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Australian Education International

Taiwan's Aim for the Top University Program

Innovation, internationalisation and opportunity

A report prepared under the 2007 Taiwan Research Visiting Scholar Grant

Research undertaken by Christopher Lawson

Foreword

This report was produced with the assistance of the Taiwanese Ministry of Education (MOE), the Taipei Economic and Cultural Office (TECO) in Australia and the Australian Commerce and Industry Office (ACIO) in Taipei. The author, Christopher Lawson, visited Taiwan from mid September to mid October 2007, under the 2007 Taiwan Research Visiting Scholar Grant program.

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The views expressed in this report are those of the author alone. They do not necessarily reflect the views of DEEWR and AEI.

List of acronyms

ACIO	–	Australian Commerce and Industry Office in Taipei
AEI	–	Australian Education International
ATUP	–	Aim for the Top University plan
BICER	–	Bureau for International Cultural and Educational Relations
CGU	–	Chang Gung University
HEEF	–	Higher Education Endowment Fund
MOE	–	Taiwanese Ministry of Education
NCCU	–	National Chengchi University
NCHU	–	National Chung Hsing University
NCKU	–	National Cheng Kung University
NCTU	–	National Chiao Tung University
NCU	–	National Central University
NSC	–	National Science Council
NSYSU	–	National Sun Yat-Sen University
NTD	–	New Taiwan Dollar (also shown as NT$)
NTHU	–	National Tsing Hua University
NTU	–	National Taiwan University
NTUST	–	National Taiwan University of Science and Technology
NYMU	–	National Yang Ming University
T12	–	The twelve universities participating in the ATUP
TECO	–	Taipei Economic and Cultural Office in Australia
THES-QS	–	Times Higher Education Supplement university rankings
UC	–	University of California
UCSB	–	University of California Santa Barbara
YZU	–	Yuan Ze University

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Abstract

With a population roughly the same size as Australia, Taiwan has about the same number of students in their university system. With more than four times as many universities as Australia, individual universities in Taiwan have found it difficult to rank highly in well-known international rankings such as the Shanghai Jiao Tong Index. To help lift the international profile of the Taiwanese university system, the Taiwanese Ministry of Education has engaged in an ambitious program to elevate at least one Taiwanese university into the top 100 universities in the world, and to develop elite departments or research centres in different areas of specialisation. Taiwanese universities receiving funding under this program are using it to invest heavily in infrastructure, upgrade teaching and research, and engage in international cooperation. This increased investment in high calibre Taiwanese universities, and the increasingly outward looking focus creates opportunities for Australian universities to form lasting, successful links with top class Taiwanese universities.

Executive Summary

The Taiwanese Ministry of Education (MOE) has invested NT$50 billion over five years in twelve universities (the 'T12' universities) to boost their international competitiveness. This works out to be approximately A$340 million per year.

Taiwan has more than 160 universities, both public and private, varying in scope, size and quality. This can make it difficult for international universities to identify appropriate Taiwanese partners to engage with on cooperative projects.

The MOE's program has identified twelve universities from these 160 as being ones that have the possibility either to break into the top 100 universities in the world, or to be amongst the best in the Asia/Pacific region in key research areas. While there are undoubtedly very good universities outside of the T12, the T12 have each received significant funding from the Ministry under this program to develop international links, to improve infrastructure, and to enhance research and teaching either across the university or in key, identified areas. This makes the T12 a useful group of universities for Australian universities to consider as partners.

Two universities (National Taiwan University and National Cheng Kung University) are receiving 47% of this funding, with the aim of having at least one of them ranked within the world's top 100 universities within ten years. The other ten universities in the T12 have been allocated the rest of the funding, with the goal of Taiwan developing at least ten elite (Asian top-tier) departments or research centres in different areas of specialisation in Asia within five years.

The T12 universities include both large, comprehensive universities (such as National Taiwan University) and small, specialised universities—both public and private (such as National Yang Ming University, a small university specialising in biomedical research). The universities are internationally recognised ones: half of them ranked in the top 500 in the world on the 2007 Shanghai Jiao Tong index, ranking them higher than more than half of Australia's universities.

For some universities, the funding they are receiving is a significant proportion of the total funding they receive from the MOE (in excess of 30%). The funding provided to these universities is letting them invest heavily in key, targeted fields of research and focus on internationalising teaching and research.

Taiwanese universities are actively looking to make partnerships with relevant universities overseas, developing joint research programs, dual degrees, student and staff exchange and attracting foreign academics to work in their universities on a short or long term basis.

The MOE program offers Australian universities opportunities to enter into cooperative research and collaborative programs in targeted areas, making use of the specialised research and newly established infrastructure in the T12 universities.

Taiwanese universities are looking to increase their international students—the MOE has a goal that each university will have at least 5% of its students sourced from overseas. To help them increase the number of international students they attract, the universities are establishing programs taught exclusively in English.

This aspect of the program provides opportunities for more student exchange between Australia and Taiwan, and for Australian students to complete full degree programs in Taiwan. More can be done to develop an awareness of these programs and opportunities.

This also provides opportunities for Australian universities to provide TESOL training to Taiwanese academics—some universities are sending staff overseas to learn how to teach in English.

Section 1. Introduction

Taiwan is a land full of energy, enthusiasm and innovation. With a land mass roughly half that of Tasmania, Taiwan supports a population of over 23 million people, giving it the second highest population density in the world, behind Bangladesh[4]. Taiwan has more than 160 universities, providing education to over a million higher education students.

Examples of Taiwan's expertise in technology and innovation abound, from the recently installed high speed rail[5], which connects Taipei in the north to Kaohsiung in the south (making the 333 km journey in an hour and a half), to Taipei's landmark building, Taipei 101, which at 101 stories towers over Taipei as one of the largest buildings in the world and hosts the world's fastest elevators.

Despite Taiwan's well known skills in technology and innovation (Taiwan ranked ninth in terms of innovation in the World Economic Forum's 2007 Global Competitiveness Report[6]), Taiwan's universities are not as well known internationally, with only one university ranked in the top 200 in the world in either the 2007 Shanghai Jiao Tong[7] or Times Higher Education (THES-QS)[8] rankings.

The international ability and standing of universities is important to the Taiwanese Ministry of Education (MOE). In a briefing provided by the MOE for this research, the Ministry noted that:

"In this era of knowledge-driven economy, cutting edge research and development that produces innovative results have become crucial factors in determining a nation's international competitiveness.

The quality of research and development in Universities is undoubtedly the key to advancing the standing of a nation within the international community[9]."

In a bid to increase the international competitiveness of its universities, the MOE embarked on an ambitious plan in 2004 to have at least one Taiwanese university ranked in the top 100 in the world within ten years, and to establish ten elite (Asian top-tier) universities or research centres within five years.

Box 1: Chang Gung University

Established in 1987 as the Chang Gung Medical College, the institution was renamed Chang Gung University (CGU) in 1997. CGU is a small, specialised university located in Taoyuan County, on the outskirts of Taipei.

CGU is one of two private universities in the T12, funded by a major industry group. CGU has colleges of medicine, engineering and management.

CGU has approximately 430 full time and 300 part time faculty, teaching around 5,700 students. While CGU only has 10 international students enrolled in postgraduate programs, the university is looking to increase its international student numbers.

The university is also developing a plan to provide full grants to some of its students to take courses or undertake joint research projects with partner universities in other countries (CGU has academic cooperative programs with the University of Connecticut, Rikko University, Paul Cezanne University and the University of Minnesota, and is pursuing links with Australian universities).

CGU is receiving NT $300 million per year from the Ministry for a research centre for Molecular Medicine. The three main areas of interest for CGU are cancer, healthy ageing and re-emerging viruses. A quarter of all cancer patients in Taiwan are treated at CGU's affiliated hospital.

Taiwanese universities receiving funding under this program are using it to invest heavily in infrastructure, upgrade teaching and research, and engage in international cooperation. This increased investment in high calibre Taiwanese universities, and the increasingly outward looking focus creates opportunities for Australian universities to form lasting, successful links with top class Taiwanese universities.

1 Bender, A, Grundvig, J & Kelly R 2004
2 Taiwan's High Speed Rail commenced operations in January 2007.
3 World Economic Forum 2007
4 Shanghai Jiao Tong University 2007a
5 THES-QS 2007a
6 Briefing from MOE on 19 September 2007.

