



**The IT Education Bubble:  
An analysis of university student statistics  
2002-2005**

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Centre for Population & Urban Research,  
Monash University,  
and  
Educational Policy Institute**



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# 1. Introduction

Just a few years ago, information technology was the fastest growing area of university enrolments, but in recent times, enrolments have nose-dived. Most Fields of Education have experienced continued enrolment growth, but information technology managed to shed over 13,500 enrolments (over 18 per cent) in the period from 2002 to 2005. The sector overall increased its enrolments by 60,555 students, or 6.8 per cent over this period. The data sources for these numerical observations were data files made available by DEST, the Department of Employment, Education and Training. The next chapter provides more information.

The IT Education Bubble: An analysis of university student statistics 2002-2005 starts with a brief description of university statistics: what they contain and how they can be used. This study was instigated by the Australian Council of Deans of Science (ACDS) and has been undertaken on behalf of them and the Deans of Information Technology. Some small sections of the text in Chapters 2 and 3 have been self-plagiarised from a recent study on the Natural and Physical Sciences prepared by the author for the ACDS (Dobson, 2007). The IT Education Bubble also examines enrolment patterns and distributions in a slightly different way by looking at

- **who** is studying information technology,
- **where** they are studying it, and
- **how** they are studying it.

Exactly **what** is studied is harder to discern, because most universities offer generalist rather than specific degrees, particularly at the undergraduate level. In 2005, over 68 per cent of information technology students were enrolled in undergraduate courses. The equivalent figure in all Fields of Education was over 70 per cent. (See Table 6).

In looking at **who** is studying information technology, there are perhaps three key differences from the situation with other Fields of Education. First, relatively fewer information technology students are enrolled in research or undergraduate degrees, and rather more tend to be enrolled in masters by coursework programmes. Second, there are relatively few women enrolled in information technology degrees. Only the Engineering and Related Technologies Field of Education has a lower proportion of female students. Third, around half of all information technology students are fee-paying overseas students. This proportion should be compared with the 25 per cent of overseas students enrolled in courses in all Fields of Education. There is a certain amount of inter-relationship between these three variables.

In looking at **where** information technology is studied, the fact that there is a high proportion of overseas students means that relatively more students are enrolled at off-shore campuses of Australian universities. There has been a strong market for information technology courses and some Australian universities have been aggressive players in that market. Therefore, there is a pattern of some regional universities teaching information technology to fee-paying overseas students, but providing this teaching in the major capital cities rather than in the regional location of their main campus. As will be shown later, the University of Ballarat teaches most of its information technology overseas students in Sydney and Melbourne. Likewise, the Central Queensland University, located in Rockhampton, North Queensland has campuses in Sydney, Melbourne and Brisbane, primarily for teaching to fee-paying overseas students. This mass teaching at interstate campuses is mostly to students enrolled in Information Technology and Management and Commerce courses, and predominantly to overseas students.

In terms of **how** information technology is studied, a greater than average number study by 'distance education'. Again, this is particularly the case for Information Technology and Management and Commerce courses.

An examination of **what** is studied in information technology courses reveals a similar phenomenon to the one revealed for other Fields of Education. That is, the great majority of information technology students are enrolled in 'general' courses. As is shown later, despite the twenty or so ways an information technology course could be described, about 88 per cent of information technology students are enrolled in 'general' courses (See Table 14).

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Perhaps the major point of difference between this report and other studies that have been completed to date is that more detail is provided here on overseas students. Standard DEST data files do not provide information about countries of origin, nor attendance at on-shore or off-shore campuses, but by using customized data sets, much more information has been gleaned.

It is a pity that more recent sector-wide enrolment figures were not available, in particular because the trends in information technology enrolments to 2005 appear bleak, and it would be useful to have more recent information.



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## 2. Higher Education Statistics: A Description

This report has been compiled using statistics obtained from the Department of Education, Science and Training (DEST). Subdivision 19E of the Higher Education Support Act (2003) requires universities to provide data files which include information on students and their courses, university departments, course enrolments, student load, past course completions and HECS liability status. From these returns, DEST compiles aggregated sets of data which are made available to universities and others, and which enable a wide range of analyses on universities and their students. Information supplied by individuals and universities is also used to assess students' liability for or exemption from paying fees of various types, including the Higher Education Contribution Scheme (HECS). (Known as HECS-HELP from 2005). Electronic data collections have been part of university reporting since the mid-1970s, and the current uniform data collection methodology was introduced in the late 1980s. This system was intended for both halves of the then binary system of higher education. The system has been extended and amended, and collection software has been upgraded several times to take account of the various changes in policy and emphasis.

The system has undergone many minor changes over the years, but two key changes affect the way users must read DEST statistics. This is particularly the case for anyone attempting to undertake time series analysis. From 2002, DEST amended the basis on which student enrolments were reported. Until 2001, student enrolment counts were based on a **snapshot** taken as at 31 March. From 2002, students enrolled at any time during the year were counted. This 'whole of year' approach therefore counts students enrolled at any time from 1 September in *Year N-1* to 31 August in *Year N*. In 2002, this counting methodology produced an 'official' total university enrolment of over 896,000. There would have been about 751,000 students in 2002, had the snapshot counting methodology been retained. To fail to be aware of this quantum leap in university enrolments could lead to a misunderstanding the real extent of increases and decreases from 2002.

Another change in the system which has affected university statistics was a 2001 change to the classifications used to aggregate courses and subjects. Among the data supplied by universities is information on the level, duration and name of the courses they offer, the subjects taught in those courses<sup>1</sup>, and the teaching departments which teach those subjects. Since 2001, universities have aggregated their courses (such as BSc, BA, etc.) to a six-digit *Fields of Education*<sup>2</sup> classification. (In earlier years, a different six-digit classification known as *Fields of Study* was used). The subjects which are the components of those courses (such as History 1 or Physics 2A) are aggregated into a six-digit *Discipline Groups*<sup>3</sup> classification. Prior to 2001 subjects were aggregated into a different four-digit classification (also known as *Discipline Groups*). Whereas the pre-2001 classifications of courses and subjects were different, the current ones are the same.

Prior to 2001, 'information technology' courses (computer science, information systems) were classified with 'science' courses within the Field of Study *09 Science*. Since 2001, 'information technology' courses have been classified within their own Field of Education *02 Information Technology*. Where subjects are concerned, prior to 2001, 'information technology' subjects were bracketed within a broad discipline group called *05 Mathematics, Computing*. Information technology subjects could be either 'Computer-based Information Science' or 'Computer Science'. Since 2001, these two categories have been replaced by

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1 In brief, the terminology adopted here is that a 'course' is a study programme, such as BSc, BA, MBA or PhD. The components of courses are 'subjects' (often known as 'units'). For instance, a first year student enrolled in a BSc degree might be enrolled in Mathematics 1, Chemistry 1, Physics 1 and Biology A. Some courses, such as PhD may not have any classroom component, and therefore may not be comprised of subjects as such. Some students enrol in more than one course. The terminology adopted here is that the first course is the *primary* course, and the latter the *supplementary* course.

2 The Field of Study classification (and the Field of Education one which has succeeded it) is a six-digit classification for universities to code the courses they teach into generic categories based on the likeness of the content and vocational orientation of those courses. The first two digits of the classification are referred to as the BROAD Field of Study (Education), the next two digits are referred to as the MAJOR Field of Study (Education) and the final two are referred to as the MINOR Field of Study (Education). Subjects (units) are classified into Discipline Groups according to the content of the subject (unit). The pre-2001 Discipline Group / Branches of Learning Classification was a four-digit classification which has been replaced by a new six-digit Discipline Group classification. The new Discipline Group classification is identical to the Field of Education classification.

3 See Footnote 2.

eighteen options. Figures 1 and 2 summarise the categories available for classifying information technology courses and subjects.

**Figure 1: Information Technology Courses and Mapping Between Field of Education and Field of Study**

From 2001		Before 2001	
020101	Formal Language Theory	090202	Computer Science
020103	Programming	090203	Information Systems
020105	Computational Theory	090202	Computer Science
020107	Compiler Construction	090202	Computer Science
020109	Algorithms	090202	Computer Science
020111	Data Structures	090202	Computer Science
020113	Networks and Communications	090202	Computer Science
020115	Computer Graphics	090203	Information Systems
020117	Operating Systems	090202	Computer Science
020119	Artificial Intelligence	090202	Computer Science
020199	Computer Science, n.e.c.	090299	Computer Science, Information Systems-Other
020301	Conceptual Modelling	090202	Computer Science
020303	Database Management	090203	Information Systems
020305	Systems Analysis and Design	090203	Information Systems
020307	Decision Support Systems	090203	Information Systems
020399	Information Systems, n.e.c.	090299	Computer Science, Information Systems-Other
029901	Security Science	090202	Computer Science
029999	Information Technology, n.e.c.	090299	Computer Science, Information Systems -Other

n.e.c = 'not elsewhere classified'

**Figure 2: Information Technology Subjects (units) Mapping Between Discipline Groups (2001) and Discipline Groups (2000)**

From 2001		Before 2001	
020101	Formal Language Theory	0503	Computer Science
020103	Programming	0502	Computer-based Info. Science
020105	Computational Theory	0503	Computer Science
020107	Compiler Construction	0503	Computer Science
020109	Algorithms	0503	Computer Science
020111	Data Structures	0502	Computer-based Info.Science
020113	Networks and Communications	0503	Computer Science
020115	Computer Graphics	0502	Computer-based Info.Science
020117	Operating Systems	0503	Computer Science
020119	Artificial Intelligence	0503	Computer Science
020199	Computer Science, n.e.c.	0503	Computer Science
020301	Conceptual Modelling	0503	Computer Science
020303	Database Management	0502	Computer-based Info.Science
020305	Systems Analysis and Design	0503	Computer Science
020307	Decision Support Systems	0503	Computer Science
020399	Information Systems, n.e.c.	0502	Computer-based Info.Science
		0503	Computer Science
029901	Security Science	0503	Computer Science
029999	Information Technology, n.e.c.	0502	Computer-based Info.Science
		0503	Computer Science

n.e.c = 'not elsewhere classified'

The last major changes to the system occurred for 2005 to take account of the Government's 'student learning entitlement' scheme (SLE). The sector's reaction to this extraordinarily bureaucratic set of reporting requirements has been documented elsewhere (see, for example Illing, 2006). The SLE changes do not affect the higher education time series.

## Beware!

Although it is useful to aggregate courses according to their content, simply having a highly detailed classification does not ensure genuine inter-university comparability unless all universities observe identical coding practices. Many university courses, particularly those offered at the undergraduate level, are generalist degrees. Figure 1 listed the range of options available for the classification of information technology courses. However, as statistics later bear out, most students are enrolled in broadly defined courses, such as 'computer science nec' (not elsewhere classified). Academic specialisation in courses is something more likely to happen at the postgraduate level.

These points are made in order to indicate that the Field of Education classification is not necessarily of much value at levels of detail beneath the 'broad' Field of Education (the first two-digit level). For these reasons, it is necessary to be wary when comparing patterns at different universities, or when Australia's performance is being compared internationally.

The Discipline Group system for the classification of subjects is perhaps more useful as a tool for providing detailed information. Even if a student is enrolled in a generalist course, the content of the subjects taken as part of that course are much more likely to be definable in more detail than is possible for the courses themselves.

The material above sought to explain (among other things) the effects of the break in the time series on analyses of university enrolments and science enrolments by the change in classification of courses from Fields of Study to Fields of Education (in 2001), and the change in counting methodology (in 2002). This point must be appreciated in order to understand properly what is being compared with what.

However it is first necessary to provide some indication of the longer-term history of enrolments in information technology / computer science courses. Strictly comparable figures for the years before and after 2002 are not available, for two reasons.

First, the Field of Education *02 Information Technology* has only existed since 2001. Prior to that, information technology / computer science courses were categorised as a sub-set of Field of Study *09 Science*. At many institutions (particularly pre-Dawkins universities), students studying information technology / computer science would have been enrolled in a generic BSc degree (as would any student intending to major in any branch of 'science'), and then taken subjects predominantly in information technology and/or computer science. Some universities have been offering specifically badged information technology / computer science courses for only a few years. The point is that all though university statistics indicate an explosion in the number of students enrolled in information technology / computer science courses, some of the growth has been due to students who would have enrolled in a BSc in earlier years, simply because their university did not offer, for example, a BCompSc degree at that time.

Second, as outlined above, DEST's methodology for counting student enrolments changed from 2002. A system based on an annual snapshot (31 March) was replaced by the so-called 'whole of year' approach, whereby students enrolled at any time during the year were to be counted. The latter methodology produces a higher enrolment figure, as evidenced by Table 1 and Figure 3.

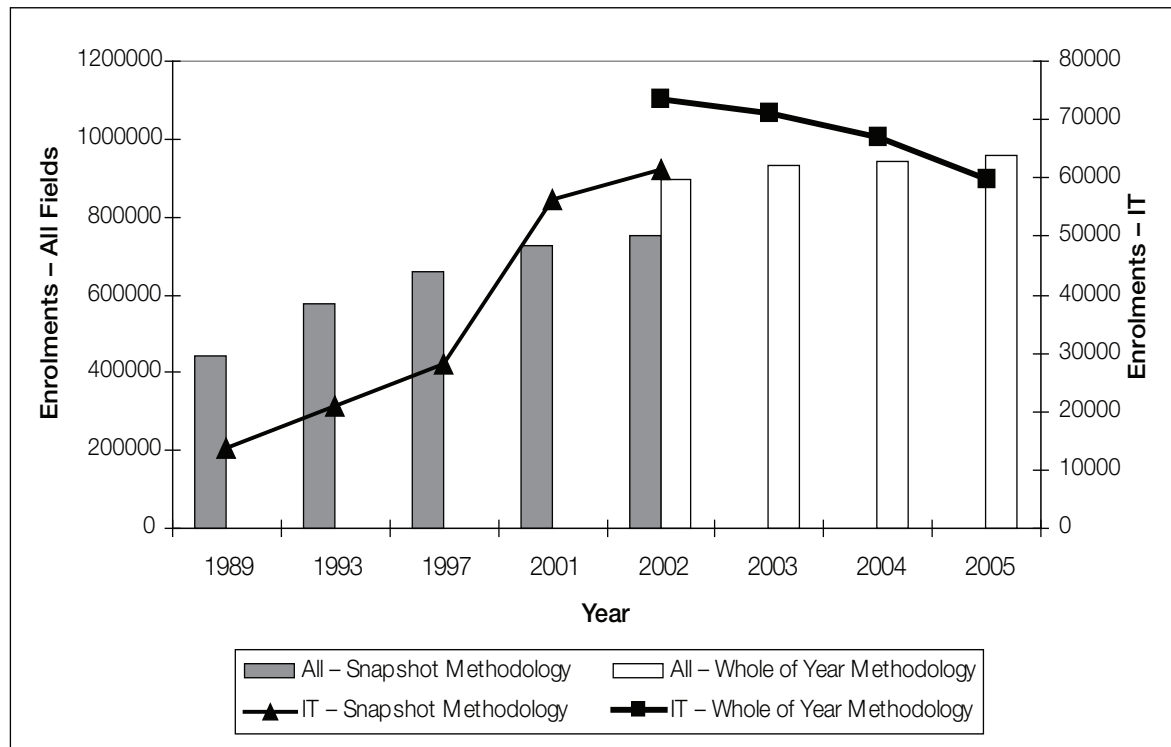
**Table 1: Higher Education Enrolments 1989 – 2005: Students in all Fields of Study/Education and in Information Technology/Computer Science**

Field of Study / Education #	1989	1993	1997	2001	2002	2003	2004	2005
Information Technology								
Snapshot Methodology	13897	21004	27991	56474	61446			
Whole of Year Methodology					73402	70986	67103	59819
All Fields of Study / Education								
Snapshot Methodology	441074	575616	658849	725099	750940			
Whole of Year Methodology					896621	929952	944977	957176

# Includes Information Technology / Computer Science enrolments as a primary course only.

In Figure 3, the columns represent enrolments in all Fields of Education, and are represented by the scale to the left. The lines represent information technology enrolments, as enumerated by the scale on the right hand. The two values shown for 2002 demonstrate the effect of DEST's change in counting methodology. As mentioned above, not all universities had specifically-identified information technology / computer science courses in earlier years, and at least some of the growth between 1989 and 2002 can be explained by this factor. The graph demonstrates the considerable decline in information technology / computer science enrolments. By 2005, the number of information technology / computer science students was about the same as it had been in 2002 using the OLD counting methodology. In terms of the new methodology, there has been a decline of over 13,000 enrolments (18.5 per cent), at a time when enrolments overall increased by over 60,000 or 6.8 per cent.

