly. This is reflected in Figure 3 where it is apparent that some universities have relatively stronger commitments in education, health, society and culture, whilst others concentrate on the natural sciences, information technology and engineering. Nearly all universities have a strong commitment to management and commerce.

The diversity of Melbourne's universities in their teaching and research profiles provides a unique capability to provide for all facets of post secondary education and learning requirements.

Reflecting their diversity, Melbourne's universities also differ in the relative mix of income sources. For example, reliance on Australian Government grants for teaching and learning averages 21.3 per cent, with The University of Melbourne relying on only 14.7 per cent of income from this source. Income from other Australian Government sources including scholarships, research grants and other forms of financial assistance – makes up a further 9.9 per cent of revenue.

More than a quarter of universities' income is derived from fees and charges – predominantly fees from international students. In 2005, income from overseas students amounted to 16.9 per cent of income. At RMIT University this proportion is 25.4 per cent and at Monash it is 19.0 per cent.

Figure 3: Melbourne's universities – Student enrolments by field of education (per cent)



The sources of revenue for Melbourne's universities are depicted in Figure 4.

Student fees paid through the Higher Education Contribution Scheme (HECS) provide 12.8 per cent of income and support from state and local government amounts to 7.3 per cent. This source of income is particularly important for 'dual sector' universities – RMIT, Swinburne and Victoria Universities.

Melbourne's universities are far less reliant on Australian Government financial assistance and support than they were when the Commonwealth assumed full funding responsibility 30 years ago. Prior to 1974, funding had been cost shared with state governments.

The provision of education services to overseas students has meant that this area of activity has shifted from a subsidiary and add-on services within pre-existing structures of courses and programs to core business – developed around specific strategies, commitments and actions. Melbourne's universities are making substantial investments in physical infrastructure in both Melbourne and in overseas locations, particularly in Asia.

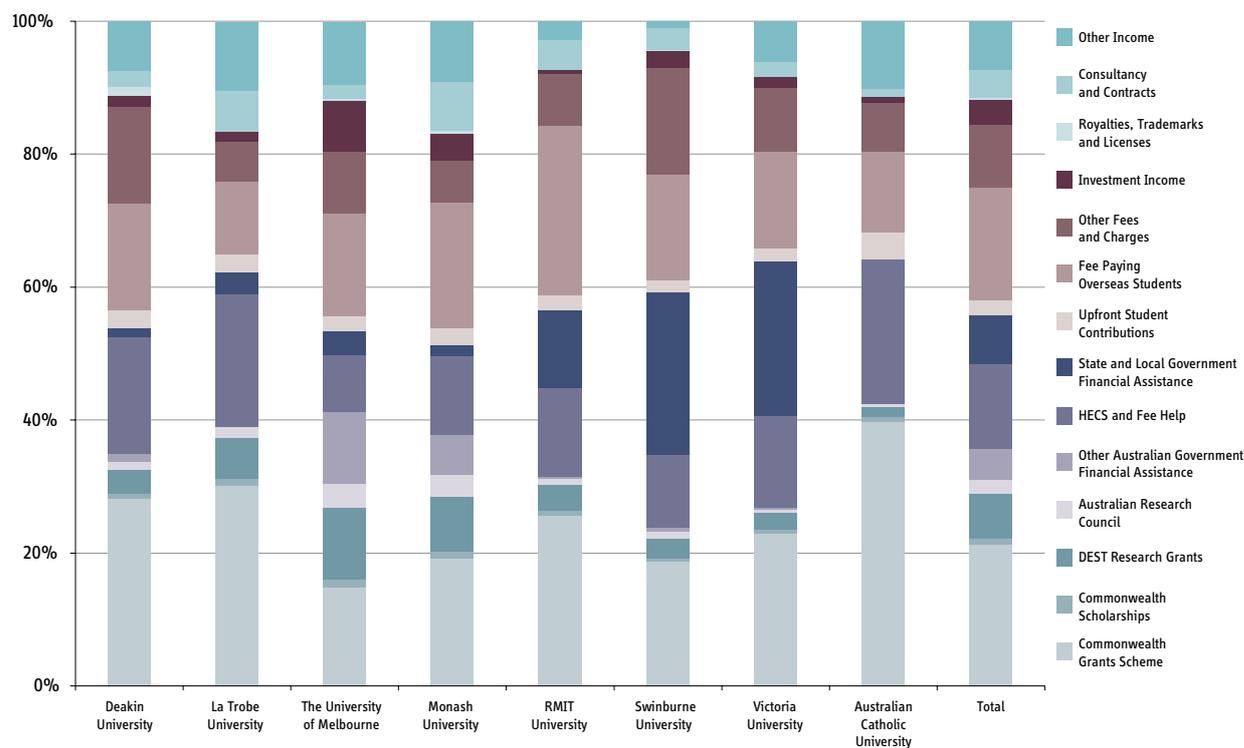
This internationalisation of Victoria's universities has had a profound impact not only on university finances and strategies, but also on the life and culture of the city.

The areas where Victoria's universities with a Melbourne metropolitan presence make a major contribution to the economic, social and cultural outcomes of the city are summarised below.

Melbourne's universities nurture the development of human capital for the services sector

The services sector is becoming increasingly important for the Australian and the Victorian economies. Almost 50 per cent of students in Victorian universities are studying courses and programs in management and commerce (including accounting, finance, the law), health sciences and services and education (teaching).

For a long time a university education was a pre-requisite for entry into areas of professional practice such as medicine, the law, engineering and architecture. More recently a university education has become a requirement for professional

Figure 4: Melbourne's universities – revenue sources (per cent)

accreditation in areas such as health care (including nursing and a range of allied health services), teaching, journalism, agricultural extension, accounting, finance and other 'knowledge based' vocations.

A qualification from a university with a Melbourne presence gives industry and society confidence in the quality and credibility of the information, advice and service they are receiving – or are about to receive.

Melbourne's universities are working closely with business and the peak professional bodies in the design of courses, programs and higher degrees that specifically meet industry and business needs. In particular, universities are responding to short to medium term skills shortages, but at the same time they are anticipating longer-term skills and knowledge requirements and are actively shaping industry and labour force preparedness through development of new knowledge and applications.

New and innovative approaches to workplace

learning are being implemented through industry placements and internships designed to integrate teaching and learning with the workplace.

Melbourne's universities are nodes in the global higher education research sector

Higher education research and development (R&D) represents 16 per cent of identified global R&D (US\$139 billion out of US\$859.6 billion). University discoveries and technological inventions are important for continuing innovation in industries such as agriculture and mining and in the 'new economy' industries such as biopharmaceuticals.

A substantial proportion of R&D expenditure is invested in research facilities and instruments that are available for use by industry and government. Victorian universities operate 25 stand-alone research facilities including nodes of major national research facilities (MNRFs). Most of these are collaborative in nature and involve industry participants.

In 2004, Victorian universities participated in 41 Cooperative Research Centres, were awarded 123 Australian Research Council linkage grants with industry contributions of \$34 million and performed \$182 million in contracts and consultancies (an important mechanism for knowledge transfer to business and government).

Melbourne universities are leading service providers for government, industry and the community

In addition to teaching, learning and research, Melbourne's universities are playing a major role in providing services for and on behalf of government, industry and the community:

- university medical centres and teaching hospitals are internationally recognised leaders in the provision of quality health care in Melbourne as well as in the Victorian regions;
- agricultural research institutes attached to metropolitan universities play an important role in maintaining animal and plant health and in agricultural extension in key primary producing areas;
- scientific facilities are available to industry for experimentation, testing and scale up;
- universities are strongly committed to outreach and community service providing education, health, social welfare, housing and environmental services; and
- university owned performing arts centres and sporting and recreational facilities are available for community use (many are funded on a partnership basis with State and local government).

University based research underpins the technology for a great deal of industrial innovation and national preparedness. Universities are also being called upon to address issues concerning the impact of climate change and global warming.

University-industry collaborations are becoming increasingly important for industry as requirements for new knowledge and breakthrough technologies to underpin new product development in globally competitive industries.

Through their commitments to outreach and community engagement universities are taking a lead in providing a wide range of community-based education, health, social welfare and environmental services.

Melbourne's universities provide and maintain a cultural infrastructure for the City

Melbourne's cultural infrastructure, which is an important asset in retaining and attracting corporate headquarters and other sources of economic vitality, is closely linked to its universities.

Universities are owners, patrons and agents in cultural life as well as being education institutions that have a significant role in training and showcasing professional writers, visual and performing artists, filmmakers and designers, arts teachers, curators and administrators and the education of their audiences.

Numerous libraries, museums, archives, galleries and bookstores and the use of these assets to hold performances (plays, music, readings, etc) revolve around the existence of the universities. In addition, a wide-range of sporting facilities are provided that are available for wider community use.

Universities are active in creating and supporting 'cultural precincts' and cultural activities across the City – for example, University Square, Federation Square and the RMIT Design Hub on the Carlton and United Breweries (CUB) site.

Melbourne's universities are the cornerstone of a 'university city' through extension of student life into the CBD – for example, support for cultural activity and services such as wireless access to university networks through urban infrastructure.

Melbourne's universities are becoming drivers of the built environment

Melbourne's universities actively create and renew the built environment through new buildings and precinct developments. In so doing they shape the urban environment in new and interesting ways – contributing to the aesthetic as well

as the economic dimensions of the urban experience. This can be an important factor in attracting and retaining business investment.

Summary

The economic, social and community contributions of Melbourne's universities are multifaceted and complex. These contributions need to be viewed not simply from any one perspective – such as academic 'factories' producing industrially applicable knowledge – but from all perspectives. This multifaceted role and the synergies between the universities and their constituencies gives richness to university-industry-community relationships.

Any one university role only makes a small contribution – the strength of contribution lies in the *combination* of all these different roles. Consequently, future metropolitan and state planning should focus on further strengthening this multifaceted contribution. Restricting the analysis to what can easily be measured distorts the picture of how universities contribute to the metropolitan environment.

The findings support the view that the higher education sector is integral to the vitality of the urban economy and social community. Not only is the current *scale* of economic activity significant to the urban economy, the *scope* of the universities' impacts is broad and exhibits strong and complex synergies with the wider urban environment.

Victoria's universities with a Melbourne metropolitan presence are playing a key role in the economic and industrial development of Victoria. But they are also playing a much wider role in social and community development as well as in preserving the State's and the nation's heritage.

Victoria's and Melbourne's universities are important public assets and resources for the knowledge economy. Their contribution is reflected not only through their economic and financial transactions with industry, government and society, but also as custodians of investments in facilities, equipment and libraries and in

cultural and arts institutions. Their contribution is also reflected in the generations of accumulated human capital and wisdom of former and current staff, students and others who are associated with universities on an ongoing or periodic basis.

Universities are partners and collaborators with government, industry and the community in the growth and development of the knowledge economy, the knowledge society and the knowledge community. A great deal has been achieved through the contributions of universities and there is much to build on in the development and implementation of future plans and strategies for knowledge based economic, industry and community development.

From a national perspective, it is important that universities are seen in a much broader framework than instruments of economic and industrial development. Whilst these contributions are important in the framework of the knowledge economy and national innovation system, there are other dimensions.

Universities are *assets* that form an integral part of Australia's economic, social, cultural and recreational infrastructure. Their value is reflected not only in the tangible outputs of educated students, scholarly publications, patents and papers, but also in the intangible contribution they make to society and the community through participation and partnership with industry, all spheres of government and the non-government sector.

Public policy should reflect these broad contributions of universities – and the effort and commitments that are being made by students, staff and administrators to achieve social and community outcomes – as well as economic and industrial ones.

In particular, policy should not detract from, or remove, the motivations and incentives that universities have to work effectively with all of their constituencies in industry, government and the broader community. Policy should recognise and support university roles and contributions in all areas. These are matters for local and state government as well as the Australian government.

1 Context

The City of Melbourne and the Vice-Chancellors of eight of the State's universities have recognised that there is the potential to further enhance Melbourne's and Victoria's competitiveness through a deeper appreciation of the role of universities as generators of knowledge, innovation, productivity, social cohesion and economic development.

Victoria's universities with a Melbourne presence are key economic, social and cultural institutions. They provide the intellectual capital and capacity necessary to build and sustain national, state and regional prosperity.

But whilst the economic and utilitarian role of universities is important to recognise, it cannot overshadow the broader social and cultural context. The success and contribution of universities have been built on foundations of intellectual excellence, innovation, integrity, openness, deep scholarship and independent criticism (Vest 2005).

1.1 The City of Melbourne and metropolitan Melbourne

The City of Melbourne is Victoria's national and international gateway, the seat of the Victorian government and the headquarters of many Victorian, national and international companies.

Melbourne is a growing city with an increasing population and expanding boundaries. It is home to people from more than 140 countries and hosts an impressive calendar of international events. The City has won awards for 'liveability', green building design and business innovations.

Melbourne is a cosmopolitan city, a happy community, a thriving business hub, a focal point for arts and culture and a great place to work and play.

Melbourne City Council
Annual Report 2005-2006

The City of Melbourne has a population of 62,000 and metropolitan Melbourne has a population of 3.6 million. Key demographic characteristics include:

- 16 per cent of residents in metropolitan Melbourne are aged between 25 and 34;
- 29 per cent of residents in metropolitan Melbourne were born overseas;
- 26 per cent of residents in metropolitan Melbourne speak a language other than English;
- more than 23,700 students live in the City of Melbourne; and
- the property and business services sector and the finance and insurance sector employ more Melburnians than any other sectors.

The Melbourne City Council is developing Melbourne's standing as a 'knowledge city'. The eight Victorian universities with a Melbourne presence are working with Council to achieve this.

1.2 Towards engagement

Melbourne's universities do not conform to the image of universities as ivory towers detached from the regions and communities in which they are located.

Universities are major players in many activities not traditionally associated with the 'ivory tower'. They are employers, purchasers, engines of economic growth, innovators, cultural meccas, branders of place and, increasingly, major real estate developers. This last role creates a web of opportunities and challenges that are not only important to the future of universities but also extend throughout the politics and economics of cities (Barbara Sherry, *Land Lines*, January 2005).

Universities work with government, industry and communities to find solutions to problems which may encompass research *and* teaching and learning. In this respect, government, industry and the community have become important stakeholders and constituencies within a broader higher education sphere of activity and influence.

Genuine engagement is being sought to position Melbourne as a *university city* rather than a city with a number of universities. Melbourne City Council, with a charter relating to planning and regulation in relation to the use of land and buildings, provision of infrastructure facilities and services, protecting the environment, promoting industry and community development, preserving the city's heritage and supporting its culture and way of life, has a key role in positioning Melbourne in this way.

The concept of university and community engagement must also be seen in the context of expectations. In practice, engagement is intended to address the challenges facing a knowledge society; creating genuine learning communities; encouraging lifelong learning; finding effective ways to overcome barriers to change; building social and human capital; encouraging economic development; and a collaborative approach to addressing and resolving issues from the perspective of *all* involved – that is, achieving mutually beneficial outcomes.

The way in which universities engage and work with their stakeholders and constituencies is defined in their plans and prospectuses, but most importantly, it is defined by the actions of their people – the executive leadership, academic staff and students. Approaches to engagement differ among institutions, reflecting traditions, capabilities, priorities and perhaps most importantly, funding.

The consultations for this study indicated that universities want to be seen as key partners in regional economic, social and community development as an integral element of their engagement and outreach strategies. Universities are developing strategies and programs that involve greater openness and commitment to government, industry and the community. These are reflected in changing structures, communication programs, policies and processes for engagement.

This study addresses the extent of engagement by looking at the economic and the wider social and cultural contributions of universities to Melbourne's character, culture and style as well as ways of doing business in a local and global economy. The study draws on the methodologies and approaches of previous studies of the economic and social impact of universities in other cities¹.

1.3 Key constituencies and stakeholders

University constituencies and stakeholders cover a very broad and diverse range of external influences and interests. The way in which universities work with these constituencies impacts on the ways in which universities contribute to the economy, society and the community.

State and local government departments and agencies

The Victorian Government determines the regulatory and governance framework for universities in the State. In addition, State Government departments and agencies recruit university educated people to work in a range of professions, including school teachers, health services professionals, social workers, agricultural extension officers, urban planners, policy analysts and economists.

¹ See GLA Economics. 2004. "World City, World Knowledge: The Economic Contribution of London's Higher Education Sector." GLA Economics: London, GLA Economics and KPMG. 2006. *London: The Knowledge Capital – The Economic and Wider Impact of London's Universities and Higher Education Colleges*. London: London Development Agency, Applesseed Consulting. 2003. *Engines of Economic Growth: The Economic Impact of Boston's Eight Research Universities on the Metropolitan Boston Area*. Boston: Masscolleges, Applesseed Inc. 2004. "Innovation & Opportunity: Harvard University's Impact in the Boston Area Economy." Applesseed: New York.

The State Government also expects universities to address skill shortages and state research priorities.

Victorian local governments and regional statutory authorities regulate and control land use, manage road access and parking, undertake urban planning and design, protect heritage assets and provide a range of infrastructure services used by universities. Access to these services requires effective cooperation and collaboration. These bodies are also important clients of universities – recruiting planners, engineers, architects, public health professionals, social workers, economists and accountants.

Professions that require university education for accreditation and right to practice

Professional services firms in the law, accounting, finance, banking, engineering and architecture rely on Melbourne's universities to educate and train young people to work in their practices. Members of the professions contribute through 'industry teaching', faculty membership, curriculum development and work experience placements.

As work in professions becomes more evidence based and bodies of knowledge accumulate, practitioners look to universities to provide a more intensive, as well as extensive, range of education services. Professional bodies also contribute to the design and funding of research programs.

Mining and manufacturing companies

Mining and manufacturing represents an important constituency for Melbourne's universities. The headquarters of several global corporations are located in the City.

These businesses recruit graduates in a range of science and engineering disciplines. Several companies are involved in joint research and learning programs with Melbourne's universities.

Companies are looking towards developing closer relationships and interactions with universities at senior executive levels – in addition to collaborations at the teaching and research centre level.

The Australian Government

The Australian Government provides funding for universities through the Australian Research Council, the National Health and Medical Council, the Department of Education, Science and Training (DEST) as well as through the programs of other departments and agencies, including the Department of Agriculture, Fisheries and Forestry and the Department of Health and Ageing.

The Australian Government is also an important client – relying on universities to address national skill shortages in science and engineering and to address national research priorities.

Universities, collectively and individually, are looking to engage more effectively with the Australian Government and move away from the conditional granting culture that currently prevails.

Other important constituencies

There are several other important constituencies that affect the way in which Melbourne's universities contribute to effective relationships and interactions with government, business and the community. They include:

- the finance sector, including commercial and investment bankers, ratings agencies and financial agents who manage university investments, as well as investors who finance university capital projects, business enterprises and start-up companies;
- a range of non-government organisations and community based health, welfare, environment and recreation organisations that collaborate on projects and who use the facilities and campus based services of Melbourne's universities;

- the print and electronic media which interacts with staff (and students) for comment and opinion on scientific, environmental, social, economic and political issues; and
- citizens who access and use university facilities and services. Citizen interest and involvement cover a spectrum from continuing education, access to research and using galleries, museums, performing arts centres and recreation and sporting facilities.

Working with stakeholders and meeting expectations creates major challenges for universities. These challenges relate to the way in which universities engage with government, industry, society and the community.

1.4 Data sources

The source data for this study are university annual reports, financial statements and Web sites, aggregated financial data published by DET, data from the DEST Higher Education Research Data Collection (HRDC) and reports by universities on commercialisation activity.

Members of the Study Steering Committee have validated information and provided additional material and commentary for inclusion in the study report.

The report includes a number of case examples and profiles of economic, industry, social and cultural contributions of universities. These are intended to be illustrative of the diversity and excellence of contributions rather than representing the outcome of an exhaustive survey of best practice. Moreover, the examples and profiles are indicative and are not intended to capture all areas of institutional strength.

1.5 Location of Victoria's universities with a Melbourne presence

The location of the campuses of Victoria's universities in the Melbourne metropolitan area is listed in Table 1.

Table 1: Location of Victoria's Universities with a Melbourne Presence

University	Campus Name (Location)
Australian Catholic University	St Patrick's Campus (Melbourne, Fitzroy)
Deakin University	Melbourne Campus (Burwood), Toorak
La Trobe University	Bundoora, La Trobe St, City
Monash University	Berwick, Caulfield, Clayton, Frankston, Parkville (Victoria College of Pharmacy)
RMIT University	City, Bundoora, Brunswick
Swinburne University of Technology	Hawthorn, Pratt (Lilydale), Prahran
The University of Melbourne	City (Parkville), Werribee, Richmond
Victoria University	City (Flinders St, Flinders Lane, Queen St), Footscray Park, Footscray Nicholson, St Albans, Sunbury, Werribee

Melbourne's universities also have a regional presence resulting from mergers with former Colleges of Advanced Education. These locations are listed in Table 2.