This report looks at the MOE's plan, the universities that received funding under this plan, some of the results to date, and the opportunities arising for Australian universities from Taiwan's investment in some of their top institutions. A short overview of each of the participating Taiwanese universities is provided in textboxes throughout the report.

A Market Data Snapshot of Taiwan and Taiwanese students studying in Australia is provided at Appendix 1.

Section 2. The Aim for the Top University Plan

In 2004, the MOE drew up the blueprints for a program, the "Aim for the Top University Plan" (ATUP)[10], which was designed to make research excellence and internationalisation the objectives of good universities[11].

The MOE's plan was developed in the context of other countries engaging in similar efforts to develop the international standings of their universities. In particular, the MOE looked at the efforts of four countries—the United States, the Republic of Korea, Japan and China—in developing Taiwan's own program. (A summary of the four programs, and a possible Australian equivalent, is provided at Appendix 2).

Under the ATUP, the MOE set aside NTD 50 billion (approximately A$1.67 billion[12]) over five years, with the possibility of an additional NTD 50 billion being provided for a further five years. With the MOE providing approximately NTD 7 to 8 billion annually specifically for research to 37 public universities, the additional funding under the ATUP represents a large increase in funding for research for participating Taiwanese universities.

Of the funding of NTD 50 billion over five years, the MOE set aside 40% for capital funding, and 60% for other budget items. Universities participating in the ATUP are allowed to spend their funding across six broad areas:

- School operational management and organisational implementation systems
- Infrastructure
- Teaching
- Academic production and R&D
- Industry-academia cooperation, and
- Internationalisation.

The MOE's ATUP specifies that the funding provided under the program is for the purpose of upgrading the basic overall facilities of schools. The scope of the funding, as specified by the MOE, includes improving or upgrading facilities for books for university teaching and research, construction, and conducting international academic exchanges. Funds can also be used to hire external staff, including distinguished scholars, experts, technical staff and post-doctoral research fellows from Taiwan and overseas, and for the hiring of top-tier teaching staff from Taiwan or overseas to specially created professorships.[13]

In an important change for Taiwanese universities, universities receiving funding under the plan have been given a large degree of autonomy in how the money can be spent, with the funds being provided as a block grant (Taiwanese universities normally have tight restrictions placed on MOE funding).

Box 2: National Central University

Originally founded in Nanjing in 1902 as the Liangjian Normal School, National Central University (NCU) was relocated to Taiwan, and assumed its present location in Jhongli, in Taoyuan, near Taipei, in 1968.

NCU is a moderate sized institution with seven colleges: Liberal Arts, Science, Engineering, Management, Electrical Engineering and Computer Science, Earth Sciences, and Hakka Studies.

NCU is receiving NT $600 million per year from the Ministry, for research centres in Earth Science and Environmental Technology, Plasma and Complex Systems, and Optics and Photonics, and centres for Applied Technology and Creative Content, and Astronomy and Space Technology.

7 The ATUP has also been referred to variously as the 'Top International Universities and Peak Research Centre Development Project' and the 'Development Plan for World Class Universities and Research Centres of Excellence'

8 Ministry of Education (Taiwan) 2006

9 Currency conversions use an exchange rate of NTD100 = A$3.34 (Median price as at 7 November 2007)

10 Ministry of Education (Taiwan)

In the short term, the MOE sees the benefit of the ATUP as providing the opportunity for reform and innovation to the successful universities, while in the long term establishing the foundation for high-quality development by future universities. The MOE hopes that the plan will help to increase the number of Taiwanese university graduates going on to research universities to undertake post-graduate research, by enhancing both the research capacity and international standing of Taiwanese universities. The MOE has a target of 10% of university graduates going on to undertake post-graduate research in Taiwan's research intensive universities, and universities participating in the ATUP are also expected to increase their undergraduate numbers by 5% each year during the plan. Universities are also expected to increase their international students to at least 5% of their student body[14].

The MOE also hopes that the benefits of the ATUP will flow to other, non-participating institutions as well, through the development of effective models for teaching, research, internationalisation and establishing world-class research centres.

11 According to the MOE, International students studying in Taiwan come from 117 countries, with Vietnam, Malaysia, Indonesia, Japan and the United States of America the top five source countries. Asian students comprise 70% of international students studying in Taiwan, with a further 19% from continental America. (Ministry of Education (Taiwan) 2008).

Section 3. The application process

While the ATUP is nominally open to all Taiwanese universities, the MOE established certain threshold criteria that universities had to meet in order to apply for funding under the plan, based on staff/student ratios and a minimum number of citations. Universities were encouraged to submit detailed proposals bidding for funding, and outlining how the funding would be spent. Universities could apply for funding either to develop themselves as a world class university, or to develop world class research centres.

For universities applying for funding as world class universities, institutions were required to submit an application that included:

- A self-evaluation of the institution's current situation and conditions for development, with an analysis of strengths and weaknesses and strategies for future development

In 2006, NCTU received NT$1,270.7 million from the National Science Council (NSC) for 705 research projects, and NT$671.5 million from industry and other institutions for 322 research projects. Nearly two thirds of all CEOs in the nearby Hsinchu Science Park are NCTU alumni, so the institution has very strong links with industry.

NCTU is receiving NT$800 million per year under the Ministry's plan, for a Peak Research Centre for Electronics and Information Technology, Research Centres in Photonics Technology and Interdisciplinary Biotechnology, and Centres for Frontier and Fundamental Science, and Technology Management and Humanistic Education.

- Annual assessment criteria for measuring accomplishment of objectives based on the institution's current situation (both qualitatively and quantitatively)
- Specific strategies for meeting the following objectives:
  - Plan for adjusting operational strategy and organisational implementation
  - Specific plans for strengthening the university's infrastructure
  - Specific plans for integrating internal departments or other schools or research organisations
  - Plans for fields of concentration, relevant leadership talent, the cultivation of talent, and holistic approaches to education in the humanities, social sciences and the arts
  - Creating integrated operational systems and raising the overall performance of the institution and a specific plan for attracting top scholars from overseas
  - Specific plans for enlisting high-calibre teaching faculty members
  - Specific plans for strengthening the effectiveness of teaching and research
  - Plans for meeting society's and industry's needs to recruit an increasing number of university graduates

Box 3: National Chiao Tung University

Founded in 1958, the National Chiao Tung University (NCTU) is located in Hsinchu, in the north west of Taiwan.

NCTU has eight colleges: Electrical and Computer Engineering; Computer Science; Engineering; Science; Biological Science and Technology; Management; Humanities and Social Sciences; and Hakka Studies.

NCTU has almost 640 faculty members, and over 800 administrative, technical and maintenance staff. The institution has approximately 13,600 students (17% at the Doctoral and 47% at the Masters level).

In 2006, NCTU had 363 international students undertaking degrees (2.7% of the student population), and 75 international students undertaking Chinese language study. The university is actively encouraging cooperation with foreign universities, institutes and industries, and provides tuition walvers and scholarships to international students.

NCTU was ranked 49th in the world in the Engineering/Technology and Computer Sciences field in the Shanghai Jiao Tong University 2007 Academic Ranking of World Universities and ranked 21st in the world in the journal article publication counts in Computer Science in the Essential Science Indicators.

12 The application process described here is taken from the MOE's 'Development Plan for World Class Universities and Research Centers of Excellence'

    - Plans to balance the development of the humanities and social sciences with the natural and applied sciences and engineering
    - Plans drawn up for fields of concentration to develop into world-class research centres, and
- Financial plans and annual funding needs within the overall plan.

Institutions applying for funding to develop world class research centres were required to submit an application that included:

- A self-evaluation of the institution's current situation and conditions for development, with an analysis of strengths and weaknesses and strategies for future improvement
- Annual assessment criteria for measuring accomplishment of objectives based on the institution's current situation (both qualitatively and quantitatively)
- Specific strategies for meeting the following objectives:
    - Plan for adjusting operational strategy and organisational implementation
    - Specific plans for strengthening the institution's infrastructure
    - Specific plans for integrating internal departments or other institutions or research organisations
    - Plans to create integrated operational systems and to raise the overall performance of the institution; and a specific plan for attracting top researchers from overseas
    - Specific plans for enlisting high-calibre teaching faulty members
    - Specific plans for strengthening the effectiveness of teaching and research
    - Plans for meeting society's and industry's needs to recruit an increasing number of university graduates
    - Plans for fields of concentration to achieve international top tier status (in a maximum of three fields), and
- Accompanying measures to be adopted institution-wide to achieve the objective, as well as specific methods to promote elite research centres and facilitate the comprehensive upgrading of the whole institution's teaching and research standards.

