

## UNIVERSITIES AND THE IT CRISIS REVISITED

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*Shortages of professional IT workers are a major cause of concern for the future of Australia's IT industry. Though there has been a sharp increase in IT training at Australia's universities during the 1990s, more than half of this increase has been directed at overseas full-fee paying students. Only a minority of these full-fee paying students are utilising the new opportunities for permanent residence available since mid-1999. The appropriate policy response should be to increase IT training places for local students.*

This article revisits and updates some issues from our previous review of the IT skills crisis in December 1999.<sup>1</sup> It includes a response to claims by the Commonwealth Minister for Education, Training and Youth Affairs (DETYA), Dr Kemp, that our assessment of recent trends in graduations in IT courses was 'inaccurate and misleading'.<sup>2</sup>

To summarise briefly, the previous article argued that the Australian Government should allocate additional funds to universities for IT training specifically earmarked for undergraduate students who are Australian residents. We concluded that this was the appropriate Government response to the broad IT crisis at the universities level, based on our analysis which showed that:

- More than half of the growth in university IT graduate completions over the period 1992-97 was attributable to full-fee paying overseas students. Thus local Australian students (who could potentially go straight into the Australian labour market and help ease the IT skills crisis) comprised a minority of the recent growth in IT graduate output.
- Federal education funding policies at university level were mainly responsible for this state of affairs, because they encouraged growth in full-fee paying overseas students in IT in a

climate in which the total Government funding of university places for local students was declining. The only way universities could move resources into the training of local students in IT was by reducing places in other fields, which was not easy given the industrial ramifications involved in such reductions.

- As a consequence, analyses confined to overall growth in university level IT output exaggerate its impact on the supply of IT graduates to the Australian labour market. It was acknowledged, however, that changes to migration rules in mid-1999 had the potential to result in an increase in the number of applications for permanent residence from overseas student graduates in IT.
- While an increased supply of Australian-trained IT graduates from the ranks of overseas students would help ease the IT skills crisis, serious equity concerns remained because capable Australian students were unable to secure a place in some university IT courses without paying full fees. The scale of this unmet demand was not known precisely, but a DETYA-funded study of this was underway at the time.

This article looks again at these issues with the benefit of additional information

on IT enrolment and graduation patterns, on unmet student demand and the effect of the 1999 migration changes on the supply of IT graduates for the Australian workforce.

#### **OVERSEAS AND LOCAL STUDENTS IN AUSTRALIAN IT COURSES IN THE 1990S**

Sections of the Australian Government have insisted that Australian universities are responding well to the IT crisis. The Government's December 1998 Discussion Paper on *Skill Shortages in Australia's IT&T Industries* indicated that there was an increase of 139 per cent (from 2,100 to 5,100) in computing graduates over the 1989 to 1996 period.<sup>3</sup> For his part, the Minister for Education Training and Youth Affairs, Dr Kemp has put out a series of statements extolling the vastly increased output of IT graduates in Australia.

The earlier (December 1999) article on IT training at the university level argued that these optimistic statements were misleading. This was because our analysis of IT graduate completion data showed that 54 per cent of the growth in IT completions between 1992 and 1997 was attributable to overseas full-fee paying students.<sup>4</sup>

While growth in *total* IT completions (as defined in our article) in the period 1992-97 was 57 per cent, local student completions increased by only 31 per cent while for overseas full-fee paying students the growth was 290 per cent.

Dr Kemp subsequently responded to these statistics in April 2000. He claimed that Australian enrolment levels in IT were growing rapidly and that 'in the 10 years to 1999', Australian students accounted for '58 per cent of all additional graduations'.<sup>5</sup> Although he chose not to say so directly, Dr Kemp's

response in fact acknowledges that in the 1990s overseas students made up a very substantial part of the total growth in IT graduations from Australian universities. The only issue is whether overseas students made up *most* of the growth (as per our analysis) or slightly less (42 per cent according to his analysis).