**Figure 3: Information Technology and All Enrolments 1989 – 2005**



### 3. University Enrolments: The Sector 2002 – 2005

This section provides the basis for comparing ‘information technology’ with the rest of the higher education sector for the period 2002 to 2005. The tables that follow have been included to provide system-wide background of a few of the sub-populations of students examined later in this study.

Table 2 provides information on enrolments by course level, sex and citizenship status. These distributions are critical to the study because the distributions of students enrolled in information technology courses differ from students enrolled in most other Fields of Education.

Table 2 shows enrolments by all students according to course level in the higher education sector overall. Overall the university student population increased in size by 60,555 or 6.8 per cent between 2002 and 2005.

Looking at the distribution of enrolments by course level, enrolments in courses at the Other Postgraduate level increased the most both numerically and proportionately. Enrolments increased by 32,900, or 18 per cent. This represents over 54 per cent of the growth, even though Other Postgraduate enrolments represented only 22.5 per cent of all enrolments in 2005 (up from 20.3 per cent in 2002). Undergraduate enrolments (which were 70.1 per cent of all enrolments in 2005) increased by a more modest 23,498, or 3.6 per cent. Higher Degree by Research enrolments, which were 5.0 per cent of all enrolments in 2005 increased in number by nearly 4,000, or 9.0 per cent.

Table 2 also shows the sector-wide gender distribution of students. Female students hold a considerable majority (54.5 per cent), and the gender gap is widening.

**Table 2 Higher Education Enrolments 2002 – 2005: Students in all Fields of Education by Course Level, Sex and Citizen / Resident Status**

Course Level	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>
<b>Course Level</b>							
Higher Degree by Research	44209	45659	47309	48201	5.0%	3992	9.0%
Other Postgraduate	182403	201656	210460	215303	22.5%	32900	18.0%
Undergraduate	647732	657736	663407	671230	70.1%	23498	3.6%
Non-Award	22277	24901	23801	22442	2.3%	165	0.7%
<b>Sex</b>							
Female	487988	505824	513420	521328	54.5%	33340	6.8%
Male	408633	424128	431557	435848	45.5%	27215	6.7%
<b>Citizenship</b>							
Domestic Students	711563	719555	716422	717681	75.0%	6118	0.9%
Overseas Students	185058	210397	228555	239495	25.0%	54437	29.4%

Finally, the table shows that the number of overseas students has increased rapidly relative to the number of domestic students. The table shows that overseas students represented 25.0 per cent of all students in 2005, and it is possible to calculate from the table that the proportion had been 20.5 per cent in 2002. The number of overseas students increased by over 54,000 (29.4 per cent) between 2002 and 2005. During the same period, enrolments by domestic students rose by only 6,188, or less than 1 per cent. Therefore, about 90 per cent of the sector-wide growth in enrolments was by overseas students.

Table 3 shows the growth in enrolments between 2002 and 2005 by institution, ranked according to the number of enrolments at each institution in 2005. The growth in enrolments at ‘private’ institutions is also interesting. Institutions grouped as ‘Other Private Providers’ are those for which no enrolments were reported in 2002. These institutions comprise a number of theological colleges, business colleges and other

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industry-specific institutions. Enrolments in private sector institutions increased by 15,527, or nearly 482 per cent between 2002 and 2005. Several 'public' universities also expanded their enrolments considerably, led by Curtin University of Technology.

As the table shows, some universities went through a period of contraction. The most spectacular examples of 'down-sizing' occurred in the state of New South Wales, at Charles Sturt University, and the Universities of New South Wales and Western Sydney, which between them had nearly 11,500 fewer enrolments in 2005 than they had had in 2002. =

Several regional institutions had spectacular increases in their enrolments between 2002 and 2005. Central Queensland University, the University of Wollongong and the University of Ballarat all increased by between 3,000 and 4,000 enrolments over the period. As noted earlier, these impressive expansions of enrolments do not necessarily indicate that the institutions in question have acted as magnets for their regions. Some regional universities now have 'campuses' in major metropolitan centres. Other regional universities that increased in size by more than 1,000 over the period were James Cook University, the University of Newcastle, the University of the Sunshine Coast and Southern Cross University.



**Table 3 Higher Education Enrolments 2002 – 2005: Students in all Fields of Education by University, Ranked by Enrolments 2005**

By University / Institution	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
Monash University	52010	53610	55726	54950	5.7%	2940	5.7%
University of Sydney	42305	45857	46250	45630	4.8%	3325	7.9%
University of Melbourne	39378	40759	41901	41827	4.4%	2449	6.2%
University of New South Wales	42333	42002	40421	39183	4.1%	-3150	-7.4%
Queensland University of Technology	39192	39980	39921	38527	4.0%	-665	-1.7%
Curtin University of Technology	33240	35656	36064	38506	4.0%	5266	15.8%
RMIT University	38280	38200	38816	38214	4.0%	-66	-0.2%
University of Queensland	37498	38161	38139	37177	3.9%	-321	-0.9%
Griffith University	30969	32074	33189	34648	3.6%	3679	11.9%
Charles Sturt University	39776	38365	35899	33560	3.5%	-6216	-15.6%
University of Western Sydney	35361	36668	34399	33309	3.5%	-2052	-5.8%
Deakin University	33033	32893	33106	33238	3.5%	205	0.6%
University of South Australia	30627	31528	32611	31988	3.3%	1361	4.4%
University of Technology, Sydney	29290	30585	31131	31602	3.3%	2312	7.9%
Macquarie University	27239	29028	29868	29985	3.1%	2746	10.1%
La Trobe University	24930	27975	27687	27208	2.8%	2278	9.1%
Central Queensland University	21763	21352	22352	25569	2.7%	3806	17.5%
University of Newcastle	23502	24323	24634	25114	2.6%	1612	6.9%
University of Southern Queensland	24271	24956	25414	24694	2.6%	423	1.7%
Edith Cowan University	23829	24110	23887	23585	2.5%	-244	-1.0%
University of Wollongong	18764	20519	21131	22124	2.3%	3360	17.9%
Victoria University	19475	20634	20024	20393	2.1%	918	4.7%
University of Adelaide	16188	17355	18292	18943	2.0%	2755	17.0%
University of New England	18202	18758	18529	18146	1.9%	-56	-0.3%
University of Western Australia	15885	16546	16806	17082	1.8%	1197	7.5%
University of Tasmania	13750	14682	16184	16760	1.8%	3010	21.9%
Swinburne University of Technology	14404	14884	15068	16018	1.7%	1614	11.2%
James Cook University	13189	13604	14395	14820	1.5%	1631	12.4%
Flinders University of SA	13644	14113	14510	14660	1.5%	1016	7.4%
Australian National University	11979	13384	14476	14317	1.5%	2338	19.5%
Australian Catholic University	11894	12011	12699	13262	1.4%	1368	11.5%
Murdoch University	12734	12724	12655	13201	1.4%	467	3.7%
Southern Cross University	11961	12878	13079	13127	1.4%	1166	9.7%
University of Canberra	10419	11270	11632	11498	1.2%	1079	10.4%
University of Ballarat	6615	7319	9030	9782	1.0%	3167	47.9%
Charles Darwin University	5612	5519	5306	5324	0.6%	-288	-5.1%
University of the Sunshine Coast	3947	4171	4630	5153	0.5%	1206	30.6%
Australian Defence Force Academy	1885	2078	2136	2079	0.2%	194	10.3%
Australian Maritime College	1956	1833	1884	1260	0.1%	-696	-35.6%
Avondale College	872	975	930	1072	0.1%	200	22.9%
Batchelor Institute	820	757	695	593	0.1%	-227	-27.7%
National Institute of Dramatic Art	173	171	168	164	0.0%	-9	-5.2%
Australian Film, Television and Rad	108	105	107	101	0.0%	-7	-6.5%
Marcus Oldham College	96	115	0	33	0.0%	-63	-65.6%
University of Notre Dame Australia	2832	3544	4181	4787	0.5%	1955	69.0%
Bond University	51	1314	3820	4493	0.5%	4442	8709.8%
Melbourne College of Divinity	340	433	397	675	0.1%	335	98.5%
Other Private Providers	0	174	798	8795	0.9%	8795	
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>

Finally in this sector-wide overview, Table 4 shows the pattern of change between 2002 and 2005 by Field of Education. As can be seen, information technology was one of four broad Fields of Education to decline in popularity between 2002 and 2005, but two of those have very few enrolments. The other Field of Education to shrink was Agriculture, Environmental and Related Studies, enrolments in which declined by 1,138 or 7.3 per cent, but information technology, which lost 13,583 or 18.5 per cent of its students over the period, was by far the biggest loser.

**Table 4 Higher Education Enrolments 2002 – 2005: Students in all Fields of Education by Broad Field of Education (Primary Course#)**

Broad Field of Education	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
Agriculture, Env. And Related Studies	18341	18300	18251	17003	1.8%	-1338	-7.3%
Architecture And Building	17756	18591	18993	19697	2.1%	1941	10.9%
Creative Arts	53214	55705	57183	58324	6.1%	5110	9.6%
Education	85149	86222	87574	91275	9.5%	6126	7.2%
Engineering And Related Technologies	59863	63349	64223	64190	6.7%	4327	7.2%
Food, Hospitality And Personal Services	150	109	70	90	0.0%	-60	-40.0%
Health	96565	99882	103031	108915	11.4%	12350	12.8%
<b>Information Technology</b>	<b>73402</b>	<b>70986</b>	<b>67103</b>	<b>59819</b>	<b>6.2%</b>	<b>-13583</b>	<b>-18.5%</b>
Management And Commerce	228789	242988	253700	260742	27.2%	31953	14.0%
Natural And Physical Sciences	60354	62104	64098	64649	6.8%	4295	7.1%
Society And Culture	178868	184769	184868	188178	19.7%	9310	5.2%
Mixed Field Programmes	1893	2048	2082	1861	0.2%	-32	-1.7%
Non Award	22277	24899	23801	22433	2.3%	156	0.7%
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>

# Some students enrol in more than one course of study. This table provides a distribution according to the 'primary' course in which students were enrolled. Subsequent enumerations of enrolments in courses classified as Information Technology show students enrolled in the Information Technology (as in this tables) PLUS students enrolled in a Information Technology course as a supplementary course.

In light of this spectacular decline, the next chapter compares information technology with the sector overall on a range of fronts.

## 4. Information Technology Enrolments – Where to from here?

Just a few years ago, information technology seemed to be THE profession to get into, and university enrolments increased rapidly as a consequence. Some universities (Monash, for example) created stand-alone faculties of information technology. Others increased the range of offerings within the information technology Field of Education. Information Technology became very popular with overseas students, and several universities greatly expanded their capacity in order to take advantage of this situation.

Figure 1 demonstrated the rapid increase in information technology / computer science enrolments, but as was noted, some of the apparent expansion in information technology enrolments can be attributed to 're-badging'. As mentioned earlier, many universities did not offer a 'bachelor of computing' or other information technology courses, but many students studied information technology at those universities by undertaking appropriate majors within a BSc (or other) course. This was particularly the case at 'traditional' universities. Universities which had formerly been colleges of advanced education were more likely to have been offering tagged 'computing' degrees already.

Students are permitted (in many circumstances) to undertake more than one course at a time. In such situations, the first course is described as the 'primary' course, and the other the 'supplementary' course. Therefore in order to correctly enumerate the total number of information technology students, those enrolled in an information technology course as a supplementary course ought to be taken into account. This information is summarised in Table 5, which provides a breakdown for the years 2002 to 2005. The table shows that there were 64,399 students enrolled in information technology courses, net of the 179 students enrolled in two information technology courses. Of these students, 59,825 were enrolled in an information technology course as a primary course, and of these, 58,174 students were enrolled in just one course. A further 4,753 students were enrolled in an information technology course as a supplementary course, of which 179 were enrolled in two information technology courses. These 179 students have been removed from the calculation, in order to avoid the risk of double counting.

**Table 5 Higher Education Enrolments 2002 – 2005: No. Information Technology Students by Primary or Supplementary Course**

Primary / Supplementary Course	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
<b>Primary Course in Information Technology</b>						
Enrolled in a single IT Course Only	71240	69295	65416	58174	-13066	-18.3%
Secondary Course in another Field of Education	2162	1691	1687	1651	-511	-23.6
Sub total	73402	70986	67103	59825	-13577	-18.5%
<b>Supplementary Course: Information Technology</b>						
	6239	6137	5696	4753	-1486	-23.8%
<b>Total No. Enrolments in IT Courses</b>	<b>79641</b>	<b>77123</b>	<b>72799</b>	<b>64578</b>	<b>-15063</b>	<b>-18.9%</b>
<b>LESS:</b>						
Enrolments in two IT Courses	556	119	65	179	-377	-67.8%
<b>Net Students Enrolled in an IT Course</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>-14686</b>	<b>-18.6%</b>

The previous table showed the decline in enrolments of students enrolled in information technology as a primary course, but it also shows that there had been a decline in enrolments in information technology as a supplementary course. Therefore between 2002 and 2005, the number of ALL information technology enrolments declined by 14,686, or 18.6 per cent. It should also be noted that information technology numbers have declined each year since their high point in 2002.