Box 4: National Cheng Kung University

Founded in 1931 as the Tainan District School for Higher Industrial Education, the institution became the National Cheng Kung University (NCKU) in 1971. NCKU has nine closely inter-linked campuses located in Tainan, in the south west of Taiwan.

NCKU is a large institution, with more than 20,000 students (34% at Masters and 15% at Doctoral level), a faculty of 1,157 and 1,435 administrative and support staff. Approximately 2.5% of its students are international students, double the number from 2006.

NCKU has nine colleges: Engineering, Electrical Engineering and Information Science, Planning and Design, Liberal Arts, Sciences, Management, Medicine, Social Sciences, and Bioscience and Biotechnology.

NCKU is Taiwan's second highest ranked university in the 2007 THES-QS rankings, and is one of the two universities receiving MOE funding to develop into a world-class university.

The university is receiving NT $1.7 billion per year from the MOE, with funding being applied to the aim of becoming a world-class university, and to research centres for Gene Regulation and Signal Transduction, Ocean Environments and Technology, Advanced Materials and Microsystems, Cardiovascular Disease, Cognition and Design for Digital Living, Sustainable Environmental Technology, Geodynamic Systems, and Creative Manufacturing Management, and a peak research centre for photoelectrics.

Section 4. The successful universities

In 2005, twenty-nine universities submitted proposals for funding under the program, with twelve selected (these twelve universities are now commonly referred to in Taiwan as the T12, reflecting a view (not universally shared) that they are the twelve best universities in Taiwan). Of the twenty-nine universities, seven submitted applications for funding as world class universities, with twenty-two universities putting forward research centre proposals[16].

The proposals were assessed by a selection committee, comprising MOE officials and academic representatives and chaired by a Nobel prize laureate.

Of the twelve successful universities, two—National Taiwan University (NTU) and National Cheng Kung University (NCKU)—received funding to develop themselves as world class universities, able to compete to be in the top 100 universities in the world. The other ten universities received funding to enhance themselves as top-tier Asian universities or to develop world class research centres. All seven universities that had submitted applications for funding as world class universities received some funding under the ATUP, with five of them receiving funding for research centres.

The funding allocations for the successful universities are shown below, in Table 1. The funding is for five years, from 2006 through to 2010. As Table 1 shows, 48% of the funding was allocated to two universities (NTU and NCKU) to become world class universities, with 52% allocated to the other ten universities to develop world-class research centres.

Taiwan's four leading universities (according to the Shanghai Jiao Tong rankings—see Table 2 below), together receive 64% of the ATUP funding, despite only enrolling a combined 4% of Taiwan's university student body[17].

Table 1: Annual funding allocations by university

University	Annual Funding	Proportion of funding
National Taiwan University	NT$3.0 billion	31%
National Cheng Kung University	NT$1.7 billion	17%
National Tsing Hua University	NT$1.0 billion	10%
National Chiao Tung University	NT$0.8 billion	8%
National Central University	NT$0.6 billion	6%
National Sun Yat-Sen University	NT$0.6 billion	6%
National Yang Ming University	NT$0.5 billion	5%
National Chung Hsing University	NT$0.4 billion	4%
National Chengchi University	NT$0.3 billion	4%
National Taiwan University of Science and Technology	NT$0.3 billion	3%
Chang Gung University	NT$0.3 billion	3%
Yuan Ze University	NT$0.3 billion	3%

More details on the centres and research centres receiving funding for each university are included at Appendix 3.

Six of the T12 universities were ranked amongst the best universities in the world in the Shanghai Jiao Tong rankings for 2007[18], with these six and a further three listed in the THES-QS rankings for 2007[19]. Table 2 shows the rankings under these two systems for each university[20].

13 Australian Education International 2005

14 Hsiao, F 2006

15 Shanghai Jiao Tong University 2007a

16 THES-QS 2007a and THES-QS 2007b

17 There is debate over the comparative values of these two ranking systems. For example, Taylor and Braddock argue that the THES-QS is a poor ranking system, as many of the components of the THES-QS are subjective, rather than objective, measures of university excellence. They argue that the Shanghai Jiao Tong measure is clearly superior to the THES-QS system, although they acknowledge the Shanghai Jiao Tong emphasis on science over literature and the humanities [Taylor, P and Braddock, R 2007].

Table 2: University rankings under the 2007 THES-QS World University Rankings and the 2007 Shanghai Jiao Tong Academic Ranking of World Universities

University	THES[18]	Shanghai[19]
National Taiwan University	=102	151-202
National Cheng Kung University	=336	305-402
National Tsing Hua University	334	305-402
National Chiao Tung University	401-500	305-402
National Central University	=398	403-510
National Sun Yat-Sen University	401-500	NR
National Yang Ming University	401-500	403-510
National Chung Hsing University	401-500	NR
National Chengchi University	NR	NR
National Taiwan University of Science and Technology	401-500	NR
Chang Gung University	NR	NR
Yuan Ze University	NR	NR

A number of the T12 universities are particularly strong in the Engineering/Technology and Computer Science fields, with three of them listed in the Shanghai Jiao Tong academic ranking of world universities for Engineering/Technology and Computer Science.

Table 3 shows the comparative rankings of Taiwanese and Australian universities in this broad subject field.

Table 3: University rankings under the 2007 Shanghai Jiao Tong academic ranking of world universities by broad subject fields—Engineering/Technology and Computer Sciences

University	Ranking[20]
National Chiao Tung University	49
University of Melbourne	51-75
University of New South Wales	51-75
University of Sydney	51-75
National Taiwan University	77-106
National Tsing Hua University	77-106
University of Newcastle	77-106

18 THES-QS 2007a and THES-QS 2007b. An equals sign (=) denotes equal ranking; universities ranked between 401 and 500 are not given an individual ranking (they are ranked in bands); NR indicates the university was not listed in the rankings; institutions are shown in the same order as in Table 1, not in world ranking order.

19 Shanghai Jiao Tong University 2007a: universities outside of the top 100 are not given an individual ranking (they are ranked in bands); NR indicates the university was not listed in the rankings; institutions are shown in the same order as in Table 1, not in world ranking order.

20 Shanghai Jiao Tong University 2007b: universities are shown in alphabetical order within ranking groups.

Section 5. Evaluation under the ATUP

On-site visits and evaluations of each of the T12 universities occur each year of the program, and the MOE was conducting a review and evaluation of the overall performance of the ATUP at the end of 2007, immediately following the author's visit to Taiwan. Results of the 2007 evaluation were not available at the time of the writing of this report.[21]

Evaluation committees comprising academically distinguished and eminent scholars and experts, both from Taiwan and from leading overseas universities and agencies, conduct the evaluations of universities under the ATUP. Universities are evaluated against specific annual quantitative indicators and qualitative indicators. Taiwan's National Science Council (NSC) provides input into the development of some of the indices for the evaluation of universities.

Specific annual indicators for universities receiving funding to become world-class universities include[22]:

- Quality of faculty: ratio of professors to assistant professors, ratio of staff with doctorate degrees, number of faculty members having received accolades from Taiwan or overseas, such as a Nobel prize or membership in an important global academic body or national academy, and so forth
- Outstanding academic fields within the institution that have successfully implemented inter-institutional integration and have met performance criteria for reaching the top international tier
- Numbers of papers published, citations in renowned international journals, and impact factors
- Academic production: number of research programs, industry-academia cooperation projects and intellectual property rights, including those for patents, technology transfers and technical papers
- Measures promoting teaching excellence, including complete teaching quality reviews and assessments, mechanisms for the reward and replacement of faculty members and mechanisms for periodic review and evaluation
- Raising the institution's level of internationalisation, such as the number of foreign students recruited, the holding of international conferences, the teaching of courses in English, collaborative research program courses, and implementation of dual degrees
- Student quality: improving student unit expenditure and student-faculty ratios, and
- The publicising of alumni achievements.