The difference between Dr Kemp's figures and ours appears to be due to two factors: different definitions of what constitutes an 'IT course and IT graduate' and the different reference period for the 1990s (1992 to 1997 in our analysis versus 1990 to 1999 in Dr Kemp's). As far as we can tell, the definition of an IT course for both Dr Kemp and ourselves includes a common core (courses in field of study 0902 computer science, information systems). But Dr Kemp included some engineering courses (field of study 060206, which we did not). As to the reference period, data on 1997 completions were the latest available at the time we prepared our analysis.

It also needs to be remembered that the DETYA statistics on which our (and presumably the Minister's) analysis are based probably artificially inflate the real growth in IT graduate numbers, both local and overseas.

During the 1990s universities tended to 'rebadge' courses which contained a large IT component, but which were not carrying an explicit label as IT courses. In other words, some students training as computer professionals may not have been enrolled in a course 'badged' as in a field of study classified as IT, but rather in, say, a Bachelor of Science, in which they undertook an IT major. As graduates, these computer science professionals would not have been recorded as IT graduates. For example, the DETYA statistics on enrolments in IT for Melbourne and Sydney Universities would

give the impression that they had only started to teach IT to undergraduates in the latter half of the 1990s. Melbourne reported 266 bachelor level enrolments in IT in 1999, but none in 1990 or 1994. Similarly, at the University of Sydney, 299 enrolments were reported in 1999 but none in the early 1990s. It is therefore likely that the official IT course statistics exaggerate the growth in IT enrolments and completions.

As indicated, our main concern (which Dr Kemp has chosen to ignore) is that the apparent robust overall growth in university IT training in Australia does not look nearly so good when the *total* IT completion figures are disaggregated by local and overseas full-fee paying students. Indeed, in recent years, growth in overseas full-fee paying IT graduate numbers has *exceeded* that of local IT graduates.

We provide new data to those in our earlier study on IT completions during the 1990s in Table 1, updated to include 1998 completions. Here, the definition of 'IT' courses has been broadened to encompass both computer science and information systems and business/data processing (040502), which Dr Kemp's figures exclude. There is no universally agreed definition of what courses should be classified as IT courses but we believe there are valid reasons for including courses classified as business/data processing. These include the fact that the IT industry is itself leading the call for IT

graduates with business knowledge and capabilities, not just technical skills.

Table 1 shows that between 1989-93, overseas full-fee paying students made up 34 per cent of the total growth in IT graduate output. In the period 1993-98, the contribution of overseas full-fee paying students to the total growth in IT graduate output from Australian universities had almost doubled to 64 per cent, with local students comprising only 36 per cent. By 1998, overseas full-fee paying students made up 34 per cent of the total *annual* output of IT graduates from Australian universities, up from 19 per cent in 1993.

### RECENT IT COMMENCEMENTS

Dr Kemp's response to our previous article also claims that over the period 1990 to 1999, the number of local students commencing IT courses (as defined by DETYA) has increased rapidly, particularly recently. If this was the case then we could look forward to a significant increase in IT completions over the next few years. Table 2 provides information on commencing IT students for the years 1990 to 1999. The table shows that there was a sharp jump in IT commencements between 1998 and 1999, comprising a 20 per cent increase for local students and a 45 per cent increase for overseas full-fee paying students.

These numbers must be viewed with some caution, given the rebadging phenomenon described above. But they do

**Table 1: Number of course completions<sup>a</sup> in IT<sup>b</sup> by local and full-fee paying overseas students, 1989-93 and 1993-98**

	1989	1993	1998	Growth 1989-93	Share of growth (%)	Growth 1993-98	Share of growth (%)
Overseas	208	978	2,578	770	33.6	1,600	64.1
Local	2,588	4,110	5,007	1,522	66.4	897	35.9
Total	2,796	5,088	7,585	2,292	100.0	2,497	100.0

<sup>a</sup> Includes undergraduate and postgraduate completions.

<sup>b</sup> Includes students enrolled in courses reported by universities as field of study 0902 Computer Science, Information Systems and field of study 040502 Business Data Processing.

