

ATTRITION, COMPLETION AND COMPLETION TIMES OF PhD CANDIDATES

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Abstract

Attrition rates and time to completion of PhD candidates has internationally become a concern of governments, universities and the candidates themselves. Suggestions that attrition is too high and, for those candidates who do complete, enrolment times are too long were investigated. Two separate datasets were used, one based initially on all 1195 PhD enrolments between 1988 and 1999 recorded at one Australian university, the other based on 601 candidates submitting PhD theses during 2001-2003 at six Australian universities. Two measures of enrolment time were used – total elapsed time from first enrolment, and candidacy time in equivalent full-time semesters. It was found that 51% of 698 candidates who had the opportunity to be enrolled for at least four years successfully completed a PhD and that, after six years, 70% had successfully completed. For the one university included in both datasets, average candidacy time did not vary from 7.4 semesters over the time period of the mid 1990s to 2001. The median elapsed time was 4.4 years. A range of candidate, candidature, discipline and institution variables in multiple regression analyses including the six universities explained 39% of variation in elapsed time and 22% in candidacy time.

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BACKGROUND AND LITERATURE

The Research Training Scheme (RTS), introduced by the Federal Department of Education, Science & Training (DEST) in mid 2001, tightened the financial guidelines for direct governmental support of research higher degree candidature, raising concerns about degree completion and timeliness. There are two issues at the forefront of concerns by government, universities, postgraduate student associations and candidates themselves:

1. Candidate attrition during candidature resulting in non-completion of the degree, and
2. A longer-than-normal period of candidature, even though the extended candidature results in successful completion of the degree.

Attrition would seem to be of greater concern for both the candidate personally and the university, whereas extended candidature leading to completion may be seen as a problem only for the university, carrying financial penalties within the RTS. However, there clearly may also be financial and personal costs for successful candidates who take more time. Attrition and time taken to completion are closely linked in the literature and both are addressed directly in this paper.

There has been concern about research higher degree non-completion and time taken to completion at least since the 1980s in Canada, UK, USA and Australia (see, for example, Smith et al, 1993; Sheridan & Pyke, 1994; Kerlin, 1995a & 1995b; Holdaway, 1996; Haksever & Manisali, 2000; Lovitts & Nelson, 2000; Martin et al, 2001; Elgar, 2003). In some cases reported studies have focussed on attrition statistics, with some American attrition estimates for doctoral studies being far higher than 50 per cent (D'Andrea, 2002). However, some university estimates have suggested that attrition over the first several years of candidature is less than 40 per cent. (For example, the University of Arizona's published statistics indicate that 36 per cent of PhD candidates in the 1990s 'attrited' in their first six years of candidature.) Other studies have suggested that more than one third leave in the first year (Lovitts & Nelson, 2000, p.49). At the high end of the scale, some estimates based on cohort studies have been that doctoral candidate attrition overall may be as high as 85 per cent in the USA (D'Andrea, 2002). At the lower end, Colebatch (2002) suggested that completion rates for research degrees in Australia have increased considerably since the 1980s to between 80 and 90 per cent in the mid 1990s.

A recent study in Canada indicated that discipline area was important for completion, with completion rates varying from 45 per cent in arts and humanities to 70 per cent in life sciences, with science completions being generally in the high 60 per cent range (Elgar, 2003). For the U.K., completion rates after 10 years differed by general discipline area with arts/humanities rates being 51 per cent, and sciences cited at 64 per cent (Wright & Cochrane, 2000). For Australia, Martin et al (2001) estimated that 60 per cent of beginning doctoral candidates in 1992 would have completed successfully by 2003 (that is 11 years after initial enrolment), suggesting an attrition rate of 40 per cent. The same study also reported 'considerable variation' in completion rates between institutions and disciplines.

Apart from discipline differences that may exist, in the USA institutional arrangements have been found to be important for attrition, which ranged from 33 per cent in one university to 68 per cent in another (Lovitts & Nelson, 2000). This study also suggested that different departmental arrangements for graduate students within the one university may be the key to discipline differences in attrition found (pp.45-46), with two of the largest factors contributing to premature student departure being lack of integration into the department's intellectual and social community, and the organisational culture of the graduate school. Lovitts & Nelson also reported that the single most important factor for completion was relationship with a faculty adviser – students who completed being twice as likely to express satisfaction with faculty advisers (p.49). But the direction of any possible causal link here was undetermined. In the same vein, the most frequently-given reasons for non-completion of PhDs in the UK over a number of studies were problems with supervision (Haksever & Manisali, 2000).

