Attrition and retention in Higher Education statistics in ICT

Report for ACDICT Executive 1/9/16 updated July 2018

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ACDICT Executive asked me to report on the availability or need for further statistics on attrition and retention. I recommend

1. The publicly available statistics in the DET Cohort report 2014 and 2015, with the 2014 Appendix 4 tables, are sufficient for ACDICT members to make comparisons and baseline their own performance.
2. ICT is the lowest performer of all disciplines on both versions of the statistics
3. Other evidence and analysis are in broad agreement with the trend shown in the graduation success rate, but there are sizeable unexplained gaps between the figures from diferent sources. Results and comparisons must be made with caution.

The revised 2016 Higher Education Standards Framework requires institutions to track rates of attrition of students in their courses. It will be useful for ACDICT members to know baseline figures against which to compare their institution's performance in educating ICT students, and ACDICT needs to know how attrition the ICT discipline as a whole stands against national performance. By comparing various sources of data and modelling we conclude that the IT field performs visibly worse than other fields, and the rate of producing graduates in IT is cause for concern. Different models and analyses however produce very different resulting measurements for success rates, and members must use great caution before making any comparison between universities' own measurements and DET reported statistics.

1. Significance of attrition and retention data
2. Attrition and retention for ICT: sources of data and analyses
3. Analysis and comment: Cohort study report 2014 (6 years tracking) and 2015 update (9 years).
4. Appendix: section from Robin King's ACDICT report

1. Significance of Attrition and Retention Data

The Higher Education Standards Framework sections 5.4 and 5.6 state

> The higher education provider maintains, monitors and acts on comparative data on the performance of students in the course of study, including information on the performance of student cohorts by entry pathway, mode of study and place of study, such data to include: student attrition; student progress; course completions; and grade distributions.
>
> The higher education provider is able to demonstrate appropriate progression and completion rates…

These requirements are on the provider, i.e. the individual institution, not the discipline. The most easily measured indicator of attrition is retention/attrition of students within the institution. DET describes this as the "normal" measure. This measure counts students who change to another institution as attrition, dropping out, even if they successfully complete their course of study at another institution. It is therefore a noisy indicator for a field such as Information technology regarded as a whole. More recent data includes tracking significant

numbers of students as they change institutions. DET describes this as the "adjusted" measure of attrition.
As ACDICT represents the ICT discipline we should are also be aware of retention and graduation success for students in ICT, even across changes of institution.

2. Attrition and retention in ICT: sources of data and analyses

The first question is what do we know about attrition and retention in IT higher education. Do we have enough evidence to state whether it is better or worse than other fields or the average for all fields?
Is there data or evidence to support institutions in making comparisons of their own performance?

Sources of data are in DET's annual reports, DET 2014 Retention and Progression Cohort study, 2015 Cohort update (published 2017) and DET data that ACDICT acquired specifically for ICT data up to 2013.

In 2014 ACDICT commissioned a report from Prof Robin King analysing Higher Education Statistics for IT, which included a section on attrition and retention. Some members of the council regarded its conclusions as contentious and asked for the report to be held back; an updated edition by Chris Johnson distributed in 2016 reduced this section. King's conclusion was that the success rate for IT bachelor students from entry to graduation was around 50%, based on reported retention data and a simple model of progression over three years, and commented that this figure should be a cause for concern. The updated report omitted the modelling from this section. It included arguments from a new cohort analysis from DET that tracked students from commencing higher education for periods of four years and six years, and indicated success (graduation) rates of 66% for all fields of study aggregated for 6 years of study. The very large difference of this overall figure from the modelled 50% in the IT field cast doubt on the validity of the modelling that was used for IT.
In detail, however, the cohort study also shows very low graduation rates for IT as a field of study: 38% (after 4 years), 57% (6 years), and 64% (9 years). This four-year figure is much lower than King's simple three-year estimate of 50%; and the four-year, six-year, and nine-year figures for IT show it to be the lowest of any field of study (for 6 years the nearest are agriculture, society and culture, engineering at 63%) (see below).