Box 5: National Yang-Ming University

Established in 1975 as the National Yang-Ming Medical College, the institution became the National Yang-Ming University (NYMU) in 1994. NYMU is a small, specialised research university located in Taipei that focuses on life science and clinical medicine.

NYMU has schools of Medicine; Medical Technology and Biomedical Engineering; Life Sciences; Nursing and Dentistry, and a centre for General Education.

NYMU has almost 300 faculty members, The institution has approximately 3,800 students (17% at the Doctoral and 32% at the Masters level). NYMU has international students undertaking international health programs taught in English, and international students undertaking programs taught in Mandarin, using English text books (approximately 30 international students, or 0.8% of the student population).

NYMU has active international collaboration with institutions such as the University of Oxford, the National Research Council of Canada, the RIKEN Genomic Science Center in Japan, and the University of Papua New Guinea.

NYMU is receiving NT $500 million per year from the Ministry, for research centres in Genetics and Epigenomics, Brain Research and Gerontology.

21 The results of the 2007 evaluation were reported in the China Times on 6 February 2008 (advice from AEI Taiwan). Information is included in Appendix 4.
22 Ministry of Education (Taiwan)
23 ibid

Annual indicators for universities receiving funding to develop world class research centres include[23]:

- Research centre faculty and researcher quality: ratio of professors to assistant professors, ratio of staff with doctorate degrees, number of faculty members having received accolades from Taiwan or overseas, number of papers published and citations in international periodicals, impact factor, number of research programs, industry-academia collaboration projects and intellectual property rights
- Concrete methods and support strategies for enlisting outstanding talent (domestic and overseas faculty, students and research staff)
- Creative mechanisms and methods for enhancing teaching performance and academic research
- Specific methods for and results of collaboration between domestic and overseas institutions and research organisations, and
- Institution's overall supporting resources: talent and manpower, funding, library equipment and facilities, building space etc.

If any university failed to pass the evaluation, that university would lose its funding, and other, non-T12 universities would be eligible to bid for this funding. In addition, the four universities perceived to have made the least progress in their plans at the end of the mid-point evaluation of the program (conducted at the end of 2007) will have to compete with other universities to continue to receive ongoing funding to the end of 2009.

The uncertainty over receiving ongoing funding has proven to be a concern for a number of the participating universities.

Box 6: National Taiwan University of Science and Technology

Founded in 1974 as the National Taiwan Institute of Technology (Taiwan's first technical university), the institution was renamed the National Taiwan University of Science and Technology (NTUST) in 1997. NTUST is located in Taipei.

NTUST is a specialised university, with five colleges: Engineering; Electrical and Computer Engineering; Management; Design; and Liberal Arts and Social Sciences.

The university has four campuses: the main campus, located in Taipei, and other campuses in Taipei County, Keelung and Hsinchu.

NTUST has approximately 330 faculty members (95% with PhD qualifications), and approximately 260 administrative, technical and maintenance staff. The institution has approximately 8,400 students (11% at the Doctoral and 34% at the Masters level).

The university has a goal to have 3.5% of its students as international students (currently the NTUST has 1%). Half of the courses in NTUST's engineering graduate school are conducted in English, and the university offers free Mandarin language courses for students.

NTUST has received NT$300 million per year under the Ministry's plan for the Taiwan Centre for Construction Technology.

Section 6. Participation in the ATUP—the universities' perspectives

For most of the T12 universities, one of the major benefits of participation in the ATUP has been the recognition of their status as an elite Taiwanese university, looking to (or already able to) compete as a world-class institution. It gives the participating universities status, something that can be used in luring students, staff or collaborative partners.

For Chang Gung University (CGU) and Yuan Ze University (YZU), the only two private universities in the T12, the status of being part of the T12 sets them apart from the many other private universities in Taiwan.

Likewise, for the National Taiwan University of Science and Technology (NTUST), the only technology university in the program, being part of the T12 differentiates them from all the other technological universities in Taiwan.

Another benefit of the ATUP has been that it has forced universities to be ambitious, to plan strategically, and to internationalise rapidly.

For universities receiving funding to develop world-class research centres, the benefits have also flowed from the research centres to other parts of the institution.

The other benefits of participating in the program vary by university, in line with the amount of funding that each receives (for example, while NTU receives 31% of the total funding, YZU receives only 3%). For some universities, the funding that they receive through the ATUP is a significant boost to their budget (in excess of 30% of their MOE funding), while for others, the MOE funding is relatively small.

A number of universities view the ATUP funding as merely restoring funding to previous levels (funding levels per student have fallen in Taiwan in recent years, as the very large expansion of the university system has not been matched by increases in MOE funding).

The amount of funding received by each university is also a source of tension, with some universities arguing that they should have received a greater share of the total funding than they in fact received.

Box 7: National Taiwan University

Founded in 1928 as the Imperial University, the institution was renamed National Taiwan University (NTU) in 1945. NTU has its main campus in Taipei, a branch campus under construction in Chupei, and an enormous experimental forest. In total, NTU occupies approximately 1% of Taiwan's land mass.

NTU has more than 32,000 students (14% at the Doctoral and 31% at the Masters level), and 1,869 faculty.

The institution has 11 colleges: Liberal Arts, Science, Social Sciences, Medicine, Engineering, Bio-Resources and Agriculture, Management, Public Health, Electrical Engineering and Computer Science, Law and Life Science.

NTU is the highest ranked Taiwanese university under either the THES-QS or Shanghai Jiao Tong rankings, and was also ranked amongst the best universities in the world in the broad subject field of Engineering/Technology and Computer Sciences.

NTU receives NT $3 billion per year for the Ministry to support its bid to be a world class university. The funding is also being applied to research centres in East Asian Civilisations, Globalisation, and Sustainable Development and Disaster-Prevention, cross-institutional research centres for East Asian Democracy and Ocean Technologies, centres for NanoScience and Technology, and Information and Electronic Technologies, and a centre of excellence for Medical Research.

Section 7. Achieving Excellence

Each of the T12 universities participating in the ATUP is doing so in different ways, and with different goals. While some universities have a clearly defined goal to become one of the top 100 universities in the world, others are focused on becoming one of the best universities in the world in one or more specialised areas. Not every university can, or need, aspire to be in the top 10 or the top 100 universities in the world[24].

7.1 Benchmarking

Different universities have different measures of excellence, noting that benchmarking themselves against ranking systems like the Shanghai Jiao Tong or the THES-QS is not always appropriate. Ranking measures like the Shang hai Jiao Tong can be biased towards the sciences and towards English language[25]—some of the Taiwanese institutions have particular strengths in areas other than the sciences, and Taiwanese universities teaching the humanities usually use Mandarin, rather than English.

International ranking systems like the Shanghai Jiao Tong also have an inherent bias against smaller institutions (a number of the T12 universities are small, specialised institutions), as most of the components that comprise an institution's rank are based on absolute numbers—favouring larger institutions—rather than on per-capita performance. For example, only 10% of the Shanghai Jiao Tong score takes into account academic performance weighted for the size of the institution (such as citations per faculty member)[26].

Some universities choose to benchmark themselves against overseas institutions (sometimes comparable in size or in the range of programs offered, sometimes an institution that the Taiwanese university aspires to emulate), or use other measures, like rankings in terms of citations, rather than benchmark themselves against either the Shanghai Jiao Tong or the THES-QS.

7.2 Internationalisation

Most of the T12 universities have set up special offices or departments to manage their participation in the ATUP, and a number of the universities have also set up international offices to manage their international affairs (other universities manage their international affairs through their research departments).

Box 8: National Sun Yat-Sen University

National Sun Yat-Sen University (NSYSU) was established in 1980, and is located in Kaohsiung city, in the south of Taiwan.

NSYSU has six colleges: Liberal Arts, Science, Engineering, Management, Marine Sciences, and Social Sciences.

The institution has approximately 9,600 students (13% at Doctoral and 45% at Masters level), and 441 full-time faculty members (almost entirely assistant professors or higher, with doctoral degrees).