Completion time for research higher degrees is calculated in a number of ways. One measure commonly used in the USA has been the time from completion of a bachelor's degree to completion of the graduate degree in question (Kerlin, 1995). This type of measure would not be appropriate in the Australian situation where, in some disciplines, there is an expectation that professional experience should be gained before proceeding with a research degree. A simple and more useful measure in our circumstances is elapsed time – that is the time from first enrolment in the research higher degree to completion of the degree. This measure has been extensively used, in part because usually it can be readily determined with a high level of accuracy (see Sheridan & Pyke, 1994). However, such a measure does not account for the nature of student enrolment (full-time or part-time) or any leave taken from studies during candidature. A variant on elapsed time is 'registered time' which excludes time before enrolment in the doctorate and any leave taken during the doctoral candidature (Sheridan & Pyke, 1994). More useful measures of completion time which recognise the nature of enrolment as well as any leave taken are more complex and elusive because the necessary information is often difficult to obtain – which perhaps explains why they have seldom been used. Part of the difficulty arises from the changing patterns of enrolment in research higher degrees, with individual candidates having a mix of full-time and part-time enrolment over the period of their candidature becoming more common, at least in Australia. Under the RTS it is the full-time equivalence of enrolment in a research higher degree that is important for student funding. For the measure of enrolment time used in these circumstances, leave is also excluded. This enrolment measure is referred to in this paper as 'candidacy' time, being the number of equivalent full-time semesters actually enrolled in the PhD degree, with part-time enrolment being counted as half that of full-time enrolment.

Whether total time or registered time was used to measure time-to-degree for doctoral students, it was suggested by Kerlin (1995) that the length of time taken had risen 'in recent years' in most disciplines.

Time of candidature measures aside, a pattern of relationships of a range of factors with successful research higher degree candidature has been identified over the recent past. An extensive review of research on attrition rates and completion times (Latona & Browne, 2001) found associations with improved completion rates for factors in three areas, namely institutional/environmental factors (including discipline

differences, candidature guidelines and a sense of belonging), supervision arrangements (feedback, meeting frequency, relationships, an early start and uninterrupted arrangements), and student cohorts and characteristics (entry qualifications, nature of enrolment, discipline differences and psychological factors). The following have also been found by others to be related to completion: entry qualification and age (Wright & Cochrane, 2000), gender and demands of outside employment (D'Andrea, 2002), providing direction and motivation, indirect help such as outside contacts (Haksever & Manisali, 2000), national citizenship (Sheridan & Pyke, 1994), having a scholarship and undertaking coursework (Smith et al, 1993). For Australia, Martin et al (2001) reported differences in completion rates by gender (females had a higher completion rate), age (very young and older students had lower completion rates), and study mode (full-time students had higher completion rate after seven years, but this would be expected with the 'normal' length of part-time candidature being up to eight years).

The focus in this brief review has been on doctoral candidacy and the PhD is the focus of this paper. Similar issues emerge for research masters candidates. Indeed for Australia, Martin et al (2001) estimated that masters candidates' completion rate was less than 50 per cent, that is it was markedly lower than that for doctoral candidates.

DESCRIPTION AND RESULTS OF THE INVESTIGATION

Information suitable for investigating PhD candidate completion and attrition rates, and relationships between candidature and completion times was available from two sources. First, completion and attrition data were available from one Australian university for 1195 candidates initially enrolled in a PhD between 1988 and 1999 with their status being determined in 2000. Second, candidature data were available for a total of 601 PhD candidates from another study who, over the period 2001-2003, had recently submitted a PhD thesis at one of six Australian universities (Holbrook et al 2001).

Candidate completion and attrition

There are basically three possible '**outcomes**' of a PhD candidature when data are extracted from university records: the candidate has **completed** the degree (defined in this study as submitting a thesis for examination¹), the candidate has **withdrawn** from study before completion (or has his/her candidature discontinued by the university, or transfers to another university), or the candidate is still **enrolled** in the degree. For a single Australian university, Table 1 indicates progression by early in year 2000 of the proportions of 1195 candidates in 12 cohorts who first enrolled in a PhD between 1988 and 1999 with each of the three 'outcomes' for periods ranging from 12 years to one year.