Table 2: Victoria's universities with a Melbourne Presence – Regional Campuses

University	Campus Name (Location)
Australian Catholic University	Aquinas Campus (Ballarat)
Deakin University	Geelong, Warrnambool
La Trobe University	Albury-Wodonga, Bendigo, Mildura, Beechworth, Shepparton
Monash University	Gippsland
RMIT University	Hamilton, Sale, Bairnsdale
The University of Melbourne	Creswick , Dookie College

The connection to a regional university is important in the context of the thinking underpinning the State Government's planning strategy, Melbourne 2030 which seeks to shift development from a city-centric hub and spoke view of Victoria to one that sees the State as a network of cities, towns and regions that relate to and depend on each other. It follows that Victoria's metropolitan universities have had and will continue to have, important links to their regional campuses. This network arrangement is substantially different from other states.

2 The economic roles and contributions of universities

Universities make a major contribution to the economy. This occurs firstly in their nature as 'businesses' that generate revenues to finance their activities and manage assets. They also contribute through the export of education services, the development of human capital and the provision of research services. Universities also nurture new businesses as start-up companies as well as being places from where staff and students launch new businesses.

2.1 Melbourne universities in a global context

Universities not only serve a local constituency. Higher education is a global phenomenon. Most Victorian universities have linkages and alliances

with overseas universities and international university networks².

Globalisation is increasing as external courses offered by overseas providers increase. The falling costs of telecommunications and the capability of the Internet are providing opportunities in the provision of education across national borders.

Students in Australia and overseas are increasingly prepared to travel internationally to obtain a quality education. External education, where there is a higher level of globalisation, offers students a convenient way of undertaking a higher education course while they are also working.

In total, there are more than 67,000 overseas students enrolled in Victorian universities. RMIT enrolls around 18,000 international students.

² The first foreign owned university opened in Adelaide in May 2006. The H. John Heinz III School of Public Policy and Management of Carnegie Mellon University will provide American postgraduate degrees in public policy and IT and will focus on attracting students from the broader Asia-Pacific region.

Approximately 10,000 RMIT students study off-shore. RMIT is building on this presence to achieve its aspirations as a global university of technology grounded in Melbourne and connected to communities, enterprises and industry around the world.

Monash University reports that it attracts annually more than 17,000 international students from more than 100 countries to its six Australian and two international campuses in Malaysia and South Africa.

The University of Melbourne is a founding member and played a leading role in the establishment of Universitas 21, an international network of 20 research-intensive universities from Asia, Europe, North America, Australia and New Zealand.

The University of Melbourne – Universitas 21

Universitas 21 is an international network of 20 leading research-intensive universities in eleven countries. Collectively, its members enrol more than 600,000 students, employ more than 80,000 academics and researchers and have more than two million alumni. Their collective budgets amount to more than US\$10 billion. The network's purpose is to facilitate collaboration and cooperation between the member universities and to create opportunities for them on a scale that none of them would be able to achieve operating independently or through traditional bilateral alliances. Established in 1997, Universitas 21 engages in a number of activities on three different levels:

- the first level encourages traditional collegial activities, such as student exchange programs;
- the second level facilitates greater international collaboration between members, such as the sharing of learning materials; and
- the third level focuses on opportunities for entrepreneurial activities. An example of this is U21Global (an online university created in partnership with Thomson Learning).

All Universitas 21 member institutions are

research-led, comprehensive universities providing a strong quality assurance framework to the network's activities.

Universitas 21, in collaboration with Melbourne University Publishing, will be publishing a series of high profile electronic books that make innovative use of the medium. Each book will be edited by Universitas 21 academics and will consist between six and eight essays on an international theme in the Humanities and Social Sciences (including Business, Education and Law).

Other Victorian universities with a Melbourne presence are involved in other global networks. RMIT is a member of the Global U8 consortium of universities with campuses in Vietnam (Ho Chi Minh City and Hanoi) and significant teaching partnerships in Hong Kong, Singapore, China and Malaysia, has established a significant educational presence in South-East Asia. La Trobe University is involved in the International Network of Universities.

La Trobe University –

The International Network of Universities

La Trobe University is a founding member of the International Network of Universities, INU, comprising 13 universities in eight different countries committed to advancing internationalisation through global cooperation. Through collaboration in student and staff mobility, research, staff development and co-operation in university management, the university can provide a richer array of international educational and research opportunities than acting alone.

The INU has endorsed the theme of Global Citizenship as a common element across the teaching and research of its member universities.

Swinburne University has developed successful relationships with universities around the world and established Swinburne University of

Technology (Sarawak campus) in Malaysia, in 2000. There is extensive collaborative research and mobility of teaching staff between Swinburne University and partner universities.

Swinburne University is the only Australian university invited to be a member of the European Consortium of Innovative Universities (ECIU), which aims to foster student and staff mobility and share innovative programs to give students a competitive edge in today's global employment market. Swinburne University has also recently negotiated an alliance with North-Eastern University in the United States.

There has also been an increasing trend for Australian universities to open up offshore campuses and learning centres. All Victorian universities have agreements with Chinese universities.

Monash University currently has overseas campuses in Malaysia and South Africa as well as learning centres in Italy and London. Deakin University has agreements with the United Arab Emirates and Malaysia to provide education programs in those countries. RMIT University has campuses in Vietnam.

RMIT University – RMIT International University Vietnam

In 1998, RMIT University was invited by the Vietnamese government to establish a fully foreign-owned university in Vietnam. In 2000, RMIT Vietnam was granted a licence from the Ministry of Planning and Investment to deliver undergraduate and postgraduate education, training and research in Vietnam. Degrees are awarded by RMIT University in Australia, allowing Vietnamese students to receive an overseas education without having to leave home.

All degree programs are recognised by the Vietnamese Ministry of Education and Training (MOET) and are audited by the Australian Universities Quality Agency. All teaching is in English.

The University commenced teaching in Ho Chi Minh City in 2001 and in Hanoi in 2004. RMIT Vietnam currently has more than 2,000 effective full-time students including international students from 18 countries such as the USA, Germany, France, Russia, Singapore, Malaysia, South Africa, China, Korea and Australia. This is a unique opportunity for students to participate in a truly international educational experience without the costs usually associated with overseas study.

Places are made available for RMIT Vietnam students to study at RMIT Melbourne as exchange students and Australian students also go to Vietnam.

La Trobe University has offshore programs with partner institutions in Bhutan, China, Hong Kong, France, Indonesia, Japan, Malaysia, Mongolia, New Zealand, Singapore and Vietnam.

Victoria University delivers a diverse range of programs from diploma to doctoral level in nine overseas countries including China, Hong Kong, Thailand, Malaysia, Singapore, New Zealand, Vietnam and Bangladesh.

Students participating in these programs have the option of completing their academic program in their own country or transferring to Victoria University in Melbourne for part of their studies. For example, since 2002, Victoria University and The University of Applied Sciences, Bad Honnef Bonn, Germany have enjoyed a relationship which allows staff and student exchange, common research projects as well as permitting students in Hospitality Management and Tourism Management to complete their compulsory study abroad year in Australia.

Victorian universities with a Melbourne presence are investing in purpose-built facilities and services for international students, predominantly in Melbourne. For example, Deakin University will open a new International Centre at its Melbourne campus in Burwood in 2007.

Deakin University – new International Centre

The new International Centre and Business Building on the Melbourne campus at Burwood is a \$65 million project that will provide students with state of the art facilities. The project is a substantial investment allowing Deakin University to fulfil its responsibilities as a leading higher education institution. The scope of the International Centre and Business Building covers the following:

- an International Centre includes offices, teaching activities and student support facilities, as well as the offices of Deakin International, Deakin University English Language Institute (DUELI) and the Melbourne Institute of Business and Technology (MIBT);
- a new Business Building will house the business component of the Faculty of Business and Law including teaching spaces, academic and administrative offices and student support spaces; and
- it will also house a 200 seat lecture theatre, 24-hour computer lab and a cafe.

The buildings have been designed with a distinctive curved form to give them 'landmark' status in accordance with their importance as the first buildings to be constructed on the western side of the campus.

Building on the attractiveness of Melbourne for overseas students, other Australian universities have established campuses in Melbourne for overseas students. These include the University of Central Queensland which has 3,000 students enrolled in Melbourne.

Another pertinent aspect of globalisation concerns R&D. The higher education sector as a whole performs 16 per cent of identified global

R&D. As the Australian Group of Eight universities have recently stressed, the relatively free flow of knowledge and data between universities globally means that the leading research-intensive universities in any particular nation act as a "conduit" for tapping into and leveraging this far greater intellectual resource³.

This conduit is of particular benefit to the business sector because linkages with local research teams provide a valued mechanism for staying abreast of the scientific and technological advances being made globally. This can be particularly important in relation to providing early warning of and responses to, disruptive technologies that may threaten the market value of a large corporation. Indeed, this is precisely why many corporations fund university research.

2.2 The economic impact of Victorian universities

Victorian universities as economic entities

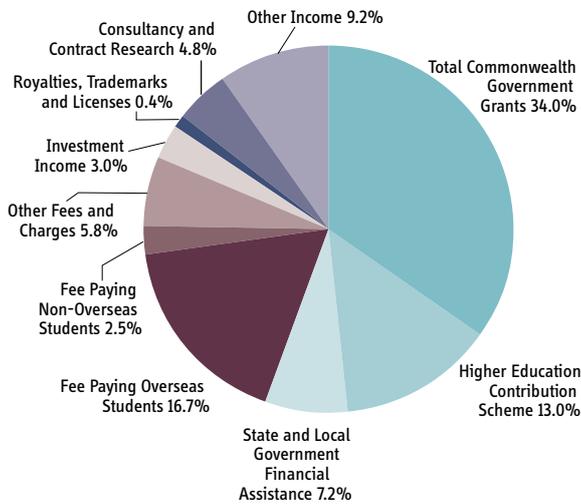
Universities are substantial businesses. In 2005 Victorian universities, predominantly located in Melbourne, generated income of \$4.1 billion:

- The University of Melbourne has revenues of \$1.1 billion;
- Monash University has revenues of \$1.02 billion⁴; and
- seven of Victoria's universities with a Melbourne presence are listed in Australia's largest 1000 businesses.

The breakdown between major categories of revenue is indicated in Figure 5. It shows that 34 per cent of revenue is derived from the Australian Government in the form of operating grants and research grants and that 13 per cent is derived from the Higher Education Contribution Scheme. These proportions are significantly less than the average for all Australian universities.

³ Group of Eight (2006). Submission to the Productivity Commission's Research Study on Public Support for Science and Innovation in Australia. Canberra: Group of Eight. ⁴ In addition, RMIT reported revenues of \$511million, Deakin \$402 million, La Trobe \$372 million, Victoria \$314 million, Swinburne \$277million and ACU (Victorian component) \$41 million.

Figure 5: Victorian Universities – Sources of income (%)



The data in Figure 8 also indicate that universities rely on overseas student fees for 16.7 per cent of revenue and other fee paying students contribute 2.5 per cent of revenue. Only 0.4 per cent of revenue is derived from royalties, trade marks and licences.

In 2004, Victorian universities made investments of \$2.4 billion. They are also holders of substantial asset portfolios. In 2005, universities reported:

- total holdings of non-current assets amounting to \$8.6 billion;
- buildings estimated to be worth \$4.1 billion and equipment worth \$238 million; and
- libraries valued at \$537 million.

The reported value of assets does not include the value of knowledge held in the form of registered intellectual property assets, or the intangible and tacit value of the knowledge, skills and experience of university staff, visitors and adjuncts.

While it is possible to identify and quantify codified knowledge, held in the form of patents (amounting to 1,825 in 2004) and holdings of library materials, the task of identifying tacit knowledge is daunting.

Overall it is estimated that higher education contributes 1.5 per cent of Victoria’s Gross State Product.

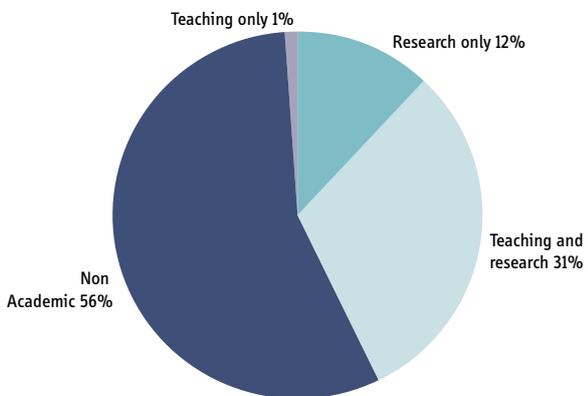
Universities as employers

Universities are substantial employers in the Victorian economy. In 2005 universities paid their staff a total of \$2.3 billion in salaries and entitlements. This is approximately two per cent of all employee compensation paid in Victoria. It is also substantially more than the total of wages and salaries paid to employees in the agriculture and mining industries.

In 2004 universities employed a total of 22,529 staff. Of these:

- 10,194 were employed in academic classifications
 - 2,833 were employed in research only positions
 - 7,059 held both teaching and research responsibilities
- 12,335 were employed in non-academic roles.

Figure 6: Victorian universities staffing profile



Universities also appoint a large numbers of visitors, honorary clinicians and adjunct professors and associate professors who make important contributions to the university community.

Universities as purchasers of goods and services in the region

In 2005 university cash expenditure, a primary economic indicator of demand for goods and services, amounted to \$5.6 billion:

- \$3.3 billion was for operating activities (including payments to staff); and

- \$2.3 billion was allocated to investing activities.

University purchasing and procurement strategies and practices have significant impacts on the local economy. These range from purchases of ICT equipment and services, repairs and maintenance and construction through to travel and food service.

Monash University, for example, spent \$23 million on information technology related purposes in 2004 and \$26 million on building related purposes. Travel and related costs amounted to \$23 million.

Due to differences in accounting and financial reporting comparative aggregate data are difficult to obtain for all universities.

Universities as contributors to international trade in services

International trade in services is becoming increasingly important to the Australian and the Victorian economies. In 2005 Australia's services exports rose four per cent to \$37.2 billion, compared with a six per cent growth in 2004.

In 2005, total education exports amounted to \$7.5 billion. This compares with personal travel services (relating mainly to tourism, but excluding education travel) of \$10.9 billion in 2005 - an increase of 2.2 per cent over 2004.

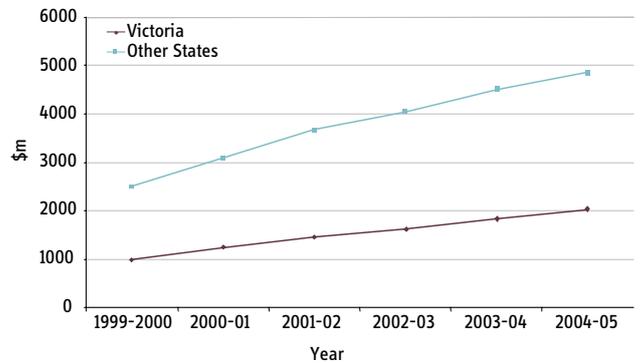
The Economic Significance of Trade in Education Services

Education services are among Australia's fastest growing exports. In 2005 they were the nation's fourth largest export earner. Victoria accounts for just over 29 per cent of Australia's exports of education services.

Over the period 1999-2000 to 2004-05 expenditure on Victorian exports of education services doubled from \$1.0 billion to \$2.0 billion.

The overall trend in exports of education services is indicated in Figure 7.

Figure 7: International trade in education services, estimated credits 1999-2000 - 2004-05

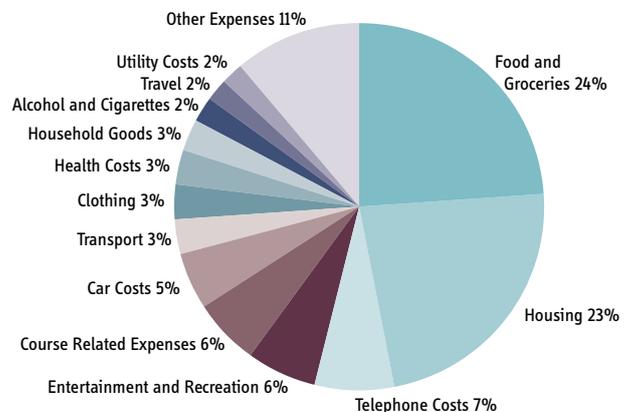


2.3 The economic contribution of overseas students

As indicated earlier, overseas students are an important component of university education in Melbourne. In 2005 Victorian universities generated \$687 million in fees from overseas students.

Using calculations developed for Australian Education International by the University of Queensland, overseas students living in Victoria spend, on average, \$599 per week on housing, food and other living expenses.

Figure 8: Estimated expenditure by overseas students in Victoria



This expenditure amounts to a significant economic injection into the Melbourne and Victorian economies and is reflected in the pattern of housing in inner-Melbourne and the emergence of supermarkets and convenience stores in the Melbourne CBD.

The 2001 Census of Population and Housing indicated that 51 per cent of the 22,635 people aged between 15 and 29 years resident in the City of Melbourne were enrolled in a tertiary institution. Of all students residing in the City of Melbourne, 54 per cent were overseas students. According to Department of Education, Science and Training data, nearly 60 per cent of overseas students resident in the City were aged between 20 and 24 years.

Fifty-seven per cent of students residing in the City of Melbourne were from South-East Asia and a further 20 per cent were from North-East Asia. A substantial number of younger overseas students also choose to study in outer suburban and regional centres.

2.4 Investment in student housing and accommodation

Melbourne has a particular advantage for international students flowing from its reputation as a 'safe-city'. Overseas students stimulate demand for rental housing and accommodation.

Inner Melbourne has always had a relatively large number of rental properties available for students. However, overseas students represent a significant new source of demand for accommodation and housing, particularly in the newer inner city apartment blocks that have been recently constructed in the City of Melbourne.

The market has responded to this growing demand for temporary student accommodation through the emergence of serviced apartment and accommodation management businesses that provide:

- safe and comfortable living environments;
- purpose designed facilities ;
- trained, on site, multi-lingual staff;

- student care and support services; and
- a student community atmosphere.

UniLodge Group

UniLodge is a privately owned specialist student accommodation group that provides property and accommodation management, property development and consultancy services, project management and real estate services.

Commencing operations in 1996, UniLodge has more than 3,700 beds under contract. It operates student housing facilities in Melbourne as well as in Sydney, Brisbane and Auckland. In selected properties it also provides boutique hotel facilities to cater for visiting parents, academic staff and other visitors.

In creating new facilities, UniLodge works closely with a range of stakeholders, including universities, owners, property developers, architects and financiers to design and implement proven student accommodation models.

UniLodge, an accepted and widely recognised brand in Asia and North America amongst students, education agents and the study abroad market, is owned by property developer Meridien.

Universities also own and manage residential colleges and student villages for international students and students from rural Victoria. Universities also assist with locating rental accommodation and home-stay arrangements.

Victoria University – Student Village

Student Village is a residential campus of Victoria University. It is located in Maribyrnong, 9km from the centre of Melbourne and provides accommodation for more than 500 tertiary students. It physically comprises six individual colleges, however all colleges interact as part of a strong community.

The residences offer a unique student lifestyle

and community that not only provides academic encouragement with onsite tutoring, dinners, study groups and 24 hour computer lab access, but also Res Lifers, who organise social and recreational activities including camps, meals, outings, dances, drama, aerobics, netball, volleyball, basketball, tennis and a host of fun orientation activities.

The sustainability of Melbourne's and Victoria's export of education services will depend not only on the quality of and innovation in, education services delivery, but also on the quality and amenity of the accommodation and related services. This has important implications for land use planning and urban and regional development strategies.

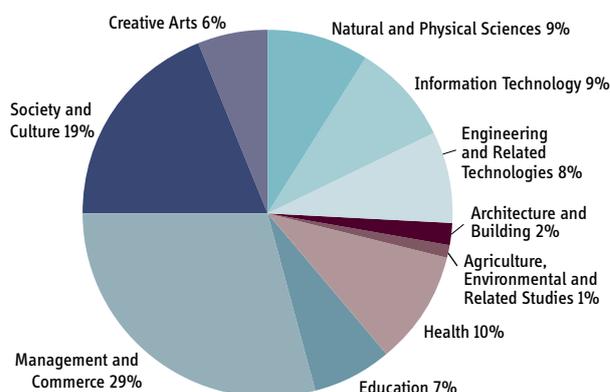
3 Universities as developers of human capital

Universities contribute to the development of human capital through teaching and provision of a learning environment.