NSYSU has approximately 100 international students (roughly 1% of the student cohort), and over 100 programs taught entirely in English.

The institution is receiving NT $600 million per year from the MOE, for a peak research centre for Photonics Technology, and research centres for Pacific Oceanography, Micro and Nano-level Analysis, and Electronic Commerce and Creative Economy.

These international offices are usually run by academics, rather than professional administrators—an academic might work for two years in the international office, then return to teaching or research. This means that there can be reasonably frequent turnover of staff in the international offices of Taiwanese universities (something that Australian universities need to be aware of).

24 As Clarke notes, while some studies have shown a short-term relationship between the perceived status [rankings] of universities and the employment and earnings outcomes for graduates from these universities, graduates of lower-ranked universities can also do well if their area of specialisation is in an area of recognised strength for that institution [Clarke, M 2007].

25 Marginson, S 2007

26 Taylor, P and Braddock, R 2007

With an increasing emphasis on internationalisation, and the establishment of international offices in many of the Taiwanese universities, institutions are looking at ways to increase their international engagement.

More and more courses are being taught either partially or completely in English, and undergraduate and postgraduate degree programs are being developed, taught entirely in English, as a way to attract more international students to Taiwan (in some universities, staff teaching in English receive extra subsidies). The MOE has a target for Taiwanese universities to have at least 5% of their students from overseas—for most Taiwanese universities, this figure is currently around 1 to 2%.

Participating universities are actively looking for two-way student exchange with partner institutions, although a number of them are facing problems in attracting international exchange students (this is one of the reasons for the development of programs taught entirely in English). To counter this, some universities are using ATUP funding to provide full scholarships and tuition waivers to international students to study in Taiwan, and others are heavily, or fully, subsidising their students to undertake part of their studies overseas. Some universities are also developing links with overseas institutions to provide intensive summer English language courses for Taiwanese students, or to train their staff to be able to deliver programs in English, providing opportunities for Australian providers.

Universities are also using ATUP funds to subsidise academics and students to attend and present papers at international conferences, and to send administrative staff overseas to look at administrative practices in other countries.

Institutions are developing and hosting major international conferences in their areas of strength, both to build recognition and to develop alternative revenue streams (as Chart 3 below shows, the number of international conferences hosted by T12 universities almost doubled between 2005 and 2006).

Institutions are also developing joint degree and research programs with overseas universities with complementary strengths, including a number with Australian universities, and hosting summer camps for both Taiwanese and international students.

Box 9: National Tsing Hua University

First established as the Tsing Hua Academy in Beijing in 1911 and then the National Tsing Hua University, the institute was relocated to Taiwan as the National Tsing Hua University (NTHU) in 1956. NTHU is located in Hsinchu, in the north west of Taiwan.

NTHU has seven colleges: Science, Engineering, Nuclear Science, Humanities and Social Sciences, Life Sciences, Electrical Engineering and Computer Science, and Technology Management. The institution also has a Commission for General Education, to coordinate basic educational programs for the university.

The university has 583 full-time faculty members, 132 researchers and 899 staff members. NTHU has just over 11,000 students (20% at the Doctoral and 32% at the Masters level).

NTHU was ranked amongst the top universities in the world for Engineering/Technology and Computer Science in the 2007 Shanghai Jiao Tong academic rankings.

NTHU is receiving NT $1billion per year from the MOE, for research centres in Information Technology and Electronics, Nanotechnology, Life Sciences, Fundamental Sciences and Technology, Science and Management, and for a centre for Energy and Environmental Research.

Each of the T12 universities is interested in forming a greater number of productive, cooperative links with Australian universities in areas of complementary strengths. Australian universities could benefit from this, as many of the T12 universities are very strong in innovation and commercialisation.

Taiwanese universities have a number of criteria that they look for in prospective international partners, including academic reputation, strengths in specific areas, and well-balanced interaction.

AEI Taiwan is forming links with the international offices of the T12 universities, and can provide more information on possible links. A list of known links with Australian universities is provided as Appendix 5.

Box 10: National Chung Hsing University

Founded as an agricultural college, the institution became the National Chung Hsing University (NCHU) in 1971. NCHU is located in Taichung, in the middle of Taiwan, and also owns four experimental forests and two experimental farms located throughout Taiwan.

With nearly 16,500 students (10% Doctoral and 28% at the Masters level), NCHU is quite a large Taiwanese university, servicing the centre of Taiwan. NCHU has more than 900 full- and part-time faculty members, and 435 administrative and support staff.

NCHU has colleges of Liberal Arts, Agriculture and Natural Resources, Science, Engineering, Life Sciences, Veterinary Medicine, and Social Sciences and Management, as well as a Biotechnology Centre and a Centre of Nanoscience and Nanotechnology.

NCHU is placing a particular emphasis on research into agricultural biotechnology, and is establishing an international centre of excellence in agriculture.

The institution is also looking to teach more of its courses in English, and is training its faculty to be able to deliver courses in English.

NCHU is receiving NT $400 million per year from the Ministry, for research centres in Biotechnology and Environmental Protection and Disaster Prevention, and a centre for Nano-bionics and Precision Engineering.

7.3 Staffing

Participants in the ATUP are developing innovative mechanisms to improve the calibre of their teaching and research staff. Some universities have, for the first time, implemented performance reviews for all staff, with financial rewards and incentives for high performing staff and extra training or redundancy for poorly performing academics. These review and evaluation systems are replacing tenure systems for some institutions, placing more accountability on (and providing increased rewards for) academics.

The financial rewards for academics can be quite substantial, with bonuses enabling some staff effectively to double their salaries, and academics developing patents being able potentially to earn significantly more than their salaries (some universities allow staff to retain as much as 60% of the value of patents developed).

Universities are also attracting distinguished foreign scholars to make short visits to Taiwan to give guest lectures, and hiring world-class experts both on short and long term contracts to help establish or develop top-tier research centres. As an example of the benefits that this process has brought elsewhere, the president of NTU cites the example of the University of California Santa Barbara (UCSB) bringing in a pair of research teams, leading to UCSB having five Nobel laureates within eight years[27].

Institutions recruiting distinguished foreign scholars are seeing an impact, with more, and better, students applying to study at the university, as well as improvements in teaching and research.

7.4 Enhancing teaching and learning

Universities are putting considerable effort into enhancing teaching and learning, at the undergraduate, postgraduate and research levels.

A number of institutions have established centres for teaching development, improved their core undergraduate curricula, and developed inter-disciplinary programs, to ensure that students receive a well-rounded and balanced education.

Universities are also looking to develop cross-disciplinary research, bringing together academics and researchers from different faculties and disciplines, to develop new courses, programs and research centres. For example, at NTU, bio-informatics professors have teamed up with the university's College of Medicine to found an Institute of Cognitive Science[28].

27 Hsiao, F 2006

28 ibid

7.5 Infrastructure

A significant proportion of the ATUP funding is being spent on developing and improving infrastructure.

Some universities are erecting new buildings to house the growing numbers of domestic and international students and visiting academics, constructing new classrooms and laboratories, developing new IT networks spanning an entire campus or connecting separate campuses, and purchasing state of the art equipment.

For other participating institutions, the funding for infrastructure available through the ATUP is allowing them to undertake much needed renovations, to make up for shortfalls in funding on infrastructure in recent years[29].

Box 11: National Chengchi University

Established in 1927, National Chengchi University (NCCU) is a comprehensive university consisting of 9 colleges, 33 departments and 42 graduate institutes. NCCU is located across three campuses in Taipei.

NCCU's colleges are in Liberal Arts; Science; Social Sciences; Law; Commerce; Foreign Language and Literature; Communication; International Affairs; and Education.

NCCU has just over 600 full time and nearly 400 part time faculty members, 65 research fellows, and 440 administrative staff. The institution has nearly 15,000 students, of which approximately two thirds are undergraduate level students (5% are Doctoral level and 28% are at the Masters level).

NCCU has one of the largest proportions of international students, with approximately 360 international students studying for degrees, and over 360 international students undertaking language training at the university. The institution offers 460 courses taught in English on campus, including international undergraduate programs.

NCCU is receiving NT $300 million per year from the Ministry for centres in Business Management, Communications, and Cross-Strait Relations and Foreign Diplomacy.