Source: DETYA aggregated data sets, 1989 to 1998

**Table 2: Commencements in IT in Science, IT and Business courses, 1990 to 1999**

	1990	1994	1995	1996	1997	1998	1999	Growth 1990-99	
								No.	%
Overseas	1,084	2,483	2,317	2,549	3,435	4,080	5,932	4,848	447.2
Local	9,060	8,696	9,502	10,643	11,039	11,274	13,531	4,471	49.3
Total	10,144	11,179	11,819	13,192	14,474	15,354	19,463	9,319	91.9

Source: DETYA aggregated data sets, 1990 to 1999

indicate that universities are beginning to expand their IT offerings, presumably in the case of local students, at the expense of other subjects. More analysis of where the cuts are coming is needed before celebrations begin. If these cuts are falling on science faculties, such an action would cut directly across current interest in promoting science teaching in Australia.

It remains the case, however, that the share of IT commencements coming from overseas full-fee paying students is still increasing and that an increasing proportion of the growth in the output of IT graduates is composed of these students. We also show below that the proportion of these overseas full-fee paying students who are applying for permanent residence is lower than has hitherto been expected. Given that the scale of growth in demand for IT graduates in Australia (discussed further below) appears to be dwarfing the supply of local graduates, the question of how to meet the demand is far from resolved.

For reasons elaborated in the conclusion, in our view, universities will have difficulty in expanding local IT training in a context where the Australian Government has capped the number of university places it is prepared to finance. We maintain that the appropriate policy response in these circumstances is for the government to allocate more funds to universities, but tied to expansion in places for local students in areas of national importance, including IT.

#### POSTGRADUATE COURSES IN IT

As indicated, universities have been left to decide for themselves as to how they respond to the IT crisis. The situation differs at the undergraduate and postgraduate level. At the undergraduate level, universities which have expanded their IT offerings have had to do so in a context of minor cuts to the total number of places funded by the Government. At the postgraduate level, however, Government policy has been to reduce sharply the number of funded places. If IT training was a priority, we should expect that postgraduate training for local students would be quarantined from this policy. But this has not been the case.

Postgraduate training in IT (at least, other than at the postgraduate research level) for local students is now conducted on a full-fee basis.

Further analysis of IT completion data by course level provides additional insights into the impact of Government funding decisions in shaping IT graduate numbers. Table 3 indicates that the local training outcome is much more serious at the postgraduate level than at the undergraduate level. Note that these tables also are based on our definition of IT courses, and cover the period 1993-98.

Table 3 shows that in the overall picture (undergraduate and postgraduate completions combined) 64 per cent of the growth in completions were by overseas students and 36 per cent by local students between 1993 and 1998. Yet, at the postgraduate level, overseas full-fee paying students accounted for 78 per cent of the

growth in IT completions compared to 59 per cent of undergraduate completions.

Local training at the postgraduate level has been far less than it would otherwise have been because of the trend in Government policy (in this case initiated by Labor) towards a requirement that postgraduate courses move to a full-fee basis. Initially this policy restricted the charging of fees for postgraduate courses aimed at people already employed who wanted to upgrade their qualifications. But during the early 1990s universities moved to charge fees (instead of HECS<sup>6</sup>) for an increasing proportion of postgraduate courses (other than research degrees). In the computing field this sometimes began on a cost recovery basis then moved to a full-fee basis similar to that of overseas students. A recent report on the equity implications of this policy change notes that the proportion of postgraduate courses in Computer Science in which fees were charged increased from 15.3 per cent in 1993 to 40 per cent in 1997.<sup>7</sup>

As a consequence, the number of commencements of local students in HECS-liable postgraduate courses in IT dropped sharply during the 1990s, particularly in IT courses at the graduate diploma level. Since the mid-1990s there has been a recovery in local commencements, mainly at the Masters by course work level, which has brought the number of commencements back to the level of the early 1990s.<sup>8</sup> This recovery may reflect a greater willingness on the part of employers to contribute to additional training for their employees. It may also reflect more favourable judgements by would-be students about the benefit/costs of taking postgraduate studies. The Gov-

**Table 3: Course completions in IT<sup>a</sup> by level of study and whether local or overseas student, 1993 and 1998**

	1993	1998	Growth 1993-98 (No)	% share of growth 1993-98
<i>Postgraduate</i>				
Overseas	330	870	540	78
Local	1,41	1,569	150	22
<b>Total</b>	<b>1,74</b>	<b>2,439</b>	<b>690</b>	<b>100</b>
<i>Undergraduate</i>				
Overseas	648	1,708	1,060	59
Local	2,69	3,438	747	41
<b>Total</b>	<b>3,33</b>	<b>5,146</b>	<b>1,807</b>	<b>100</b>
<i>Total</i>				
Overseas	978	2,578	1,600	64
Local	4,11	5,007	897	36
<b>Total</b>	<b>5,08</b>	<b>7,585</b>	<b>2,497</b>	<b>100</b>

<sup>a</sup> See Table 1.