Tables 6 and 7 consider information technology enrolments by course level, looking first at course level groupings. Compared with students enrolled in courses in all Fields of Education (Table 6), information technology students are more likely to be enrolled in courses at the Other Postgraduate level, and less likely to be enrolled in either research courses or bachelor degrees.

However, in common with other Fields of Education, the majority of information technology students are enrolled in undergraduate courses. Perhaps more interesting is the fact that whereas the Australian higher education sector overall continues to expand, the number of students studying information technology is in decline. The previous table showed that there were 14,686 fewer students enrolled in information technology courses in 2005 than there had been in 2002. Only at the research level were student enrolments increasing. There were almost 500 more students in 2005 than in 2002, an increase of about 38 per cent. However, there were declines of 1,608 in enrolments in courses at the Other Postgraduate level, and around 13,500 in undergraduate courses.

**Table 6 Higher Education Enrolments 2002 – 2005: Information Technology and All Fields of Education, by Course Level**

Course Level	2002	2003	2004	2005		Growth 2002 – 2005	
					No.		
<b>Information Technology</b>							
Higher Degree by Research	1301	1481	1657	1797	2.8%	496	38.1%
Other Postgraduate	20188	18641	19101	18580	28.9%	-1608	-8.0%
Undergraduate	57596	56882	51976	44022	68.4%	-13574	-23.6%
Non-Award							
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>
<b>All Fields of Education</b>							
Higher Degree by Research	44209	45659	47309	48201	5.0%	3992	9.0%
Other Postgraduate	182403	201656	210460	215303	22.5%	32900	18.0%
Undergraduate	647732	657736	663407	671230	70.1%	23498	3.6%
Non-Award	22277	24901	23801	22442	2.3%	165	0.7%
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>
<b>IT Per Cent of All</b>							
Higher Degree by Research	2.9%	3.2%	3.5%	3.7%		12.4%	
Other Postgraduate	11.1%	9.2%	9.1%	8.6%		-4.9%	
Undergraduate	8.9%	8.6%	7.8%	6.6%		-57.8%	
Non-Award	0.0%	0.0%	0.0%	0.0%		0.0%	
<b>Total</b>	<b>8.8%</b>	<b>8.3%</b>	<b>7.7%</b>	<b>6.7%</b>		<b>-24.3%</b>	

Table 7 drills down to the next course level, showing enrolments in information technology only. As can be seen, there was a decline in enrolments at all course levels except PhD and Masters by Coursework. In fact, there was strong growth at the Masters by Coursework level, but this growth was more than offset by declines in Graduate Diploma and Graduate Certificate enrolments.

**Table 7 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments by Level of Course**

Level of Course	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
Doctorate by Research	1000	1134	1359	1497	2.3%	497	49.7%
Masters by Research	301	347	298	300	0.5%	-1	-0.3%
HD by Research Total	1301	1481	1657	1797	2.8%	496	38.1%
Masters by Coursework	12707	13858	15741	16038	24.9%	3331	26.2%
PG Qualifying	57	49	29	16	0.0%	-41	-71.9%
Grad Dip – New Area	4221	2618	1727	1282	2.0%	-2939	-69.6%
Grad Dip – Extended	2303	1417	940	545	0.8%	-1758	-76.3%
Graduate Certificate	870	654	614	653	1.0%	-217	-24.9%
Coursework Doctorate	30	45	50	46	0.1%	16	53.3%
Other Postgraduate Total	20188	18641	19101	18580	28.9%	-1608	-8.0%
Bachelors Graduate Entry	68	52	25	18	0.0%	-50	-73.5%
Bachelors Honours	6206	6619	6169	5013	7.8%	-1193	-19.2%
Bachelors Pass	50987	49922	45513	38632	60.0%	-12355	-24.2%
Associate Degree	51	44	62	66	0.1%	15	29.4%
Associate Diploma	96	71	60	64	0.1%	-32	-33.3%
Diploma	75	58	52	161	0.3%	86	114.7%
Enabling Course	17	20	19	10	0.0%	-7	-41.2%
Other Award Course	96	96	76	58	0.1%	-38	-39.6%
Undergraduate Total	57596	56882	51976	44022	68.4%	-13574	-23.6%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>

Table 8 shows that female students are considerably under represented in information technology, making up only 20.2 per cent of all information technology students. Overall, enrolments by female students represented 54.5 per cent of the total enrolments in the sector in 2005. Table 8 also shows that the proportionate decline in the number of women in information technology courses between 2002 and 2005 was far greater than it had been for men. The number of women dropped by over one-third, and their proportion of the loss was over 46 per cent, even though women made up only about 20 per cent of all information technology enrolments in 2005. Female information technology students represented 4.1 per cent of all university students in 2002, but by 2005, this had declined to 2.5 per cent.

**Table 8 Higher Education Enrolments 2002 – 2005: Information Technology and All Fields of Education by Sex**

Sex	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Information Technology</b>							
Female	19814	18352	15861	13037	20.2%	-6777	-34.2%
Male	59271	58652	56873	51362	79.8%	-7909	-13.3%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>
<b>All Fields of Education</b>							
Female	487988	505824	513420	521328	54.5%	33340	6.8%
Male	408633	424128	431557	435848	45.5%	27215	6.7%
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>
<b>Female Per Cent of All</b>							
Female	4.1%	3.6%	3.1%	2.5%		-20.3%	
Male	14.5%	13.8%	13.2%	11.8%		-29.1%	
<b>Total</b>	<b>8.8%</b>	<b>8.3%</b>	<b>7.7%</b>	<b>6.7%</b>		<b>-24.3%</b>	

Table 9 shows that by 2005, over 48 per cent of students enrolled in information technology courses were overseas students, up from 40.5 per cent in 2002. This is by far the largest proportion of overseas students in any Field of Education. In 2005, the proportion of overseas students in courses in all Fields of Education was a more modest 25 per cent. Therefore, the proportion of overseas students in information technology is almost double the system-wide average. Although the number and proportion of overseas students enrolled in information technology courses declined over the period (-1,060 and -3.3 per cent, respectively), the decline was rather modest compared with that of domestic students. The number and proportion of domestic students quitting information technology was 13,626, and 29.0 per cent respectively.

**Table 9 Higher Education Enrolments 2002 – 2005: Information Technology and All Fields of Education by Citizenship Status**

Citizen ship Status	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Information Technology</b>							
Domestic students	47024	44258	39420	33398	51.9%	-13626	-29.00%
Overseas students	32061	32746	33314	31001	48.1%	-1060	-3.30%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.60%</b>
<b>All Fields of Education</b>							
Domestic students	711563	719555	716422	717681	75.0%	6118	0.9%
Overseas students	185058	210397	228555	239495	25.0%	54437	29.4%
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>
<b>Overseas Per Cent of All</b>							
Domestic students	6.6%	6.2%	5.5%	4.7%		-222.7%	
Overseas students	17.3%	15.6%	14.6%	12.9%		-1.9%	
<b>Total</b>	<b>8.8%</b>	<b>8.3%</b>	<b>7.7%</b>	<b>6.7%</b>		<b>-24.3%</b>	

The situation with overseas students and information technology courses is explored in more depth in Chapter 8.

Tables 10 and 11 consider information technology students' university attendance. Table 10 shows that the great majority of information technology students are on-campus ('internal') students, and that the proportion of on-campus students was nearly 86 per cent in 2005. From the table it is possible to calculate that this proportion has been consistent back to 2002. This is a higher proportion than for the sector overall. The number of both internal and external information technology students declined over the period, but there was an increase in the number of multi modal students.

According to Table 11, information technology students are more likely than students overall to attend university full time. Table 12 shows that 71.5 per cent of information technology students attended full time in 2005, and this proportion has been consistent since 2002. The equivalent figures for students enrolled in courses overall varied between 64 and 66.5 per cent.

Perhaps this difference can be explained by the high relative presence of overseas students in information technology courses. Most overseas students are required by visa restrictions to attend full time.



**Table 10 Higher Education Enrolments 2002 – 2005: Information Technology and All Fields of Education by Attendance Mode**

Attendance mode	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Information Technology</b>							
Internal Mode	68436	66555	62537	55229	85.8%	-13207	-19.3%
External Mode	9029	8240	7774	6273	9.7%	-2756	-30.5%
Multi-modal	1620	2209	2423	2897	4.5%	1277	78.8%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>
<b>All Fields of Education</b>							
Internal Mode	724914	747421	754828	761969	79.6%	37055	5.10%
External Mode	139228	140028	137465	133697	14.0%	-5531	-4.00%
Multi-modal	32479	42503	52684	61510	6.4%	29031	89.40%
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.80%</b>
<b>Info Tech Per Cent of All</b>							
Internal Mode	9.4%	8.9%	8.3%	7.2%		-35.6%	
External Mode	6.5%	5.9%	5.7%	4.7%		49.8%	
Multi-modal	5.0%	5.2%	4.6%	4.7%		4.4%	
<b>Total</b>	<b>8.8%</b>	<b>8.3%</b>	<b>7.7%</b>	<b>6.7%</b>		<b>-24.3%</b>	

**Table 11 Higher Education Enrolments 2002 – 2005: Information Technology and All Fields of Education by Attendance Type**

Attendance Type	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Information Technology</b>							
Full-time attendance	55461	54001	51624	46047	71.5%	-9414	-17.0%
Part-time attendance	23624	23003	21110	18352	28.5%	-5272	-22.3%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>
<b>All Fields of Education</b>							
Full-time attendance	574580	605230	619696	636872	66.5%	62292	10.8%
Part-time attendance	322041	324722	325281	320304	33.5%	-1737	-0.5%
<b>Total</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>
<b>Info Tech Per Cent of All</b>							
Full-time attendance	9.7%	8.9%	8.3%	7.2%		-15.1%	
Part-time attendance	4.1%	3.8%	3.4%	2.9%		-8.5%	
<b>Total</b>	<b>13.8%</b>	<b>12.7%</b>	<b>11.7%</b>	<b>10.1%</b>		<b>-23.6%</b>	

Table 12 shows that the majority of information technology students were enrolled in Victoria and New South Wales, and that these states were therefore the ones that ‘lost’ the most enrolments over the period. The table shows the distribution of information technology enrolments by State/Territory, according to the location of the university. However, a couple of regional universities have interstate ‘campuses’, and the distribution indicated in the table does not necessarily reflect the physical location of the information technology students themselves. The Central Queensland University, for example, has over 3,700 overseas information technology students, but few of these are located at the main Rockhampton campus. In 2005, CQU had 1,793 students at a campus in Sydney, and a further 1,300 in Melbourne. The University of Ballarat has over 2,300 overseas information technology students at locations in Sydney and Melbourne. (CPUR, DEST Customised Data Set, 2005). Matters, relating to overseas students in information technology have been examined in Chapter 8.

**Table 12 Higher Education Enrolments 2002 – 2005: Information Technology and All Fields of Education by State / Territory**

State / Territory	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Information Technology</b>							
Australian Capital Territory (1.6%)	2223	2118	1734	1452	2.3%	-771	-34.7%
New South Wales (33.1%)	20467	19984	17842	16053	24.9%	-4414	-21.6%
Northern Territory (1.0%)	349	311	221	173	0.3%	-176	-50.4%
Queensland (19.7%)	17807	16200	15383	13416	20.8%	-4391	-24.7%
South Australia (7.5%)	3531	3652	3531	3213	5.0%	-318	-9.0%
Tasmania (2.4%)	1252	1649	2224	2281	3.5%	1029	82.2%
Victoria (24.7%)	26748	26482	25831	22376	34.7%	-4372	-16.3%
Western Australia (10.0%)	6020	5904	5333	4913	7.6%	-1107	-18.4%
Multi State	688	704	635	522	0.8%	-166	-24.1%
<b>Total (100.0%)</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>
<b>All Fields of Education</b>							
Australian Capital Territory (1.6%)	24283	26732	28244	27911	2.9%	3628	14.9%
New South Wales (33.1%)	289886	300234	296546	297191	31.0%	7305	2.5%
Northern Territory (1.0%)	6432	6276	6001	5917	0.6%	-515	-8.0%
Queensland (19.7%)	170880	175747	182569	185922	19.4%	15042	8.8%
South Australia (7.5%)	60459	63035	65502	66486	6.9%	6027	10.0%
Tasmania (2.4%)	15706	16515	18068	18020	1.9%	2314	14.7%
Victoria (24.7%)	228561	236822	241755	242951	25.4%	14390	6.3%
Western Australia (10.0%)	88520	92580	93593	97180	10.2%	8660	9.8%
Multi State #	11894	12011	12699	15598	1.6%	3704	31.1%
<b>Total (100.0%)</b>	<b>896621</b>	<b>929952</b>	<b>944977</b>	<b>957176</b>	<b>100.0%</b>	<b>60555</b>	<b>6.8%</b>
<b>Info Tech Per Cent of All</b>							
Australian Capital Territory (1.6%)	9.2%	7.9%	6.1%	5.2%		-21.3%	
New South Wales (33.1%)	7.1%	6.7%	6.0%	5.4%		-60.4%	
Northern Territory (1.0%)	5.4%	5.0%	3.7%	2.9%		34.2%	
Queensland (19.7%)	10.4%	9.2%	8.4%	7.2%		-29.2%	
South Australia (7.5%)	5.8%	5.8%	5.4%	4.8%		-5.3%	
Tasmania (2.4%)	8.0%	10.0%	12.3%	12.7%		44.5%	
Victoria (24.7%)	11.7%	11.2%	10.7%	9.2%		-30.4%	
Western Australia (10.0%)	6.8%	6.4%	5.7%	5.1%		-12.8%	
Multi State #	5.8%	5.9%	5.0%	3.3%		-4.5%	
<b>Total (100.0%)</b>	<b>8.8%</b>	<b>8.3%</b>	<b>7.7%</b>	<b>6.7%</b>		<b>-24.3%</b>	

# Australian Catholic University 2002 – 2005; Australian College of Theology 2005 (2,336 enrolments)

Note: Australian population distribution by State/Territory. Source: ABS, 3101.0 Australian Demographic Statistics, June 2006

Table 13 shows the distribution of information technology enrolments by university, ranked according to the number of enrolments in 2005. Monash University was still Australia's largest information technology university, but its body of information technology students also declined the most. Between 2002 and 2005, Monash lost 2,788 information technology students, or about 30 per cent of the enrolment in 2002. Central Queensland University was also a big 'loser' of information technology enrolments (-1,717, or 27.1 per cent), as were Queensland University of Technology (-1,651 or 33.0 per cent), Swinburne (-1,171 or 35.0 per cent) and University of New South Wales (-1,106 or 43.1 per cent). By way of contrast, the University of Ballarat increased its information technology enrolment number by 1,580 or 152.7 per cent. Those universities which have suffered large enrolment declines in their information technology enrolments must also have suffered a huge financial setback, particularly where the loss has been of overseas fee-paying students.