7.6 Industry-academia collaboration

Universities are working closely with industry to develop new patents and ideas. Several institutions have established incubation centres, and host companies on their campuses. Universities are also focusing on making their research relevant to the local community and the local industry, with some institutions taking considerable pride in giving back to and supporting their local community.

The industrial-academic collaboration has proven financially successful to date, generating an additional NTD 1.2 billion in 2006 over 2005, with nearly a 50% increase in patents and an increase of NTD 13 million in technology transfer.

Box 12: Yuan Ze University

Founded in 1989 as the Yuan Ze Institute of Technology, the institution was renamed Yuan Ze University (YZE) in 1997. YZE is a small private university located in Taoyuan County, on the outskirts of Taipei.

YZE has colleges of Humanities and Social Sciences; Management; Engineering; Informatics; and Electrical and Communication Engineering. The institution also boasts Taiwan's only on-campus science park, closely integrating it with industry.

YZE has 282 faculty members, mostly with Doctoral qualifications, and 374 staff. The institution has nearly 9,500 students, of which 24% are at the Masters level and 3% at the Doctoral level. Approximately 75% of the students are full-time.

The institution has 71 international students, and teaches a quarter of its courses in English. All courses in YZE's graduate school of management are taught entirely in English.

YZE has active international collaboration with 48 universities in 12 countries

YZE is receiving NT $300 million per year from the MOE to develop research centres for Fuel Cells and Communication Technology. YZE has matched the MOE contribution with donations from industry.

29 ibid.

7.7 Management and advisory boards

A number of universities have established peer review mechanisms, bringing in foreign academics to review their operations and provide feedback.

Some universities are modelling themselves on internationally recognised institutions, such as Princeton University's Institute of Advanced Studies, and receiving cooperation, guidance and leadership from institutions like Purdue University.

NCKU, for example, has established an advisory board to advise on and evaluate the planning and execution of NCKU's participation in the ATUP.

Meeting twice a year, the advisory board consists of university presidents and distinguished scholars, including representatives from Academia Sinica, Tokyo Institute of Technology, Leiden University, Hong Kong University of Science and Technology, Seoul National University, Technical University Munich, Tohoku University and Purdue University.

7.8 Publicity

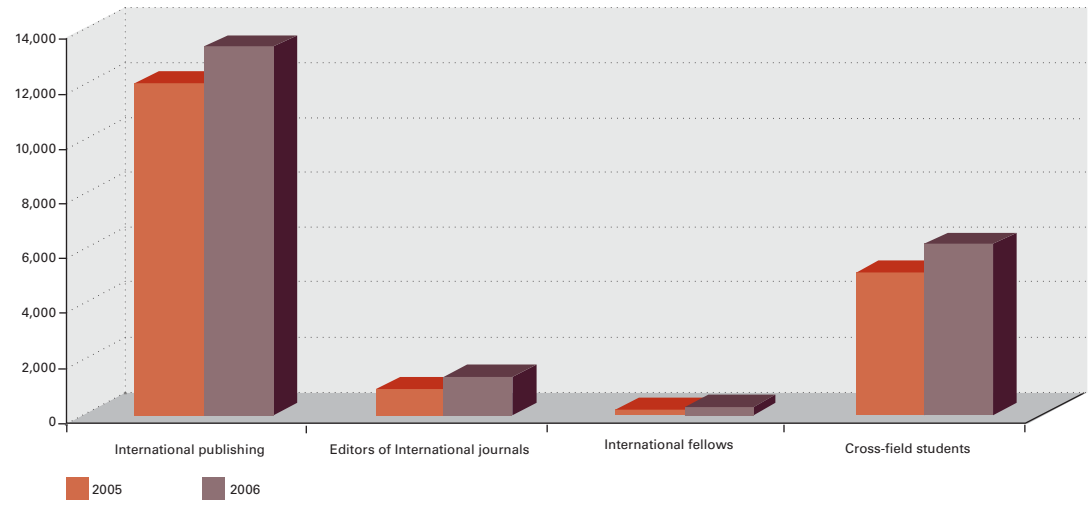
Participating universities are also looking at effective communication strategies to publicise their achievements under the ATUP. Several universities have brought out weekly or monthly newsletters talking about their accomplishments, and some universities have been featured in major scientific journals and magazine

Section 8. Early results for the ATUP plan

In evaluations conducted to date, the major qualitative benefits identified for participating universities in the ATUP program have been: improvements to university organisation and operations; upgrades to institution infrastructure; enlisting outstanding talent from overseas; and introducing measures to promote teaching excellence. In particular, the evaluation committees found that the majority of the T12 universities focused on improving their infrastructure in the first year of the program, with research to become more of a priority in later years.

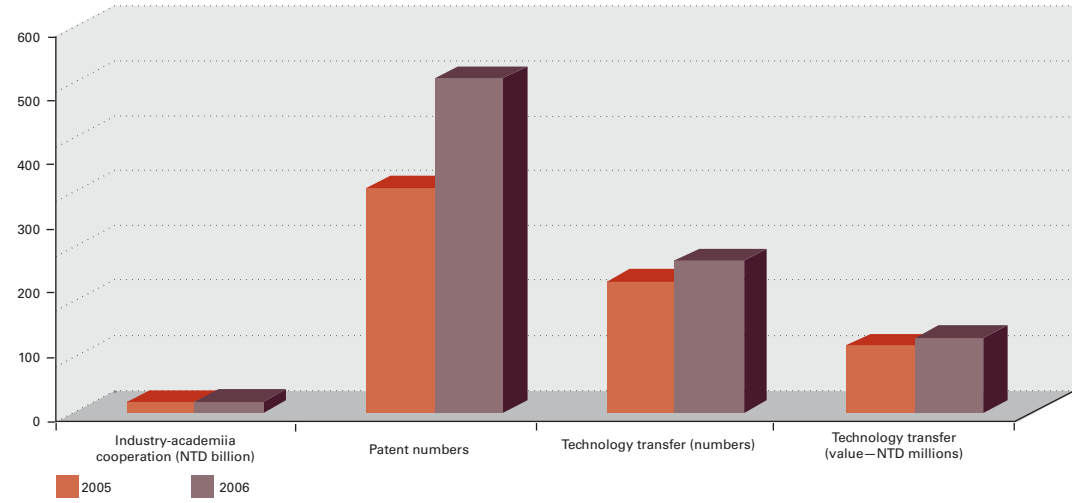
The MOE also reported quantitative results across three broad areas – academic performance, industrial-academic collaboration, and internationalisation, showing improvement in the first year of the ATUP (2006) in each of these areas for the T12 universities.

Chart 1: Academic Performance



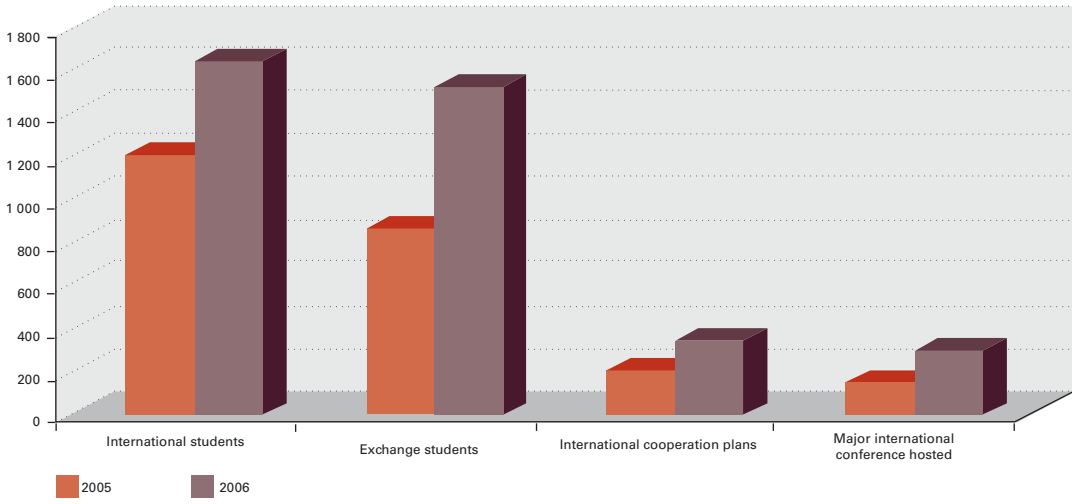
A major improvement has been seen in the number of international fellows at participating universities, with an increase of nearly 70% in 2006 over 2005 (an extra 133 fellows). A significant increase (43%) was also seen in the number of Taiwanese academics chosen to be editors of international journals, and there was almost a 20% increase in the number of students undertaking studies across more than one discipline field (cross-field students).