A marked rise in the numbers of candidates entering PhD studies at this university was evident over the 12 years. As would be expected, completion rates in 2000 were higher for candidates entering between 1988 and 1993 than in later years, ranging

¹ Submitting a thesis for examination was taken as virtually the same as successfully completing the PhD. Although revisions and even re-examinations were required in some cases, possibly delaying the degree award for one year, only one of the 601 candidates involved in the second dataset for this study subsequently was not awarded the degree.

from 57 to 91 per cent. As wholly part-time candidates enrolling from 1993 would not have completed even their funded candidature time at the beginning of 2000, the completion rates in the latter years are not a sound indication of actual completions that would take place over 'normal' candidature time. In addition 23 per cent had taken between one and six semesters of leave, which would also delay completion. Withdrawal rates tend to be about one quarter rising almost to 30 per cent for 1994 entrants. Although no more than 10 per cent of candidates entering before 1993 were still enrolled in 2000, as would be expected, the proportion still enrolled in 2000 rose quite steeply for those first enrolled in the latter years. This simple table of elapsed time provides basic information for candidate cohorts but is not a good measure of candidacy time because it fails to take into account the full-time/part-time nature of each candidate's enrolment and any leave taken.

TABLE 1: PhD CANDIDATE ENROLMENT STATUS IN 2000 BY YEAR OF COMMENCEMENT

YEAR COMMENCED	No.	COMPLETED %	WITHDRAWN %	ENROLLED %
1988	35	91	6	3
1989	44	77	21	2
1990	76	74	22	4
1991	74	73	22	5
1992	95	66	24	10
1993	96	57	20	23
1994	108	44	29	28
1995	105	45	15	40
1996	114	32	18	51
1997	170	14	11	75
1998	181	4	11	85
1999 *	97	0	1	99

* Clearly the enrolment data were incomplete for this year.

When attempting to provide reliable estimates for the successful completion rates of PhD candidates, there is a need to address issues associated with the type of information presented in Table 1. The first major issue is basically one of how much time can reasonably be allowed for completion to occur? In making such estimates, some of the relevant options of time to be allowed for completion are the DEST funded time (4 years or 8 semesters of equivalent full-time enrolment), candidature time before an extension is required (5 years or 10 semesters of full-time equivalent enrolment at the university providing the data in this case), or the whole period of enrolment, however long that is. Completion estimates for these three periods are shown in Table 2.

The first row of Table 2 was developed for the 698 PhD candidates who had completed or withdrawn within four years of full-time equivalent candidature, plus candidates who had completed four years and were still enrolled at the beginning of 2000. The second and third rows have a similar basis but use five and six years respectively as the cut-offs in identifying continuing candidates. These rows have somewhat fewer numbers because continuing candidates with less than the cut-off in each case have been excluded. The third row may also be taken as the 'whole period of enrolment' estimate, because there were less than 0.5 per cent of candidates still enrolled after six years of candidacy.

TABLE 2: PhD ENROLMENT STATUS AT THREE IMPORTANT TIME PERIODS FOR ENROLLED CANDIDATES

ENROLMENT PERIOD	No.	COMPLETED %	WITHDRAWN %	ENROLLED %
Up to 8 semesters (4 years) (within DEST funded time)	698	51	27	22
Enrolment of 9 or 10 semesters (within candidature time)	662	66	28	5
Enrolment of 11 or 12 semesters (normal end of all candidature)	648	70	30	0

From a national (DEST) funding perspective, 51 per cent of PhD candidates completed within the funded period of four years. But it should be remembered that, as many of these would have been part-time for at least some of their candidature, elapsed time may have been much greater. From the University's PhD regulation perspective which specifies candidature length as five years after which candidates are required to seek an extension of candidature, 66 per cent of candidates were successful. Perhaps it is more relevant from the candidate and supervisor's perspective that 70 per cent achieve a PhD within six years of candidature. It should also be noted that at least a few of the withdrawn candidates would not have discontinued their studies altogether but would have continued them at another university, so an unknown proportion of these transferring candidates would have successfully completed a PhD elsewhere.

The least desirable outcome of PhD candidature for all concerned is withdrawal, and the longer a candidate is enrolled before withdrawing the more damaging it is, financially and probably emotionally. Of the 30 per cent of candidates who withdrew overall, about one-quarter (26%) had withdrawn after only one semester, more than a half (53%) within two semesters, two-thirds (68%) within three semesters, and almost all (92%) within the first three years of candidature. The fact that two-thirds had withdrawn in the first year and a half suggests that attrition does tend to occur early in candidature, hopefully minimising both types of costs.