3.1 The student population

In 2005 Victorian universities had a student population of 243,000. The largest proportion of enrolments was in the area of management and commerce, followed by studies relating to society and culture. These two areas made up almost half of all enrolments. Further detail is provided in Figure 9.

Figure 9: Enrolments in Victoria's universities by field of education (per cent)



The pattern of enrolments indicates the importance of universities for education and training for careers in the service industries – notably management and commerce, health and education. Taken together, these three areas account for 46 per cent of all enrolments. Universities also maintain a strong commitment to traditional liberal arts education, with 19 per cent of enrolments in disciplines relating to society and culture.

Enrolments in science, engineering and technology related disciplines account for 26 per cent of enrolments.

Approximately 86 per cent of students study internally with a further 11 per cent enrolled for external study. Three per cent of students are enrolled in 'multi-modal' university-vocational education and training facilities. These are located at RMIT, Swinburne and Victoria Universities.

As well as universities, there are in addition, a number of private higher education providers. Many are associated with public universities for the delivery of courses to international students. There are also a number of theological colleges. Several VET institutions in Melbourne offer degree courses, including Box Hill, Caulfield and Northern Melbourne Institutes of TAFE.

3.2 Education and training for the professions

For a long time a university education was a pre-requisite for entry into areas of professional practice such as medicine, the law, engineering and architecture.

More recently a university education has become a requirement for professional accreditation in areas such as health care (including nursing and a range of allied health services), teaching, journalism, agricultural extension, accounting, finance and other 'knowledge based' vocations.

Professions are calling for their areas of practice to be more strongly science and evidence based. University-based research is making a major contribution to the development of bodies of knowledge that are available for transfer and translation into practice.

A qualification from a university with a Melbourne presence gives industry and society confidence in the quality and credibility of the information, advice and service they are receiving or are wanting to access.

Melbourne's universities are working closely with business and the peak professional bodies in the design of courses, programs and higher degrees (including corporate master's programs) that specifically meet industry and business needs. Teaching and research are often undertaken in parallel through industry funded research centres and programs.

Recently, business schools have been offering corporate MBAs, tailored specifically to the requirements of a large business or corporation. Student work can be undertaken and recognised as part of a work related assignment. Many universities also offer courses and programs tailored specifically to small ICT business owners and managers through business schools and faculties of management.

Deakin University has grown to become Australia's leading provider of education and training for private and public organisations, working in part-

nership with government, major corporations and professional associations – such as IBM, Coca-Cola, Amatil, Coles Group, General Motors-Holden, Ford, Qantas and CPA Australia. The University recently entered into an agreement with the Coles Group.

Deakin University – Coles Group Institute for the Future

Coles Group and Deakin University have collaborated in the formation of a unique education and development centre for the corporation's 165,000 staff.

The Institute provides a wide range of development opportunities for employees throughout the Group's major retail brands and support functions, ranging from customer service training at store entry level right through to MBA programs.

The Coles Group Institute was a company-wide extension of the successful Coles Institute which offered training and development opportunities within Coles Supermarkets, also through a partnership with Deakin.

The Vice-Chancellor of Deakin University, Professor Sally Walker, has said that the agreement between the Coles Group and Deakin presented a clear and positive message to corporate communities 'that sees Deakin making education available, not just on-campus and off-campus, but also in the workplace'.

3.3 Work integrated learning (WIL)

To meet the requirements of the professions and the development of industry and professionally relevant and applicable skills, universities are giving a greater emphasis to integrating their teaching and learning with the workplace through work integrated learning initiatives. This contribution is of particularly importance to addressing the skills shortage in key professional areas.

RMIT University aims to be the first choice

provider of work relevant learning in Australia, preparing students for professions and vocations of the future. Many of its programs include work-place experience and/or are shaped directly by industry. For example, all business programs at RMIT have a work integrated learning component or include a 'cooperative year' – where students learn 'on the job'.

Melbourne businesses have been employing RMIT Business Cooperative students for more than 30 years and more than 3,000 students have successfully completed the program. Currently, more than 300 organisations support the program with more than 700 students employed each year.

Overseas work placements are also available and recent destinations include China and South-East Asia. Employers, academic staff and students cite work integrated learning as an important teaching and learning opportunity. The program offers students 'real-world' learning and exposure to future employers, while business benefits from the energy and ideas of students and access to work-ready graduates. RMIT business programs also benefit from new ideas and information on current business practice.

RMIT University – Student internships in advertising

RMIT was approached by a large advertising agency in the CBD to develop student internships. The agency identified a need for work-ready graduates. This was the basis for the internship which RMIT then developed. Students are selected through a competitive process in the final year of their degree and undertake a three-month summer internship where they gain experience working on 'live' projects. This not only enables students to get into the workforce more quickly, but gives them exposure to a potential employer. This pilot project may serve as a model of industry engagement for other advertising agencies in the City of Melbourne.

Designs for Denim

RMIT was contacted by the CEO of Guess Jeans (Australia and NZ) to collaborate on an industry based project to design a new clothing product. 'Designs on Denim' involved the CEO personally presenting a design brief to students and delivering lectures on the company's target markets and business plans. Fifty-seven students participated and their garments were displayed in a city gallery and promoted during the City of Melbourne retail week. The best five designs were displayed in the Guess Queen Vic store.

Other companies in Melbourne involved in RMIT work placements include Nortel, ANZ, APRA, Australian Bureau of Statistics, Holden and Vic Super.

RMIT's School of Global Studies, Social Science and Planning and the Salvation Army's Crisis Services have a formal agreement to work together in areas of student learning, research, professional development and consultancy. RMIT students undertake work placements with crisis services. Crisis services staff are encouraged to further their knowledge and skills through study at RMIT.

RMIT University – The Salvos' Crisis Contact Centre

The Centre, in Grey Street, St Kilda, is a referral, support and advocacy network that helps people with housing, financial, legal and health concerns. It provides emergency accommodation, support for victims of domestic violence and health and counselling services for street drug users and sex workers. Students from a range of disciplines – social science, youth work, social work and many others – learn professional skills within this real-world environment, while experienced Crisis Services staff become teachers, peers and role models – and potentially fellow students.

There are already strong research links between RMIT students and staff and the Centre. RMIT has been involved in research into homelessness among the Centre's users. Youth and social work students have been engaged in the design and delivery of Centre programs that develop the independent living skills of young people. RMIT researchers have been working with the Centre's Health Information Exchange, a primary health care service.

Many of Deakin University's courses have a built-in internship component which allows students to combine work integrated learning with theoretical knowledge in an Australian context. A diverse range of areas are offered, such as business, journalism, public relations, media and sociology.

Most work placements are located throughout Australia, so as well as receiving valuable job training, students experience a new area of Australia as well. Past participants have worked with Great White Shark Expeditions, Seaworld and the Dolphin Research Institute.

Victoria University's business students have also participated in work integrated learning as a featured component of all courses dating back to the early 1970's. Students now fully integrate their learning in the workplace with an on-line curriculum that explores the development of the key skills and attributes that business graduates require. This ensures that the positive link between university-based learning and graduate employment outcomes are optimised.

Victoria University's Centre for Work Integrated Learning attracts a wide variety of high-profile employers across all major business disciplines, locally and abroad. Host organisations include Ford (Australia's largest work integrated learning employer), major accounting, banking and finance firms as well as most of the Faculty's and the University's strategic partners including the Western Bulldogs, Hotel Sofitel, Melbourne Airport and the Melbourne Magistrates Court. This activity is complemented through the development of

relationships with local and small business operators in the West (for example, Qenos, SPE, Createl, George Weston Foods).

Students from the University's courses in International Trade and Global Logistics and Transport are highly regarded and sought after by trade facilitators in the local region, mirroring the importance of Melbourne as a national transport hub. Local and national export/import firms such as ANL, Seaway, Toll (and formerly Patricks), PLM Global and others have consistently recruited Victoria University's students in these important courses.

Victoria University has had the benefit of several marquee courses in the area of hospitality and tourism management, which attract key employers from Melbourne, interstate and internationally. Many of these organisations visit the university to recruit Victoria University's students exclusively. Organisations such as Crown and Hotel Sofitel and Australian Pacific Tours in Melbourne create inter-departmental rotational training programs from which graduate trainees are often selected.

Additionally, up to 50 students per semester enjoy overseas work integrated learning positions in North America, Europe and Asia, with established partners in these sectors, consistent with the ever-increasing respect for Australia's tourism and hospitality education.

Victoria University – Qantas and Victoria University students at Los Angeles International Airport

Qantas Airways, through Hallmark Aviation Services in Los Angeles, has exclusively recruited Victoria University tourism students to train as Customer Service Agents since 2002. The program which sees students training in an operational airline position with Qantas for 12 months at Los Angeles airport is unique in the Australian higher education sector. Upon return to complete their studies, students have readily snared impressive jobs with Jetstar and other carriers serving Melbourne's airports.

Bachelor of Laws students at Victoria University have also engaged regularly with the profession through a dedicated work integrated learning program, Professional Legal Practice.

Victoria University –Lawyers in practice at the Melbourne Magistrates Court

Victoria University law students have volunteered at the Melbourne Magistrates Court on a daily basis assisting Victoria Legal Aid since 2004. Approximately 50 students a year participate on a roster gaining experience in the jurisdiction of the court, working with magistrates on legal research and client support roles.

Many students move into other positions at the courts in Corrective Services and other government assistance programs for disadvantaged groups. Other students undertake paid and unpaid work at various Community Law Centres (CLCs) such as North Melbourne and Flemington/Kensington CLC and the Refugee and Immigration Legal Centre.

The Magistrates Court program has been extended to embrace the Sunshine Magistrates Court.

Victoria University maintains an anatomy laboratory in the basement level of 300 Flinders Lane that serves as a teaching resource primarily for students enrolled in the osteopathy program. The laboratory houses both dry (bones, models) and wet (cadavers) specimens. The osteopathy students participate in cadaver dissection as part of their study in anatomy.

Final year Agricultural Science students at La Trobe University are trained as global scientists through a unique case study program that involves interactions with communities from both Australia and developing countries. During this program students are exposed to issues that consider social and cultural practices within the community.

La Trobe University has a strong commitment to clinical legal education – a legal practice based

method of legal education. In 1978 the Department of Legal Studies appointed a solicitor/lecturer to establish the West Heidelberg Legal Service. This relationship continues today.

The School of Law and Legal Studies also works with Victoria Legal Aid and a number of non-profit and government agencies. These arrangements enable students to participate, under supervision, in the legal and community work of the agencies. In this way students provide services to the local and wider communities whilst enriching their understanding of legal theory through their practical experience.

In nursing, social work and physiotherapy clinical placements also form part of the curriculum at La Trobe. The University also facilitates internships in tourism and hospitality programs

3.4 The student experience

In addition to the more instrumental aspects of learning and education, Melbourne's universities also provide a very high quality 'student experience' through the range of learning opportunities provided. This also becomes part of the universities' contribution to the cultural and social life of the City. This has indirect benefits in terms of business development, as indicated in the explosion of businesses on Swanson Street addressing students' recreational needs.

In some cases, the borders between campus and city are dissolving. For example, RMIT has extended wireless access to its network to users of the State Library. This benefits students, many of whom use the library as a study space and social gathering point, but also benefits other library users. Wireless access is also available through RMIT at the large Melbourne Central shopping complex, which covers three city blocks in the heart of the city and encompasses a number of cafes, food halls and restaurants.

Victoria University has a strategic commitment to provide high-standard facilities that optimise the learning environment to meet the teaching,

learning and social needs of the University community. To this end, in November 2006 Victoria University opened a world standard Learning Commons facility on the 15th floor of its campus at 300 Flinders Street.

Victoria University – The Knowledge Commons

The student centred environment provides integrated library, IT and learning support for students. The modern facilities and extensive views over the City provide an excellent backdrop for independent learning as well as collaborative study that characterises the current generation of students. They also provide an attractive social and interactive hub for local and international students who study at this busy City campus. A large number of computers are popular with Victoria University's technically savvy and highly mobile students. The 'one stop shop' approach also enables students to access personalised learning support services to maximise learning, career and personal opportunities.

From another dimension, the learning experience involves participation in external projects and competitions where students can use and extend their knowledge in practical situations. For example, final year mechanical engineering students at Swinburne University are now regular entrants in the Formula SAE (Society of Automotive Engineers) competition. RMIT also has a strong involvement with the Formula SAE project and in 2006 RMIT's team – comprising students from the School of Aerospace, Mechanical and Manufacturing Engineering – won both the Australasian event and the USA FSAE East Coast event at the Ford Proving Grounds near Detroit.

Swinburne and RMIT Universities – The Formula SAE Project

A number of Victorian universities participate in FSAE. At Swinburne, FSAE began in 2000 as a dynamic and exciting final year project for mechanical engineering students and has evolved to become an interdisciplinary project within the Faculty of Engineering and Industrial Sciences, involving a large group of students from engineering, business and multimedia design. It is a final year project unlike any other and gives students an opportunity to work in a real-world environment under the sort of pressure experienced in industry.

The Formula SAE (Society of Automotive Engineers) competition began in the USA in 1981, with the Australasian competition beginning in 2000. Teams are run solely by current university students with the concept being to conceive, design and fabricate a small open wheeled formula style race car. Strict design rules are put in place by the SAE in order to challenge the students in all aspects of the engineering of a performance vehicle.

The project itself sees a team of highly motivated and dedicated students working together to design, build, test, race and manage a formula-style open wheel race car to compete at the Formula SAE-A competition, held in December each year. Swinburne competes against other universities from across Australia and overseas and has continually developed and evolved its car into a highly performing package that exemplifies the skill and commitment of the team.

Team Swinburne has enjoyed many successes since 2000, including winning the prestigious Design Event in 2000 and the National Instruments Test Award in 2002 and 2003.

4 Universities as “engines of innovation”

Universities are seen by some policy makers and scientists as a key source of knowledge for industrial innovation. The way in which teaching and research translates into industrial products and services is complex, but the role of universities in educating students for careers in industry and undertaking research with an industrial application is widely acknowledged.

In 2004 Victorian universities were awarded \$1.3 billion in Australian Government grants for teaching and research. State and local government grants totalled \$278 million. Grants amounting to \$135 million were also received from international and industry sources for research. These resources are used to create valuable knowledge products and services which are transferred to end users through publication, collaboration and access to facilities and equipment.

4.1 Knowledge products and services

The research outputs of Victorian universities are impressive. In 2004 scholars in Victorian universities produced:

- 194 books and 1,005 book chapters
- 5,763 articles published in scholarly journals
- 2,738 refereed papers presented at conferences.

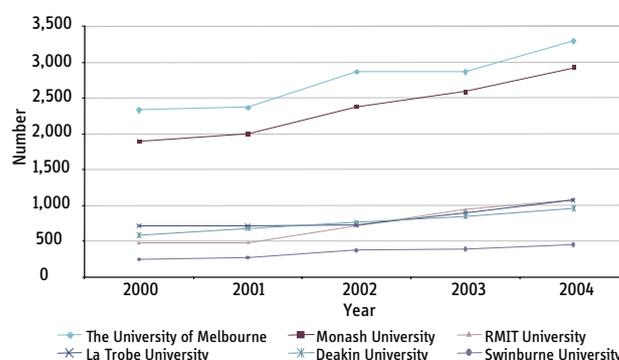
Whilst scholarly publication principally serves academic purposes, industry, government and non-government organisations are also users of these research outputs. Sometimes this is merely for information – to gain insights on where scholarly research is heading and the direction of leading edge thinking.

Publication also identifies researchers with whom industry and other stakeholders may wish to make contact and engage in further research. Publication is also an important outcome of university-industry collaboration: the Australian Research Council (ARC) requires that the results

of collaborations under ARC Linkage grants be published.

The level of academic publication has increased substantially, namely by 57 per cent in all Victorian universities over the period 2000-04. The trend is indicated in Figure 10.

Figure 10: Victorian universities – Weighted publications



Melbourne is a global hub for bio-medical research. In 2004 there were 1,521 research staff employed in Melbourne’s world class medical research institutes (MRIs). This compares favourably with research staff numbers in overseas bio-medical research clusters including Toronto (1,149); San Diego (1,430); Montreal (822) and Raleigh-Durham (910). In 2004 Melbourne’s MRIs held 82 overseas funded research grants with a value totalling \$20.2 million – an increase of more than 50 per cent on 2001 levels.

4.2 Intellectual property protection and technology licensing

Universities seek to protect intellectual property and licence it to industry and other users for a number of reasons:

- to promote the application of the results of scientific research for the public good;

- to recruit, reward and retain faculty interested in seeing their technologies further developed;
- to provide opportunities for exchanges of information and materials with industry;
- to promote economic development; and
- to generate an income stream for reinvestment into research and teaching.

The management of strategies to achieve these purposes involves complex trade-offs-as well as resourcing. There are substantial public and industry benefits that flow from licensing technology over and above the returns to a university. Few universities are sufficiently resourced to carry out these functions efficiently and effectively.

Most universities and medical research institutes have established technology transfer offices to arrange for the protection of intellectual property and licensing of technologies to industry. In 2004 there were a total of 61 people employed in these roles in Victorian universities. The largest office was at Monash University.

In 2004 Victorian universities reported a total of 86 invention disclosures and filed applications for 156 patents. Medical research institutes reported 121 invention disclosures and filed 140 patent applications. A total of 67 patents were issued to universities and 17 to medical research institutes.

In terms of licensing intellectual property for application in industry, universities executed 67 new licences in 2004, giving a total of 102 active licences. These generated \$5.7 million in income. Medical research institutes had a total of 278 active licences, generating \$10.3 million in revenue.

Consistent with experience and practice both inter-state and overseas, technology licensing is not a major source of income or a priority activity for Melbourne's universities. However, Melbourne's universities have a commitment to undertaking research that is both excellent and relevant for adoption, application and use in industry, government and the community. These

commitments are reflected in areas of research strength.

4.3 Melbourne's universities areas of research strength

Universities adopt a variety of approaches in identifying their research strengths. Some have used traditional indicators such as research income, the number of research active staff, the number of publications, higher degree by research completions and success in winning research grants.

The emergence of new forms of knowledge creation has seen the emergence of the university research centre as a significant organisational and management vehicle. Research centres have facilitated interdisciplinary research that has been the hallmark of knowledge based industrial innovation. All Melbourne's universities have established research centres to pursue research, teaching and industry/community collaboration objectives.

The University of Melbourne lists 70 centres for teaching and research, not including ARC funded research centres. Monash University has more than 100 research centres at a departmental, faculty and university level to provide critical mass, foster a community of scholars and enhance international collaboration. La Trobe University supports more than 40 research centres and institutes at various levels.

Other universities have fewer centres but they are nonetheless regarded as important vehicles for increasing the range of sources of external income to support the research of the university, in particular from non-government and international agencies.

RMIT University, for example, is in the process of establishing four research institutes – Health Innovation, Design, Global Cities and Platform Technologies. These institutes are built around areas of research excellence and the interests of industry partners and bring together expertise of researchers from across RMIT. This initiative is

central to RMIT's research, industry and community engagement strategies.

Major research activities associated with the Melbourne campus of Australian Catholic University are defined by the a number of centres and flagships, including: the Centre for Early Christian Studies; the Centre for Lifelong Learning; the Centre of Physical Activity Across the Lifespan (CoPAAL); the Flagship for Creative and Authentic Leadership; the Mathematics and Literacy Education Research Flagship; and the Quality of Life and Social Justice Flagship

Indeed, most universities have strategically selected research strengths and established research centres that reflect their institutional vision. In a number of instances, universities have identified and committed to selected research strengths following a competitive institutional process. A snapshot of research strengths in Melbourne's universities (which is illustrative rather than exhaustive) follows.

Advanced materials and manufacturing

Melbourne's universities have established internationally regarded research capabilities in advanced materials and manufacturing. These capabilities represent a major contribution to Melbourne's industrial research and development infrastructure.

Deakin University identifies a research priority in advanced materials manufacturing and performance. The University carries out research on two key themes: metals manufacturing and performance and advanced fibres and polymers.

The Materials Manufacturing and Performance Research Group is equipped with a wide range of experimental equipment. This includes a large laboratory rolling mill, complete metallographic facilities and advanced numerical modelling facilities, pilot fibre processing and textile dyeing facilities and ISO accredited fibre and textile testing laboratories.