**Table 13 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments by University (Ranked 2005)**

University	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
Monash University	9182	8793	7972	6394	-2788	-30.4%
Central Queensland University	6340	5257	4898	4623	-1717	-27.1%
RMIT University	4775	4586	4530	4068	-707	-14.8%
Queensland Uni. Of Technology	5005	4734	4194	3354	-1651	-33.0%
University of Wollongong	3441	3401	2814	2934	-507	-14.7%
University of Ballarat	1035	1273	2465	2615	1580	152.7%
Uni. Of Technology, Sydney	2684	2635	2620	2457	-227	-8.5%
Charles Sturt University	3197	3090	2922	2316	-881	-27.6%
University of Tasmania	1252	1649	2224	2281	1029	82.2%
University of South Australia	2556	2679	2555	2260	-296	-11.6%
Swinburne	3346	3260	2886	2175	-1171	-35.0%
Edith Cowan University	2559	2541	2304	2121	-438	-17.1%
Victoria University	2868	2724	2391	2121	-747	-26.0%
Deakin University	1846	2082	2147	1945	99	5.4%
University of Western Sydney	2718	2765	2228	1920	-798	-29.4%
Uni. of the Sunshine Coast	2308	2144	2217	1876	-432	-18.7%
University of Melbourne	2416	2341	2059	1813	-603	-25.0%
Macquarie University	1908	1947	1753	1645	-263	-13.8%
Griffith University	2087	1840	1660	1488	-599	-28.7%
UNSW	2569	2245	1792	1463	-1106	-43.1%
Curtin	1572	1494	1423	1386	-186	-11.8%
La Trobe University	1280	1423	1381	1240	-40	-3.1%
University of Queensland	1430	1450	1399	1166	-264	-18.5%
University of Newcastle	1206	1159	1148	1148	-58	-4.8%
University of Sydney	1433	1535	1231	968	-465	-32.4%
University of Canberra	1212	1174	932	784	-428	-35.3%
Murdoch University	1059	1006	844	727	-332	-31.4%
University of New England	503	413	628	662	159	31.6%
James Cook University	454	473	492	603	149	32.8%
UWA	762	760	641	570	-192	-25.2%
University of Adelaide	444	459	471	530	86	19.4%
Australian Catholic University	688	704	635	522	-166	-24.1%
Southern Cross University	797	784	699	514	-283	-35.5%
ANU	667	647	578	495	-172	-25.8%
Flinders Uni. Of South Australia	531	514	505	414	-117	-22.0%
Bond University	10	143	383	183	173	1730.0%
ADFA	344	297	224	173	-171	-49.7%
Charles Darwin University	349	311	221	173	-176	-50.4%
Sunshine Coast	173	159	140	119	-54	-31.2%
Notre Dame	68	103	121	109	41	60.3%
Other Institutions	11	10	7	44	33	300.0%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>-14686</b>	<b>-18.6%</b>

Earlier the point was made that merely having a classification (of courses) offering many different possibilities did not necessarily improve the accuracy of data. Table 14 verifies this. Despite the availability of 22 individual sub-Fields of Education in information technology, universities classified about one-third of their courses as ‘computer science’ or ‘computer science nec’ (‘not elsewhere classified’), another third as ‘information systems’ or ‘information systems nec’, and over 21 per cent as ‘information technology’

or 'information technology nec'. In fact, many universities classified information technology courses to a Field of Education, which in a sense doesn't exist. The shaded row shows student enrolments described by universities as '020000 Information Technology', but this isn't one of the options available in DEST's documentation. It is clear that for all its detail, the Field of Education classification really needed to provide an option 'Information Technology – General', which is about as precisely as it would be possible to describe some information technology courses, particularly at the undergraduate level.

**Table 14 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments by Field of Education**

Field of education	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Computer Science</b>							
Computer Science	22612	20945	20142	17312	26.9%	-5300	-23.4%
Formal Language Theory	56	7	5	4	0.0%	-52	-92.9%
Programming	76	150	246	285	0.4%	209	275.0%
Computational Theory	7	8	4	1	0.0%	-6	-85.7%
Compiler Construction	1	1	1	1	0.0%	0	0.0%
Algorithms	1	1	0	0	0.0%	-1	-100.0%
Data Structures	213	286	624	345	0.5%	132	62.0%
Networks and Communications	645	772	487	855	1.3%	210	32.6%
Computer Graphics	376	453	497	569	0.9%	193	51.3%
Operating Systems	1	1	0	0	0.0%	-1	-100.0%
Artificial Intelligence	5	4	10	15	0.0%	10	200.0%
Computer Science nec	4059	4138	4328	3785	5.9%	-274	-6.8%
<b>Information Systems</b>							
Information Systems	17637	16249	14662	14916	23.2%	-2721	-15.4%
Conceptual Modelling	20	17	18	17	0.0%	-3	-15.0%
Database Management	2	5	403	911	1.4%	909	45450.0%
Systems Analysis and Design	1090	1180	1027	770	1.2%	-320	-29.4%
Decision Support Systems	4	3	1	0	0.0%	-4	-100.0%
Information Systems nec	9940	9615	7394	5974	9.3%	-3966	-39.9%
<b>Information Technology</b>							
Other Information Technology	3896	4684	4723	4230	6.6%	334	8.6%
Security Science	184	232	343	547	0.8%	363	197.3%
<b>Information Technology</b>	<b>7008</b>	<b>7274</b>	<b>5719</b>	<b>4974</b>	<b>7.7%</b>	<b>-2034</b>	<b>-29.0%</b>
Information Technology nec	11252	10979	12100	8888	13.8%	-2364	-21.0%
<b>Total</b>	<b>79085</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>-14686</b>	<b>-18.6%</b>

An examination of the DEST enrolment data file for 2005 reveals that over 87 per cent of undergraduate students were enrolled in courses classified into six 'generalist' fields (Computer Science, Information Systems, Information Technology and Computer Science nec, Information Systems nec, Information Technology nec). Another 5.5 per cent of students were classified as being enrolled in courses described as 'Other Information Technology'.

## 5. Student Load: Leaching and Learning

As noted earlier, a detailed Field of Education classification will not automatically lead to detailed information about course enrolments. This is particularly so at the undergraduate level. Courses are often quite broad in their coverage, with students being required (or having the option) to study subjects from a diverse range of disciplines. However, the Discipline Group classification of subjects might be expected to provide more detail, because the classification is applied to subjects, which are components of courses. Table 15 summarises the overall pattern between 2002 and 2005. The table shows all teaching (by Discipline Group) to students enrolled in all courses. Information Technology was one of two disciplines which declined over the period. In the case of Agriculture, Environmental and Related Studies, the loss was minimal, amounting to just 0.3 per cent of the teaching in that discipline. However, the losses in information technology were substantial, amounting to 8,570 EFTSL<sup>4</sup> or 15.5 per cent. To gauge the extent of this loss, if one presumes that one EFTSL is worth between \$10,000 and \$15,000, the loss to those departments teaching information technology subjects could be valued at between \$85m to \$128m. At the same time, some disciplines expanded considerably. Management and Commerce in particular grew strongly over the period and to a lesser extent Health, and Society and Culture. Information Technology's proportion of all student load declined from 8.8 per cent to 6.9 per cent over the period. Readers should note that as a measure, student load is expressed to three decimal places. For reasons of clarity of reading, these tables expressed in whole numbers, so occasional rounding errors will be present.

**Table 15 Student Load (EFTSL) 2002 – 2005: Teaching in All Discipline Groups**

Discipline group	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
Agriculture, Environmental And Related Studies	8704	9007	9243	8675	-29	-0.3%
Architecture And Building	11970	12477	12971	13476	1506	12.6%
Creative Arts	46607	48305	48394	48896	2288	4.9%
Education	51547	53170	54039	56065	4518	8.8%
Engineering And Related Technologies	36874	39076	39564	39225	2351	6.4%
Food, Hospitality And Personal Services	107	117	107	160	53	49.2%
Health	57512	60803	63543	67099	9587	16.7%
Information Technology	55237	52596	50741	46667	-8570	-15.5%
Management And Commerce	114663	124229	127868	132784	18121	15.8%
Mixed Field Programmes	384	415	480	585	201	52.5%
Natural And Physical Sciences	73735	75597	77407	79297	5562	7.5%
Society And Culture	169408	175068	176859	181163	11755	6.9%
Total	626749	650860	661216	674092	47344	7.6%
Information Technology Per Cent of All	8.8%	8.1%	7.7%	6.9%	-18.1%	

Rounding errors apply

Table 16 examines the distribution of student load for students enrolled in all courses. Information Technology courses have retained their proportion of all teaching of information technology subjects. That is, the proportion of 'service teaching' of information technology subjects to non-information technology students has changed little. Although in 2005 there were 5,293 fewer equivalent full time information technology students studying information technology subjects than in 2002, students enrolled in courses in other Fields of Education also took rather less Information technology than in the past. Management and Commerce students, for example reduced their consumption of information technology subjects by 1,297 EFTSL, a decline of over 14 per cent. Students in Engineering, Natural and Physical Sciences and Society and Culture courses also reduced their uptake of information technology teaching (by 876 EFTSL, 552 EFTSL and 351 EFTSL, respectively).

<sup>4</sup> 'EFTSL' is an abbreviation which means 'Equivalent Full Time Student Load'. It is a measure of the number of equivalent full time students.

**Table 16 Student Load (EFTSL) 2002 – 2005: Information Technology Teaching by Broad Field of Education (primary course)**

Field of Education	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
Agriculture, Environmental And Related Studies	101	101	137	133	32	31.8%
Architecture And Building	132	139	109	146	14	10.5%
Creative Arts	1195	1172	1102	1070	-125	-10.4%
Education	403	473	480	392	-11	-2.9%
Engineering And Related Technologies	3962	4021	3780	3085	-876	-22.1%
Health	158	159	128	142	-16	-10.3%
Information Technology – Primary Course	36727	34980	33627	31433	-5293	-14.4%
[Information Technology – Supplementary Course] #	[1,720]	[1,757]	[1,630]	[1,299]	[-421]	[-24.5%]
Management And Commerce	8960	8343	8325	7664	-1297	-14.5%
Natural And Physical Sciences	1758	1596	1433	1206	-552	-31.4%
Society And Culture	1367	1154	1185	1016	-351	-25.7%
Mixed Field Programmes	35	35	39	64	28	80.4%
Food, Hospitality And Personal Services	2	1	1	3	2	92.5%
Non Award	436	421	395	313	-124	-28.3%
Total	55237	52596	50741	46667	-8570	-15.5%
Information Technology Per Cent of All	66.5%	66.5%	66.3%	67.4%	61.8%	

# the student load for Information Technology – Supplementary Course is included elsewhere in this table

Rounding errors apply

As was noted earlier, some students enrol in more than one course. The student load identified in Table 16 as being taught to students enrolled in 'Information Technology' courses shows the teaching only to those enrolled in information technology as a primary course. Analysis of the files shows that some of the students enrolled in courses in other Fields of Education were enrolled in an information technology course as a supplementary course. These students amounted to 1,720, 1,757, 1,630 and 1,299 EFTSL in years 2002 to 2005, respectively. One can see that the number of equivalent full time students taking information technology as a supplementary course also declined (by 421 EFTSL, or 24.5 per cent). All information technology students have been taken into account in the tables that follow. These tables analyse patterns in the subjects in which information technology students enrol.

Table 17 shows the disciplines studied by students enrolled in courses in the information technology Field of Education. As can be seen, the decline in enrolments in information technology courses was equivalent to 11,416 full time students. About half of this decline was in information technology subjects, but the situation in information technology has also had an impact on teaching in other disciplines, particularly Engineering, Natural and Physical Sciences and Society and Culture.



**Table 17 Student Load (EFTSL) 2002 – 2005: Information Technology Field of Education by Discipline**

Discipline group	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
Creative Arts	1705	1573	1390	1321	-384	-22.5%
Engineering And Related Technology	3907	4130	3574	2360	-1547	-39.6%
Information Technology	38447	36737	35257	32732	-5715	-14.9%
Management And Commerce	5294	5251	4387	3929	-1365	-25.8%
Natural And Physical Sciences	3636	3371	2858	2237	-1399	-38.5%
Society And Culture	3388	3299	2921	2363	-1025	-30.3%
Other Discipline Groups	198	190	179	218	20	10.1%
Total	56576	54550	50564	45160	-11416	-20.2%
Information Technology Per Cent of Total	68.0%	67.3%	69.7%	72.5%	50.1%	

Rounding errors apply

The next tables look at patterns based around the Disciplines studied by information technology students according to course level, sex and citizenship status. Table 17 showed that the decline in teaching to information technology students was spread about 50:50 between information technology and non-information technology disciplines. Table 18 shows which sub-groups of students have been responsible for those changes.

Table 18 first examines the distribution of students according to their course level. Higher Degrees by Research enrolments in the information technology Field of Education presents an anomaly. Where the general pattern has been one of decline, more students are taking research degrees in information technology. Nearly all teaching to information technology research students is in information technology disciplines.

There has been growth in the teaching to students enrolled in information technology courses at the Other Postgraduate level, but the growth has been in the teaching in the information technology disciplines. Teaching in non-information technology disciplines declined over the period. Table 6 showed the change in enrolments by course level, and, among other things, it showed a decline in enrolments in courses at the Other Postgraduate level (-1608). Notwithstanding this decline, net teaching to students at the Other Postgraduate course level increased. How then could there have been a decline in the number of Other Postgraduate enrolments, but an increase in the student load (EFTSL) taught to those students? Part of the answer must be that on average, Other Postgraduate students in 2005 took more subjects compared to the situation in 2002. That is, there was probably an increase in the proportion of full time students. The equivalent full time student load (EFTSL) will always be lower than the number of enrolments, because many students study part time.

It can be seen therefore that most of the change has been at the Undergraduate level. Undergraduate information technology students now receive less teaching to the tune of 6,885 EFTSL in information technology disciplines and 5,423 EFTSL fewer in non-information technology disciplines. The downturn in information technology therefore will have had a considerable effect on those teaching the other disciplines (as identified in Table 17).