TABLE 3: COMPLETION RATES OF PhD CANDIDATES AFTER 5 YEARS BY BFOS

BFOS	Completed %	Withdrawn %	Enrolled %	Total N
Arts, Human & SS	47	41	12	119
Business	39	61	0	41
Education	56	42	2	64
Engineering	83	14	3	155
Health	73	24	3	135
Science	70	24	5	148
OVERALL	66	29	5	662

As discussed above, a large part of the candidate completion debate centres around the extent to which attrition rates differ by discipline area. When candidates who had completed, withdrawn or were still enrolled after five years were considered separately by the six Broad Fields of Study (BFOS) taught at this university, attrition rates did vary significantly ($\chi^2 = 76.62$, $df = 10$, $p < .001$). As shown in Table 3, of the 662 relevant candidates at that time the overall proportion of withdrawals was 29 per

cent, with a range from 14 per cent for Engineering to 61 per cent for Business. A little more than 40 per cent of the candidates in the Arts, Humanities & Social Sciences and Education BFOS had withdrawn, while slightly less than one quarter of candidates in the Health and Science BFOS.

Descriptive data on time to completion

For the same dataset, 455 of the 1195 PhD candidates enrolled between 1988 and 1999 had completed their degree by 2000. As shown in Table 4, the mean candidacy time for these completing candidates was 7.4 semesters.² The six BFOS are shown in the table in ascending order of candidacy time (full-time equivalent semesters of enrolment). Education candidates had the shortest candidacy time, and Science candidates the longest. A Scheffe test following a simple analysis of variance indicated that there was a statistically significant difference (at the .05 level) between these two BFOS. Most of the other BFOS had a mean candidacy time of 7.5 semesters and did not differ.

Although this dataset provided useful information about completion and attrition rates of individual candidates described above, it was limited to one university and limited to candidates first enrolled by 1999. After allowing for part-time candidature and leave, most completed candidates had been enrolled before 1993. We turn now to the second dataset of 601 completed PhD candidates from six universities which included more detailed and recent information about candidates. However, the second dataset included only completed candidates and could not be used to estimate completion and attrition rates.

TABLE 4: CANDIDACY TIME (IN SEMESTERS) BY BFOS

BFOS	N	CANDIDACY TME (SEMESTERS)
Education	39	6.5
Business	17	6.6
Health	100	7.5
Engineering	129	7.5
Arts, Hum. & Soc.Sc.	62	7.5
Science	108	7.8
OVERALL	455	7.4

For the second dataset, the distributions of candidature times (elapsed and candidacy times) were checked. Two potential problems were evident. First, five of the 601 candidates had less than one year of elapsed time from initial enrolment to thesis submission or less than two semesters of candidacy time. It was likely that they had transferred from another university shortly before submitting their theses, but nothing of any previous candidature history was known. These five candidates were omitted from the analyses because essential information was lacking. Analyses were conducted with the remaining 596 candidates.

The distribution of elapsed time for the remaining 596 candidates was strongly positively skewed. Although their mean elapsed time was 5.0 years (the standard

² The distribution of candidacy time was approximately normal.

deviation was 2.0 years), the median value was only 4.4 years. One quarter had completed in 3.7 years and three-quarters had completed in 5.9 years.

The distribution of candidacy time was approximately normal, with a mean of 7.9 semesters (or almost 4 years) and a standard deviation of 1.9 semesters. One quarter had completed in seven semesters and three quarters had completed in nine semesters.

Clearly the nature of candidate enrolment, that is whether full-time or part-time, would have a major impact on elapsed time to completion of a PhD degree. But the enrolment picture is more complex than that simple distinction. Almost one-third of the 596 completing candidates across the six universities involved had a mix of full-time and part-time enrolment during their candidature. For these 596 candidates, 55 per cent of candidatures consisted entirely of full-time enrolments, 14 per cent were entirely part time, and 32 per cent had a mix of full-time and part-time candidature. To describe the nature of each candidate's enrolment, the percentage of full-time enrolment was calculated – for individuals this measure clearly ranges from 100 per cent to zero. The mean proportion of full-time enrolment across all 596 candidates was 74 per cent.

As shown in the first two columns of Table 5, the two BFOS Education, and Arts, Humanities & Social Sciences had the lowest proportions of full-time enrolment at 52 and 62 per cent (respectively), and they also had the longest elapsed times at five years or more. Engineering and Science had the highest proportions of full-time enrolment at 90 and 84 per cent (respectively) and had among the shortest elapsed times, both being less than 4.5 years. Health and Business also had shorter elapsed times.