Deakin University – Stamping Technology in Automotive Manufacturing Process (STAMP)

STAMP is an industrially and government funded collaboration between Ford Australia, BlueScope Steel, Castrol, SIRF, the ARC and Deakin University. The program's main focus is to optimise the sheetmetal-forming processes used by the Ford Motor Company of Australia.

STAMP is funded by contributions from each of the industry partners. In addition, further funding has been obtained from state and federal government sources.

STAMP's major areas of interest are: Metal flow during forming operations; the optimisation of lubrication in sheet metal forming; die-coatings on sheet metal forming – chromium; the effect of new steels such as bake hardenable steels; the effect of coatings on steels – e.g. zincalume coatings; wear of dies during metal forming operations.

The research of the STAMP program is performed in the industrial partners' production facilities, using actual production equipment. This research is performed by Masters students who spend 80 per cent of their time on-site. Whilst on-site the students act as employees of the industrial partner and are entered into the companies graduate training programs. Several students have moved on to challenging new positions within the industrial partners.

The students spend the remainder of their time at Deakin University where they receive supervision and conduct necessary background work such as literature searches.

Melbourne University identifies major research strength in advanced materials science and engineering. The major emphasis in this area is on the creation of a range of novel materials with biological and industrial uses including biocompatible materials based on innovative nanotechnologies. Dental Science has developed

bio-materials with the mechanical properties of teeth. Research on novel non-Newtonian fluids and intelligent polymers has been strongly supported by industry. Minerals processing and metals refining have also been core activities.

RMIT's industry-relevant research strengths and technology focus is also reflected in its research around sensitive materials and systems. Aerospace is a significant area of research strength, where researchers have, for example, created a sensitive strain gauge the size of a band aid that can be used on aircraft panels and which can transmit readings back to base. Some 94 per cent of gold medal-winning Australian athletes at the last Olympics wore cooling vests using RMIT research into materials that absorb heat without the burning effect of ice.

RMIT University is also focussing research on the challenge of producing vehicles that are up to 85 per cent recyclable. By meeting this need at home, the future of the automotive industry will be reflected in global relationships and export opportunities for Australian products. RMIT has been addressing this issue through the Centre for Design.

RMIT University – Functional Design for Automobiles

Using virtual design as the main medium, together with modelling, simulation and virtual prototyping, the automotive industry expects to see mass customisation of vehicles within 10 years. This necessitates the development and implementation of new design and manufacturing technologies, which will allow new models of vehicles to be developed within a few months rather than years as is currently the case.

RMIT has been working on the function and flexibility of the car seat – providing a new generation of products that are innovative, easier to manufacture and therefore more economical. This major research project benefits from close relationships between RMIT,

the Cooperative Research Centre for Advanced Automotive Technologies and major industry partners such as Futuris (which is engaged in automotive component manufacture through Air International, Australia's largest supplier of seating and interior systems for passenger vehicles).

Swinburne University also has strength in advanced industrial technologies. Research in the area of intelligent manufacturing systems and materials has been undertaken at Swinburne for more than 15 years. Although engineering based, the research is often multidisciplinary and spans a number of the University's units, notably the School of Engineering and Science and the Industrial Research Institute Swinburne (IRIS). IRIS is one of Australia's longest established advanced manufacturing research and development centres, having completed more than two decades of service to Australian industry.

Swinburne University – The Industrial Research Institute, Swinburne (IRIS)

IRIS provides a range of manufacturing R&D support mechanisms including collaborative research, leveraged research grants and industry placement of postgraduate researchers.

This capability is backed up with academic expertise and multimillion dollar facilities including low and high powered lasers; state of the art metal deposition machinery, micro-fabrication and non-contact inspection facilities. IRIS can provide an interface between universities and companies, be they small technology start-ups or large established corporations.

In addition to research and development, the range of services includes feasibility studies, design and testing of developments and customised short term training. It also has an important educational role in providing post-graduate courses in niche areas of relevance to industry.

The research component is conducted under five programs: Intelligent Manufacturing Systems; Laser Technology; Microtechnology; Microwave Technology; and Robotics and Non Contact Inspection. IRIS is a member of seven CRCs.

Swinburne University also has research strength in optics and applied laser technology. Four major research centres have been created under the umbrella of the new purpose-built Swinburne Optronics and Laser Laboratories (SOLL). The centres have a wide range of world-class, state-of-the-art laser research facilities. Research areas cover a broad spectrum ranging from industrial applications of lasers to laser-based technologies of the future and laser studies of atoms and molecules at the most fundamental level.

Information, communications and related technologies

Melbourne's universities have research strength in information, mathematical and communication sciences, telecommunications, photonics, signal processing and intelligent systems. These areas of research also make a major contribution to Melbourne's industrial research infrastructure base.

For example, RMIT has research strengths relating to information retrieval from very large databases, including the Internet. One research group has developed into a commercial enterprise which has been spun out as a successful company with clients in many sectors including defence, education and government in Australia and overseas.

Deakin University has a comprehensive range of expertise and excellence with specialisation in signals and systems identification (SSI); robotic and haptics (RH); visual information processing (VIP); systems modelling and control (SMC); automation in bio-medicine (AB) and manufacturing assembly multi-stage benchmark algorithm (MB).

The University of Melbourne undertakes major research activities involving mathematical,

computer science and software engineering. It also has expertise in the fields of declarative programming, artificial intelligence, information retrieval and knowledge management database systems that complement the research in electrical and electronic engineering.

Monash University has established a Research Centre for Synchrotron Science. The University has contributed land to the Synchrotron Facility and to the establishment of synchrotron beam lines.

Swinburne University has a research strength in how new information and communications technologies are put to use by users, communities, organisations and societies in a way that creates new intersections of technology, content and use. Research activity is concentrated in the areas of: convergent communications and technologies; human computer interaction; internet computing and ecommerce; affective human-computer interaction and information technology innovation.

A key resource of new communication technologies is the SCHIL Usability Laboratory, a state of the art observational facility in which human interaction can be studied under controlled conditions with a wide range of information and communications technology-based systems.

Victoria University also has research strength in telecommunications and micro-electronics. The University's Centre for Telecommunications and Micro-Electronics provides excellence in research and development in telecommunication and micro/nano-electronics and micro-technologies. The Centre has established strong partnerships with government, industry and other research centres both nationally and internationally

Architecture and design

At Deakin University research aims to provide intellectual services to the building, construction, property and facilities management industry through a collaborative network of research-active academics, external experts and industry partners. Such services include pure research, applied

research, research training, consulting and leveraging resources and infrastructure using funds primarily won from competitive government sources and private organisations.

RMIT University has longstanding research strengths in areas relating to architecture and design. The University's new Research Institute in Design aims to lead communities to technologies and tools to support a more proactive construction of the world around us – that is, its navigation through design.

RMIT University will also deepen its engagement with industry with the construction of a landmark building to house a new Design Hub. The Design Hub will be built on 3,000 square metres retained by RMIT when it sold the former Carlton and United Breweries site, on the corner of Swanston and Victoria streets, Carlton.

RMIT University – RMIT Design Hub

The Design Hub will bring together academics and research students from across disciplines, creating the space for vibrant interaction between RMIT and industry partners. It will include RMIT's new Design Research Institute, postgraduate education in design, exhibition space, modelling and prototyping workshops, facilities and collaboration space.

The Design Hub will provide space within which researchers and industry can combine expertise and facilities to deal with design and innovation issues and where industry can engage in more speculative, long-term projects. Design and consultation on the Design Hub will take place over 2007, with architects appointed in late 2006. Construction will begin in early 2008 and is expected to be completed in early 2009.

Fundamental science

The University of Melbourne undertakes leading-edge fundamental scientific research programs relating to the synthesis and characterisation of complex molecules, x-ray and neutron optics,

astronomy, condensed matter physics, surface and interface studies, geophysics and geochemistry. The University has a commitment to preserve a strong international research presence in the basic enabling sciences for the advancement of fundamental scientific discoveries as central pillars to support excellence in more applied areas.

Swinburne University's Centre for Astrophysics and Supercomputing, one of Australia's premier astronomy groups, has an international reputation. The Centre is dedicated to inspiring a fascination in the universe through research and education. The Centre undertakes research in the areas of: galaxies, globular clusters, pulsars, square kilometre array simulations, star and planet formation, supermassive black holes, big bang cosmology and astronomy visualisation.

The Centre is a regular user of many large astronomical instruments including the Hubble Space Telescope, the Parkes 64m radio telescope and the Keck 10m observatory (the world's largest optical telescope). State-of-the-art visualisation capability is provided by a virtual reality theatre.

Swinburne University – Centre for Astrophysics and Supercomputing

Astrophysics research within the Centre spans the entire electromagnetic spectrum covering computational, theoretical and observational astronomy. The Centre hosts a supercomputer – the fastest within Australia dedicated to astrophysical research. Centre astronomers are regularly awarded observing time on major telescopes including the Anglo-Australian Telescope, Parkes Telescope, Australia Telescope Compact Array, Keck Observatory and the Hubble Space Telescope.

The commercial arm of the Centre, SpaceWorks, uses the synergy of astronomers, visualisation researchers, animators, artists and programmers to create new dimensions in astronomy and visualisation through a range of virtual reality projection systems and edu-

cational content. Projects include constructing the innovative virtual reality environment called VROOM – currently housed at the Melbourne Museum and Astrotours, an interactive 3D experience for school children.

The online astronomy program, Swinburne Astronomy Online (SAO), is perhaps the largest Internet-based astronomy learning program in the world.

At La Trobe University physical and mathematical sciences are an area of research strength that enjoys a high international reputation in materials and surface science, space physics, complex systems and algebraic structures.

Medical and health sciences

Melbourne's universities have a particular strength in neurological sciences. At The University of Melbourne, research to investigate various neurological functions of the brain is frontier science being pursued by expert teams from a number of perspectives. Researchers are at the forefront in areas such as ageing, stroke and Alzheimer's, Parkinson's and other neuro-degenerative diseases. Magnetic Resonance Imaging collaborations with the Howard Florey Research Institute and the Austin Brain Imaging Research Institute are providing new insights into the structure and functioning of the brain.

The University is lead collaborator in the Centre of Clinical Research Excellence (CCRE) in Neurosciences, a multi-disciplinary clinical research model focusing on producing innovative patient centred research, training and education into stroke, epilepsy and other neurological disorders.

The University of Melbourne – CCRE in Neurosciences

The Centre operates as a multi-disciplinary network of expert clinical researchers investigating all aspects of neurological health and diseases. Research disciplines range from neurology and medicine through

physiotherapy, occupational therapy, speech therapy and nursing, to neurophysiology, psychology, neuroimaging, neuroepidemiology and public health.

The Centre was established in 2003 and builds upon the achievements of the Centre of Clinical Excellence in Hospital Based Research from 1998-2001. The Centre is based at the Austin Health Repatriation campus in Heidelberg, Victoria and administered by the Department of Medicine Austin Health/Northern Health, The University of Melbourne.

The Centre offers an innovative multi-disciplinary model for clinical research into the neurosciences, which integrates nursing, physiotherapy, occupational therapy, medicine and other related disciplines.

The Centre has strong working relationships with the Brain Research Institute, the Department of Medicine Austin Health/Northern Health, the Epilepsy Research Centre, the National Stroke Research Institute, the Rehabilitation Sciences Research Centre, the School of Nursing at The University of Melbourne and the School of Occupational Therapy at LaTrobe University.

Since the 1970s Monash University has been a driving force in the development of assisted reproductive technologies in both Australia and overseas. The Queen Victoria Medical Centre's clinical IVF program, which is the Monash University IVF program, is now called Monash IVF (previously the Infertility Medical Centre) and has Victorian clinics at the Epworth Hospital in Richmond, the Monash Day Surgery in Clayton and five regional clinics throughout the state: Bendigo, Casterton, Geelong, Sale and Northern Melbourne.

Monash University: IVF Clinics

In Melbourne during 1979 and 1980, Professor Carl Wood and Associate Professor John Leeton, Dr Alan Trounson (a world renowned embryologist), Dr Alex Lopata and Mr Ian

Johnston investigated the use of artificial hormones to control the ovulation cycle of women on IVF treatment. This became known as the Fertility Drug Schedule.

In June 1980, the world's fourth IVF baby was born in Melbourne as a result of the combined efforts of doctors and scientists from Monash University's Department of Obstetrics and Gynaecology at Queen Victoria Medical Centre and The University of Melbourne's Department of Obstetrics and Gynaecology at the Royal Women's Hospital.

In 1998 Monash IVF established a clinic in Brisbane, four in Queensland regional centres and one in Northern NSW.

In 2005 Monash IVF signed a joint venture with Wesley IVF (Brisbane) creating Wesley Monash IVF. Monash IVF is also affiliated with clinics in New Zealand, Sri Lanka, China and Hungary.

Since the early 1970's Monash IVF has helped many families achieve their goal of having a healthy baby. More than 18,000 children have been born as a result of successful treatment in these programs. Twelve out of the first 15 IVF babies born in the world are Monash IVF babies.

Swinburne University has research strength in human brain function and cognition, commonly termed cognitive neuroscience. Specific areas of research include: the biological basis of human intelligence; computer modelling of brain function; functional brain imaging studies; neurobiological effects of electromagnetic fields; neurobiology of learning disorders with particular reference to dyslexia; neuroscience of visual processing, visual attention and conscious awareness; psychopharmacology of anxiety, mood disorders and cognition, sensory neuroscience with particular reference to taste and smell.

Deakin University has a research focus on ageing and chronic illness. Research is concentrated within two program areas: risk and symptom management and community wellbeing. Much of

this research is being pursued through Deakin's Clinical Partnerships Program initiative.

Deakin University – Clinical Partnerships

The School of Nursing's Clinical Partnership Program is the first coordinated program of its kind in Australia. This extensive program connects Deakin University's School of Nursing to nine health care organisations in the public and private sector and in metropolitan and non-metropolitan areas.

The goal of this innovative program is to facilitate clinical multi-disciplinary research. The program enables research to be strategically focussed in areas of clinical importance to the health care field. These alliances facilitate major multi-site clinical trials to be undertaken and provide a base for national and international involvement.

Each partner health care organisation has a joint appointment with the School of Nursing in the form of either a Professor of Clinical Nursing or a Senior Research Fellow. This model facilitates research and relates the School's education offerings to specific health-care needs of the community.

Deakin University also has a strong research capability in physical activity and nutrition. Research is directed towards the biological, behavioural, social and environmental determinants of physical activity and nutrition, with a particular emphasis on the health impacts of obesity, diabetes, cardiovascular diseases and osteoporosis.

Deakin University has a commitment to research excellence in social and mental health. Research work involves two streams: the identification of health risk behaviours that impact on social and mental health at the individual level, which will lead to the development of early prevention and intervention strategies and the way in which social exclusion and marginalisation contribute to poor health, educational disadvantage,

unemployment and other social outcomes and broader social, material and environmental factors.

La Trobe University has research strength in health systems, reform and delivery. One of the major developments in this area was the establishment of the Refugee Health Research Centre in December 2003. The Centre is a partnership between the Victorian Foundation for Survivors of Torture and the Faculty of Health Sciences. Through the Centre, the University seeks to develop further its research, as well as its community engagement, in refugee youth, refugee protection, newly emerging communities and health services research.

Health is the focus of one of RMIT University's new research institutes, which brings together researchers across disciplines and reflects RMIT's research strengths in medical and life sciences. Its research is focused on four-interrelated themes: lifestyle solutions for healthy communities, evidence-based Chinese medicine, advanced technologies for therapeutics and diagnostics and molecular therapies and solutions for 'lifestyle' diseases.

Much of this research is linked with the quest for industry-relevant solutions: for example, the RMIT Drug Toxicology and Testing enterprise at Bundoora assists organisations in rapidly identifying compounds of low toxicity and high activity before entry into animal testing models and human clinical trials, thereby reducing the investment risk and increasing the success rate.

Monash University has a major commitment to injury prevention. The Monash University Accident Research Centre (MUARC), formed in 1987, is Australia's largest multi-disciplinary, injury and injury prevention research institute. Research spans all settings in which injury occurs – transport, the workplace, the home and recreational and other community locations. Research relevance and excellence have produced results which have had a significant impact upon both government and industry injury prevention efforts.

Monash University Accident Research Centre (MUARC)

MUARC conducts research of the highest standard, creates new and improved methods and provides incisive interpretations of research findings. The Centre identifies emerging injury problems, monitors progress, determines and evaluates solutions and advises on safety strategies. It works cooperatively with both public and private sector organisations to define the scope of research projects and encourage the adoption of recommended injury prevention measures.

The Centre has 90 staff and postgraduate students. One hundred projects are current at any one time, covering all aspects of injury prevention. The disciplines in which Centre staff has expertise include: epidemiology, psychology, medicine, many branches of engineering, industrial ergonomics, biostatistics, public health, nursing, human factors, computer science and statistical analysis. MUARC's reliance on external funding and its commitment to delivering quality outputs means that it is more client-focused than conventional academic research centres.

While some MUARC staff have experience in teaching university undergraduates, the Centre's focus is on transferring knowledge and expertise to organisations and individuals who can implement safety improvements in their organisations.

In recent years, the Centre has run a short course in the Biomechanics of Crash Injury and Vehicle Crashworthiness. This course is aimed at injury prevention specialists, practising engineers and road safety professionals seeking specific training in how to prevent injuries by the application of modern safety design principles and the use of latest technology.

In addition, MUARC senior staff have developed and presented safety training courses to road safety professionals in Victoria,

Queensland and Western Australia, including tailored courses for staff in specific government organisations (for example, VicRoads).

Biotechnology

Melbourne is recognised as a global hub for bio-medical research and is a platform for the Victorian Government's Biotechnology Strategy. Most universities have commitments to research and knowledge transfer in biotechnology.

Deakin's University's Institute for Biotechnology, BioDeakin, draws together existing strengths in bio-medical and bio-health sciences, plant and aquatic biology, biotechnology, bio-processing, bio-informatics and bio-ethics.

Deakin University – BioDeakin

BioDeakin is a new whole-of-university initiative, created to advance scholarship, research and teaching across a range of applied biotechnology areas. This multi-disciplinary grouping of scientists encompasses the University's strengths in bio-medical and bio-health sciences, plant and aquatic biology, biotechnology, bio-processing, biotech management, bio-informatics and bio-ethics. The goal is to generate and transform knowledge from biotechnology into practical solutions, which will advance health, social, environmental and economic development.

Deakin's Metabolic Research Unit works closely with ChemGenex Pharmaceuticals, a publicly listed biotechnology company that is focussed on gene and protein discovery and validation. Deakin/ChemGenex Pharmaceuticals research has been partnered with a leading European pharmaceutical company to develop new therapeutic treatments for diabetes and obesity.

Deakin's Centre for Cellular and Molecular Biology is at the forefront of the investigation of the effects of heavy metals on biological systems. Metals such as copper, zinc, chromium and arsenic are essential for life, but

pose serious health threats when their balance is disturbed by genetic or environmental disorders.

Researchers in the Centre have isolated the gene responsible for the genetic copper deficiency disorder, Menkes disease. The defect in both cultured cells from Menkes patients and in a mouse model of Menkes disease has been corrected. Centre researchers are also investigating another potentially fatal copper related disorder, Wilson's disease. This work will help to develop treatments not only for copper diseases but also for other diseases, such as Alzheimer's disease and some motor neurone diseases.

Research into human and veterinary medicines is an area of central importance to The University of Melbourne. The Bio21 project was initiated with the prospect of discovering and developing new protein and medicinal chemical pharmaceuticals for human and veterinary use. It is a multidisciplinary research area of excellence involving several expert groups:

- bio-prospecting, functional genomics, medicinal and natural product chemistry groups are located in biochemistry and molecular biology, chemistry and pharmacology;
- immunological studies and vaccine research are pursued in microbiology and immunology, veterinary science and by groups collaborating with affiliated medical research institutes; and
- exploratory drug discovery and industry-sponsored drug development groups in pharmacology and combinatorial chemistry and bioinformatics groups in various departments form part of this focused effort. The research impacts on such areas as cardiovascular and respiratory science, neuroscience, parasitology, endocrinology and immunology.

The University has created a Bio21 Molecular Science and Biotechnology Institute to focus academic research activities. Monash University has established an international reputation for research excellence in bio-medical sciences

(including biochemistry and molecular biology, microbiology and physiology).

At Swinburne University biotechnology and bio-engineering technology are being applied to both fundamental and applied studies, many of which are in response to an industry-identified issue, or a problem that requires expertise in this area. Major research activities include: development of novel drug-delivery systems; development of methods to biodegrade plastics (for example, by using environmentally friendly wood decomposing fungi); application of enzyme technology in industrial processes; extraction of bioactive compounds from biological substrates; formulation of spreading formulations for the non-lethal repellency of birds and development of methods for efficiently removing heavy metals from waste water streams.