The various DET sources of data on retention are evidently difficult to reconcile, perhaps because cohort tracking introduces a difference of some 6 percentage points from the previous simple attrition measure. The public debate is likely to use data from the cohort study, and it is also richer enabling making comparisons over longer periods of study, and between fields of study (and between types of institutions, entry criteria for students, etc). For ACDICT's purposes I conclude that the King model is no longer required. The cohort model still has shortcomings, and may be flawed due to measurement distortion from the effects of students changing fields of study, but there is no available evidence to further refine this analysis.

Another alternative source of data is a comparison that can be made using input-output measurements. Using other DET data comparing the number of commencing IT bachelor students and the number graduating bachelor in IT three or four years later, also gives a

figure close to 50%. This is hard to reconcile with the cohort model that measures output but compares for individual students. The poor fit between this 50% and the six year graduation figure of 57% may be as good fit as we can get, given the changing intake numbers.

The second edition of the ACDICT report on Higher Ed Stats [Johnson 2016] had the following section on Attrition and Retention:

> **Bachelor degree annual success and retention rates [Johnson 2016]**
>
> The available data on retention and success rates year by year is difficult to reconcile with the recent report on cohort studies of success for students over the whole university sector (*Completion Rates of Domestic Bachelor Students - A Cohort Analysis, 2005-2013* <https://docs.education.gov.au/system/files/doc/other/cohortanalysis2005-2013.pdf>**.** The differences are as large as a measured 66% success in 6 years for the cohort study, against a 3-year modelled value of 50% from the year-by-year data for IT.
>
> The retention rate data are indicative of high attrition overall in IT, but using the retention rate data for modelling graduation rates evidently underestimates the actual rates for several reasons. The retention rates are based on aggregated overall enrolments. There is insufficient information to correlate this with the cohort study. The actual annual retention rates vary quite widely by institution, study pattern and students' basis of admission. They do not allow for students moving from one institution to another, for example, which has been included in the cohort study, nor account for the observed pattern of students reducing their intensity from full-time to part-time while completing their degree possibly over 6-8 years. The Australian Council of Engineering Deans reported on cohort retention data for engineering students in http://www.olt.gov.au/project-curriculum-specification-support-uts-2008. That study showed the limitations of drawing too much from the aggregated data, and also that the basis of admission plays a large part in predicting the likelihood of graduation.

Robin King's report in 2014 performed more analysis on attrition figures for IT students, and proposed a simple model of success from commencement to graduation three years later, under the reported rates of attrition for each year [see Appendix 1]. His overall conclusion is that approximately 51% of commencing IT students graduate or are still studying after 3 years. Interpreting this figure as "graduates" (assuming none remain as students) gives results that are confirmed by the DET statistics on numbers of commencing students and graduates: for example, the number of 2011 commencing bachelor IT students was 12,173, and the number of bachelor graduates in 2013 (an approximation to the same cohort, chosen by assuming that a three-year program is typical) is 6,302, giving a rate of 51.8%. But using these numbers is again simplistic, because many students take longer than the minimum three years to graduate, and the numbers are increasing. If the pipeline of student progression were in steady state this would not matter, and any year's graduating numbers would represent the combination of all previous cohorts. In a situation of numbers increasing over time as we have in IT in the last few years (showing an 14% increase in bachelor commencements 2009–2014), this model underestimates the actual rate of graduates compared to intake. The DET Completion Rates Cohort Study shows that graduation rates for a single cohort (all fields) average 46.6% after 4 years, 66% after 6 years, and after nine years, 73.6%. If IT student numbers are increasing over the years the

pipeline of those yet to graduate will also be swelling, and the number of graduates in any one year will underestimate the graduates yet to come from the preceding intakes.