TABLE 5: COMPARISON OF PROPORTION OF FULL-TIME ENROLMENT AND COMPLETION TIMES BY BFOS

BFOS (N) ¹	PROP OF FT ENROLMENT: MEAN %	ELAPSED TIME IN YRS: MEDIAN ²	CANDIDACY TIME (SEM): MEAN (MEDIAN) ³
Education (47)	52	5.0	7.2 (7.5)
Health (112)	75	4.2	7.5 (7.5)
Business (38)	67	4.0	7.7 (8.0)
Science (174)	84	4.2	8.0 (8.0)
Arts, Hum. & Soc.Sc. (126)	62	5.4	8.2 (8.0)
Engineering (58)	90	4.3	8.2 (8.0)
<i>Agriculture</i> (41)	77	4.4	8.3 (8.0)
OVERALL (596)	74	4.4	7.9 (8.0)

Notes:

1. The BFOS are listed in order of candidacy time.
2. The median value for elapsed time is shown in each case in preference to the mean in recognition of the skewed nature of the distribution.
3. As candidacy time distribution was normal, the mean is used. However, the median is also shown (in parentheses) for purposes of comparison with elapsed time.

Candidacy time for the major BFOS ranged from a mean of 7.2 semesters for Education to 8.2 semesters for Arts, Humanities & Social Sciences and for Engineering, and 8.3 semesters for Agriculture. It will have been noted that

Agriculture was included in the second dataset, but not in the first. Although Agriculture had the longest candidacy time, because of the relatively small number of candidates, its removal would make no substantial difference to the overall mean candidacy time.

Although there are clear differences between them, the results shown in both Tables 4 and 5 for the different datasets are generally consistent but different from the results for international studies which normally show Science as having the shortest candidatures and Arts and Humanities the longest. However, as indicated above, the measures of enrolment used in the overseas studies were more coarse, being either elapsed time or a similar measure.

The question of whether candidature times have changed in recent years can also be addressed by comparing candidacy times in the first and second datasets for the university for which completion times were available over two time periods. The 455 candidates in the first dataset who completed their PhD in the mid to late 1990s can be compared with the 101 candidates in the second dataset at the same university who completed a PhD in 2001. For all BFOS, the mean candidacy time remained consistent at 7.4 semesters over both periods, and there were no more than inconsistent and minor differences over this time for the various major BFOS.

Relationships between candidature characteristics and candidature times

Much of the previous research into candidature time also focussed on a range of information about individual candidates and their candidature that, singly or in combination, may be important for research degree completion times. The second dataset of 596 candidates described above includes a wide range of candidate, candidature and institutional information which can be tested for relationships to both elapsed and candidacy times.

Hypothesised causal relationships between a wide range of 26 candidate, candidature and institutional variables, and measures of candidature time (both elapsed time³ and candidacy time) were examined using multiple linear regression analyses. The list of potential explanatory variables available for these analyses is shown below with variables grouped as (1) candidate characteristics, (2) candidature characteristics, (3) discipline area (BFOS), and (4) University of enrolment.

1. Candidate characteristics

Gender

Age at commencement

Entry qualification (honours, research masters, coursework masters, other)

Local or overseas student

Whether a native English speaker

English proficiency

2. Candidature characteristics

Proportion of candidature that was full time

Whether fee paying

Whether a scholarship was held

Whether upgraded to a PhD during candidature

³ Owing to the skewed nature of the distribution of elapsed time, discussed above, this distribution was first normalised before being included in the regression analysis.

Semesters of leave taken

Whether change in supervision

Whether candidature problem was notified

3. Discipline area - Broad Fields of Study

Agriculture

Arts, Humanities & Social Sciences

Business (including Law & Legal Studies)

Education

Engineering (including Architecture & Built Environment)

Health (including Veterinary Science)

Science

4. University of enrolment

University 1 to University 6 inclusive

Elapsed time and candidacy time

First, all variables in the four groups were entered into two separate multiple regression equations as explanatory variables with elapsed time and candidacy time as the response variable in each case. A progressive backward elimination of variables with non-significant regression coefficients was undertaken. Using the 0.05 probability level for significance, it was found that a total of 11 explanatory variables were significantly related to one or both of the candidature time variables available – total time from first enrolment in the degree and submission of the thesis (called ‘elapsed time’), and time of enrolment in full-time equivalent semesters (‘candidacy time’). The lists of significant variables are shown in Table 6 in descending order of magnitude of standardized regression coefficients when elapsed time was the response variable.