**Table 18 Student Load (EFTSL) 2002 – 2005: Information Technology Field of Education by Course Level, Sex and Citizen / Resident Status, and Discipline Group**

	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
<b>Information Technology Disciplines</b>	38447	36737	35257	32732	-5715	-14.9%
<b>Other Disciplines</b>	18129	17813	15307	12428	-5700	-31.4%
<b>Total</b>	<b>56576</b>	<b>54550</b>	<b>50564</b>	<b>45160</b>	<b>-11415</b>	<b>-20.2%</b>
<b>Course Level</b>						
<b>HDR</b>						
Information Technology Disciplines	875	1039	1161	1296	421	48.1%
Other Disciplines	46	31	56	49	2	4.9%
<b>Total</b>	<b>921</b>	<b>1070</b>	<b>1217</b>	<b>1345</b>	<b>423</b>	<b>45.9%</b>
<b>OPG</b>						
Information Technology Disciplines	9398	8486	9832	10148	750	8.0%
Other Disciplines	1863	1725	1563	1613	-250	-13.4%
<b>Total</b>	<b>11261</b>	<b>10211</b>	<b>11395</b>	<b>11761</b>	<b>500</b>	<b>4.4%</b>
<b>UG</b>						
Information Technology Disciplines	28174	27212	24263	21289	-6885	-24.4%
Other Disciplines	16219	16058	13690	10765	-5453	-33.6%
<b>Total</b>	<b>44393</b>	<b>43270</b>	<b>37953</b>	<b>32054</b>	<b>-12338</b>	<b>-27.8%</b>
<b>Sex</b>						
<b>Female</b>						
Information Technology Disciplines	9250	8273	7040	6130	-3120	-33.7%
Other Disciplines	4765	4548	3602	2768	-1997	-41.9%
<b>Total</b>	<b>14014</b>	<b>12822</b>	<b>10642</b>	<b>8898</b>	<b>-5116</b>	<b>-36.5%</b>
<b>Male</b>						
Information Technology Disciplines	29197	28464	28217	26603	-2595	-8.9%
Other Disciplines	13364	13264	11706	9660	-3704	-27.7%
<b>Total</b>	<b>42561</b>	<b>41728</b>	<b>39922</b>	<b>36262</b>	<b>-6299</b>	<b>-14.8%</b>
<b>Citizenship status</b>						
<b>Domestic</b>						
Information Technology Disciplines	21060	19343	16854	14388	-6671	-31.7%
Other Disciplines	11980	11681	10039	8057	-3922	-32.7%
<b>Total</b>	<b>33039</b>	<b>31024</b>	<b>26893</b>	<b>22446</b>	<b>-10594</b>	<b>-32.1%</b>
<b>Overseas</b>						
Information Technology Disciplines	17387	17395	18403	18344	957	5.5%
Other Disciplines	6149	6132	5269	4370	-1778	-28.9%
<b>Total</b>	<b>23536</b>	<b>23526</b>	<b>23671</b>	<b>22715</b>	<b>-821</b>	<b>-3.5%</b>

Rounding errors apply

The gender-based pattern is more even, and the presence of both sexes in information technology courses declined between 2002 and 2005. However, information technology students of both sexes reduced their consumption of non-information technology teaching to a greater extent than they did with subjects in the information technology disciplines. In some senses, the flight of women from information technology has been quite spectacular. By 2005 women made up only 18.7 per cent of all student load consumed by information technology students, down from nearly a quarter in 2002.

The pattern based on the distribution of domestic and overseas students is also interesting. Domestic information technology students have left information technology in droves, and their departure has had a big impact on information technology and non-information technology subjects alike. The reduction in student load between 2002 and 2005 was 6,671 EFTSL in information technology subjects, and 3,922 EFTSL in non-information technology subjects. In both instances, this represents a decline of about one-third.

There was also an overall decline in teaching to overseas information technology students, comprising an increase in subjects in the information technology Disciplines, and a decline in non-information technology subjects.

Table 19 considers information technology teaching to information technology students only, according to the discipline group of the subjects the students were enrolled in. Assuming that universities have classified their subjects consistently, it would seem that Programming and Computer Science have been the areas hardest hit by the information technology downturn, followed by Information Systems, Database Management and Networks and Communications. On the other hand, a few disciplines within information technology appear to have become more popular.

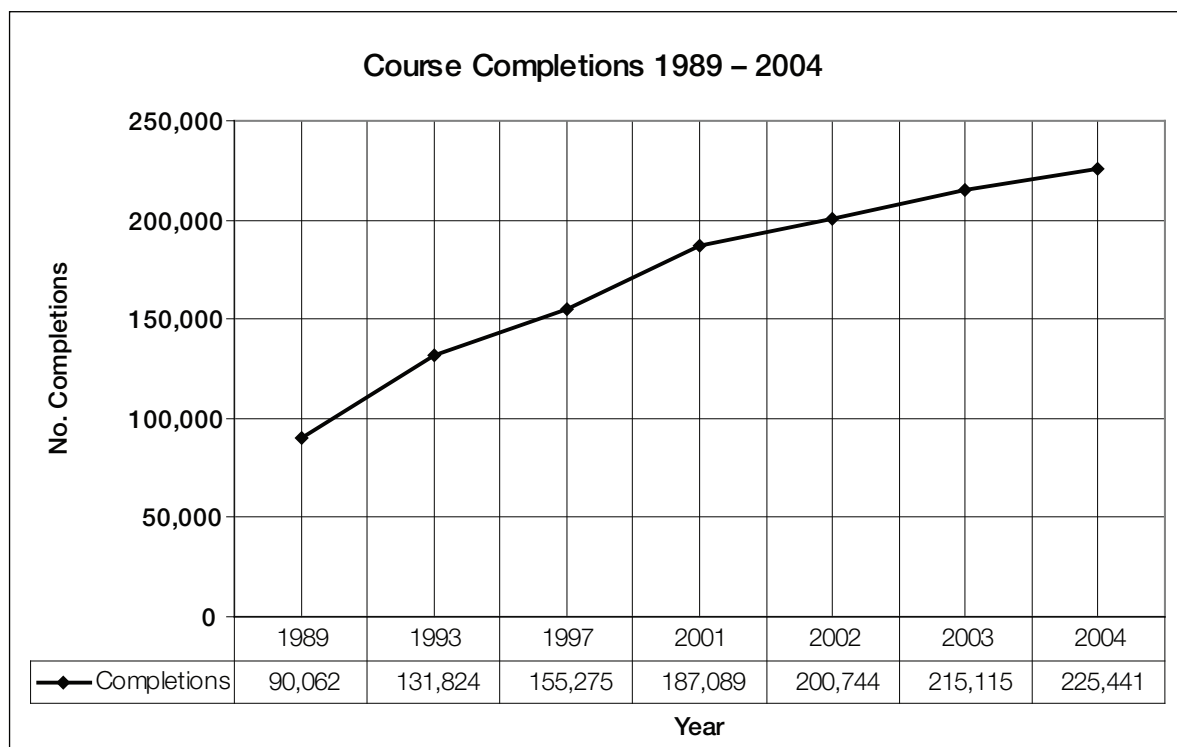
**Table 19 Student Load (EFTSL) 2002 – 2005: Information Technology Student Load by Information Technology Discipline, Ranked**

Discipline	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
Programming	7414	6857	6039	5140	-2274	-30.7%
Computer Science	4005	4069	3272	2716	-1289	-32.2%
Information Systems	3101	2691	2737	2151	-950	-30.6%
Database Management	3030	2715	2477	2247	-783	-25.8%
Networks and Communications	3555	3400	3228	2908	-647	-18.2%
Systems Analysis and Design	3219	3143	3081	2903	-316	-9.8%
Data Structures	449	423	321	302	-147	-32.7%
Computational Theory	338	288	228	195	-143	-42.3%
Security Science	884	832	859	802	-82	-9.3%
Operating Systems	975	1032	1081	899	-76	-7.8%
Artificial Intelligence	587	547	611	533	-54	-9.2%
Formal Language Theory	173	150	138	128	-45	-26.0%
Computer Science nec	1546	1216	1338	1522	-24	-1.6%
Information Technology	11	0	2	0	-11	-100.0%
Compiler Construction	54	62	51	47	-7	-13.0%
Algorithms	287	266	316	349	62	21.6%
Other Information Technology	282	249	350	376	94	33.3%
Computer Graphics	711	763	803	834	123	17.3%
Information Technology nec	4041	4263	4238	4168	127	3.1%
Information Systems nec	2947	3003	3362	3127	180	6.1%
Decision Support Systems	460	496	504	724	264	57.4%
Conceptual Modelling	378	275	218	661	283	74.9%
<b>Total</b>	<b>38447</b>	<b>36737</b>	<b>35257</b>	<b>32732</b>	<b>-5715</b>	<b>-14.9%</b>

## 6. Course Completions

This chapter examines the number of students completing courses. The ‘massification’ of the Australian higher education from 1989 started with the so-called Dawkins Reforms. As noted in chapters 4 and 5, there was a rapid expansion in the number of enrolments, with the consequent lagging expansion in the number of course completions. Figure 4 demonstrates this expansion, from just over 90,000 in 1989 to over 225,000 in 2004. This was an increase of 150 per cent.

Figure 4: Course Completions All Fields of Education 1989 – 2004



Most of the tables in this chapter relate to the years 2002 to 2004. Although this study was undertaken in the early months of 2007, completions data for 2005 (part of the 2006 DEST statistics collection), had yet to be released.

Table 20 examines course completions between 2002 and 2004, comparing information technology with other Fields of Education. The table demonstrates that whereas most Fields of Education showed an increase in the number of graduates, there was a 4.1 per cent decline in information technology. This decline needs to be compared with the 12.3 per cent increase in completions overall. The information technology proportion of all course completions declined slightly, from 9.0 per cent to 8.6 per cent and 7.7 per cent in years 2002 to 2005 respectively.

**Table 20 Course Completions 2002 – 2004: All Fields of Education**

Field of Education	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
Agriculture, Environmental And Related Studies	3870	4082	4053	183	4.7%
Architecture And Building	4168	4257	4179	11	0.3%
Creative Arts	12070	13792	14417	2347	19.4%
Education	22998	24301	25120	2122	9.2%
Engineering And Related Technologies	10696	11788	12575	1879	17.6%
Food, Hospitality And Personal Services	36	34	25	-11	-30.6%
Health	23811	24274	26031	2220	9.3%
<b>Information Technology</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>
Management And Commerce	56035	61589	65267	9232	16.5%
Natural And Physical Sciences	13155	13570	14790	1635	12.4%
Society And Culture	35822	38890	41636	5814	16.2%
<b>Total</b>	<b>200748</b>	<b>215115</b>	<b>225441</b>	<b>24693</b>	<b>12.3%</b>
Information Technology per cent of Total	9.0%	8.6%	7.7%	-3.0%	

The next three tables compare course completions in information technology with completions overall against three main variables: course level, sex and citizenship status.

Table 21 compares course completions in information technology and All Fields of Education by course level. The decline in information technology completions included a small increase in research degree completions and a more substantial increase in undergraduate completions. However, these increases of 12.2 per cent and 15.5 per cent respectively were more than offset by the 28.9 per cent decline in course completions at the Other Postgraduate level. Other Postgraduate completions in information technology declined from 12.7 per cent of all completions at this level in 2002 to 7.6 per cent in 2004. The pattern in the sector overall was one of growth at all course levels.

**Table 21 Course Completions 2002 – 2004: Information Technology c.f. All Fields of Education by Course Level**

Course Level	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
<b>Information Technology</b>					
Higher Degree by Research	139	129	156	17	12.2%
Other Postgraduate	7979	6772	5675	-2304	-28.9%
Undergraduate	9969	11637	11517	1548	15.5%
<b>Total</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>
<b>All Fields of Education</b>					
Higher Degree by Research	5867	6356	6501	634	10.8%
Other Postgraduate	63017	70515	74738	11721	18.6%
Undergraduate	131864	138244	144202	12338	9.4%
<b>Total</b>	<b>200748</b>	<b>215115</b>	<b>225441</b>	<b>24693</b>	<b>12.3%</b>
<b>Information Technology per cent of All</b>					
Higher Degree by Research	2.4%	2.0%	2.4%	2.7%	
Other Postgraduate	12.7%	9.6%	7.6%	-19.7%	
Undergraduate	7.6%	8.4%	8.0%	12.5%	
<b>Total</b>	<b>9.0%</b>	<b>8.6%</b>	<b>7.7%</b>	<b>-3.0%</b>	

Table 22 shows that the decline in the number of female information technology graduates was greater than the decline in the number of completions by males. This is notwithstanding the fact that female student completions in information technology represent only about one-quarter of all information technology completions. By contrast, women make up about 56 per cent of course completions in All Fields of Education.

**Table 22 Course Completions 2002 – 2004: Information Technology c.f. All Fields of Education by Sex**

Sex	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
<b>Information Technology</b>					
Female	4828	4995	4446	-382	-7.9%
Male	13259	13543	12902	-357	-2.7%
<b>Total</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>
<b>Female Per Cent of Total</b>	<b>26.7%</b>	<b>26.9%</b>	<b>25.6%</b>		
<b>All Fields of Education</b>					
Female	111434	119557	125540	14106	12.7%
Male	89314	95558	99901	10587	11.9%
<b>Total</b>	<b>200748</b>	<b>215115</b>	<b>225441</b>	<b>24693</b>	<b>12.3%</b>
<b>Female Per Cent of Total</b>	<b>55.5%</b>	<b>55.6%</b>	<b>55.7%</b>	<b>42.9%</b>	
<b>Information Technology per cent of All</b>					
Female	4.3%	4.2%	3.5%	-2.7%	
Male	14.8%	14.2%	12.9%	-3.4%	
<b>Total</b>	<b>9.0%</b>	<b>8.6%</b>	<b>7.7%</b>	<b>-3.0%</b>	

Table 23 considers citizenship status, and shows that the decline in course completions in information technology was caused by the downturn in the number of course completions by domestic students, which was 1,227 fewer in 2004 than it had been in 2002. The number of overseas course completers increased by 488, or 5.5 per cent. The overseas student proportion of all course completions in information technology increased from 49.5 per cent to 54.4 per cent as a consequence. Although there was an increase in the number of course completions by overseas students, that increase was modest when compared with course completions growth in the sector at large.

**Table 23 Course Completions 2002 – 2004: Information Technology c.f. All Fields of Education by Citizenship Status**

Citizenship Status	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
<b>Information Technology</b>					
Domestic student	9142	8606	7915	-1227	-13.4%
Overseas student	8945	9932	9433	488	5.5%
<b>Total</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>
<b>Overseas Per Cent of Total</b>	<b>49.5%</b>	<b>53.6%</b>	<b>54.4%</b>	<b>-66.0%</b>	
<b>All Fields of Education</b>					
Domestic student	151555	157003	161622	10067	6.6%
Overseas student	49193	58112	63819	14626	29.7%
<b>Total</b>	<b>200748</b>	<b>215115</b>	<b>225441</b>	<b>24693</b>	<b>12.3%</b>
	<b>24.5%</b>	<b>27.0%</b>	<b>28.3%</b>	<b>59.2%</b>	
<b>Information Technology per cent of All</b>					
Domestic student	6.0%	5.5%	4.9%	-12.2%	
Overseas student	18.2%	17.1%	14.8%	3.3%	
<b>Total</b>	<b>9.0%</b>	<b>8.6%</b>	<b>7.7%</b>	<b>-3.0%</b>	

The rest of the tables in this chapter are concerned with course completions only in the information technology Field of Education. Table 24 breaks down information technology course completions according to the level of detail permitted by the Field of Education classification. According to the table, there was an increase in the number of Computer Science graduates, but a decline in numbers of Information Systems



and Other Information Technology graduates. It is clear (again) that the large number of options for the classification of courses doesn't necessarily increase the level of detail. Most course completions were in:

- Computer Science and Computer Science nec ('not elsewhere classified'),
- Information Systems and Information Systems nec,
- Information Technology and Information Technology nec, and
- Other Information Technology.