3. Analysis and comment: Cohort study report

How do the annual retention rates for IT students (ranging over 68.3%-85.4%) compare to other fields of study? (is IT worse or better than others?)
The complement of the retention figures above is the "attrition" measure:

> *Attrition rate for year(x) is the proportion of students who commenced a bachelor course in year(x) who neither complete nor return in year(x + 1).*

To compare IT with the overall average we must combine the IT students male-female-domestic-international rates above into a single figure weighted by relative numbers in these groups – but we do not have these weights broken into full-time and part-time.
The range of possible values can be estimated by taking the numbers as if all were full time or all part time. Weighted for numbers in the categories male-female, domestic-international, the range of retention is from 79.3% (if all were full-time) to 70.1% (if all are taken to be part-time) for commencing students in 2012.
This corresponds to an attrition rate between 20.7% and 29.9%.

The comparative Australian Government DET Higher Education statistics for 2014 include Appendix 4, Attrition, Retention and Success for commencing students for 2001-2013, listing attrition for individual institutions and states aggregated across all fields of study.
The national rate is 18.67% attrition, for all commencing students. The variation is high: rates vary between institutions as one would expect, but also between the states. The mean for each of the five largest states range from 16.64 (Vic) to 20.83 (Qld). The lowest for any large university is 7% (Melbourne). [1]

Two measures are reported, one from an institutional viewpoint, the other for a student viewpoint. The number of students who change institutions mid-program has a marked effect on these attrition rates. The 2013 attrition rate for commencing students within the same institution is 20.84, but if students are also tracked between institutions using their individual CHESS identifier the attrition rate is only 14.79: that is, 6 percentage points of apparent attrition are accounted for by students who change to a different higher education institution. DET describes the former, larger attrition figure as the "normal" calculation, the student-tracking figure as "adjusted". For purposes of measuring educational academic success it seems desirable to use the adjusted rate, tracking individual students, rather than track same-institution enrolments. The latter may however measure institutional churn, perhaps indicating student dissatisfaction (or opportunism).
The Cohort Study reports for each field of study the rates of students, four, six and nine years from commencing, who have completed, are continuing to study, re-enrolled after first year but subsequently resumed dropped out, and who never returned after first year. For the four year period the rates of completion are around 36-37%. A better measure of actual progress requires a longer period, given that there are numbers of students who reduce intensity from full-time to part-time, completing degrees while working. In 2014 the

[1] Similar figures are reported in 2018, leading to comments from Minister Birmingham and veiled threats about future funding drivers: the implication is that higher levels of attrition means wastage of money and of student aspirations, and represents a failure by the university.

study reported progress over 6 years; in 2015 the reports went to nine years. There is a significant increase in completion over the extra three years in all fields. For the **six year** period the rates of completion in ICT were around 56%, after nine years, an additional 7% of students: see the following table extracts.

After 6 years (table A institutions) [cohort study 2014]

Year commenced	Graduated (within 6 years)	Still studying	Re-enrolled but dropped	No re-enrolment after first year	[2]+[3] *Graduated or still studying*
2005 ICT	56.1%	13.1%	18.6%	12.2%	69.2%
2006 ICT	55.4%	12.3%	20.0%	12.3%	67.7%
2007 ICT	56.0%	13.6%	18.7%	11.7%	69.6%
2008 ICT	56.6%	13.2%	19.3%	10.9%	69.8%

After 9 years (table A and B institutions) [cohort study 2015]

Year commenced	Graduated (within 9 years)	Still studying	Re-enrolled but dropped	No re-enrolment after first year	[2]+[3] *Graduated or still studying*
2005 ICT	63.2%	4.9%	20.8%	11.0%	68.2%
2006 ICT	62.5%	4.9%	21.5%	11.1%	67.4%
2007 ICT	63.8%	5.2%	20.3%	10.7%	69.0%

The variation between the cohort years here is small compared to the variation between ICT and other fields. Choosing one entry year as the basis for comparison, other fields have significantly higher rates of graduation or continuing to study:

After 6 years (from 2008, domestic students table A institutions)