Swinburne's commitment to bio-medical research is reflected in its Bio-S initiative.

Swinburne University – Bio-S at Swinburne

Swinburne's Bio-S hub has research strengths in polymer science, natural product discovery, biosensor development, plant molecular biology, tissue engineering, environmental microbiology and sensory neuroscience. Bio-S coordinates seven research groups from three faculties across the University, enhancing the flow of information and resources between these groups to promote highly interdisciplinary and collaborative projects.

The initiative is supported by world class imaging, micro-fabrication and analytical facilities and houses the only facility in the southern hemisphere capable of testing to the current international standards for biodegradable plastics.

Bio-S research has led to the development of products with environmental and health benefits for the local and international communities, including biodegradable packaging materials now sold on world markets and new

disinfectants used in the Australian and New Zealand veterinary markets.

Patented analytical microarray technologies are also being developed for commercial use.

Deakin University has a particular focus on agricultural biotechnology. In plant systems the research focuses on the responses of plants to environmental stresses and aims to enhance human wellbeing, increase the efficiency of plant breeding and produce plants with increased resistance to detrimental environmental factors. Research in animal systems is similarly concentrated on resistance and adaptation to different environments and is directed towards promoting animal reproduction, enhancing natural production of economically important marine species and control of the salt and water balance of animals in different environments.

At The University of Melbourne significant strengths have been established in plant biology, particularly in the fields of molecular and cellular biology and the chemistry of complex carbohydrates. Genetic modification of food products, especially cereal crops and pastures, to improve pest resistance, yield and quality is the major emphasis of collaborative research in agriculture, including at the Joint Centre for Crop Innovation. Equine Virology, Zoological Studies and Animal Biotechnology are key areas with strong industry and international collaborations.

In February 2006 a new \$20 million Victorian AgriBiosciences Centre (VABC) was opened at La Trobe University. The Centre acts as a science and business incubator to support research discoveries through conversion to delivery for the agricultural biotechnology sector. The Centre is a consortium comprising La Trobe University, the Department of Primary Industries, the Molecular Plant Breeding CRC, Florigene Ltd (a division of Suntory), Monash and RMIT Universities. The consortium is chaired by Professor Roger Parish, Head of La Trobe University's School of Life Sciences.

The research will focus on helping plants survive drought and cold, boosting their salt tolerance, controlling when crops flower, enhancing crop yields, reducing crop losses to pest and diseases and improving quality. Twelve La Trobe University staff members and 25 postgraduate scholars are involved in research projects connected with the new Centre. The VABC also houses a Research Hotel to provide an additional science and business incubator for the agricultural biotechnology sector on the La Trobe R&D Park.

La Trobe University – Victorian AgriBiosciences Centre (VABC)

The VABC co-locates and clusters academic and commercial research and development groups in the agricultural biotechnology sector, fostering an environment that promotes effective interactions, networks and the incubation of spin off companies.

Co-locating academic and commercial R&D groups fosters an environment that promotes effective interactions, networks and the incubation of spin-off companies. La Trobe University also provides opportunities for VABC tenants to collaborate with visiting scholars and to access overseas speakers for seminars, forums and conferences.

The new Centre is seen as a watershed in the trend to successfully combine research, academic and industry requirements into facilities that satisfy high-end research needs as well as the commercial demands of industry.

Arts, humanities and social sciences

Deakin University has directed research towards extending knowledge and understanding of the problems associated with citizenship and globalisation and to communicate them to a wider audience. A key focus is on contemporary and historical issues, arising from the research spheres of state and society, culture and heritage, economy and society, gender and health and the international system.

La Trobe University has research strengths in a number of arts and humanities related disciplines:

- **Archaeology.** Researchers here have continued to develop archaeology to enrich understanding of human settlement in Victoria, Australia and internationally. Much of the work has been funded privately by development projects, including mining and urban growth initiatives. Significantly, these partnerships have been incorporated into teaching programs. The University has an international reputation in the archaeology of Central America.
- **Linguistics.** The University is a leading international centre in language history, documentation and typology, in particular in relation to the languages of Asia, Australia and South America and in language pathology and language acquisition. In 2004, the University took major steps in building its expertise in Sino-Tibetan languages, instrumental phonetics and the languages of Papua New Guinea. The Research Centre for Linguistic Typology has a focus on developing inductive generalisations about human language.
- **Modern Asian Studies.** La Trobe University has the highest concentration in Australia of prominent Asianists in the social sciences and humanities. The research continues to inform the University's teaching program at all levels: La Trobe is one of only two universities in Australia to teach all four of the great Asian languages, Mandarin Chinese, Hindi, Indonesian and Japanese.

La Trobe University provides, on a national level, academic leadership and guidance on literature, linguistics, the history of the Hellenic Diaspora and socio-economic issues by maintaining and developing programs and activities in support of the Greek language and culture and the Hellenic civilisation in the broader Australian society. This is especially important in the context of Australia's large Greek immigrant population.

The University of Melbourne has research strength in historical studies, policy, culture and society.

Strengths include historical and urban studies, literature, art, music, languages and philosophy. There is a highly regarded public policy research base in key areas such as criminology, politics, social work, urban planning and in the ARC Special Research Centre for Applied Philosophy and Public Ethics.

RMIT University also has strength in applied social sciences with strong links to industry and the community. The RMIT Centre for Applied Social Research, for example, conducts research which focuses on key social challenges affecting Melbourne and Australia more broadly. The newly formed Global Cities Institute conducts research around urban sustainability, with key themes focussing on Melbourne and a number of cities in the Asia-Pacific region. Its research programs have significant 'on-the-ground' impact, emphasising questions of security, sustainability and resilience in the face of globalisation and global climate change.

Economics, business and management

Universities contribute to Melbourne's and the nation's commercial and economic life through applied theoretical and applied economics and financial analysis on many aspects of the Australian economy and social services.

Policy orientated research is undertaken in the Melbourne Institute of Applied Economic and Social Research and the Departments of Economics and Finance. Strong links exist with government departments and business for forecasting, economic modelling and securities investigations.

The Melbourne Institute of Applied Economic and Social Research

Through its programs the Melbourne Institute of Applied Economic and Social Research gives business, government and the broader public access to the leading practitioners and researchers with whom it engages, improving decision-making and public debate.

The Melbourne Institute provides a wide range

of research consultancies for business and government, often for a national audience. In addition, each year it collaborates with The Australian to hold the Economic and Social Outlook Conference. This attracts political leaders from the Commonwealth and the states, senior government officials, leaders of business and community organisations and leading academics to discuss and debate such issues as: how long will the resources boom continue and what are its implications for other sectors of the economy?; what are the medium term policy options to better provide education and health for a more prosperous and equitable future?; the pros and cons of different policy approaches to the issues of water, greenhouse gas emissions and urban congestion; and, fresh approaches to Commonwealth-State relations.

The Melbourne Business School hosts the following industry oriented research centres:

- Centre for Management of Information Technology;
- Centre for Manufacturing Management;
- Coles Myer Centre for Retailing and Marketing; and
- Ian Potter Centre for Financial Studies.

RMIT University's Centre for Management Quality Research contributes to the science of organisational performance measurement and quality. With expertise in the public, manufacturing, higher education, small to medium enterprise, industrial and service sectors, this centre is now recognised as a national and international centre of excellence in its field.

RMIT University – Centre for Management Quality Research

The core aim of the Centre is to identify and generate policy level information in the small business sector, thereby contributing to the understanding of the economic sustainability of communities.

Supporting RMIT's commitment to applied and

inter-disciplinary research programs, the Centre focuses on organisational performance measurement, improvement and quality. This occurs through taking the systemic view of an organisation as typified by 'business excellence' models and frameworks developed in Australia and internationally. Work is undertaken within broad categories that include small and medium enterprises, industrial research and development functions, higher education, healthcare, tourism and government.

The current focus is on improving the competitiveness of the small-to-medium enterprise sector through comparison with international competitors. This benchmarking initiative has been piloted in Melbourne's northern suburbs and is supported by the Northern Area Consultative Committee. This assessment of performance in small to medium businesses covers financial, service, quality, people management, R&D and marketing.

One of the findings is that while many small to medium businesses are actively involved in R&D, little is understood about their initiatives. The discovery of how these businesses, including those established as family trusts, conduct and fund R&D activity, is passed on to policy makers and strategists.

The Centre has also addressed the management of innovation and marketing in this business sector. Working with companies in partnership with small business consultants and again supported by the Northern Area Consultative Committee and Commonwealth funding, the Centre is assisting small to medium businesses in their desire to be competitive in globalised markets. The outcomes of this research contribute to evidence-based policy in this sector of the Australian economy.

Swinburne University, in Australia in the mid 1980s, pioneered the teaching of entrepreneurship, at a graduate level and since then has played

an active part in related research areas. Major research activities include:

- the management of deliberate creativity and innovation activities in organisations;
- the effective commercialisation of innovation and the process of new-venture creation, its organisation and management;
- the financing of new ventures and the related means of exploiting intellectual property including angel finance and formal and informal venture capital;
- the study of entrepreneurial business planning and its application to the analysis and solution of a diverse range of managerial and social problems;
- the study of social entrepreneurship including new not-for-profit ventures and the renewal of mature third sector enterprises; and
- research into the effective teaching of entrepreneurship and the development of ethical, professional entrepreneurs.

Victoria University has a major commitment to economic policy and collaborative management research through the Centre for Strategic Economic Studies. A current project has the objective of improving the knowledge base of the pharmaceutical industry, in both a global and Australian context, with the aim of developing policy options, which seek to satisfy the sometimes competing objectives of accessibility, efficiency and industry development.

Victoria University – Centre for Strategic Economic Studies: Pharmaceutical Industry Project

Most countries seek access for all their citizens to the health benefits delivered by the latest range of innovative drugs at minimum cost. They also generally provide an intellectual property regime and sometimes a range of other incentives, to encourage the development of the pharmaceutical and biotechnology sectors, through the discovery of new medicines and other medical devices.

At the same time, pharmaceutical and biotechnology companies and other stakeholders, such as investors and the scientists themselves, require adequate financial incentives to devote the necessary resources to the task.

The implications for business strategies and business models of the rapidly evolving structure of the industry, arising from the radical transformation in its technological basis, have been considered. A particular focus of this work has been to document the increasing importance of alliance formation in the diffusion and adoption of these new technologies. The project is ongoing and the insights gained from this intensive analytical phase are used to inform the development of policy options to help address the identified pricing, regulatory and industry development issues of the industry.

Financial support for this project has come from industry and government sources. Of particular importance has been a major three-year grant through the Merck Company Foundation's Program on Pharmaceutical Industry Issues with matching funding provided by the Victorian Government. The Merck program involves an international group of centres researching the pharmaceutical industry, which meets biennially.

Sustainability

Deakin University has developed a national and internationally recognised research capability in sustainable natural resources management. Research encompasses collaboration across areas of integrated catchment management, resource management, environmental engineering and conservation biology and ecology.

Swinburne University has research strength in social sustainability. Research seeks to improve the wellbeing and social integration of individuals, organisations and societies. Social sustainability and wellbeing have become key problems in recent times as a result of the sweeping

economic and political changes associated with globalisation and privatised welfare delivery. Major research activities include: social policy, housing studies and individual health.

4.4 Cooperation and collaboration with industry and the community

In addition to working with industry in specific areas of research strength, Victoria's universities with a Melbourne presence also collaborate extensively through a number of structured collaborative and cooperative arrangements supported by Australian Government funding. Available data for 2004 indicate that Victorian universities:

- participated in 41 Cooperative Research Centres;
- were awarded 123 ARC Linkage grants involving an industry contribution of \$33 million (\$10 million in cash and \$23 million in kind);
- received \$182 million for contract research and consultancy for industry and government in Australia and overseas; and
- worked with industry and the community through a very large number of research centres and institutes in science, engineering, technology, the social sciences, the humanities and the arts.

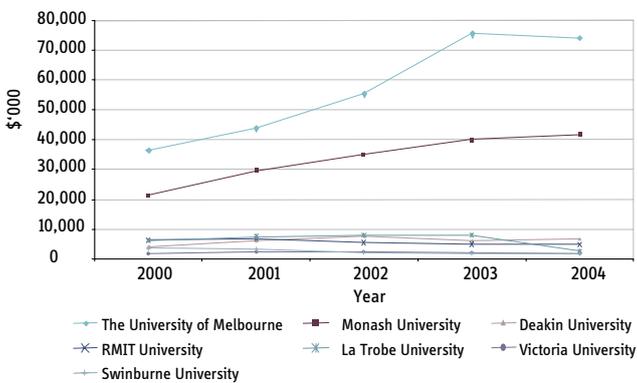
Industry funding for research and development

Excluding consultancy work and fee for service contracts, Victorian universities received \$135 million in research income from industry and other non-government sources in 2004. This represented 30 per cent of all income for Australian universities from this source. The proportion has increased from 25 per cent in 2000.

Overall, the level of industry funding for research in Victorian universities has increased by two thirds between 2000 and 2004. This compares with an increase in industry funding for all Australian universities of just under 40 per cent over the period.

The level of industry funding for research at The University of Melbourne has more than doubled over the period and has increased by 94 per cent at Monash University. At Deakin University, there has been an increase of more than 60 per cent in industry funding. This reflects a substantial increase in the level of engagement between these universities and industry. Trends in research income from industry are indicated in Figure 11.

Figure 11: University research income from industry



With the globalisation of research and industry, collaborations are becoming international in their orientation. An agreement signed in early November 2006 with Monash University and a number of Chinese Universities and industry is indicative.

Monash University research and industrial engagement with China

Monash University has established a new consortium to provide a platform for research and industrial engagement between Australia and China.

The Australia-China Consortium on Engineering Education and Research (ACCEER) will foster active interaction between Monash, Wuhan University of Technology and Central South University. Industrial partners include Rio Tinto, the Aluminium Corporation of China Ltd (CHALCO) and the Wuhan Iron and Steel (Group) Corporation.

The consortium has set up several collabora-

...tive programs including an annual research workshop, supervision of postgraduates, special guest professorships and credit transfers in undergraduate engineering programs between Monash and the Chinese member universities.

Specific research collaborations will focus on nano-materials, light alloys, digital control and the aerodynamics of rapid trains. The collaborations will lead to mutual visits by postgraduates and researchers from the universities and industry from next year.

The industrial members provide assistance to facilitate student exchanges and opportunities for engineering students to gain work experience with leading industrial companies in both countries.

Monash University is now holding discussions with the Victorian and Australian Governments, BHP Billiton and a number of Australian companies, in relation to joining ACCEER.

Collaboration between universities

The strength of Victorian universities' research and their links into teaching and learning and service to industry and the community, are also reflected in some key collaborations between universities. The Victorian Institute of Chemical Sciences, for example, is a collaboration between RMIT, Melbourne and Monash Universities, with support from the Victorian Government.

The Victorian Institute of Chemical Sciences

The Institute fosters research linkages and outreach with industry and communities across Melbourne and beyond. Its purpose is to be the leading multi-campus institute in Australia for teaching and research in chemical sciences and it is recognised internationally for its research quality and breadth and through opportunities provided by its educational programs.

The institute was established with an infrastructure grant from the State Government's

science, technology and innovation (STI) initiative in 2003. Stakeholders in industry, education and government now have the opportunity to engage with a centrally managed, broadly based chemical sciences resource, offering a range of products and services.

The Institute has established activities in four areas: Drug Discovery and Chemical Synthesis; Chemistry Education and Outreach; Environmental Solutions and Molecular Analysis and Dynamics. The Institute provides services to external clients through its Molecular Resolution Facility, School Outreach Programs and Centre for Scientific Instrumentation.

Collaborations are also international in their focus. For example, The Centre for China Studies was established in September 2005 jointly by La Trobe University, Peking University and Beijing Foreign Studies University. It is the first such joint Centre specifically dedicated to China Studies to be established in Australia.

The Centre aims to promote Chinese language and culture in Australia and strengthen the links between China and Australia through the establishment of long-term programs of cooperation and exchange between universities in the two countries. It also aims to serve as a resource Centre for China Studies for academics, students and the wider community as well as enhancing the reputation of the University in China by the facilitation of co-operative research and training programs.

4.5 Research precincts and technology parks

Victorian Government policy for technology parks aims to increase the performance of existing and future parks to international best practice levels. A particular focus for long term development of technology precincts is to encourage the development of a community in and around the precincts. These communities cover technological, scientific, economic and social dimensions. Current projects cover:

- Monash Strategy for Regional Growth – Monash University – CSIRO supported collaborations around manufacturing and materials;
- Parkville Precinct Strategic Plan – a significant hub for bio-medical and biotechnology research, including the Bio21 project; and
- Werribee Technology Precinct Strategic Plan – a major agri-food hub.

Monash University's Clayton campus and the Monash Institute for Medical Research are located at the centre of an industry cluster in the south east region of Melbourne. This is a major centre of enterprise in the state and is known for its high technology industries and research facilities, including those of the University, CSIRO and the Australian Synchrotron.

The Monash Science Technology Research and Innovation Precinct (STRIP)

Monash University has established the Monash Science Technology Research and Innovation Precinct (Monash STRIP). This is a \$300 million development on the Monash Clayton campus with plans to create jobs for thousands of Australians through research into next-generation industries.

The STRIP houses University and corporate enterprises that are developing novel products from leading edge technologies. Tenants in the STRIP are working across a range of disciplines including human therapeutics, stem cell research, green chemistry, nanotechnology, bioinformatics, health economics and IT.

The Monash Institute of Medical Research, located in the Precinct, has been pioneering research into the characterisation and application of stem cells, the cause and treatment of inflammation and cancer and the improvement of women's, men's and children's health. Its outstanding reputation has been built on ground-breaking advances in assisted human reproduction, the reduction of SIDS, advances in stem cell research and the treatment of arthritis.

Monash Institute for Medical Research (MIMR)

Close collaboration with the resources of Monash University and the Monash Health Research Precinct enables MIMR to increase the impact of its research by translation from 'bench to bedside' and by the commercialisation of its activities. MIMR's core facilities provide scientists with the opportunity to access equipment and services that are too costly for individual laboratories to maintain. All services are available to MIMR researchers and the wider scientific community.

The Gandel Charitable Trust Sequencing Centre, a facility MIMR shares with its fellow Monash Research Precinct Members, Prince Henry's Institute and Southern Health, provides high quality, long read DNA sequences. The Monash Gene Targeting Facility provides customised, genetically modified mice to the academic research community.

The Parkville Precinct, located on the northern edge of Melbourne's CBD, is home to a number of well-established health, research and education institutions, which deliver high levels of health, social and economic benefits to Victoria and Australia. The Precinct is highly developed and has many significant commercial, residential and parkland interfaces. The Precinct is the focus of the Bio21 initiative.

The Government of Victoria, through the Bio21 initiative, has co-invested in two major developments, the newly opened Bio21 Institute and the refitted Joint Proteomics Facility and in six collaborative infrastructure projects involving many Bio21 members. Bio21 provides a unique platform for innovative discovery from basic science, through translational research, to delivery of community outcomes.

The University of Melbourne – The Bio21 Initiative

Bio21 is a bio-medical, biotechnology research cluster supporting collaborative projects, shared technology platforms, business development and education programs. The 15 members encompass universities, tertiary health services, medical research institutes, CSIRO and other member-based organisations providing international strengths in bio-medical research, education and healthcare.

Bio21 is a medical research and discovery district or precinct, similar to such places in Toronto and Boston. These precincts all have a 'centrepiece' building and organisation, like the Bio21 Institute, for carrying out interdisciplinary and translational research, performing a pivotal role in knowledge transfer, engaging with industry and government and providing management services and funds to new companies.

The Bio21 bio-medical research precinct reflects the intent of the Victorian Government's Biotechnology Strategic Development Plan. It is expected to make an important contribution to building Parkville as a world class bio-medical research precinct as well as contributing to developing Melbourne as a leading bio-medical cluster.

The Geelong Technology Precinct (GTP) is based at Deakin University's 376 hectare Waurin Ponds campus. The Precinct is an important part of the whole of university approach to discovery-with convention facilities and student accommodation, in addition to a wide range of well-equipped laboratories and work areas.

Deakin University – The Geelong Technology Precinct (GTP)

The GTP allows Deakin University to bring together significant numbers of researchers who work alongside each other. It is already home to four core research areas – biotechnology,

nanotechnology, prototyping and wine science. Key tenants and initiatives are:

Advanced Materials Research: covering advanced manufacturing and performance of materials, materials manufacturing, intelligent systems and advanced fibres, textiles and polymers. Researchers in this area work in collaboration with industry to develop new materials, material technologies and material processing techniques suitable for the textiles, metals and automotive manufacturing industries.