Together these very general categories comprised almost 97 per cent of all course completions in the Information Technology Field of Education

**Table 24 Course Completions 2002 – 2004: Information Technology by Detailed Field of Study**

Field of Education	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
<b>Computer Science</b>					
Computer Science nec #	925	906	761	-164	-17.7%
Computer Science	4419	4640	4866	447	10.1%
Artificial Intelligence	1	0	2	1	100.0%
Programming	6	19	16	10	166.7%
Networks and Communications	209	216	116	-93	-44.5%
Data Structures	36	57	70	34	94.4%
Computer Graphics	58	75	108	50	86.2%
Computational Theory	1	0	1	0	0.0%
Formal Language Theory	22	0	0	-22	-100.0%
Operating Systems	1	0	0	-1	-100.0%
<b>Computer Science Sub total</b>	<b>5678</b>	<b>5913</b>	<b>5940</b>	<b>262</b>	<b>4.6%</b>
<b>Information Systems</b>					
Information Systems nec	2669	2654	2060	-609	-22.8%
Information Systems	4701	4431	3395	-1306	-27.8%
Systems Analysis and Design	204	250	236	32	15.7%
Decision Support Systems	0	1	1	1	
Database Management	0	1	2	2	
Conceptual Modelling	8	4	1	-7	-87.5%
<b>Information Systems Sub total</b>	<b>7582</b>	<b>7341</b>	<b>5695</b>	<b>-1887</b>	<b>-24.9%</b>
<b>Other Information Technology</b>					
Information Technology	1382	1584	1416	34	2.5%
Information Technology nec	2722	2692	3082	360	13.2%
Security Science	27	30	47	20	74.1%
Other Information Technology	696	978	1168	472	67.8%
<b>Other Information Technology Sub total</b>	<b>4827</b>	<b>5284</b>	<b>5713</b>	<b>886</b>	<b>18.4%</b>
<b>Total</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>

# Nec Not Elsewhere Classified

Table 25 provides further detail of the course level of students completing information technology courses. The area of greatest loss, as noted in Table 21 was at the Other Postgraduate level. Drilling down to the next level of detail reveals that Graduate Diploma completions declined the most. Bachelor degree completions represented the greatest area of growth.

**Table 25 Course Completions 2002 – 2004: Information Technology by Course Level**

Course Level	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
<b>Higher Degree by Research</b>					
Higher Doctorate	0	0	1	1	
PhD	99	94	111	12	12.1%
Masters by Research	40	35	44	4	10.0%
<b>HD Research Sub total</b>	<b>139</b>	<b>129</b>	<b>156</b>	<b>17</b>	<b>12.2%</b>
<b>Other Postgraduate</b>					
Coursework Doctorate	0	6	2	2	
Graduate Diploma	3346	2004	1223	-2123	-63.4%
Graduate Certificate	353	292	301	-52	-14.7%
Masters by Coursework	4249	4451	4137	-112	-2.6%
PG Qualifying (Masters Preliminary)	31	19	12	-19	-61.3%
<b>Other Postgraduate Sub total</b>	<b>7979</b>	<b>6772</b>	<b>5675</b>	<b>-2304</b>	<b>-28.9%</b>
<b>Undergraduate</b>					
Associate Degree	6	10	15	9	150.0%
Associate Diploma	24	17	18	-6	-25.0%
Bachelors Graduate Entry	24	18	7	-17	-70.8%
Bachelors Honours	398	403	403	5	1.3%
Bachelors Pass	9388	11097	11002	1614	17.2%
Diploma	28	34	29	1	3.6%
Other Award Course	101	58	43	-58	-57.4%
<b>Undergraduate Sub total</b>	<b>9969</b>	<b>11637</b>	<b>11517</b>	<b>1548</b>	<b>15.5%</b>
<b>Total</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>

Table 26 shows the number of course completions in information technology by sex and citizenship status. The table further confirms that the declines in the number of course completions can be attributed to declines in numbers of domestic students. As shown earlier, the increase in overseas student course completions was over shadowed by the decline in completions by domestic students.

**Table 26 Course Completions 2002 – 2004: Information Technology by Sex and Citizenship Status**

Sex	2002	2003	2004	Growth 2002 – 2004	
				No.	Per Cent
<b>Female</b>					
Domestic student	2386	2244	2008	-378	-15.8%
Overseas student	2442	2751	2438	-4	-0.2%
<b>Female Total</b>	<b>4828</b>	<b>4995</b>	<b>4446</b>	<b>-382</b>	<b>-7.9%</b>
<b>Male</b>					
Domestic student	6756	6362	5907	-849	-12.6%
Overseas student	6503	7181	6995	492	7.6%
<b>Male Total</b>	<b>13259</b>	<b>13543</b>	<b>12902</b>	<b>-357</b>	<b>-2.7%</b>
<b>Total</b>					
Domestic student	9142	8606	7915	-1227	-13.4%
Overseas student	8945	9932	9433	488	5.5%
<b>Total</b>	<b>18087</b>	<b>18538</b>	<b>17348</b>	<b>-739</b>	<b>-4.1%</b>
<b>Female Per Cent of Total</b>					
Domestic student	13.2%	12.1%	11.6%	51.2%	
Overseas student	27.3%	27.7%	25.8%	-0.8%	
<b>Total</b>	<b>26.7%</b>	<b>26.9%</b>	<b>25.6%</b>	<b>51.7%</b>	

As course completions is an indicator which lags behind enrolments, it can be expected that the number will continue to decline into the future.

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## 7. Campuses: Where do Information Technology Students Study?

The analysis presented to this point of the study was undertaken using DEST's 'standard' data files, available *gratis* from their website (<http://www.dest.gov.au>). DEST also provides customised data sets to researchers with special research interests (for a modest fee). The analysis for this and the next chapter was undertaken using customised data sets held by Monash's Centre for Population and Urban Research. These data sets included information about each student's country of origin and the location of the campus at which they were studying. For inexplicable reasons, there were minor differences in the student counts for 2002 between DEST's standard and customised data sets<sup>5</sup>. These slight variations have been footnoted in the tables, as appropriate.

Post-massification universities are not restricted to conducting business at any particular location. Although most universities limit their activities to two or three locations, others teach further afield. University teaching can be conducted at both Australian ('on shore') and overseas ('off shore') campuses, and within Australia, universities are free (perhaps with some limitations) to establish campuses where ever they chose to do so. As is noted later, some regional universities have campuses in state capital cities.

In a sense, there is yet another category of 'study' which is neither on nor off shore. Some students pursue their studies by 'distance education', which means that they don't regularly attend any campus. Any analysis of where students study should consider this. As tables below show, not all universities operate according to the same 'model' of providing information technology teaching to their students. Although some universities teach information technology face-to-face, and exclusively at on-shore campuses, others combine teaching on shore, off shore and by distance education.

Table 27 provides an overall summary of where Australia's domestic and overseas are enrolled for their information technology courses, and whether or not they are campus-attending students ('internal') or are studying by distance education ('external'). The table reveals that:

- The population of information technology students was divided 51.9 per cent / 48.9 per cent between domestic and overseas students respectively. The overseas student proportion had increased from 40.1 per cent in 2002.
- Of information technology students, 9.7 per cent had been enrolled by distance education in 2005, down from 11.2 per cent in 2002. Slightly more domestic students were enrolled via distance education in 2005 and the proportion enrolled via distance education increased slightly between 2002 and 2005.
- Whereas about 25 per cent of overseas students were enrolled through off-shore campuses in 2005 (7,658 out of 31,001 enrolments), only 22 domestic students attended off-shore campuses. The proportion of overseas students enrolled through overseas campuses had risen from 16.8 per cent in 2002.
- The rate of decline in enrolment numbers was greater for domestic students. The overall decline in the number of domestic students was 13,538, or 28.8 per cent, compared with a more modest decrease (of 1,060, or 3.3 per cent) for overseas students. In fact, the number of internal, off shore, overseas students actually increased by 2,808 (76.4 per cent) between 2002 and 2005.
- The numbers of students enrolled in information technology courses by distance education fell across the board.

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<sup>5</sup> The differences between the two files are as follows: in 2002 overall there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

**Table 27 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments  
Campus attended by Citizenship Status**

Citizenship Status	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
<b>Overseas Students</b>							
<b>On Shore</b>							
Internal	24340	23739	24283	21896	34.0%	-2444	-10.0%
External	2316	2477	1759	1447	2.2%	-869	-37.5%
Sub total	26656	26216	26042	23343	36.2%	-3313	-12.4%
<b>Off Shore</b>							
Internal	3775	5521	5575	6535	10.1%	2760	73.1%
External	1630	1009	1693	1123	1.7%	-507	-31.1%
Sub total	5405	6530	7268	7658	11.9%	2253	41.7%
<b>On and Off Shore</b>							
Internal	28115	29260	29858	28431	44.1%	316	1.1%
External	3946	3486	3452	2570	4.0%	-1376	-34.9%
Sub total	32061	32746	33310	31001	48.1%	-1060	-3.3%
<b>Domestic Students</b>							
<b>On Shore</b>							
Internal	42030	39487	35089	29679	46.1%	-12351	-29.4%
External	4900	4754	4321	3697	5.7%	-1203	-24.6%
Sub total	46930	44241	39410	33376	51.8%	-13554	-28.9%
<b>Off Shore</b>							
Internal	6	17	13	16	0.0%	10	166.7%
External	0	0	1	6	0.0%	6	
Sub total	6	17	14	22	0.0%	16	266.7%
<b>On and Off Shore</b>							
Internal	42036	39504	35102	29695	46.1%	-12341	-29.4%
External	4900	4754	4322	3703	5.8%	-1197	-24.4%
Sub total	46936	44258	39424	33398	51.9%	-13538	-28.8%
<b>All Students</b>							
<b>On Shore</b>							
Internal	66370	63226	59372	51575	80.1%	-14795	-22.3%
External	7216	7231	6080	5144	8.0%	-2072	-28.7%
Sub total	73586	70457	65452	56719	88.1%	-16867	-22.9%
<b>Off Shore</b>							
Internal	3781	5538	5588	6551	10.2%	2770	73.3%
External	1630	1009	1694	1129	1.8%	-501	-30.7%
Sub total	5411	6547	7282	7680	11.9%	2269	41.9%
<b>On and Off Shore</b>							
Internal	70151	68764	64960	58126	90.3%	-12025	-17.1%
External	8846	8240	7774	6273	9.7%	-2573	-29.1%
Sub total	78997	77004	72734	64399	100.0%	-14598	-18.5%

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

Table 28 considers each Australian state / territory and the extent to which information technology students study away from their 'home' state / territory. As can be seen, the number and proportion of students enrolled at an institution in one state, but studying at a campus in a different state or overseas varies considerably. It should also be noted that the proportion of students studying elsewhere has increased since 2002. Between 2002 and 2005, the number of students studying at interstate campuses increased by 547, or from 5.4 per cent of the total to 7.5 per cent. Over the same period, the number studying at overseas campuses increased by 2,271, or from 6.8 per cent of the total to 11.9 per cent.

**Table 28 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments. 'Outflow' of Enrolments by State / Territory**

Campus Location	No.				Per Cent			
	2002	2003	2004	2005	2002	2003	2004	2005
<b>ACT</b>								
Same State Campuses	2192	2094	1713	1442	98.6%	98.9%	98.8%	99.3%
Interstate Campuses	0	12	21	10	0.0%	0.6%	1.2%	0.7%
Overseas Campuses	31	12	0	0	1.4%	0.6%	0.0%	0.0%
ACT Total	2223	2118	1734	1452	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	31	24	21	10	1.4%	1.1%	1.2%	0.7%
<b>New South Wales</b>								
Same State Campuses	17594	17178	15160	13637	86.1%	86.0%	85.0%	84.9%
Interstate Campuses	44	56	338	421	0.2%	0.3%	1.9%	2.6%
Overseas Campuses	2793	2750	2344	1995	13.7%	13.8%	13.1%	12.4%
NSW Total	20431	19984	17842	16053	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	2837	2806	2682	2416	13.9%	14.0%	15.0%	15.1%
<b>Northern Territory</b>								
Same State Campuses	349	287	209	173	100.0%	92.3%	94.6%	100.0%
Interstate Campuses	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Overseas Campuses	0	24	12	0	0.0%	7.7%	5.4%	0.0%
NT Total	349	311	221	173	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	0	24	12	0	0.0%	7.7%	5.4%	0.0%
<b>Queensland</b>								
Same State Campuses	13379	12623	11814	9843	75.4%	77.9%	76.8%	73.4%
Interstate Campuses	3789	3056	3173	3312	21.3%	18.9%	20.6%	24.7%
Overseas Campuses	587	521	396	261	3.3%	3.2%	2.6%	1.9%
QLD Total	17755	16200	15383	13416	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	4376	3577	3569	3573	24.6%	22.1%	23.2%	26.6%
<b>South Australia</b>								
Same State Campuses	3428	2949	2828	2686	97.1%	80.8%	80.1%	83.6%
Interstate Campuses	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Overseas Campuses	103	703	703	527	2.9%	19.2%	19.9%	16.4%
SA Total	3531	3652	3531	3213	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	103	703	703	527	2.9%	19.2%	19.9%	16.4%
<b>Tasmania</b>								
Tasmanian Campuses	1250	1261	1115	1021	99.8%	76.5%	50.1%	44.8%
Interstate Campuses	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Overseas Campuses	2	388	1109	1260	0.2%	23.5%	49.9%	55.2%
TAS Total	1252	1649	2224	2281	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	2	388	1109	1260	0.2%	23.5%	49.9%	55.2%
<b>Victoria</b>								
Same State Campuses	24799	24296	22450	18213	92.7%	91.7%	86.9%	81.4%
Interstate Campuses	451	493	1065	1088	1.7%	1.9%	4.1%	4.9%
Overseas Campuses	1498	1693	2316	3075	5.6%	6.4%	9.0%	13.7%
VIC Total	26748	26482	25831	22376	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	1949	2186	3381	4163	7.3%	8.3%	13.1%	18.6%
<b>Western Australia</b>								
WA Campuses	5625	5448	4933	4351	93.4%	92.3%	92.5%	88.6%
Interstate Campuses	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Overseas Campuses	395	456	400	562	6.6%	7.7%	7.5%	11.4%
WA Total	6020	5904	5333	4913	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	395	456	400	562	6.6%	7.7%	7.5%	11.4%
<b>Multi State</b>								
Same State Campuses	688	704	635	522	100.0%	100.0%	100.0%	100.0%
Interstate Campuses	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Overseas Campuses	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Multi State Total	688	704	635	522	100.0%	100.0%	100.0%	100.0%
Net 'Outflow'	0	0	0	0	0.0%	0.0%	0.0%	0.0%
<b>All States / Territories</b>								
Same State Campuses	69304	66840	60857	51888	87.7%	86.8%	83.7%	80.6%
Interstate Campuses	4284	3617	4597	4831	5.4%	4.7%	6.3%	7.5%
Overseas Campuses	5409	6547	7280	7680	6.8%	8.5%	10.0%	11.9%
<b>Total</b>	<b>78997</b>	<b>77004</b>	<b>72734</b>	<b>64399</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
Net 'Outflow'	9693	10164	11877	12511	12.3%	13.2%	16.3%	19.4%

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set

The incidence of Australian universities teaching through overseas campuses also varies across the sector. Table 29 summarises the distribution of the 7,680 information technology students studying at off shore campuses by university. The University of Tasmania now has the largest number of information technology enrolments at overseas campuses, followed by Monash and RMIT. The growth in information technology enrolments at Tasmania's overseas campus(es) has been spectacular. Monash and RMIT also increased their overseas campus information technology enrolments numbers over the period, in contrast with the experience of Charles Sturt University, Victoria University and the University of Wollongong. Growth notwithstanding, Monash and RMIT both had fewer off shore information technology students in 2005 than they had had in 2004. There is no doubt a rational explanation for Victoria University's volatile enrolment pattern of off shore information technology enrolments.