Commenced 2008 After 6 years	Graduated	Still studying	Re-enrolled but dropped	No re-enrolment after first year	[2]+[3] *Graduated or still studying*
National average	*67.1%*	*11.3%*	*13.8%*	*7.9%*	*78.4%*
Physical sciences	70.8%	12.3%	11.5%	5.3%	83.1%
Engineering	62.0%	18.6%	14.5%	4.9%	78.6%
Management and Commerce	67.2%	11.3%	14.2%	7.4%	78.5%
Information technology	56.6%	13.2%	19.3%	10.9%	69.8%

After 9 years (from 2007, domestic students table A and B institutions)

Commenced 2007 After 9 years	Graduated	Still studying	Re-enrolled but dropped	No re-enrolment after first year	[2]+[3] *Graduated or still studying*
National average	*73.6%*	*4.1%*	*14.5%*	*7.8%*	*77.70%*
Physical sciences	77.6%	4.2%	12.8%	5.4%	81.80%
Engineering	75.7%	5.2%	14.4%	4.7%	80.90%
Management and Commerce	73.1%	3.9%	15.2%	7.8%	77.00%
Information technology	63.8%	5.2%	20.3%	10.7%	69.0%

Attrition for ICT is higher than other fields both in first year and in later year non-enrolment. The ICT figures for completion rate are the lowest for any field of study, by almost 6 points (below engineering, agriculture, society and culture). Even allowing for ICT students drawing out their studies by turning part-time, the combined number who have graduated or still studying after 6 or 9 years is 9 or 10 percentage points lower than the overall average or than other fields. The reason is seen here in the early years: while attrition for ICT is somewhat higher in first year (at 10-11% it is twice the rate of engineering), it is markedly higher in later years (19-20% versus 14-15%) (this is the category labelled "re-enrolled (after first year) but dropped").
This is evidence for a problem with ICT as a discipline. There is nothing in these figures to relate to any reasons in students, educators, institutions, or industrial opportunities.

King's conclusion from the earlier figures that attrition rates in IT are relatively higher than average is therefore borne out. I agree with his comment that this should be a matter of concern to ACDICT members.

Appendix 1

ACDICT King report 2014: Bachelor degree annual success and retention rates

The success rate is the proportion of courses (expressed as per cent) passed by a student in a given year. The following summary table shows the aggregated success rates for the last three years. Note that the part-time numbers may be quite small especially for international students, in these and the subsequent retention data. Commencing students with advanced standing are not in the first program year.

Annual Success Rates

	Domestic				International			
	male		female		male		female	
	full-time	part-time	full-time	part-time	full-time	part-time	full-time	part-time
For *commencing students*								
2011	75.1	64.2	79.2	64.6	77.5	74.1	84.0	78.6
2012	75.5	66.5	78.8	68.4	77.0	76.4	84.4	80.6
2013	75.2	66.1	80.9	72.8	75.3	74.3	82.5	74.1
For all students (commencing and continuing) (eg over 3-years of study)								
2011	79.7	72.2	83.4	74.0	81.5	78.8	88.6	80.4
2012	79.1	72.0	83.6	75.8	81.3	77.8	88.2	83.2
2013	79.0	71.8	83.7	76.4	81.6	77.8	88.2	80.6

Clearly these data do not change much from year to year.

- Part-time students' success rates are consistently lower than those of full-time students.
- Women perform consistently better than their male peers.
- The 'all student' rates are a few per cent higher than those of commencing students, demonstrating that once students are firmly in their program, they will tend to succeed.

Retention rates record the number of students who have graduated from a study year, or are enrolled in the subsequent year, expressed as a proportion of the latter as a percentage. The most recent validated data is the retention from 2012 into a confirmed enrolment in 2013, or graduation. The last three years of aggregated data are provided here.