Chart 2: Industrial-academic collaboration



Industrial-academic collaboration has also improved for the T12 universities, with an additional NTD1.2 billion generated by cooperation with industry; almost a 50% increase in the number of patents; and an additional NTD13 million generated through technology transfer.

Chart 3: Internationalisation



The largest improvement in performance across the quantitative indicators has been in the broad area of internationalisation.

Overall, participating universities have increased their international students by over a third; had a 76% increase in the number of exchange students; had a two-thirds increase in the number of international cooperation plans; and almost doubled the number of major international conferences hosted in Taiwan by T12 universities.

Section 9. Conclusion

The implementation of the ATUP has provided a substantial funding boost to some of Taiwan's elite universities, allowing them to improve their infrastructure, increase their international activities, and enhance their international standing.

Taiwan's ATUP presents a significant opportunity for Australian universities to engage with Taiwanese counterparts, for a number of reasons:

- Each of the twelve universities participating in the ATUP are among the best, or are the best, in their particular field in Taiwan.
- Each of these universities are aiming to be amongst the best in Asia, or in the world, in their fields of excellence, and are receiving significant amounts of funding from the MOE to assist them in this goal.
- The universities are engaging with world class universities in their areas of excellence, so collaboration with the Taiwanese universities could lead to collaborative activities with other world class institutions.
- Each of the Taiwanese institutions taking part in the ATUP program is interested in cooperation and collaboration with suitable Australian institutions.

The MOE's program offers Australian universities opportunities to enter into cooperative research and collaborative programs in targeted areas, making use of the specialised research and newly established infrastructure in the T12 universities.

The ATUP also offers opportunities for more student exchange between Australia and Taiwan, and for Australian students to complete full degree programs in Taiwan, in courses taught entirely in English. The increasing numbers of programs being delivered in English also present opportunities for Australian universities to work with Taiwanese universities on the delivery of courses in English.

While there is growing interest in increased cooperation and collaboration with Australian institutions, and senior delegations from some of the T12 universities have visited Australia in recent years, there is still a lack of awareness amongst some Taiwanese universities about Australia's strengths and areas of expertise. AEI Taiwan is working to address this information gap.

Taiwanese universities are quite 'brand' conscious, and are aware of the Australian universities that have ranked highly in the Shanghai Jiao Tong and THES-QS systems, but are less aware of the world class research being conducted in niche areas in other Australian universities.

AEI Taiwan has been closely involved in this project to examine Taiwan's ATUP, and is available to provide assistance both to Taiwanese universities interested in greater collaboration with Australia, and to Australian institutions interested in closer links and cooperation with the T12 universities, or other Taiwanese organisations and institutions.

Appendix 1: Market Data Snapshot Taiwan

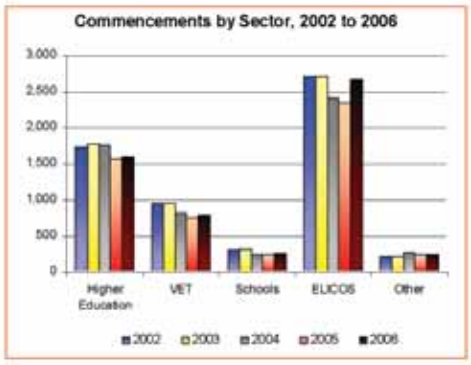
Australian Government
Australian Education International

Market Data Snapshot

Number 19 | June 2007 |

Taiwan

In 2006 the number of Taiwanese commencing study overseas increased by 9.1% to total in excess of 37,000 students. Australia is gaining recognition as a quality study destination and is positioned third in the Taiwan market behind the United States and United Kingdom, and ahead of Japan and Canada. Commencements in Australia from Taiwan grew 7.9% in 2006, the most significant increase (14.2%) being in the ELICOS sector.



With China's recent economic growth, Taiwan has shifted most of its low-technology manufacturing to China and re-focussed on value-added processes such as advanced technology, research, design, and the services sector. While Taiwanese industry demands skilled graduates with an international outlook and English language skills, it is reported that the domestic education system has been unable to respond sufficiently to meet the needs of the new economy. Australian providers across all sectors are in a position to benefit from this level of demand for a quality international education, particularly in the following areas where predicted shortfalls of skilled graduates will exist—

a) *High-tech industries*: Semiconductor, Digital display, Digital content, Biotechnology, ICT & Technology, Management, Basic Sciences, Industrial Engineering, Environmental Sciences, and Green technologies (particularly in the field of Photovoltaics).
b) *Services industries*: Design (particularly in the field of Industrial Design), Marketing, Environmental Protection, Medical Services, Tourism, Hospitality, and Recreation.
c) *Creative industries*: Arts Management, New Media, Creative Arts, and Design.

Higher Education (HE)

- Taiwan is Australia's 9th largest HE market for enrolments. March 2007 Year to Date (YTD) figures show a 5.3% increase in commencements on 2006.
- Due to an oversupply of domestic undergraduate places, the Taiwan HE market has shifted to a predominately postgraduate one (at 64%). A postgraduate degree from abroad is increasingly seen as a differentiator for employees in the domestic labour market and a prerequisite to securing a good job.
- Business Administration and Management courses remain the most popular areas of study in this sector at 47% of commencements, followed by Arts, Humanities and Social Sciences at 10%, and Computer Science and Information Systems at 7.6%.
- Australian institutions are well-positioned to meet the above-mentioned areas of predicted skill shortages, particularly at the postgraduate level.

English Language Intensive Courses for Overseas Students (ELICOS)

- The Taiwan ELICOS market experienced significant growth in 2006, with a 14.2% increase in commencements on 2005. Taiwan is Australia's 6th largest market for both commencements and enrolments in this sector.
- The enthusiastic uptake of the Working Holiday Maker (WHM) visa since its introduction to Taiwan in November 2004 has affected ELICOS student visa numbers. With a lower application fee, many students have opted to study under the WHM visa over student or tourist visas which are reflected in a March 2007 12.3% YTD decline in ELICOS student visas issued. The recent Australian WHM and ELICOS exhibition in Taipei attracted over 5,000 attendees, setting the foundation for further growth under this visa class.

Vocational Education and Training (VET)

- Taiwan remains a developing VET market, and commencements in 2006 increased 6.2% on 2005.
- 'Services, Hospitality and Transport' (including Tourism) have overtaken 'Business Administration and Management' (36.6% and 32% respectively) as the most popular fields of study in the VET sector from Taiwan. The areas of 'Language Studies', 'Nursing' and 'Visual and Performing Arts' have also seen increases in commencements.

Schools

- Taiwan is Australia's 9th largest market for schools sector enrolments and the 8th largest for commencements.
- The schools market grew at modest levels in 2005 and 2006, however March 2007 YTD figures show an encouraging 16.5% increase on 2006 numbers. This market growth has been supported by the AEI Taipei Australian Schools Exhibition, run annually since 2005.
- Seventy-eight percent of Taiwanese school students choose to study in Australian non-government schools, primarily for their boarding facilities.

For further information about international education in Taiwan, contact Dean Woodgate, Director Education, Science and Training, Taipei at dean.woodgate@aei.gov.au or consult AEI Online https://aei.gov.au/AEI/MIP/CurrentMarketInformation/ByCountry/default.htm.

Appendix 2: International schemes to develop world-class universities

In 2000, the State of California established four California Institutes for Science and Innovation, providing each with US$100 million over four years to support research in biomedicine, bioengineering, nanosystems, telecommunications and information technology. Each institute was hosted by at least two University of California (UC) research centres across universities within the UC system, and each institute is promoted by the UC system as being "world-class centers using multi-disciplinary strategies and state of the art facilities to focus on the development of cutting edge technologies"[30].