**Table 29 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments at Overseas Campuses by University (> 200 enrolments) (Ranked 2005)**

University	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
University of Tasmania	2	388	1109	1260	16.4%	1258	62900.0%
Monash	277	308	1046	950	12.4%	673	243.0%
RMIT	267	486	923	827	10.8%	560	209.7%
Victoria University	956	885	349	821	10.7%	-135	-14.1%
University of Wollongong	868	1080	822	709	9.2%	-159	-18.3%
Charles Sturt University	1329	892	796	492	6.4%	-837	-63.0%
UNSW	345	496	427	439	5.7%	94	27.2%
University of South Australia	46	629	604	422	5.5%	376	817.4%
Curtin	110	156	152	278	3.6%	168	152.7%
Edith Cowan	249	256	209	269	3.5%	20	8.0%
Swinburne				238	3.1%	238	
Deakin University				213	2.8%	213	
University of Newcastle			78	202	2.6%	202	
Other Universities	962	971	767	560	7.3%	-402	-41.8%
<b>All Universities</b>	<b>5411</b>	<b>6547</b>	<b>7282</b>	<b>7680</b>	<b>100.0%</b>	<b>2269</b>	<b>41.9%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set

Table 30 provides a distribution by university of information technology student enrolments at interstate campuses. The Central Queensland University (CQU) is by far the biggest provider of information technology teaching at interstate locations. In 2005, CQU had 1,798 enrolments at a Sydney campus and 1,301 in Melbourne. The University of Ballarat in the state of Victoria had 1,025 enrolments at a Sydney campus and 25 in Adelaide. The University of New England reported an increasing presence in Melbourne (352 enrolments in 2005), but at a campus located at '3001', which must be incorrect, because this is the postcode of GPO post office boxes.

Table 30 also shows enrolments in information technology courses by students studying within the same state as their regional university, but at the capital city of that state. For example, the regionally-located University of Ballarat had 1,024 students enrolled at a campus in Victoria's state capital Melbourne. It should be noted that these interstate (or capital city-located) campuses are almost exclusively for overseas students. For example, in the case of the University of Ballarat, in 2005 only one of the 1,200 students studying information technology at the Sydney campus was a domestic student; at the Melbourne campus, there were two.



**Table 30 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments at Interstate Campuses by University (Ranked 2005)**

University / Interstate Campus	2002	2003	2004	2005	
				No.	Per Cent
CQU (Sydney)	2123	1800	1770	1798	37.2%
CQU (Melbourne)	1533	1157	1277	1301	26.9%
Ballarat	451	474	1031	1045	21.6%
UNE			267	352	7.3%
JCU			50	160	3.3%
Victoria		16	29	43	0.9%
Other Universities	177	170	173	132	2.7%
<b>Total Interstate Campuses</b>	<b>4284</b>	<b>3617</b>	<b>4597</b>	<b>4831</b>	<b>100.0%</b>
<b>Capital City Campuses</b>					
Ballarat (Melbourne)	170	354	1003	1024	
CQU (Brisbane)	240	205	209	221	
CSU (Sydney)	183	213	205	168	

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set

Table 31 shows those universities that have information technology students enrolled by distance education. As can be seen, the overall number declined by nearly 30 per cent between 2002 and 2005, with three of the four biggest players in information technology distance education showing decreases of between 30.2 per cent and 43.1 per cent.

**Table 31 Higher Education Enrolments 2002 – 2005: Information Technology Enrolments by Distance Education by University (Ranked 2005)**

University	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	Per Cent	No.	Per Cent
Charles Sturt University	2351	2269	2151	1667	26.6%	-684	-29.1%
Uni. Southern Queensland	1686	1609	1777	1503	24.0%	-183	-10.9%
Monash University	1665	1548	1313	1132	18.1%	-533	-32.0%
Central Queensland University	1066	896	750	625	10.0%	-441	-41.4%
Deakin University	441	385	337	267	4.3%	-174	-39.5%
Edith Cowan University	367	195	175	256	4.1%	-111	-30.2%
University of New England	363	286	252	208	3.3%	-155	-42.7%
Southern Cross University	145	186	166	118	1.9%	-27	-18.6%
Murdoch University	138	134	111	105	1.7%	-33	-23.9%
University of South Australia	180	213	182	103	1.6%	-77	-42.8%
Curtin University of Technology	28	42	63	97	1.5%	69	246.4%
University of Newcastle	81	133	101	75	1.2%	-6	-7.4%
Other Universities	335	344	396	110	1.8%	-225	-67.2%
<b>Total</b>	<b>8846</b>	<b>8240</b>	<b>7774</b>	<b>6266</b>	<b>100.0%</b>	<b>-2580</b>	<b>-29.2%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

This chapter provided information at a detail not usually available from DEST's very broad published data. The pattern of off shore provision, and the incidence of students pursuing their studies by distance education is well known, and even the presence of university campuses in capital cities is also recognised. However, perhaps it is less well known that these campuses are the exclusive domain of fee-paying overseas students. This is certainly the pattern in the teaching of information technology.

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## 8. A Closer Look at Overseas Students in Information Technology

The aim of this chapter is to look at overseas students a little more closely by drilling down deeper into customised data in order to consider students' country of origin. As was the case for Chapter 7, the DEST data file used for the purpose was customised rather than the 'standard' format file which contained 88 fewer information technology students in 2002<sup>6</sup>.

The fact that overseas students' presence in information technology far exceeds their presence in other Fields of Education has been shown in several places. Table 27 in the previous chapter revealed that in 2005, overseas students represented 48.1 per cent of all primary course enrolments in information technology courses. This is about twice the representation of overseas students in university courses overall. Between 2002 and 2005, the number of enrolments in information technology declined by 14,598, but the number of overseas students represented only 1,060 of this decline. The majority of the decline in information technology enrolments is therefore very much the result of declining interest among domestic students. Table 27 also examined the distribution of enrolments by campus location and attendance mode. It showed that in 2005 the overseas student population comprised 23,343 on shore students (i.e., studying at Australian campuses) and 7,658 off shore students. Of these students, 1,447 and 1,123 were studying by distance education through on shore and off shore campuses respectively. The next few tables examine information technology enrolments for 2005 against a number of variables, based on campus location and attendance mode.

Table 32 summarises the 2005 overseas student population in information technology by country, showing whether students were at on- or off-shore campuses, and showing the numbers enrolled via distance education. As can be seen, there were far more information technology students from India (7,854 enrolments or 25.3 per cent of all overseas students) and China (6,321 enrolments or 20.4 per cent) than from any other country. There is a large numerical gap to third (Hong Kong, 2,711 enrolments or 8.7 per cent). It can also be seen that students from India are most likely to be attending on shore campuses. In fact over 98 per cent of Indian students are enrolled through on shore campuses, compared with about 70 per cent in the case of Chinese students (calculated from Table 32). Students from China, Hong Kong, Singapore and Malaysia are much more likely to be studying information technology at off shore campuses than are Indian students. Perhaps one reason for the relative paucity of off shore Indian students is that India is a relatively new 'market' in terms of Australian universities. Also, research by others has examined the propensity of overseas students from some countries to undertake their university studies in Australia in order to increase the possibility of acquiring permanent residence status in Australia (For example, see Baas, 2006).

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6 As noted in Chapter 7, the more detailed material on Information Technology student enrolments in Chapters 7 and 8 had to be prepared from customised enrolment files purchased from DEST. The differences between the two files are as follows: in 2002 overall, there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments. Tables have been appropriately footnoted.

**Table 32 Higher Education Enrolments 2005: Overseas students in Information Technology Courses by Country of Permanent Home Residence (Ranked by Country Total, 2005)**

Country of Permanent Home Residence	On Shore			Off Shore			All OS Students			
	Internal	External	Internal Per Cent of On shore	Internal	External	Internal Per Cent of Off shore	Internal	External	Total No.	Per Cent
India	7180	553	92.8%	114	7	94.2%	7294	560	7854	25.3%
China	4415	13	99.7%	1888	5	99.7%	6303	18	6321	20.4%
Hong Kong	1149	117	90.8%	1269	176	87.8%	2418	293	2711	8.7%
Malaysia	1004	287	77.8%	604	357	62.9%	1608	644	2252	7.3%
Singapore	650	133	83.0%	1042	423	71.1%	1692	556	2248	7.3%
Indonesia	1399	25	98.2%	183	7	96.3%	1582	32	1614	5.2%
Bangladesh	995	65	93.9%	5	1	83.3%	1000	66	1066	3.4%
Sri Lanka	518	2	99.6%	263	66	79.9%	781	68	849	2.7%
Thailand	510	10	98.1%	2	7	22.2%	512	17	529	1.7%
Vietnam	355	1	99.7%	131	0	100.0%	486	1	487	1.6%
Pakistan	362	5	98.6%	5	1	83.3%	367	6	373	1.2%
Taiwan	343	6	98.3%	1	0	100.0%	344	6	350	1.1%
Sth Korea	340	4	98.8%	1	0	100.0%	341	4	345	1.1%
Other Countries	2676	226	92.2%	1027	73	93.4%	3703	299	4002	12.9%
<b>Total</b>	<b>21896</b>	<b>1447</b>	<b>93.8%</b>	<b>6535</b>	<b>1123</b>	<b>85.3%</b>	<b>28431</b>	<b>2570</b>	<b>31001</b>	<b>100.0%</b>

Table 33 examines primary course enrolments in information technology by university, ranked by the total number of overseas student enrolments. The University of Southern Queensland, Monash and Charles Sturt University were the biggest players in the 'external' information technology student market. Together they had over 94 per cent of the external enrolments in information technology.

**Table 33 Higher Education Enrolments 2005: Overseas Enrolments in Information Technology Courses by University (Ranked by University Total, 2005)**

University	On Shore			Off Shore			All OS Students			
	Internal	External	Internal Per Cent of On shore	Internal	External	Internal Per Cent of Off shore	Internal	External	Total No.	Per Cent
CQU	3492	42	98.8%	188		100.0%	3680	42	3722	12.0%
Monash	2011	33	98.4%	322	628	33.9%	2333	661	2994	9.7%
Ballarat	2272		100.0%	25		100.0%	2297	0	2297	7.4%
RMIT	1304	1	99.9%	827		100.0%	2131	1	2132	6.9%
Wollongong	1174	1	99.9%	697		100.0%	1871	1	1872	6.0%
Tasmania	274		100.0%	1260		100.0%	1534	0	1534	4.9%
VU	552		100.0%	821		100.0%	1373	0	1373	4.4%
USQ	207	1144	15.3%				207	1144	1351	4.4%
UniSA	710	3	99.6%	422		100.0%	1132	3	1135	3.7%
Swinburne	738		100.0%	238		100.0%	976	0	976	3.1%
QUT	968		100.0%				968	0	968	3.1%
Deakin	738	9	98.8%	213		100.0%	951	9	960	3.1%
CSU	283	128	68.9%		491	0.0%	283	619	902	2.9%
Edith Cowan	560	7	98.8%	259	4	98.5%	819	11	830	2.7%
UWS	312		100.0%	439		100.0%	751	0	751	2.4%
UTS	735	1	99.9%				735	1	736	2.4%
Curtin	357	4	98.9%	278		100.0%	635	4	639	2.1%
La Trobe	558		100.0%				558	0	558	1.8%
Griffith	550		100.0%				550	0	550	1.8%
UNSW	486		100.0%				486	0	486	1.6%
Melbourne	464		100.0%				464	0	464	1.5%
Macquarie	422	2	99.5%				422	2	424	1.4%
Newcastle	180	37	82.9%	202		100.0%	382	37	419	1.4%
UNE	381		100.0%				381	0	381	1.2%
Adelaide	208		100.0%	104		100.0%	312	0	312	1.0%
Queensland	309		100.0%				309	0	309	1.0%
Sydney	296		100.0%				296	0	296	1.0%
James Cook	199		100.0%	72		100.0%	271	0	271	0.9%
Canberra	251		100.0%				251	0	251	0.8%
ACU	193	31	86.2%				193	31	224	0.7%
Southern Cross	70		100.0%	153		100.0%	223	0	223	0.7%
ANU	147		100.0%				147	0	147	0.5%
Murdoch	106	3	97.2%	14		100.0%	120	3	123	0.4%
UWA	113		100.0%	1		100.0%	114	0	114	0.4%
Flinders	112		100.0%				112	0	112	0.4%
Bond	88		100.0%				88	0	88	0.3%
Notre Dame	39		100.0%				39	0	39	0.1%
NTU	22		100.0%				22	0	22	0.1%
Sunshine Coast	8		100.0%				8	0	8	0.0%
ADFA	7	1	87.5%				7	1	8	0.0%
<b>Total</b>	<b>21896</b>	<b>1447</b>	<b>93.8%</b>	<b>6535</b>	<b>1123</b>	<b>85.3%</b>	<b>28431</b>	<b>2570</b>	<b>31001</b>	<b>100.0%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

Tables 34 to 39 examine country-based patterns among on-shore overseas students more closely. Table 34 shows the distribution of on-shore enrolments in information technology by country. The table demonstrates a varied pattern of enrolment expansion or decline for different countries. India was not only the major source of information technology on-shore enrolments, but was also the country from which expansion had been the greatest. In the few years from 2002 to 2005, on-shore enrolments from Indian students increased by 3,495, or 82.5 per cent. There was also considerable expansion in on-shore enrolments in information technology from China (an increase of 1,436 or 48.0 per cent), but on-shore enrolments in information technology by students from Indonesia, Hong Kong, Malaysia and Singapore all declined considerably over the period. The table also shows that students from India represented one-third of all on-shore information technology enrolments in 2005, followed by China with 19.0 per cent.