Source: DETYA Integrated Data Sets, 1989-98.

ernment could argue that its user pays policy is beginning to work (though only at the postgraduate level because there have been next to no local undergraduate students enrolling as full-fee paying students in IT). Yet from the point of view of Australian employers desperate for a larger supply of highly trained IT specialists, the effect of the user pays policy has been that the supply of locals with postgraduate training in IT is no higher than it was a decade ago. There has been an expansion in the output of postgraduate IT numbers but mostly amongst full-fee overseas students.

Furthermore, the Government's policy is probably undermining efforts to improve access for some disadvantaged groups. The report cited above found that: ...the introduction of full fees was acting as a significant barrier to access, particularly for women and students from disadvantaged and rural backgrounds. ...A number of people could no longer afford to undertake courses that improved their professional competence.<sup>9</sup>

The decision to move to a full-fee basis for local students at the postgraduate level runs counter to the stated government policy of encouraging local IT

training. In this respect Australia contrasts starkly with some of the nations it would like to emulate in the promotion of IT industries. For example, in Israel, the funding formula for universities is adjusted to ensure the production of graduates required in new fields like IT and the biotech industry.

#### **UNMET LOCAL STUDENT DEMAND FOR IT COURSES**

Our previous article suggested that there was no lack of qualified students willing to take undergraduate IT courses and noted that a study was underway into unmet student demand. This study is now completed, though not yet published. It was conducted for DETYA by the South Australia Centre for Economic Studies (Adelaide and Flinders Universities). A series of four reports on this and other IT & T education issues have been provided to DETYA.

We understand from interviews with universities involved in the study that the main report by the South Australia Centre found, that in 1999, there was indeed unmet local student demand for IT & T courses at Australian universities. (IT & T courses were defined as those in the same fields of study as Dr Kemp's definition, detailed above.) The main report estimates that in 1999 there were around 2,000 to 2,500 Australian applicants for IT course places who were assessed as meeting all the entry requirements and equally capable of doing the courses as those accepted, but who were unable to gain entry.

These 2,000 to 2,500 local students unable to gain entry were equivalent to:

- around 17 per cent of all local students (14,900) commencing these IT courses in 1999; or
- about 12 per cent of the *total* number of students (20,200 local and overseas

students) commencing these IT courses; or

- around 45 per cent of the 5,500 overseas students commencing these IT courses in 1999.

The South Australian work confirms that, if the Government did increase the number of funded places to local students in IT, the universities would have no trouble finding willing and capable students ready to take them up.

#### **IT GRADUATES AVAILABLE TO THE AUSTRALIAN LABOUR MARKET**

Our recommendation that extra funded places be provided for local IT students makes sense only if employers need more graduate level staff and cannot get them from some other source. While there hardly seems much doubt that a serious IT specialist supply crisis exists, given the volume of industry complaints about staff shortages, we briefly review some recent evidence on the situation before exploring the potential supply of IT expertise from migration.

Table 1 showed that in 1998 (the latest completion data available), there were over 7,500 IT graduates in total from Australian university faculties of science, computing and business. These figures include those with bachelor degrees and postgraduates such as those completing graduate diplomas which may involve just one year of formal training on top of an undergraduate science or other degree.

Around 5,000 of these graduates were local students, most of whom according to recent Graduate Destination Surveys enter the computing labour market. The other 2,500 were full-fee paying overseas students, nearly all of whom in previous years have left Australia on completion of their course.