The Victorian Centre for Advanced Materials Manufacturing (VCAMM): VCAMM focuses on delivering commercial outcomes to the automotive, aerospace and high-performance materials sectors. Specific materials include steel, light metals and composite materials.

Textiles Research: The textiles and fibres research group works with natural and synthetic fibres. It covers a wide range of fields such as chemistry, fibre metrology, dyeing, polymers, extrusion, processing and conductive polymers. Research is conducted in areas such as the application of nano-materials and conducting fibrous materials. This group works in collaboration with partners such as Australian Wool Innovations.

National Centre for Cool Climate Wine Science: The Centre is a teaching and research winery, which addresses critical questions for premium wine production in cool climates. The research focus is on canopy management, clonal selection and integrated disease control. Its aim is to develop new markets and production techniques for the industry. A 10-hectare vineyard with mixed plantings was established at the site in 2001.

ChemGenex Pharmaceuticals: AGT is a leading Australian ASX listed biotechnology company, which focuses on gene discovery and validation. It incorporates the commercialisation of in-house intellectual property together with a fee for service technology platform. The company serves biotechnology and

pharmaceutical partners in the validation of genes and proteins as therapeutic leads.

Water Resource Management: Water resource management focuses on environmental engineering, combining expertise in industrial systems, environmental technologies and catchment and ecosystem management.

The Mobile Architecture and Building Environment Laboratory (MABEL): MABEL is the world's first mobile facility to offer integrated on-site measurements of power, sound, light and comfort for buildings. This innovative project aims to improve building design and energy efficiency for the purpose of achieving environmental and economic savings.

The International Fibre Centre (IFC): The IFC supports training and education in the fibre and textile industries. It is a collaborative partner in Deakin University's advanced fibre research.

La Trobe University has invested in a Research and Development park at Bundoora. It is one of Australia's largest wholly university-owned and managed technology parks.

La Trobe University – R&D Park, Bundoora

The Park is also home to the Technology Enterprise Centre, a business incubator for new ventures in information technology, biotechnology and the life sciences. The Centre is integrated into the Master Plan of the La Trobe University R&D Park to provide new start-ups with a support growth plan to take their venture from idea to fruition.

The Park provides, within the La Trobe University environment, accommodation and facilities for the promotion and support of commercial science and technology R&D so as to build on the particular strengths of the University's teaching and research facilities and expertise and to provide a means of further developing those strengths in collaboration with outside researchers, teaching institutions, government agencies and private industry.

The La Trobe R&D Park is also home to the Walter and Eliza Hall Institute Biotechnology Centre. The Centre provides laboratories for the commercial incubation of the Institute's discoveries, including the establishment of start-up biotechnology companies. The Centre provides state of the art facilities for high throughput chemical screening, medicinal chemistry, gene mapping and genotyping, monoclonal antibody production and mouse genetics.

4.6 Universities as incubators for new business development

Universities have taken on an increasing role in the formation and operation of new businesses. Available data indicate that the creation of start-up companies is a preferred route for commercialisation of university research in Australia, particularly in the life sciences.

Research teams commonly form start-up companies with the support of university technology transfer offices in order to access research grants that finance continued research and funds from enterprise development programs, including 'pre-seed' funds, in an endeavour to be 'investment ready' for venture capital funding.

In 2004 there were 91 operational start-up companies that were dependent on licensing/assignment of technologies from Victorian universities and medical research institutes. Furthermore, Victorian universities and medical research institutes held equity in 60 start-up companies. The value of this equity is estimated for financial reporting purposes to be in the region of \$43 million. Many companies are making important contributions to health and medical outcomes, as well as environmental and business solutions. Some examples follow.

Cortical is a Melbourne based drug discovery and development company, which was formed in 2003 around the work at Monash University's Centre for Inflammatory Diseases and Monash's Victorian College of Pharmacy.

Monash University – Cortical

Cortical's mission is to produce small-molecule solutions to therapeutic targets in inflammation and commercialise these via R&D and where appropriate via strategic partnership with pharmaceutical and biotechnology companies. Diseases as diverse as arthritis, psoriasis, asthma, multiple sclerosis and colitis are characterised by inflammation and may be targeted with drugs from Cortical's R&D.

Based in Melbourne, Cortical operates its R&D in fully complemented laboratories within the Monash research precincts.

Cortical has raised A\$2 million in first close venture capital financing – \$1 million from GBS Venture Partners' Genesis Pre-Seed Fund Ltd (formerly Rothschild Bioscience Managers Ltd) and \$1 million from Start-up Australia Ventures Pty Ltd.

Metabolic Pharmaceuticals Limited, another Monash spinout company, has the mission of developing novel therapies for diseases with application to worldwide markets, including obesity, obesity-related diseases such as type 2 diabetes and more recently, pain management and osteoporosis. Metabolic Pharmaceuticals Ltd has also established modern laboratories at the Baker Heart Research Institute (Melbourne) for some in-house activities.

Spatial Vision Innovations was incubated within RMIT's then-Faculty of Applied Science and spun out as an incorporated venture in 2000.

RMIT University – Spatial Vision Innovations

Spatial Vision works at the leading edge of geospatial and information technology and integrates geographic information with business applications delivered through web-based systems.

The company has accumulated significant experience in the development of land, natural resource management and applied social and economic research systems for organisations in Australia and internationally. Its client

base has expanded substantially to include catchment management and other resource management organisations, emergency management authorities and national parks

InQuirion Pty Ltd is another highly successful spin-off based on intellectual property developed by RMIT. The company develops and markets TeraText software – a text database system and search engine built for the management of very large (terabytes) text-based databases. Since 2001 it has built an impressive client base including defence and police organisations both here and overseas as well as legislatures, libraries and other archives.

Laser Surfacing Solutions Pty Ltd is a joint venture company between the Industrial Research Institute of Swinburne (IRIS) and Hardchrome Engineering. It is offering industry advanced surfacing solutions based on laser technology.

Swinburne University – Laser Surfacing Solutions Pty Ltd

The company utilises a state-of-the-art laser facility based at Swinburne's Hawthorn campus in Melbourne and comprises a high-power Nd:YAG laser delivered through a 0.6 mm diameter optical fibre. This has been combined with a four-axis integrated CNC system providing a wide range of manipulation options. Laser surfacing offers a number of advantages compared to conventional surfacing technologies.

This facility can provide advanced hardfacing or cladding options, especially on thin walled or heat sensitive substrates. The laser can also be used for surface alloying or surface modification by melting or heat treatment.

In addition to start-up companies, universities work in partnerships with businesses that support research, teaching and learning. For example, a group of Whittlesea farmers are participating with RMIT University in a herbal farming project

designed to meet the needs of the burgeoning Victorian complementary medicine industry and to sow the seeds for a future export industry. The project reflects a university contribution to new business development-based on an innovative applied research.

RMIT University – Whittlesea Herb Farm

The venture grew out of RMIT's School of Health Science's Chinese Medicine Division, which recognised the need for authentic herbal medicine ingredients free from contaminants and which met requirements of Victorian and Commonwealth medicines regulatory agencies. At the same time, the City of Whittlesea was concerned about local unemployment and the number of small farms in the municipality which were no longer economically viable.

A partnership involving RMIT, the City of Whittlesea, the Whittlesea chapter of the Victorian Farmers Federation and Northern Metropolitan Institute of TAFE is piloting the cultivation and harvesting of a broad range of medicinal herbs for which there is high demand. The project has had funding assistance from the Commonwealth and State Governments. The farm is now producing small quantities of herbs for the local market, with certification undertaken by RMIT.

The next stage of the project will be to scale-up the production of herbs to commercially viable levels. The total global market for medicinal herbs is around \$US60 billion per year. An ARC Linkage funding application has been prepared focusing on two herbs for which there is significant market demand and which have potentially invaluable health effects – artemisia annua, which is being explored as a possible cure for malaria and salvia miltiorrhiza, a common ingredient in many Chinese medicines.

Over time, start-up companies such as these are expected to have a substantial economic impact through sales, employment and exports.

There are also businesses formed by faculty in collaboration with external investors and by students following (or prior to) graduation. This form of new business development is practiced more widely in ICT related disciplines, engineering, management and the social sciences. Typically, these businesses require little in the way of start-up capital and investment in complementary assets.

CEOS Ltd

CEOS was founded and incorporated in 1994 by three PhD graduates from The University of Melbourne. Their initial business focus was on the development of broadband telecommunications, opto-electronics and electronics products. These developments resulted in a Portfolio of Leading Edge Products in dense wavelength division multiplexing (DWDM) optical access networks, gigabit backplanes and interconnections, broadband electronics, burst-mode receivers, wireless RF sub-systems, ultra-sensitive analogue electronics and high reliability software controlled electronic products.

In 1998, the company began the development of a photonic based vehicle counter, classifier and speed measurement product that became

known as the Infra-Red Traffic Logger ("TIRTL"). This unique product counts, classifies, determines the lane and measures the speed (1% accuracy @ 250 km/hour) of passing vehicles. CEOSI has more than 100 units of TIRTL to state instrumentalities in Australia and partners in the USA, Singapore and Europe. Significant growth in sales is forecast both in Australia and overseas for the coming fiscal year. In 2000, CEOS obtained industry and Australian and Victorian State Government support for the establishment of REDlab, a premier laboratory, managed and operated by CEOS, that offers state of the art test equipment to new high technology start up companies and universities.

REDlab has been supported by the REDcentre, Nokia Australia, Pacific Broadband Networks and the Australian Photonics CRC. It has also been supported by the Commonwealth through the Test-IT Program of the Department of Communications, IT and the Arts and by the Government of Victoria through the Science, Technology and Innovation (STI) Program. Agilent Technologies, a world leader in test products, generously supported REDlab by providing it with leading edge test instruments.

5 Universities in a community, cultural and social setting

Universities are, in general, open communities. Citizens have access to their facilities and services not only for the purposes of learning and scholarship but also for a wide range of social and cultural interactions.

5.1 Universities as communities

Universities work as communities that provide places for learning and inquiry in all fields of knowledge and serve as 'gateways to the univer-

sal reservoir of knowledge'. As Clark Kerr observed, a university is not one community but several:

... the community of the undergraduate and the community of the graduate, the community of the humanist, the community of the social scientist, the communities of the professional schools, the community of all the non-academic personnel, the community of the administrators. Its edges are fuzzy – it

reaches out to the alumni, legislators, farmers, businessmen, who are all related to one or more of these internal communities⁵.

This perspective sees universities as promoting liberal education, protecting freedom of inquiry and fostering the preservation and advancement of knowledge by providing a social space for intelligent conversation, social criticism and dissent⁶.

A university community offers a wealth of cultural, institutional and recreational opportunities for social interaction, leadership and personal development. It is an environment in which students will be challenged and supported to extend themselves intellectually and creatively, so that graduates are prepared for the 21st century and are at home anywhere in the world.

Victoria's universities with a Melbourne presence constitute a community of more than a quarter of a million people. In 2004 it consisted of 241,000 students and 22,500 staff. This academic community represented 5.3 per cent of Victoria's resident population in 2004. This does not include visiting, honorary and adjunct appointments.

University graduates, as active alumni, represent an extension of the university community. Universities are currently giving more attention to their alumni – not only as a source of philanthropy but as an important and continuing extension of the university community.

Melbourne Metropolitan University Alumni Communities and Networks

The University of Melbourne alumni community consists 140,000 men and women in 125 countries. The University has established international alumni networks in Europe, Indonesia, Japan, Malaysia, the People's Republic of China, the Philippines, Singapore, Sri Lanka, Taiwan, Thailand, the United Kingdom and the United States of America.

The Monash Alumni Association is a network for Monash graduates, staff, family and friends,

committed to building a strong, involved and active Monash community. With alumni numbering more than 150,000 in more than 120 countries, Monash claims one of the strongest and largest alumni networks in the world. Every Monash graduate is part of this network and is entitled to the services provided to all alumni by the University.

The RMIT alumni community comprises approximately 200,000 graduates and includes more than 50 alumni representatives to assist graduates in linking with other alumni in their location, profession, or area of interest. Through these representatives, members can participate in social and career networking activities and take on leadership roles.

Victoria University alumni receive a range of services and benefits provided through the Alumni Relations Program. These include the personal and professional development program to update skills, benefits such as library access (for financial members) and a range of social events including reunions, anniversaries and general celebrations.

La Trobe University keeps close contact with its 114,000-strong alumni worldwide across 100 countries through events, seminars, emails, its web site, loyalty card and magazine for La Trobe University graduates.

5.2 Universities and community service

Victorian universities are committed to advancing the intellectual, cultural, economic and social welfare of Melbourne. The social welfare component is receiving greater attention as universities give a greater commitment to their third mission of service, community outreach and engagement.

The study has indicated that universities with a Melbourne presence are involved in and provide assistance to, a wide range of community based education, health, social welfare and housing services.

5 Kerr, Clark. 2001. *The Uses of the University*. Cambridge, MA.: Harvard University Press. 6 Altbach, Philip G, Robert O Berdahl and Patricia J Gumpert eds. 1999. *American Higher Education on the 21st Century: Social, Political and Economic Challenges*. Baltimore: The John Hopkins University Press.

In the community education area, Australian Catholic University has made a major commitment to mathematics education in the Victorian schools system.

Australian Catholic University – Mathematics Teaching and Learning Centre (MTLC)

The MTLC at Australian Catholic University has conducted a wide range of research, evaluation and professional development programs related to mathematics education over the past 17 years, with considerable impact on teachers, students and parents in Victorian schools.

The project with the greatest impact on Melbourne and Victorian schools and classroom practice was the Early Numeracy Research Project, jointly conducted by Australian Catholic University (85%) and Monash University (15%). Funding for this project from the Victorian Department of Education and Training, the Catholic Education Office Melbourne and the Association of Independent Schools has totalled almost \$2 million.

This project included one-to-one interviews on a regular basis over three years with more than 11,000 students in 70 schools and a related professional development program. A particular feature was research on approaches for supporting young children experiencing difficulty in learning mathematics.

The research tools, which emerged from the Early Numeracy Research Project, are recommended for use by all Victorian Government schools and are also being utilised in Canada, Denmark, Germany, New Zealand, Sweden and the USA.

State support to the MTLC has been complemented by federal funding of around \$2.5 million, including a project focusing on school-parent-community partnerships and another on innovative practices in mathematics, science and technology, in which Australian Catholic University is coordinating the work of

around 110 academics from 24 Australian universities, serving as “Critical Friends” to around 300 projects in all parts of Australia.

Australian Catholic University and the MTLC place a high emphasis on sharing the findings of the University’s research with practitioners and more than 1,000 teachers have participated in postgraduate and professional development programs at the University in the past five years, where participants relate research findings to their day-to-day work.

Australian Catholic University has a strong commitment to social justice. This is also reflected in research activities and, by way of example, the University has just commenced a project on understanding and enhancing the mathematical development of children with Down’s syndrome.

La Trobe University is developing a partnership with the Victorian Department of Education and Training to improve the provision of educational services to communities in the northern suburbs of Melbourne.

In the first instance, this partnership will involve the six schools in the Heidelberg West, Heidelberg Heights, Bellfield and Macleod areas that plan to form the Macleod and Heidelberg Education Federation. The partnership will involve the establishment of a Centre for Innovative School Education (CISE) as part of the renewal of existing school infrastructure and as a unique educational development for the northern suburbs and regional growth corridor.

In community health, Victoria University provides an osteopathic medicine clinic as a community service in the heart of Melbourne.

Victoria University – Osteopath Clinic

The Victoria University Osteopathic Medicine Clinic is the main teaching clinic for students of the osteopathic program and provides a community service in the heart of Melbourne’s

CBD at 301 Flinders Lane, just round the corner from Flinders Street Station. Osteopathic treatment is also now available at the St Albans Health Sciences Teaching Clinic.

In the Clinic, osteopathic treatment is provided by senior (4th and 5th year) students under the supervision of qualified and registered osteopaths, as part of the students' clinical training program. The fact that the treatment is carried out by students under supervision means that treatment fees are considerably lower than those normally charged by city centre osteopaths – up to 60 per cent less.

In the housing area, La Trobe University is involved in a residential, education and research development project.

La Trobe University – Development of the Mont Park/Plenty hospital site

A redevelopment of the former Mont Park, Plenty, Gresswell and Macleod hospital sites is taking place to create a new integrated residential, education and research precinct adjacent to La Trobe University.

Former hospital buildings with high heritage value are being preserved, along with the area's attractive parkland setting. The residential component of the project, known as Springthorpe, is already widely recognised as setting new benchmarks in master planned community design, privacy and integration into the surrounding environment.

Universities also have commitments to environmental protection and sustainability through their outreach activities and commitments. For example, Victorian universities are frequently involved in collaborative projects with local government and community based organisations for the preservation, restoration and repair of the natural environment.

In working on these projects, universities bring an important scientific knowledge and research based understanding to the work.

5.3 Universities as centres for the arts, culture and discourse

Museums and galleries

Victorian universities perform an important role in contributing to the arts and cultural life of Melbourne. This is reflected in the operation and maintenance of a number of museums and art galleries across the city. In some cases these facilities are integral to the university teaching and research function, combined with a knowledge transfer objective, whilst in others there is a stronger community engagement purpose being served.

The museums and galleries of The University of Melbourne provide an insight into the history of the University itself and that of Melbourne, Victoria and Australia. Most of the museum collections owe their origins to the teaching of academic disciplines and professions in Victoria, with many pieces in the collections dating back to the inception of the University in the 1850s.

The University of Melbourne – The Ian Potter Museum of Art

Constituted by statute of the University Council in July 1998, the Ian Potter Museum of Art has custodial responsibility for the University's art collection, as well as participating in teaching and research, exhibiting, publishing and conducting public programs. Through its core activities the Potter provides for the acquisition, maintenance, conservation, cataloguing, exhibition, investigation, interpretation and promotion of the art collections of The University of Melbourne. In partnership with academic departments, the Potter takes part in teaching and research, as well as offering vocational opportunities to students in relevant degree programs.

In seeking to establish itself as a nationally and internationally acclaimed university art museum, the Ian Potter Museum of Art promotes the key values of the University's

strategic and operational plans, contributing to the profile of the University and to the cultural experience of its Parkville campus.

The Potter's relationships with academic departments mean that its education programs encompass teaching from school holiday programs and VCE classes through to major exhibitions emerging from graduate research. Likewise, while all art collections have their own history, the University's is a very local one. The objects often speak strongly of specific individuals, sites and philosophies. This local history is evident, for example, in the considerable number of portraits in the collection, or in the area of antiquities, which has strong ties to teaching and field research.

The Potter is located on the boundary of the campus, bridging the campus and the wider community. It is a gateway in a physical and conceptual sense. Exhibitions, publications, public forums and consultancies offer research, knowledge and the pleasures of art to the Melbourne community. In sharing the University's assets, both cultural and intellectual, the Potter dispenses with an older, negative definition of the art museum – as an elite cultural gatekeeper – replacing it with the idea of the museum as a gateway.

Other University of Melbourne museums include:

- Classics and Archaeology Collection – showcases the University's significant collection of Egyptian, Greek and Roman antiquities, all located at the Ian Potter Museum of Art;
- Grainger Museum – established in the 1930s by the composer, pianist and folklorist Percy Grainger, to show the sources from which composers draw their inspirations; and
- Harry Brookes Allen Museum of Anatomy and Pathology – contains more than 12,000 specimens, of which more than 3,000 are on display at any one time.

The La Trobe University Art Museum aims to make the University Art Collection available to as wide

an audience as possible. In addition to the far reaching exhibition program, approximately 80 per cent of the collection is on public display across the University's city and regional campuses.

La Trobe University – Art Collection

The Art Collection has expanded to consist more than 2,500 works including a collection of public sculptures. The Collection is regarded as one of the most important Australian post-war art collections in the university sector.

Currently the Art Museum curates two exhibitions per year for the City of Darebin's Bundoora Homestead Arts Centre as well as a minimum of two exhibitions for regional galleries. As part of these exhibitions Art Museum staff present floor talks, educational programs and formal lectures. These initiatives are integral to the University's and the Art Museum's strong commitment to community engagement.

The ICON Gallery at Deakin University's Melbourne Campus has been designed and situated to provide great accessibility for students, staff and the general public. As the hub of a contemporary arts precinct, the ICON provides substantial space and facilities for professionally curated exhibitions drawn from the University's art collection, group and solo exhibitions by significant contemporary artists, travelling exhibitions and selected student work.