Annual Rates for Retention in the Provider Institution

	Domestic		International	
	male	female	male	female

	full-time	part-time	full-time	part-time	full-time	part-time	full-time	part-time
For commencing students								
2010	81.2	64.1	83.4	55.6	89.0	82.7	91.8	81.1
2011	82.0	65.5	84.3	59.2	86.7	85.0	89.3	86.0
2012	81.7	64.2	82.4	65.9	85.4	85.6	91.1	85.5
For all students (commencing and continuing) (eg over 3-years of study)								
2010	83.9	66.1	84.5	65.4	83.5	73.4	83.2	73.4
2011	84.5	69.0	86.6	66.7	81.9	69.9	82.6	73.5
2012	83.7	68.3	85.4	68.8	81.6	71.4	83.6	71.2

Similar observations to those made on success rates can be made about these data. There is a causal relationship between retention and success: a student who does not succeed at least to some extent will not progress, although may choose to enroll in another program in the institution (as would be included in these data). Moves to another institution are not included.

Annual Rates for Retention in the Provider Institution and in IT

	Domestic				**International**			
	male		female		male		female	
	full-time	part-time	full-time	part-time	full-time	part-time	full-time	part-time
For commencing students:								
2010	75.2	60.3	70.2	48.8	87.3	82.2	89.3	81.1
2011	75.2	61.5	73.7	52.2	85.2	84.8	86.9	85.4
2012	76.2	60.9	72.1	62.8	84.1	84.1	89.7	85.5
For *all students (commencing and continuing (eg over 3-years of study)*								
2010	79.4	63.6	73.4	58.8	82.1	72.8	81.0	73.4
2011	79.0	65.7	78.6	61.2	80.6	69.6	80.6	73.2
2012	79.4	65.5	77.3	66.0	80.4	70.4	81.8	70.6

The differences between corresponding data in the last two Tables provide insight into the loss from IT into other discipline areas (in the same institution). The mean differences over the three years of data reported are:

Mean Differences between Retention in the Institution and Retention in the Institution and in IT

	Domestic				**International**			
	male		female		male		female	
	full-time	part-time	full-time	part-time	full-time	part-time	full-time	part-time
commencing	6.0	3.7	10.8	5.8	1.5	0.7	2.1	0.3
all students	4.8	2.9	8.8	5.1	1.4	0.7	1.9	0.5

It is not surprising that commencing students leave the discipline at higher rates than all students, and that international students appear more committed to their chosen program.

> [*cwj: note that this ignores possible flows the other way, from non-IT fields (such as engineering, science, maths, business) into IT, so the figures underestimate the true retention in IT.*]

These data indicate that women leave IT at a higher rate than their male peers, but continue to study. Given the high investment into recruiting Australian women into IT in many institutions, this ought to be addressed. The average retention rate in the institution and IT of about 72% for women enrolled full-time cannot be satisfactory.

These data allow estimates of overall completion (graduation) rates to be calculated. Assume the annual data applies to full-time students who entered a three year program in 2010. The overall rate of retention to graduation is the product of three annual rates.

Estimates for the Graduation Rate of Full-time Students in IT

	Domestic		**International**	
	male	female	male	female

Commencing to Year 2	75.2	70.2	87.2	89.3
Year 2 – 3	79.0	78.6	80.6	80.6
Year 3 - graduation	79.4	77.3	80.4	81.8
Overall estimate commencement to graduation	**50%**	**45%**	**53%**	**53%**

[*cwj note: the retention from third year combines graduates with those continuing to study into a fourth year. There are relatively few students in four-year IT programs, but many students switch to part-time study in their final years, as suggested by anecdotal experience and by the DET Cohort analysis. Together these cast doubt on interpreting this 50-53% figure as indicating the rate of graduates graduating.*]

Whilst such graduation rates underestimate the actual rates for several reasons, they are indicative of high attrition. The actual annual retention rates vary quite widely by institution, study pattern and students' basis of admission.

The retention rates are *not* based on cohort studies, but aggregated overall enrolments. They do not allow for students moving from one institution to another, for example. (The Australian Council of Engineering Deans reported on cohort retention data in http://www.olt.gov.au/project-curriculum-specification-support-uts-2008). That study showed the limitations of drawing too much from the aggregated data, and also that the basis of admission plays a large part in predicting the likelihood of graduation.) Nevertheless, knowing these national retention data (and their limitations) may be useful for informing future national debates on the performance of IT higher education. ACDICT members should also be familiar with their institutions' individual data.

References

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