The figure of only 5,000 local IT graduates in 1998 is very disappointing when viewed against indicators of demand for computer professionals in Australia. It represents less than four per cent of the size of the computing professionals workforce in August 1998, as estimated by the Australian Bureau of Statistics (ABS) Labour Force Survey; and only around one half of the average growth recently of around nine per cent per year or some 10,000 people annually. (According to the ABS Labor Force Survey there were 142,500 persons working as computing professionals in May 2000 compared to only 111,700 in May 1997. This implies an average growth of about 10,000 per year.) Industry sources claim that far higher numbers will be needed over the next few years.<sup>10</sup>

With employment growth averaging some 10,000 per annum (before taking account of replacement demand to make up for those retiring, leaving the field or going overseas), it is clear that the supply of locally trained IT graduates (up to 5,000) is well short of the actual growth in IT employment. There is currently a net inflow of computing professionals from overseas, which recently has averaged just over 1,000 per year (see Table 4). Thus other sources of computing expertise must be being tapped.

The computing field is distinctive for the extent to which it draws on persons with training outside formal IT studies. This partially reflects the fact that it is not a 'registrable profession' in which entry is controlled by a formal accrediting authority and which requires a specialist university level IT course (as with law or medicine). Entry to professional level jobs may also occur through on the job

**Table 4: Net overseas migration of computing professionals, 1996-97 to 1998-99**

		1996-97	1997-98	1998-99
Arrivals	Permanent (settlers)	1,324	1,248	1,430
	Long-term resident	1,407	1,676	1,250
	Long-term visitor	989	1,389	2,257
	PLT <sup>a</sup> total	3,720	4,314	4,937
Departures	Permanent	438	549	690
	Long-term resident	1,567	2,076	2,132
	Long-term visitor	652	819	724
	PLT total	2,657	3,444	3,546
Net	Permanent	886	669	740
	Long-term resident	-160	-400	-882
	Long-term visitor	337	570	1,533
	PLT total	1,063	869	1,391

<sup>a</sup> Permanent and long-term

Source: Department of Immigration and Multicultural Affairs, unpublished, April 2000

experience, in many cases building on TAFE and private computing college training, the level of which has increased rapidly in recent years.

We are led to conclude that the shortfall between the recorded growth in employment of IT professionals and the introduction of new IT graduates into the workforce is being met largely by the reclassification of the current pool of persons with IT training (outside universities) and experience. Clearly, this is a situation that cannot be maintained if the predictions for IT job growth are to be fulfilled. The claims about shortages are compelling, as are industry assertions that if Australia is to be competitive in such a vital industry, it needs an increased flow of highly trained recruits. Australia's universities will have to be the main source of this additional training, since it is unlikely that overseas-trained IT professionals will be available in the numbers required.<sup>11</sup>

**WILL CHANGES TO MIGRATION RULES ATTRACT MORE OVERSEAS FULL-FEE PAYING IT GRADUATES TO STAY IN AUSTRALIA?**

The rapid expansion in overseas full-fee training described above is good news in

the sense that it adds to growth in the export of services and it provides universities with a valuable additional income stream. But its impact on the Australian labour market has been limited because in the past, the graduates were required to leave Australia, at least for a couple of years while they accumulated job experience. Since mid-1999, however, overseas full-fee paying students who graduate in IT and some other professional fields in demand in Australia have been encouraged to apply for permanent residence. They are given bonus points for Australian qualifications, and the previous requirement of two years work experience has been waived if they apply within six months of completing their course in Australia. The skill selection system has been structured such that those who hold university qualifications in occupations deemed to be 'in-demand' in Australia, (currently including IT professionals) are almost certain to be accepted for permanent residence.

In the previous article it was suggested that, on the basis of data on the number of applications for accreditation of qualifications in the IT area being received by the Australian Computer Society (ACS), the agency responsible for assessing these qualifications, many former full-fee paying overseas students in IT would utilise the new migration opportunities.<sup>12</sup> In order to apply for permanent residence an applicant must first seek accreditation of his or her qualifications then apply for migration. Subsequent investigation of the extent to which those seeking this accreditation actually apply for immigration indicates that the numbers will be less than first thought. DIMA has analysed the applications received from computing professionals for the year 1999-2000. This analysis shows that there were 1,153 IT

professionals who applied under the two points assessed categories (the Independent and Skills Australia Linked categories) and who achieved the required pass mark. Of these, 708 received the bonus points allocated for those with Australian qualifications. Just over one quarter (188 or 27 per cent) of this group of 708 were born in India, 92 in Hong Kong, 83 in Malaysia, with most of the rest born in other East and South-East Asian countries.