Deakin University – ICON Gallery

With the establishment of the ICON Gallery on the Melbourne Campus at Burwood, Deakin University is now placed to present an even wider and more comprehensive series of exhibitions and arts events within this new and exciting gallery, together with the innovatively refurbished Stonington Stables Museum of Art on the Toorak Campus.

Through a vibrant exhibition program and a distinctive collections management application, the Museum of Art is committed to providing a

focus for current cultural and intellectual scholarship, research and professional practice, while delivering a dynamic visual arts focus for the University both nationally and internationally.

Victoria University's Department of Visual Art, Design and Multimedia has opened a spectacular new gallery facility on Level 16 at 300 Flinders Street – located directly opposite Flinders Street station in the heart of the city's advertising and design precinct and the vibrant café culture of Flinders Lane and Degraeves Street.

Performing arts

The Melbourne Theatre Company is the oldest professional theatre company in Australia and a semi-autonomous department of The University of Melbourne.

The University of Melbourne – Melbourne Theatre Company (MTC)

The Company was established in 1953 as the Union Theatre Repertory Company (UTRC). It was originally administered and directed by John Sumner. At the time there was no professional theatre company in Australia. The theatre world was either amateur or imported.

Some of the notable early members of the Company included Zoë Caldwell, Patricia Conolly, Noel Ferrier, Frank Gatliff, Barry Humphries, Reg Livermore, Monica Maughan, Frederick Parslow, Alex Scott and Frank Thring.

John Sumner was the driving force for MTC for 34 years turning the Union Theatre into the nation's largest theatre company. In 1955 he directed the Company's first Australian play, *Summer of the Seventeenth Doll* by Ray Lawler. He not only directed plays but was also responsible for developing the model on which most State theatre companies in Australia are now based.

In 2006 work started on the construction of MTC's own 500-seat theatre at Southbank.

The Company will continue to hire the Playhouse and the Fairfax Theatre at the Arts Centre, although on a less frequent basis.

MTC has gone through many changes since its inception, but one constant is its relationship with The University of Melbourne.

The National Institute of Circus Arts (NICA) is the national centre of teaching excellence for professional education and training in contemporary circus arts. NICA is incorporated as an independent company of Swinburne University of Technology.

Swinburne University – The National Institute of Circus Arts (NICA)

NICA was established at Swinburne University in 2001 to meet the increasing demand for physical theatre and circus in the performing arts. NICA has strong international links with the circus world globally, including a partnership with Cirque du Soleil. It has a unique purpose built training facility and performance space.

NICA draws its staff and students from across Australia and internationally. They compete successfully in global competitions and are employed both in Australia and internationally after graduation.

NICA is dedicated to developing and nurturing talented young contemporary circus performers through a three-year degree, the Bachelor of Circus Arts. NICA also offers short courses, social circus workshops and training programs and houses the Circa NICA agency to service a broad range of circus entertainment needs.

NICA established itself as an integral part of the cultural and social fabric of Melbourne when NICA students provided the spectacular aerial acts for the opening ceremony of the Commonwealth Games in Melbourne in 2006. The City of Melbourne also recognised NICA's role in the city with an Encouragement Award in its prestigious Australian Business Arts Foundation Awards, 2006.

Monash University Arts Centres are the largest single cultural resource outside the inner Melbourne metropolitan area. Situated at both the Clayton and Peninsula campuses, Monash University Arts Centres' key function is the facilitation of opportunities for the development and presentation of arts activity.

Monash University – Monash Performing Arts

Monash Performing Arts boasts a range of flexible performance venues equipped to cater for any requirement. Whether for performance, film screenings, presentations, graduations, lectures or conferences, the venues are available for hire at reasonable rates, including expert Technical, Customer Service and Box Office support.

Robert Blackwood Concert Hall: Seating 1,598, the Robert Blackwood Concert Hall is designed for large scale music concerts. Its huge stage caters for a full-size symphony orchestra, while its stepped staging makes the venue ideal for choral performances. The Louis Matheson Pipe Organ, built by Jurgen Ahrend, is acclaimed as one of the finest instruments of its kind in the world.

Alexander Theatre: Intended for performances of all kinds and capable of 35mm and 16mm film projection, the Alexander Theatre has a maximum capacity of 508. Boasting a fly tower, fore-stage lift and a false proscenium which can be adjusted over a wide range of variables, the venue is truly flexible.

George Jenkins Theatre: The George Jenkins Theatre is a 428 seat venue catering for all performance and conference needs. Excellent acoustics, versatile stage access and an intimate atmosphere make the theatre unique to the Peninsula and Greater Melbourne.

Music

Australia's first music degree was awarded in 1879 by The University of Melbourne. The Conservatorium of Music became the Faculty of

Music in 1926, but its traditional name continued to be widely used in the community.

The University of Melbourne – Melbourne Conservatorium of Music

The Conservatorium of Music, a graceful white building on Royal Parade, dates from 1909 and is classified by the National Trust of Victoria. It contains the elegant 350 seat Melba Hall, with the finest acoustics for chamber music in Melbourne. Melba Hall also houses two of the finest concert Steinways in Melbourne and is a highly sought after venue for solo recitals and for professional recordings.

This concert hall underwent major restoration and refurbishment in 1986 under the direction of leading architect Darryl Jackson. The restoration and refurbishment assure the building's functionality as well as its original grand style. Jackson's theory was that widely spaced aisles and plush seating add to the pleasure of the concert experience and, in conjunction with translucent stained glass windows and the polished wooden stage of the Hall contribute to its inviting ambient atmosphere.

In 1996 the facilities associated with Melba Hall were substantially upgraded to complement the venue and add to the comfort of performers.

International cultural linkages

Universities have a commitment to building cultural linkages with Asia as an integral part of their commitments to teaching and research.

The University of Melbourne's Asialink Centre is a non-academic department of the University, supported by the Myer Foundation and the University. It provides both employment support for young people interested to work in Asia and also significant cultural links with Asia in art and other fields.

The University of Melbourne – Sidney Myer Asia Centre

The Sidney Myer Asia Centre is a purpose built facility to house the Asia Institute (formerly Melbourne Institute of Asian Languages and Societies) and the Asialink Centre. Its purpose is to be a catalyst for Australia's understanding and engagement with contemporary Asia and to foster awareness of the importance to civilisation of the diverse Asian cultures, both ancient and modern.

The Sidney Myer Asia Centre was a \$18.5 million project designed by Bob Nation of Nation Fender Katsalidis to form a 'book-end' to the award-winning Ian Potter Museum of Art as part of the streetscape of the University's external profile on Swanston Street. The building was erected by Probuild Constructions and in 2002 won the Master Builders Association of Australia award for 'Excellence in New Construction (Buildings) \$10-50 million'. It comprises the 500 seat Carrillo Gantner Theatre and five storeys of teaching and learning, research and academic office space.

To mark the centenary of the arrival in Melbourne of one of Australia's most successful immigrants – Sidney Myer – the Myer family reinforced its commitment to Asia-Australia relations in 1999 with a \$2 million grant to The University of Melbourne for the design and building of the Sidney Myer Asia Centre.

Public art

Melbourne's universities make important contributions to and support for, public art, youth culture and youth theatre.

RMIT University – Shoal Fly By

RMIT's Spatial Innovation Architecture Laboratory worked with the artists Michael Bellemo and Cat Macleod to design and develop their

maquettes of the Shoal Fly By series, public art for the Melbourne Docklands precinct. The artwork consists four separate sculptures which depict the form and movement of surfaces in water.

SIAL researchers and summer students worked with the artists to develop a digital design process, beginning with translating the physical to the digital using SIAL's laser scanning measurement techniques. Algorithms were developed to approximate the wires to a series of tangential arcs, as nearly all tube bending is done using two dimensional arcs. This involved collaborating with the fabricators and constraining the design process to fabrication tolerances. In addition to the digital models that were developed, documentation of the tubes was principally in the form of spreadsheets, extracting spatial information which can ultimately be input for computer numerically controlled tube bending machines.

Figure 12: Shoal, the first of four sculptures, completed and on site at Docklands



RMIT Gallery is Melbourne's most vibrant public art and design gallery. It presents Melbourne's broadest and most unique exhibition program, exploring all aspects of visual culture. It presents changing exhibitions of Australian and international design, including fashion, architecture, fine art, craft, new media and technology.

RMIT University – RMIT Gallery

RMIT Gallery is housed in Storey Hall, an internationally acclaimed example of architectural innovation. It is located on Swanston Street, at the centre of Melbourne's key cultural tourism areas.

RMIT is undertaking a restoration and contemporary conversion of the original classical building to accommodate a world-class exhibition space and art gallery, with student display spaces and a café in the basement. The finished project, incorporating the existing building and a new annexe, will provide a conference centre comprising a 750 seat auditorium, 230 seat lecture theatre and five seminar rooms.

The building's interior and facade incorporate Roger Penrose's 'fat and skinny tiles', an invention by the renowned Oxford Professor of Mathematics that reduces the number required for the non-periodic covering of a continuous surface from 20,426 types to just two.

Storey Hall has received several major awards including: The National Interior Architecture Award, The Marion Mahony Award for Interior Architecture, The William Wardell Award for Institutional Architecture, The RAIA Victorian Architecture Medal (for the best building of the year across all categories) and The Dulux Colour Grand Prix.

Youth media

Media that is run for and by youth provides a vital means of engaging this demographic not only with each other but also with their surrounding community. It also provides youth with a voice whereby they can contribute to and shape their community. Universities currently host and provide funding to a number of youth run media organisations.

RMIT University – Youth Media Organisations

The Student Youth Network (SYN): SYN is a community media organisation run by the youth of Melbourne, for the youth of Melbourne and involves several universities and youth organisations. SYN provides access, participation, education and training to all students and youth aged 12-25 who would like to become involved in radio, television, print and web media. Through SYN, youth gain practical experience, contributing material and productions for publication and broadcast. RMIT, in addition to providing funding currently provides space and infrastructure support for SYN on its city campus.

RMITV: RMITV is Australia's leading community television production house. Each month several hours of television programming for community television networks across Australia are produced. RMITV's mission is to enable students from every course and facility across Australia to envision their television and new media concepts and ideas. It helps young, often first-time producers, realise their goals and dreams in the complicated yet fulfilling industry of television production. It further seeks to bring together a community of students from different tertiary education systems for the common goal of creating and furthering student television and new media projects.

RMITV is a full member of the Melbourne Community Television Consortium (MCTC) – the organisation that runs Channel 31. It is part of and funded by the RMIT Student Union and from 2007 is funded by RMIT. RMIT provides space and infrastructure support for RMITV.

Conferences and public events

Melbourne's universities, through their schools, faculties and memberships of national and international associations and networks, organise and support a very large number of conferences each

year. These draw large numbers of international and interstate visitors to the city and generate substantial economic, social and cultural impacts.

La Trobe University – Public events

The staging of public events, such as conferences, seminars, lectures and sponsorship of cultural, sporting, or other prominent events, is a fundamental part of the University's community commitments.

The University's major public events include its annual Open Days: close to 30,000 people visited La Trobe's metropolitan and regional campuses in 2006. A wide variety of public lectures held at all campuses supports the University's learning and teaching objectives. They include the annual Science Lecture; the Deans' Lectures and an annual lecture in honour of Hyllus Maris, an Indigenous leader and visionary whose initiatives in Aboriginal education included the establishment of the first registered secondary college for Indigenous People in Victoria.

The University also sponsors several important public events including the Melbourne Writers' Festival and the Tournament of Minds events throughout Victoria.

Victoria University provides public access to its conference centre located at Level 12, 300 Flinders Street, in the heart of Melbourne's central business district. The centre caters for a wide variety of functions and events, including: prestigious lectures, conferences and seminars, book and product launches, tradeshows and exhibitions, plays and recitals, auctions, fashion parades and business meetings, as well as private functions including cocktail parties, wedding receptions and engagements.

Most universities encourage scholars to deliver public lectures, either under the direct sponsorship of the university or through an academic or professional association.

The University of Melbourne – A Forum for the debate of ideas

"A university should always be a forum for the debate of ideas. That's why each year, The University of Melbourne hosts around 200 public lectures and every day of each semester, faculties and departments offer seminars, symposiums, colloquiums and forums which are open to the public."

– Professor Glyn Davis AC, Vice-Chancellor, The University of Melbourne

Significant speeches delivered at, or on behalf of, The University of Melbourne include:

- Menzies Oration on Higher Education by Professor James Wilkinson, Director of the Derek Bok Center for Teaching and Learning, Harvard University, on 11 July 2006;
- International Public Lecture by Dr Jane Goodall DBE (founder of the Jane Goodall Institute and a UN Messenger of Peace) in July 2006;
- Redmond Barry Lecture by Professor Glyn Davis, Institutions as Ideas: Change at The University of Melbourne, on 7 July 2006;
- AN Smith Lecture in Journalism by The Honourable Peter Beattie, Premier of Queensland, on 14 December 2005; and
- Chancellor's Human Rights Lecture by The Right Honourable Malcolm Fraser AC CH, former Prime Minister of Australia, on 29 November 2005.

Public lectures and forums are at the heart of the intellectual life of Australian Catholic University. Significant contributions in 2006 included the following:

- Catholic Education: Achievements and Challenges – keynote speaker was His Excellency Archbishop Ambrose De Paoli, Apostolic Nuncio in Australia;
- Islam and Modern Challenges: Formula for Change, a public conversation with Imam Yahya Hendi, Chaplain, Georgetown University;

- Religions and Public Society: Building Peace by Dr Bernard Sabella, Bethlehem University;
- Socratic Forum Consilium per disputatio in association with B-HERT and Griffith University – a public debate That We Should Keep Religion out of Australian Politics facilitated by the Hon. Dr Barry Jones AO;
- Therapeutic Cloning with Professors Max Charlesworth, Jack Martin, Sir Gustav Nossal and Bernadette Tobin moderated by Professor Frank Brennan SJ AO; and
- Walking the Fine Line: Evangelization in a Pluralist World by Cardinal Cormac Murphy-O'Connor of Westminster.

Monash University has an extended program of public lectures delivered at its campuses. The schedule for 2006 included:

- Sir Gustav Nossal – Monash Golden Key's "Excellence & Inspiration" Colloquium II;
- Professor Eric Ketelaar – From Duyfken to Digital: Paper and Digital Semiophores;
- 2006 Ogden Transport Public Lecture – UK transport and social inclusion: past, present and future; and
- Professor Barry Marshall, Nobel Laureate – Rod Andrew Oration, Helicobacter pylori and its role in gastritis and peptic ulcer disease.

RMIT University, in collaboration with the Victorian Peace Network, the Globalism Institute and the National Tertiary Education Union (RMIT University Branch) sponsors a series of public lectures on global justice.

5.4 Universities as providers of sporting and recreational facilities

Universities have traditionally offered a wide range of opportunities for students to participate in sport and recreation. Universities have significant investments in sporting facilities which are usually available to the community.

The University of Melbourne – Melbourne University Sport

Melbourne University Sport is a semi-autonomous department of the University and is part of the Academic Services division.

The facilities at Melbourne University Sport are considered among the very best in Melbourne. Following a \$5.3 million architecturally designed refurbishment, the heritage-listed Beaurepaire Centre now provides state of the art fitness facilities for the University community.

The Beaurepaire Centre, which was used for training in the 1956 Olympic Games, includes a 25m, six-lane heated indoor lap pool, the 850m² two level Strength and Fitness Gym which provides the latest pin-loaded and free weight gym equipment as well as a mezzanine cardio zone with inspiring views overlooking the athletics track and sports fields.

Facilities in the Sports Centre building include six squash courts, a Group Cycling Studio, MindBody Studio, Cardio Box Studio, Massage and Physiotherapy Clinic and two multi-purpose stadiums.

Melbourne University Sport is a members only facility. All current students and staff of The University of Melbourne and graduates from any university worldwide and their immediate families (siblings, partner, spouse and children) can become a member.

Monash University emphasises that "sport at Monash is not just about sport for Monash". Each campus is expected to play a distinctive role in its local community, providing facilities and opportunities for people and organisations, some facilitated by informal agreements and others by formal alliances.

Monash University – Monash Sport

Monash University, particularly at its Clayton campus, is widely recognised as having some of the finest sporting facilities of any university in Australia. With more than 70 affiliated sports clubs and a myriad of informal opportunities for activity, many thousands of students and staff can satisfy their desire for competition, improved fitness, better health and group or individual involvement in ways that best suit their lifestyle and particular requirements.

Since 2002, responsibility for sporting facilities and services across a number of Monash University campuses has come under the auspices of Monash Sport, a service provider within Monyx Pty Ltd, the University's service organisation. Sporting activities and services have become more consistent and coherent across campuses. The University's aim is for students, staff and the communities in which it has contact, to have 'seamless access' to sporting opportunities within the greater Monash.

Across its Australian campuses, Monash owns seven indoor sports halls, three fitness gyms, three aerobic studios, one aquatic complex, sixteen tennis courts, two all-weather hockey pitches, three multi-sport ovals, five soccer pitches, 13 squash courts, a 43-bed ski lodge, a nine hole golf course, a baseball diamond, a beach volleyball court and a specialised martial arts facility.

There are also numerous other sports practice venues – such as synthetic cricket wickets, together with a range of sport health services, such as physiotherapy, massage, podiatry and dietetics. Facilities are conservatively valued in excess of \$40 million.

Victoria University provides aquatic centres and sport and fitness centres at five of its Melbourne campuses.

La Trobe University, Bundoora campus has an Indoor Sports Centre and extensive playing fields for sport. The Indoor Sports Centre comprises a 25m indoor heated pool, a weights training room, a multi-purpose hall and squash and tennis courts. The University makes all these facilities available to the community seven days per week, 363 days per year.

La Trobe University – Sports Centre

During the summer season the playing fields are configured with three cricket fields (two turf) and a baseball diamond. During the winter seasons the same fields are configured as one Australian Rules Oval (the oval is the same size as the MCG), four soccer pitches and one baseball diamond. The baseball diamond has lighting to AA standard and is used by the Victoria Institute of Sport (VIS) and the State baseball associations for finals: it is considered to be the best baseball field in Melbourne.

The Sports Centre often makes its facilities available for local schools, both primary and secondary. The students of the University are a tremendous resource for the Centre; if a school needs swimming teachers or sporting umpires for their programs, the Sports Centre can provide them.

Also in the Bundoora area, RMIT University collaborates with local government to provide sports facilities. A major initiative has been the Bundoora Netball and Sports Centre (BNASC).

RMIT University – Bundoora Netball and Sports Centre (BNASC)

BNASC is a joint venture between the RMIT Union, RMIT University and the City of Whittlesea. This world-class, multi-purpose facility offers a wide range of programs and services. The Centre provides an expansive sport and fitness service to both university students and the local community. The brand new, state-of-the-art complex offers the best in sporting venues and gym and sporting equipment.

Sporting facilities include netball, basketball, tennis, indoor soccer, volleyball and badminton courts, as well as a hockey pitch, fully equipped gymnasium and group fitness room.

In addition to sporting and recreational facilities, La Trobe University has also invested in a wildlife sanctuary for both educational and recreational purposes.

La Trobe University – The Melbourne Wildlife Sanctuary

The Melbourne Wildlife Sanctuary is a special conservation, educational and recreation place developed by La Trobe University. The site, part of the Melbourne (Bundoora) Campus of La Trobe University, consists approximately 30 hectares and includes beautiful wetlands and woodlands, including 400-year old River Red Gums. It provides home to 175 species of birds, reptiles, amphibians and mammals in a pre-European settlement setting.

6 Universities as custodians of knowledge assets

In addition to their economic, industry and community contributions, universities are recognised and valued for their role in and contribution to the creation and diffusion of knowledge for the benefit of both industry and society. They provide the knowledge foundation for a university city.

6.1 Scientific facilities and instruments

Victoria's universities with a Melbourne presence operate, maintain and provide access to a range of specialised research facilities and instruments. These assets are often dual-use, that is they are also available for use by industry and government.

Major research assets associated with metropolitan universities

Condensed matter and analytical techniques:

- The Synchrotron (Monash University);
- National Electron Microscopy Facility (The University of Melbourne); and
- Micro-Analytical Research Centre (University of Melbourne).

Informatics:

- Melbourne Advanced Research Computing Centre (The University of Melbourne);
- Interactive Information Institute (based at RMIT) which carries out R&D and innovation in computing communications and new media; and
- Victorian Partnership for Advanced Computing (combines the expertise of six Victorian universities) which works on computational engineering, biotechnology, materials science, financial data analysis and geographical information systems.