In 1999, the Republic of Korea provided funding for the Brain Korea 21 project, to enhance the international competitiveness of Korean universities. From 1999 to 2005, the Korean government provided US$1.2 billion to develop world-class graduate schools, develop specialised regional universities and increase industry-university collaboration[31]. In 2006, the government allocated a further US$2 billion over seven years to the project, with one aim being to have ten South Korean universities ranked in the world's 'top 200' by 2012[32].

In 2002, the Japanese Ministry of Education, Culture, Sports, Science and Technology established the 'Plan of Centres of Excellence for the 21st Century of Japanese Higher Education', aiming to select the 30 best universities in Japan, providing them with funding to support their international objectives and lead Japan's internationalisation agenda[33].

China has also established plans to provide funding for universities of excellence, first to approximately 100 universities under 'Project 211' in 1996, followed by the establishment in 1998 of the '985' program, which provided significant funding initially to China's nine top universities and subsequently to an additional 30 universities.[34]

Australia's A$6 billion Higher Education Endowment Fund (HEEF) is another possible example of funding earmarked for universities to develop their international capacity. Australia's former Minister for Education, Science and Training, Ms Bishop, was quoted in September 2007 as saying "the idea is for the Higher Education Endowment Fund to support the emergence of world-class institutions… to leapfrog universities above the norm"[35], although the current Australian government is reviewing the allocation mechanism for the HEEF[36].

30 Foust, B 2005 [page 1]
31 Hyun-Chong, L 2005
32 Australian Education International 2006a
33 Yakushiji, T 2002
34 Australian Education International 2006b
35 Armitage, C 2007
36 Lane, B 2008

Appendix 3: ATUP Funding Allocations—annual allocations

Listed below is each of the twelve universities receiving annual funding under the MOE's ATUP. Also listed is the budget allocation in both Taiwanese and Australian dollars[37] for each of the five years of the program, and the centres and research centres receiving funding[38].

National Taiwan University
(http://www.ntu.edu.tw/eng2007/)

NT $3 billion (approximately A$100 million)

Research Centre for East Asian Civilisations

Research Centre for Globalisation

Centre for NanoScience and Technology

Centre for Information and Electronic Technologies

Centre of Excellence for Medical Research

Genetic Medicine Research Centre

Cancer and Infectious Disease Research Centre

Centre for Integrated Life-Science and Biotechnology

Research Centre for Sustainable Development and Disaster-Prevention

Cross-institutional Research Centres

Research Centre for East Asian Democracy

Research Centre for Ocean Technologies

National Cheng Kung University
(http://www.ncku.edu.tw/ver2006/en/)

NT $1.7 billion (approximately A$57 million)

Research Centre for Gene Regulation and Signal Transduction

Research Centre for Ocean Environments and Technology

Research Centre for Advanced Materials and Microsystems

Research Centre for Cardiovascular Disease

Research Centre for Cognition and Design for Digital Living

Peak Research Centre for Photoelectrics

Research Centre for Sustainable Environmental Technology

Research Centre for Geodynamic Systems

Research Centre for Creative Manufacturing Management

National Tsing Hua University
(http://www.nthu.edu.tw/index-e/index.htm)

NT $1 billion (approximately A$33 million)

Research Centre for Information Technology and Electronics

Research Centre for Nanotechnology

Research Centre for Life Sciences

Centre for Energy and Environmental Research

Research Centre for Fundamental Sciences

Research Centre for Technology, Science and Management

National Chiao Tung University
(http://www.nctu.edu.tw/english/index.html)

NT $800 million (Approximately A$27 million)

Peak Research Centre for Electronics and Information Technology

Research Centre for Photonics Technology

Research Centre for Interdisciplinary Biotechnology

Centre for Frontier and Fundamental Science

Centre for Technology Management and Humanistic Education

National Central University
(http://www.ncu.edu.tw/e_web/index.php)

NT $600 million (Approximately A$20 million)

Research Centre for Earth Science and Environmental Technology

Research Centre for Plasma and Complex Systems

37 Currency conversions use an exchange rate of NT$100 = A$3.34 (Median price as at 7 November 2007)
38 AEI 2007, updated to November 2007 exchange rates.

Centre for Applied Information Technology and Creative Content

Centre for Astronomy and Space Technology

Research Centre for Optics and Photonics

National Sun Yat-Sen University
(http://www.oia.nsysu.edu.tw/english/index.php)

NT $600 million (Approximately A$20 million)

Peak Research Centre for Photonics Technology

Research Centre for Pacific Oceanography

Research Centre for Micro and Nano-level Analysis

Research Centre fro Electronic Commerce and Creative Economy

National Yang Ming University
(http://www.ym.edu.tw/english/)

NT $500 million (Approximately A$17 million)

Genetics and Epigenomics Research Centre

Brain Research Centre

Gerontology Research Centre

National Chung Hsing University
(http://www.nchu.edu.tw/New_nchu_3/english/index.ph/)

NT $400 million (Approximately A$13 million)

Research Centre for Biotechnology

Centre for Nano-bionics and Precision Engineering

Research Centre for Environmental Protection and Disaster Prevention

National Chengchi University
(http://www.nccu.edu.tw/english/)

NT $300 million (Approximately A$10 million)

Centre for Business Management

Centre for Communications

Centre for Cross-Strait Relations and Foreign Diplomacy

National Taiwan University of Science and Technology
(http://www-e.ntust.edu.tw/front/bin/home.phtml)

NT $300 million (Approximately A$10 million)

Taiwan Centre for Construction Technology

Chang Gung University
(http://www.cgu.edu.tw/eng_cgu/eng_index.html)

NT $300 million (Approximately A$10 million)

Research Centre for Molecular Medicine

Yuan Ze University
(http://www.yzu.edu.tw/eng_2003/)

NT $300 million (Approximately A$10 million)

Research Centre for Fuel Cells

Research Centre for Communication Technology

Appendix 4: ATUP Funding Allocations—2007 review

Following a review of the ATUP at the end of 2007, funding amounts were adjusted for the majority of universities. Three additional universities have been granted funding from 2008 to 2010, and there are now considered to be 11 top universities and four key specialist universities (YZU was dropped from the top university list and is now considered a key specialist university)[39].

Table 4: Revised funding allocations by university: 2006-2007 and 2008-2010

Top Universities 2010	Funding 2006-2007 NT$ Billion	Funding 2008- NT$ Billion
National Taiwan University	3.00	3.00
National Cheng Kung University	1.70	1.70
National Tsing Hua University	1.00	1.20
National Chiao Tung University	0.80	0.90
National Central University	0.60	0.70
National Sun Yat-Sen University	0.60	0.60
National Yang Ming University	0.50	0.50
National Chung Hsing University	0.40	0.45
National Cheng Chi University	0.30	0.20
National Taiwan University of Science and Technology	0.30	0.20
Chang Gung University	0.30	0.20
Key Specialist Universities		
Yuan Ze University	0.30	0.09
National Taiwan Ocean University	-	0.09
Kaohsiung Medical University	-	0.09
Chung Yuan Christian University	-	0.07

39 Advice from AEI Taiwan, based on an article in the China Times on 6 February 2008.

Appendix 5: Formal links between Australian universities and T12 universities

Universities Australia conducts surveys of the formal links between Australian universities and overseas higher education institutions. The table provided below is extracted from the Universities Australia survey for November 2007.

Table 5: Formal links between Australian universities and T12 universities, November 2007[40]

T12 university	Australian universities
National Chengchi University	Flinders University
National Central University	University of Canberra
National Cheng Kung University	The University of New South Wales
	University of South Australia
	National Chengchi University
National Chengchi University	The Australian National University
National Chiao Tung University	Griffith University
	The University of New South Wales
	University of South Australia
	University of Wollongong
National Chung Hsing University	The University of Newcastle
	University of South Australia
National Sun Yat Sen University	The Australian National University
	Griffith University
	La Trobe University
National Taiwan University	Griffith University
	The Australian National University
	The University of Adelaide
	The University of Melbourne
	The University of New South Wales
	The University of Sydney
	University of South Australia
	University of Canberra
	Macquarie University
National Taiwan University of Science and Technology	La Trobe University
National Tsing Hua University	La Trobe University
	The University of Melbourne
Yuan Ze University	The University of Sydney
	Swinburne University of Technology
	University of Western Sydney

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