DIMA officials estimate that between 40 and 50 per cent of the 708 were recent graduates (that is, those who applied within six months of completing their course). The other 50 to 60 per cent were not recent graduates. Most of these would have applied after at least two years absence from Australia. Our earlier analysis showed that there were at least 2,500 full-fee paying overseas students who completed degrees in IT in 1999. It appears that only 300-400 (around half the 708) took advantage of the new immigration rules in place since mid-1999. This is a meagre harvest. It seems that many former full-fee paying overseas students in IT (and some other fields, including nursing) who are seeking Australian accreditation (as from the ACS) are doing so for the purpose of enhancing their employment prospects when they return home rather than for immigration purposes. This may not be surprising, given the good career prospects in IT in their home countries. One other factor is that even those former full-fee paying overseas IT graduates who take advantage of the new rules still have to leave Australia in order to apply for permanent residence, and can usually only return when the visa is granted. This may well be a disincentive to apply for migration.

We conclude that at present it seems

unlikely that the Australian IT industry can rely on a major boost to its ranks of Australian-trained graduates from the rapidly expanding numbers of full-fee paying overseas students.

### CONCLUSION

Our view remains that universities are unlikely to be able to provide the expansion in IT training which is needed to meet industry demand as long as present funding arrangements remain unchanged. In a context where the Australian Government has capped the number of university places it is prepared to finance, universities cannot expand local training without cutting enrolments in other areas. Such cuts may involve expensive redundancies as well as student and community protests from the affected areas. When universities gain no extra funded local places if they do embrace such a policy, why would they suffer this pain? On the other hand there is a major financial gain if extra places are provided for overseas full-fee students.

We maintain that the appropriate

policy response is for the government to allocate funding to universities tied to the expansion in places for local students in areas of national importance, such as IT. The exact amount of additional funding required for this purpose in IT is beyond the scope of this article. But if the number of additional IT places required for local students is currently around 2,000-2,500 annually (as found by the S A Centre for Economic Studies), on current Federal funding formulas of around \$10,000 per student place, this implies an additional IT allocation of around \$20-25 million per year.

This is a modest amount set against the national benefits for Australia of greater long-term IT industry growth. There are also important equity consequences of such a policy. It would open up opportunities for many Australian students who may otherwise miss the chance to enter an industry which offers great personal rewards as well as a chance to contribute to a more competitive Australian IT industry.

### References

- <sup>1</sup> B. Birrell, I. R. Dobson, B. Kinnaird and T. F. Smith, 'The IT workforce crisis: what is the solution?' *People and Place*, vol. 7, no. 4, p. 69
- <sup>2</sup> D. Kemp, Letter to the Editor, *Campus Review*, vol. 10, no. 14, 19-25 April, 2000, p. 12
- <sup>3</sup> Department of Communication, Information and Technology and the Arts, *Skill Shortages in Australia's IT & T Industries*, December 1998, p. 10
- <sup>4</sup> Birrell et al., *ibid.*
- <sup>5</sup> D. Kemp, Letter to the Editor, *op cit.*, p. 12
- <sup>6</sup> HECS is the acronym for Higher Education Contribution Scheme.
- <sup>7</sup> D. Anderson, R. Johnston and B. Milligan, *Access to Postgraduate Courses: Opportunities and Obstacles*, Higher Education Council, April 2000, p. 19
- <sup>8</sup> Data supplied by DETYA (unpublished).
- <sup>9</sup> G. Maslen, 'Report finds full fees proving a barrier for women to postgraduate courses', in *Campus Review*, July 12-18, 2000, (reporting on the findings of D. Anderson et al.)
- <sup>10</sup> See for example, *Australian Financial Review*, 17 August 2000
- <sup>11</sup> B. Birrell, 'Information Technology and Australia's immigration program: is Australia doing enough?', *People and Place*, vol. 8 no. 2, pp. 77-83
- <sup>12</sup> B. Birrell et al., *op. cit.*, p.72