Engineering:

- Testing Facility for Modelling High Temperature Metallurgical Reactors (University of Melbourne);
- Experimental Building Fire Facility and Furnace Laboratory (Victoria University);
- Sir Lawrence Wackett Centre for Aerospace Design Technology (RMIT);
- Polymer Technology Centre (RMIT);

- Molecular Beam Epitaxy Laboratory (La Trobe University); and
- Microelectronics and Materials Technology Centre (RMIT).

Life sciences:

- Australian Stem Cell Centre (Monash University);
- The Australian Animal Health Laboratory (AAHL) – an important research and preparedness asset;
- Analytical Facility for Complex Carbohydrates (University of Melbourne);
- Biopolymer Functional Testing Laboratory (University of Melbourne);
- Joint Facility for Food and Animal Health (University of Melbourne); and
- Melbourne University Herbarium (University of Melbourne).

The evolution of this substantial set of assets is actively supported by the Victorian Government under the science, technology and innovation (STI) initiative.

The existence of these research facilities and instrument clusters in Melbourne constitutes an important asset for cutting-edge technological innovation in sunrise industries in Victoria.

Of particular significance is the soon to be commissioned Australian Synchrotron. The Synchrotron will serve universities, research organisations and industry throughout Australia. The Victorian Government has contributed \$157 million to the project – about three-quarters of the capital cost. This is the largest-ever investment by an Australian state government in innovation infrastructure.

Monash University – The Australian Synchrotron

The synchrotron is a large machine (about the size of a football field) that accelerates electrons to almost the speed of light. As the

electrons are deflected through magnetic fields they create extremely bright light.

The light is channelled down beamlines to experimental workstations where it is used for research. Synchrotron light is advancing R&D in fields as diverse as:

- biosciences (protein crystallography and cell biology);
- medical research (microbiology, disease mechanisms, high resolution imaging and cancer radiation therapy);
- environmental sciences (toxicology, atmospheric research, clean combustion and cleaner industrial production technologies);
- agriculture (plant genomics, soil studies and animal and plant imaging);
- minerals exploration (rapid analysis of drill core samples and comprehensive characterisation of ores for ease of mineral processing);
- advanced materials (nanostructured materials, intelligent polymers, ceramics, light metals and alloys and electronic and magnetic materials);
- engineering (imaging of industrial processes in real time, high resolution imaging of cracks and defects in structures and the operation of catalysts in large chemical engineering processes); and
- forensics (identification of suspects from extremely small and dilute samples).

The Synchrotron will provide a world-leading technical capability. It is expected that it will provide a nucleus around which new science and industry networks will form. The synchrotron will deliver better and faster experimental techniques that will not only enhance current fundamental and applied research, but also open up new avenues of investigation to Australian science.

It is also expected that the Synchrotron will promote international science collaboration – now recognised as vital to leading-edge R&D.

6.2 Libraries

University libraries are centrepieces of the teaching, learning and research functions of a university. They are also important for knowledge transfer and engagement with the wider community.

Libraries are much more than repositories of monographs, journals, serials, newspapers, maps and works of art. They provide a wide range of value added services to students, staff and other users. They can be a centrepiece of a fully engaged university.

6.3 Archives

The University of Melbourne Archives collects, manages and provides access to the historical records of the University, Victorian business, trade unions and other labour organisations, community and cultural organisations, as well as the personal papers of many individuals prominent within them.

The University of Melbourne – Archives (UMA)

Records date back to the first years of the colony of Victoria up until the present day and cover a very wide field of endeavour. The Archives were established in 1960 and to date hold some 15 km of records. They are available for research use and may be used in the Cultural Collections Reading Room in the Baillieu Library.

The collections of University records are divided into three categories: official, clubs/societies and private.

Official records include the records of governance and administration beginning with the earliest minutes of Council (1853) and its committees, Professorial Board (1855-1978) and Academic Board (since 1978) and Faculties and Departments. Registrars' correspondence, Vice-Chancellors' files, architectural plans and photographs.

The records of University clubs and societies

document student and staff activities in some 75 bodies including the Students' Representative Council, sporting clubs such as the Athletics Club and Women's Tennis Club and departmental associations such as the Medical Students' Society, the Science Club, the Chemical Society and the German Club, all of which were formed in the 19th century.

The business collections at UMA comprise records of both businesses and the personal papers of businessmen and women covering 150 years of Victorian history. The collections are particularly strong in mining and metals treatment and in manufacturing but cover a rich diversity of other businesses such as architecture and building, law, primary industry, publishing and transport. Examples of collections from within these categories are: Bates, Smart, Blake & Riggall, Associated Pulp & Paper Mills Ltd, RB Ritchie & Son Pty Ltd, DW Thorpe Pty Ltd and Huddart Parker Ltd. The business collections hold the records of more than 220 companies totalling approximately 6,000 metres of records, some of which are restricted.

6.4 Publishing and bookstores

Universities have typically managed 'university presses' to publish the works of scholars. Most have closed as competition from global publishing houses has intensified. Melbourne University Press has, however, remained in existence. Monash University has established an electronic publishing business.

Melbourne University Press was founded in 1922 to sell books and stationery to students. It soon developed its own publishing program and later established its own printing facilities.

The University of Melbourne – Melbourne University Press (MUP)

MUP's first publication, in 1922, was a duplicated set of notes from the Physics School,

then known as Natural Philosophy. As 'Practical Physics, Part One', these notes remained in print until 1947. The first monograph was Myra Willard's *History of the White Australia Policy*, published in 1923 with a first print run of 600 copies.

In January 2003 MUP became Melbourne University Publishing Ltd, a wholly owned subsidiary of The University of Melbourne. It publishes approximately 70 books and electronic products each year over a wide range of subject areas and disciplines and maintains a backlist of some 350 titles.

Melbourne University Publishing Ltd publishes under two main imprints: Melbourne University Press and the Miegunyah Press. Scholarly titles are published under the MUP imprint. The Miegunyah Press is a special imprint of

MUP, begun in the late 1960's at the suggestion of Sir Russell Grimwade. It is supported by a bequest from the Grimwade family and allows MUP to produce books of enduring quality with the highest production standards.

Melbourne, like university cities around the world, is well endowed with high quality bookstores. They are also places to meet and are important for the cultural life of a university city. Melbourne's universities not only own and operate on-campus bookstores, they also operate 'off-campus' bookstores with shopfronts onto Melbourne's main streets and in busy shopping arcades.

This broad access to scholarly and related material in numerous City and metropolitan locations provides Melbourne with the ambience and style of a university city.

7 Universities making a difference to the urban environment and infrastructure

Universities are recognised as important places in metropolitan (as well as regional) communities. They contribute to their communities through architecture and urban precinct development, including open campuses, planning and architectural contributions, environmental protection and improvement and preservation of historic buildings.

Universities have been active in the preservation and restoration of public buildings, often in partnership with local government.

7.1 Planning and development

Melbourne 2030 identified 'specialised activity centres' as playing a vital role in Melbourne's economy. These centres are identified as:

- Bundoora – La Trobe and RMIT Universities and technology parks;

- Burwood – Deakin University;
- Clayton – Monash University/health research precinct – science and technology park, including the Synchrotron;
- Footscray – Victoria University;
- Heidelberg – Austin and Repatriation medical centre bio-medical alliance precinct – health research;
- Parkville – medical and bio-scientific institutes, including Bio21;
- Prahran – The Alfred medical research and education precinct; and
- Werribee – animal and food research centre.

Melbourne 2030 envisages that these centres will provide a mix of economic activities that generate high numbers of work and visitor trips and require that their planning and development should reinforce their specialised economic function. Mixed

uses that complement the role of these centres are to be encouraged, but not in a way that compete with nearby Principal or Major Activity Centres.

Melbourne 2030

Melbourne 2030 supports the development of an innovation economy by encouraging the expansion and development of logistics and communications infrastructure. It will support the development of business clusters and work to help approval processes for industry sectors and developments targeted under the Government's Innovation Economy policy. It will also promote a physical environment that is conducive to innovation and to creative activities.

Successful innovation economies depend on society as a whole being more creative, from large companies and government departments to individuals. This includes having a robust arts and culture sector.

Melbourne 2030 provides that future planning and development of research precincts should emphasise their ability to foster interaction between researchers and industry. Space is required so that new and emerging applications can benefit from co-location.

The RMIT's Globalism Institute has been working with municipal councils, local organisations and the Victorian Government on various initiatives relating to community sustainability and well-being. These initiatives have received funding support through ARC Linkage grants, VicHealth and RMIT Research and Innovation.

The Institute has recently been involved with the Broadmeadows and St Kilda communities in conducting social mapping activities which assess the impact that street activities, celebrations and rituals have in promoting inclusiveness and well-being within communities as well as the impact globalisation has on communities.

RMIT University's Virtual Reality Centre (VRC) provides the tool sets and interdisciplinary expertise to work with researchers and industry using visualisation and sound. The VRC can provide virtual replications of plans to identify planning issues prior to physical changes being made – with the aim of reducing costly alterations at latter stages.

VRC Projects currently in train include the Doncaster Hill development in the City of Manningham for Melbourne 2030, the Dandenong Central Activity District, City of Dandenong and the Maribyrnong River Valley Project, involving the Melbourne, Maribyrnong, Brimbank, Hume and Moonee Valley Councils and the Department of Sustainability and Environment.

7.2 Universities in the city

Melbourne is unique among Australian cities in having a large number of university campuses in the centre of the City. Both Melbourne and RMIT Universities have been located in the north of the City for more than 120 years. More recently, Victoria University has consolidated and redeveloped its business, law and health services activities at the southern and western precincts of the CBD.

La Trobe University is establishing a new campus in central Melbourne. Located in the historic Argus Building at 290 La Trobe Street, the new campus is being redeveloped as a major centre for research, learning and teaching in business and health sciences. The emphasis is on post-graduate coursework programs, university pathways and high profile research centres. The ground floor will be leased commercially, restoring to this section of Elizabeth Street the vibrant commercial precinct once envisaged. The exterior of the building will remain intact, while the interior will be transformed into a thriving university campus.

The extent of university activity in central Melbourne, particularly for overseas students, has introduced a new vibrancy into the City and generated substantial demand for housing as well as food, retail and entertainment services.

7.3 Preservation and restoration of heritage assets

Melbourne's universities respond to community expectations for preservation and restoration of heritage assets under their control.

Restoration and preservation of the former criminal justice precinct, including the former Magistrate's Court, the City Watch House and the Old Melbourne Gaol, is the product of collaboration between RMIT University, the Victorian Government and the National Trust. RMIT University now occupies some of the historic buildings for teaching and administration. The landscaped grounds of the old Police Garage are available for student relaxation and recreation.

The landscaped open space and careful preservation of buildings makes this a valuable addition to Melbourne's tourist attractions.

Figure 13: Restored interior of Old Melbourne Magistrate's Court



RMIT is also involved in restoration of the Capitol Theatre and Capitol House, one of Melbourne's most important historic buildings. Designed by Walter Burley Griffin and Marion Mahony Griffin, it was completed in 1924. The Theatre is best known for its extraordinary crystal inspired ceiling.

RMIT University – Capitol Theatre

In 1998 Melbourne City Council commissioned a study which explored the possible use of the venue as a festival and arts based centre. This background led to the appointment of RMIT University to undertake master planning, safety upgrade and disabled access works. The University bought the theatre in 1999 and has begun a process of refurbishment which will take some years. The works have generally involved "undoing" inappropriate 1960's work, reopening disused spaces, safety upgrades and provision of disabled access. The theatre, which seats 600 people, is currently used for lectures, festivals and events for both RMIT and the Melbourne public.

The approach throughout the project has been to encourage a process of discovery by the public of this valuable building. Demolition work was undertaken to reveal the original spatial arrangement and interlinking of foyer spaces which were upgraded to allow partial public access. A new audio visual installation and theatre lighting systems were incorporated in an unobtrusive way, the lighting system utilising sliding ceiling panels which were originally used for ventilation. Geometric ceilings were re-lamped to return to their former glory. A new lift and disabled access corridor to the theatre use soft natural materials which complement the crystalline geometry of the theatre interiors.

The theatre is notable for a number of pioneering concepts such as early use of reinforced concrete, marvellous stained glass details and a highly complex three dimensional spatial arrangement. Its greatest asset is the magical geometric plaster ceilings. These are based on organic design principals of natural orders and are composed in a way which is both evocative and very modern. The ceilings are indirectly lit in four colours and the lighting was used in conjunction with the original orchestral scores in the early silent film era to add drama for the filmgoer. This feature provides a spectacular sight.

In 2000 Central Hall (earlier known as Cathedral Hall) was transferred by the Archdiocese of Melbourne to the new city campus of Australian Catholic University.

Australian Catholic University – Central Hall

Adjacent to the University, Central Hall was constructed in 1903 onto the Exhibition Boot Factory in Brunswick Street, Fitzroy and incorporated all the facilities needed for a large venue capable of staging a range of theatrical, musical, ceremonial and social functions.

The elegant cantilevered balconies were a structural novelty allowing excellent sight lines; the acoustics were regarded as being without equal in Melbourne; and the much-admired plaster ceiling added in 1912-13 further enhanced the magnificence of the Hall. Its flat floor venue and acoustics have been compared to the famous Grosser Musikvereinssaal in Vienna.

Central Hall has served the Melbourne community in many different capacities as the chosen site for congresses, lectures, meetings, concerts, social events and other gatherings of the Melbourne Catholic, Italian and wider communities for a century. Since 2000, it has become an important venue for the intellectual life and visual and performing arts in the University and its local community. Central Hall is currently being restored with funding from the Australian Government's National Heritage Investment Initiative, the Potter Foundation, the Archdiocese of Melbourne and the University.

The Queen Street campus of Victoria University occupies two striking heritage buildings in the heart of Melbourne's legal precinct. The buildings have been refurbished as part of Victoria University's commitment to legal education.

Victoria University – Public Records and Land Titles Offices

295 Queen Street is the former Public Records Office. It has been refurbished to enhance its heritage status, while providing an attractive yet practical home for the University's School of Law, the Law Library, the Sir Zelman Cowen Centre for Continuing Legal Education and Victoria University's Judicial Administration and Justice Studies Institute. The building also contains two moot courts, computer laboratories, lecture theatres and seminar rooms.

283 Queen Street is the former Land Titles Office and is also a significant heritage building. It is a major focus for the University's business and law activities, which include postgraduate business programs, undergraduate law and continuing legal education. The building also provides space for the expansion of activities associated with the Victoria Law School, the Sir Zelman Cowen Centre and the Victoria Graduate School of Business.

The Melbourne base of Australian Catholic University at 115 Victoria Parade was built in 1924 as the Note Printing Branch of the Commonwealth Bank (in turn the Reserve Bank of Australia).

Australian Catholic University – Note Printing Branch of the Commonwealth Bank

The Note Printing Branch operated at 115 Victoria Parade for almost 60 years, before relocating to Craigieburn in October 1981. Its former premises were utilised by several departments of the Victorian Public Service prior to being purchased by Australian Catholic University in 1998 and extensively renovated. Occupied in 2000, the University's new campus gained a 2003 Property Council of Australia Award (Victoria Division) in the category of refurbished buildings, in partnership with the architectural firm Woods Bagot. The two former bank vaults are now the student common room and a music general learning area at the University, respectively.

Deakin University has converted Geelong's old woolstores into a modern inner city campus site which also contains a state of the art, 1,500 seat concert auditorium. The complex is situated within Deakin University's Geelong Waterfront campus.

Deakin University – The Costa Hall

Costa Hall achieved its name after a generous benefaction was made by the prominent Costa family of Geelong to Deakin University towards the cost of developing The Great Hall.

The 1500 seat concert hall of international standing has been the venue for several

symposiums, sittings of the Victorian parliament, graduations, conferences and cultural performances. This grand space provides Geelong with a venue able to house large-scale concerts, conference meetings and lectures.

7.4 Marketing and promotion of the City

Universities contribute to marketing and promotion of Melbourne as a city through joint promotions, contribution to city reputation and brand and coordinated international student marketing around Melbourne's identity and lifestyle.

8 Issues and implications

Previous studies on the contribution of universities to the local and regional economies have concentrated on the impact of universities as businesses in a higher education industry and on the outcomes of their investments in research for new business creation, industrial development and national wealth creation. This study has taken a wider focus and drawn attention to the broader social, community and cultural contributions of Melbourne's universities.

Economic contributions

This study has found that the impact of universities in terms of their substantial expenditure and investment in the Melbourne economy, whilst important, underplays the very significant role that universities play in other areas. In particular, Melbourne's metropolitan universities are major exporters of education services that are delivered through education programs provided for a very large number of overseas students.

Melbourne has benefited significantly from the contribution of overseas students to the lifestyle, culture and vitality of the City. A very large number of international students live in inner Melbourne

and create a demand for accommodation, food and other retail and cultural services.

Students study, learn and relax on a 24-hour cycle. Universities have responded by making facilities available on a continuous basis. New retail and food service businesses have also responded to cater for new patterns of demand.

Export income earned through the provision of education services for international students is in the same league as income from tourism. The commitment of universities to quality and innovation in teaching, the maintenance of international standards and the development of new knowledge through research, provide the foundation for sustainability and viability of this industry.

The commitment of universities to the preservation and restoration of heritage buildings has also made an important contribution to the tourism industry.

Business and industry contributions

Melbourne's universities make a substantial contribution to education and research for the mining, manufacturing and other industrial companies

that are headquartered in the City. Industry supported centres for teaching and research are a feature of all Melbourne's universities, including the research oriented and the technology oriented institutions.

Melbourne's universities contribute in a very substantial way to the work of State Government departments and agencies in the health, education and agriculture sectors by not only educating clinicians, technicians, teachers and extension workers, but also by supporting the delivery of services to patients, students and primary producers.

Victoria's universities with a Melbourne presence are contributing significantly to the development of new and innovative ways to meet the education and training needs of the professions and service industries. Work integrated learning initiatives are making a vitally important contribution to addressing the skills shortage.

As the professions and service industries become increasingly knowledge based, universities are contributing by providing the science, the technology and the evidence to underpin informed and effective policy development, decision making and improved professional practice.

Cultural, recreational and sporting contributions

Melbourne's universities contribute in significant ways to the cultural, recreational and sporting life of the city. The universities have supported, through outreach, engagement and service programs, the development of a vibrant youth culture in the city and created an environment for public art that is unique in Australia. The connection of universities to the heart of the City has created an interest and an involvement in urban design and public architecture.

Outreach, engagement and service, reflected in commitments of the universities to community health, education, welfare, housing and the environment, are also unique among Australian capital cities. This reflects a commitment to the

integration of teaching and learning with research and practice.

Urban development and planning

The importance and commitment of Victoria's universities with a Melbourne presence to the City, business and the community, suggests that there are further opportunities to develop Melbourne as an internationally and globally oriented university city.

Melbourne City Council can provide the leadership for the continuing development of higher education as a key industry for Melbourne and Victoria. It can provide support by ensuring that the development and implementation of statutory planning, land use, urban infrastructure, transport, retail and housing policies complement the engagement, outreach and service strategies of universities.

Given the importance of universities as public places they are often critical partners in urban renewal and re-vitalisation projects. The study has provided evidence of what can be achieved through joint ventures and partnerships between universities, local government, non-government organisations and private developers.

A leadership role

The City of Melbourne can continue to assist in marketing education services overseas and supporting the development of agreements with universities in other cities around the world. It can also assist universities develop and implement their industry and community engagement policies and strategies through its knowledge of the economic, social and cultural profiles of the City.

The opportunities for an integrated approach to achieving educational, economic, industry and community outcomes through a collaborative approach between the City of Melbourne and Victoria's universities with a Melbourne metropolitan presence are unique in Australia. The current and potential contributions of Melbourne's

universities are the foundations for positioning Melbourne as 'Australia's University City'.

Melbourne's universities are currently developing policies and strategies in relation to their contributions to the urban economy, society and community. Most have senior executives with specific roles relating to outreach, engagement and knowledge transfer. They are giving a very high priority to renewing the long established 'social contract' with their communities through these 'third mission' responsibilities (Gibbons 1998; 2003; Howard Partners 2006).

Elected Members and Council senior executive staff, through their own roles and responsibilities, are fully engaged with industry and the community in the framework of the Council's economic,

urban and community development strategies. They also bring overseas linkages and perspectives as Melbourne develops as an international city. There are clear synergies and benefits through closer collaboration between the Melbourne City Council and Victoria's universities with a Melbourne presence.

Melbourne City Council as an institution of the third sphere of government has a key role in working with universities in developing and implementing their third stream initiatives and in articulating a third horizon (visionary) approach to the development of a genuine university city.

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