**Table 34 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence**

Overseas Students	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	%	No.	%
India	4238	4585	6938	7733	33.1%	3495	82.5%
China	2992	3214	3812	4428	19.0%	1436	48.0%
Indonesia	2779	2528	2029	1424	6.1%	-1355	-48.8%
Malaysia	2550	2428	2031	1291	5.5%	-1259	-49.4%
Hong Kong	2653	2611	2351	1266	5.4%	-1387	-52.3%
Bangladesh	1016	1170	1213	1060	4.5%	44	4.3%
Singapore	2476	2103	1124	783	3.4%	-1693	-68.4%
Sri Lanka	816	786	671	520	2.2%	-296	-36.3%
Thailand	828	759	609	520	2.2%	-308	-37.2%
Pakistan	646	479	392	367	1.6%	-279	-43.2%
Vietnam	432	448	417	356	1.5%	-76	-17.6%
Taiwan	655	569	492	349	1.5%	-306	-46.7%
South Korea	718	683	554	344	1.5%	-374	-52.1%
Other Countries	3857	3853	3409	2902	12.4%	-955	-24.8%
<b>Sub total</b>	<b>26656</b>	<b>26216</b>	<b>26042</b>	<b>23343</b>	<b>100.0%</b>	<b>-3313</b>	<b>-12.4%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

Tables 35 to 39 examine the major players in on-shore information technology enrolments for several individual countries and the universities those students are enrolled at.

Table 35 shows that Central Queensland University and the University of Ballarat are particularly favoured by on-shore information technology students from India. In fact, about half of on-shore Indian information technology students attended these two universities.

**Table 35 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – India**

University	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	%	No.	Per Cent
CQU	1191	889	1453	1975	25.5%	784	65.8%
Ballarat	252	425	1605	1871	24.2%	1619	642.5%
USQ	89	124	510	591	7.6%	502	564.0%
UniSA	32	54	181	332	4.3%	300	937.5%
RMIT	293	353	295	323	4.2%	30	10.2%
La Trobe	132	238	311	299	3.9%	167	126.5%
UNE		1	214	292	3.8%	292	
VU	269	337	364	281	3.6%	12	4.5%
Monash	345	405	415	284	3.7%	-61	-17.7%
Swinburne	269	369	278	183	2.4%	-86	-32.0%
Deakin	61	102	185	170	2.2%	109	178.7%
Griffith	180	142	134	163	2.1%	-17	-9.4%
CSU	71	50	73	130	1.7%	59	83.1%
Edith Cowan	71	80	107	108	1.4%	37	52.1%
ACU	164	159	139	105	1.4%	-59	-36.0%
Other Universities	819	857	674	626	8.1%	-193	-23.6%
<b>Total</b>	<b>4238</b>	<b>4585</b>	<b>6938</b>	<b>7733</b>	<b>100.0%</b>	<b>3495</b>	<b>82.5%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

Table 36 shows that on-shore information technology students from China spread themselves around a lot more. About on-third of these students were enrolled at the University of Wollongong, Monash or Central Queensland University, but overall, their distribution was more spread than was the case with students from India.

**Table 36 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – China**

China	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	% of Total	No.	Per Cent
Wollongong	475	417	495	669	15.1%	194	40.8%
Monash	279	335	453	534	12.1%	255	91.4%
CQU	380	350	360	396	8.9%	16	4.2%
RMIT	176	217	247	324	7.3%	148	84.1%
UTS	72	101	177	220	5.0%	148	205.6%
UNSW	317	270	235	214	4.8%	-103	-32.5%
Tasmania	9	25	56	148	3.3%	139	1544.4%
Adelaide	9	28	84	147	3.3%	138	1533.3%
Melbourne	87	123	124	145	3.3%	58	66.7%
Sydney	71	112	129	143	3.2%	72	101.4%
Macquarie	114	149	158	140	3.2%	26	22.8%
QUT	76	90	118	135	3.0%	59	77.6%
La Trobe	53	80	102	131	3.0%	78	147.2%
UniSA	63	75	79	104	2.3%	41	65.1%
Other Universities	811	842	995	978	22.1%	167	20.6%
<b>Total</b>	<b>2992</b>	<b>3214</b>	<b>3812</b>	<b>4428</b>	<b>100.0%</b>	<b>1436</b>	<b>48.0%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.



Numbers of on-shore information technology enrolments from students with permanent home residences in other countries are rather smaller. Tables 37 to 39 show that Monash University is a major provider of information technology to students from Indonesia, Hong Kong and Malaysia. Numbers of students from these countries declined over the period 2002 to 2005.

**Table 37 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – Indonesia**

Indonesia	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	% of Total	No.	Per Cent
Monash	610	523	409	273	19.2%	-337	-55.2%
RMIT	382	336	286	216	15.2%	-166	-43.5%
UTS	178	155	133	116	8.1%	-62	-34.8%
Other Universities	1609	1514	1201	819	57.5%	-790	-49.1%
<b>Total</b>	<b>2779</b>	<b>2528</b>	<b>2029</b>	<b>1424</b>	<b>100.0%</b>	<b>-1355</b>	<b>-48.8%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

**Table 38 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – Hong Kong**

Hong Kong	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	% of Total	No.	Per Cent
Monash	623	644	343	203	16.0%	-420	-67.4%
Swinburne	186	261	344	126	10.0%	-60	-32.3%
Other Universities	1844	1706	1664	937	74.0%	-907	-49.2%
<b>Total</b>	<b>2653</b>	<b>2611</b>	<b>2351</b>	<b>1266</b>	<b>100.0%</b>	<b>-1387</b>	<b>-52.3%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

**Table 39 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – Malaysia**

Malaysia	2002	2003	2004	2005		Growth 2002 – 2005	
				No.	% of Total	No.	Per Cent
USQ	601	593	475	335	25.9%	-266	-44.3%
Monash	525	484	343	188	14.6%	-337	-64.2%
Other Universities	1424	1351	1213	768	59.5%	-656	-46.1%
<b>Total</b>	<b>2550</b>	<b>2428</b>	<b>2031</b>	<b>1291</b>	<b>100.0%</b>	<b>-1259</b>	<b>-49.4%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

As noted earlier, information technology is one of the few Fields of Education in which female students are under represented. In 2005, women made up only 20.2 per cent of all enrolments in information technology courses (see Table 8). Engineering is the other major area of female under representation. Table 40 looks at on-shore enrolments in information technology by Country of Permanent Home Residence and Gender. The table is in rank order according to the proportion of enrolments by female students. As can be seen, India, the biggest player in the on-shore information technology market provides a relatively low proportion of the female students in information technology. The countries identified in the top half of the table (down to Singapore) have at least the system-wide average for female students in information technology.

## Study in Australia and the Permanent Residency

Recent studies have indicated that many overseas students subsequently seek permanent residency (PR) in Australia. Birrell (2007: 55) noted “the expansion in overseas student enrolments in the higher education sector appears to be driven by the interest on the part of overseas students wishing to obtain PR. This generalisation is based on evidence that most of the growth in overseas student enrolments in the higher education sector has occurred in courses which potentially lead to a PR outcome within two years and from students from countries with a high propensity to seek a PR visa”. Another study of the overseas student market by Birrell revealed that one-third of overseas students who completed their course in 2003 sought permanent residence (Birrell 2005). Statistics reveal that South Asian countries had the highest rates of permanent residency: Pakistan 67 per cent, Bangladesh 71 per cent, India 73 per cent and Nepal 77 per cent (Birrell 2005).

**Table 40 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – Female Proportion of all, 2005**

Country of Permanent Residence	Female	Male	Total	Female Per Cent of Total
Thailand	192	328	520	36.9%
Malaysia	378	913	1291	29.3%
Taiwan	95	254	349	27.2%
Indonesia	352	1072	1424	24.7%
China	1004	3424	4428	22.7%
Sri Lanka	110	410	520	21.2%
Other Countries	604	2298	2902	20.8%
Singapore	157	626	783	20.1%
Vietnam	69	287	356	19.4%
Korea S	66	278	344	19.2%
Hong Kong	198	1068	1266	15.6%
India	756	6977	7733	9.8%
Bangladesh	55	1005	1060	5.2%
Pakistan	8	359	367	2.2%
<b>Total</b>	<b>4044</b>	<b>19299</b>	<b>23343</b>	<b>17.3%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

Although not wishing to oversimplify Australia’s immigration requirements, in order to settle in Australia, most people from overseas are assessed according to a points system based on their age, language skills, qualifications and relative employment shortages in Australia. Additional points are available to applicants with Australian qualifications, and for those with an occupation on the Government’s MODL – the Migration Occupations in Demand List. People with occupations on the MODL receive an extra 15 points, and five points more if they have a firm job offer (Birrell, 2006: 56).

At least part of the reason for the popularity of information technology courses has been the fact that at one time, all information technology specialisations were on the MODL. However, the Government amends the MODL from time to time, in its efforts to match Australia’s skilled migration policy with labour market shortages. Kinnaird (2002: 58) reports that in June 2002, the number of computing professionals’ specialisations on the MODL was reduced from 26 to 12. Whereas student applicants with acceptable qualifications in a MODL occupation are highly likely to be eligible for a PR visa, many students completing several information technology specialisations might not earn enough points. An increase in the PR points ‘pass mark’ in 2005 has further eroded the ‘value’ of many information technology courses for obtaining PR.

The potential ‘drawing power’ of information technology is demonstrated in Table 41, which shows that the number of overseas students commencing information technology courses on-shore dropped considerably between 2004 and 2005. This downward trend is unlikely to be reversed in the foreseeable future.

**Table 41 Higher Education Enrolments 2002 – 2005: Overseas On-Shore Students in Information Technology Courses by Country of Permanent Residence – Commencing and Continuing Students**

Commencing / Continuing	2002	2003	2004	2005	Growth 2002 – 2005	
					No.	Per Cent
Commencing Students	12983	11213	12258	9086	-3897	-30.0%
Continuing Students	13673	15003	13784	14257	584	4.3%
<b>Total</b>	<b>26656</b>	<b>26216</b>	<b>26042</b>	<b>23343</b>	<b>-3313</b>	<b>-12.4%</b>

# Data for this table were generated from a customised data set purchased by the Centre for Population and Urban Research. In 2002 there were 88 fewer students on the customised data set, with variations between internal (+95) and external (-183) enrolments.

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## Conclusion

Over the period 2002-2005 when university enrolments grew by 6.8 per cent, from 896,621 to 957,176, information technology enrolments crashed by 18.6 per cent, almost a fifth, falling from 79,085 to 64,399. In fact the crash was greater among undergraduate enrolments which fell by 23.6 per cent, almost a quarter, from 57,596 to 44,022. Even more extraordinary in proportionate terms was the fall in graduate diploma enrolments by almost three quarters, from 6,524 to 1,827. This fall is masked in the 'other postgraduate' statistics by an increase in coursework masters enrolments of over 3,000, from 12,707 to 16,038.

These statistics are an interesting commentary on the potential volatility of a market driven higher education system. It raises questions about the effectiveness of market signals when in 2007 there is considered to be a skills crisis involving among other things a shortage of graduates in information technology.

The interest is sharpened by recently released DEST figures on 2006 enrolments which show the crash deepening. Information technology enrolments have fallen by a further 9000 from 2005 to 2006. The average rate of fall over 2002-2005 is about 5000 per year, so the rate of decline has almost doubled in 2006. Commencing enrolments for 2006 fell by 18 per cent from the previous year.

Gender is a distinguishing feature of the information technology student population. Female enrolments fell by around a third during 2002-2005 while male enrolments fell only 13 per cent. The proportion of female information technology enrolments consequently fell from 25 per cent in 2002 down to 20 per cent in 2005. This 20 per cent proportion of women in information technology contrasts significantly with university enrolments overall, where women are a majority 55 per cent and rising.

The study reflects on other aspects of the financial dynamics of the Australian higher education system. Real reductions in government funding for higher education have driven the sector to fund itself via fee paying overseas students. Almost 90 per cent of the 60,555 growth in enrolments was in international students, with their proportion growing from 21 per cent to 25 per cent during 2002-2005.

The information technology field of study makes a far greater contribution to this area than the average. In 2002 some 40 per cent of information technology students were from overseas. However, the decline of some 14,700 information technology enrolments over 2002-2005 includes only about 1,000 international students. With domestic enrolments declining dramatically and international enrolments declining only marginally the proportion of international information technology students has grown from 40 per cent to 50 per cent, so the proportion of international students in information technology is now twice that for the sector as a whole.

The statistics in Table 30 showed the extent to which some institutions have gone to capture a significant share of this market, in particular opening up interstate and capital city campuses for the purpose. Central Queensland University had by far the greatest number of students at such campuses, 1798 in Sydney, 1301 in Melbourne and 221 in Brisbane in 2005. The University of Ballarat had 1045 students in Sydney and 1024 in Melbourne. These campuses are almost exclusively for overseas students.

It may be possible that international information technology enrolments are no longer holding and are contributing to the accelerated decline noted above. At Monash, the university with Australia's largest number of information technology enrolments, the decline from 2002-2007 is nearly 5,000 of which about 3,000 are international students, bringing international students to about one quarter of their 2002 level, and domestic students to just over half.

The 2002-2005 enrolment statistics for information technology provide some examples of the interaction between immigration policy and the international student market. Rules affecting permanent residency eligibility were changed in the lead up to both the 2003 and 2005 academic years, and for each there is a notable decline from the previous year in commencing information technology international students; in 2005 it amounted to 30 per cent.

The international market for information technology students is highly concentrated with six countries providing 17,202 or about three-quarters of the 23,342 students studying on-shore in 2005. Of these India accounted for 7,733 and China for 4,428, with Indonesia, Malaysia, Hong Kong and Bangladesh ranging from 1,424 down to 1,060. Some of these countries have very high rates of permanent residency, such as India at 73 per cent. This may go some way to explain both the high level of enrolments in some countries

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(although not China) and the volatility of international student numbers in the face of changes to permanent residency eligibility.

The trends depicted in this report have caused major changes in information technology in Australian universities. Some information technology faculties have been closed and their teaching and research absorbed into other faculties. This leaves open the question of whether and how the tertiary sector will respond to the emerging skills shortage in information technology.

Likewise there remains the question of how the interstate and capital city campuses developed for interstate students will be managed in the face of such a precipitous fall in demand for information technology. Perhaps these campuses offer their owner institutions a greater degree of flexibility in shifting fields of education in response to changes in international student demand.

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