When the variable groupings were considered in separate regression equations, it is of interest to note that, for both response variables, the set of candidature characteristics was the most important group, explaining almost 35 per cent of the variance in elapsed time and almost 10 per cent of the variance in candidacy time. Continuing with elapsed time as the response variable, candidate characteristics were next in importance (5%), followed by BFOS (4%) and finally University (2%). Shared variance resulted in 39 per cent of the total variance in elapsed time being explained when all the significant variables were included simultaneously. For candidacy time as the response variable, University of enrolment was second in importance (6%), followed by candidate characteristics (4%) and finally BFOS (1%). In this case the total variance explained in candidacy time by all significant variables was 22 per cent.

The relationships of each of the individual explanatory variables with the response variables are now described.

Proportion of full time enrolment. Being enrolled full time gives a shorter overall elapsed time, and it is clearly the most important variable for elapsed time. Other things being equal, it would be expected that part-time enrolment should take twice as long as full-time enrolment measured by time from first enrolment in the degree. But full-time enrolment results in a longer candidature time when measured in equivalent full-time semesters (that is, candidacy time). There is no obvious reason why this should be the case, except perhaps the possibility that many part-time candidates work on their theses for more than half a normal working week and many

full-time candidates work part-time, reducing the hours per week they have to work on their theses.

TABLE 6. STANDARDISED REGRESSION COEFFICIENTS OF EFFECTS OF PREDICTOR VARIABLES ON TWO RESPONSE VARIABLES: ELAPSED TIME AND CANDIDACY TIME

PREDICTOR VARIABLES	RESPONSE VARIABLES	
	Elapsed time ¹	Candidacy time ²
Candidature & other characteristics		
Proportion of FT enrolment	-0.471	0.227
Candidature problem notified	0.267	0.374
Scholarship held	-0.136	-0.137
Age at commencement	-0.146	-0.145
Native English speaker	0.112	0.112
Arts, Hum., Soc.Sc. BFOS	0.076	NS
University 5	NS	-0.311
University 2	NS	0.158
Semesters of leave taken	- ³	0.099
University 4	NS	-0.091
Female candidate	NS	0.076
Engineering & Architecture BFOS	NS	0.071
TOTAL VARIANCE EXPLAINED	39%	22%

Notes:

1. Time from first enrolment in the degree to submission of the thesis for examination.
2. Length of candidature in equivalent full-time semesters of enrolment (with periods of leave from candidature omitted).
3. Semesters of leave was not included as a variable in the regression equation with elapsed time as the response variable. Clearly any leave taken would add to elapsed time.

Candidature problem notified. Candidates who notified a problem during candidature took longer, in particular in candidacy time for which this was the most important explanatory variable. Many problems notified were related to expiration of the allowed period of candidature.

Scholarship held. Candidates who held a scholarship had shorter candidature on both measures. These candidates would, of necessity, be full-time students and would tend to have enrolled in the degree with more impressive entry qualifications than most other candidates. One might imagine that entering with higher qualifications should assist degree completion, but entry qualification did not have a unique contribution to completion time.

Age at commencement of candidature. On average, older candidates had shorter candidatures on both measures. They would also tend to be more often enrolled as part-time candidates.

Native English-speaker. Candidates who were native English-speakers had longer candidature. This is probably a counter-intuitive finding, given the language problems of many overseas candidates that are frequently documented and discussed.

Overwhelmingly, non-native English speakers would also be overseas students, either on scholarship or full-fee paying. Either of these latter characteristics would tend to lead the candidate to have a greater sense of urgency for completion and thus assist in achieving a shorter candidacy.

Arts, Humanities & Social Sciences BFOS. Candidates enrolled in this BFOS generally had longer elapsed time, although not a longer candidacy time.

There were also four variables that were related to candidacy time, but were not related to elapsed time.

University. On average, candidates at Universities 4 and 5 had shorter candidacy times and candidates at University 2 had longer candidacy times than candidates at the other three universities. It would be necessary to look closely at individual university candidature mix and enrolment policies in attempting to identify possible reasons for these between-university differences.

Semesters of leave taken. Candidates who took leave also had longer candidacy time. This was not expected, unless candidates were taking leave to assist completion when their normal candidature was in danger of expiring. If this were the case, perhaps leave should have been taken earlier by some candidates before time-related problems developed.

Candidate gender. Female candidates, on average, had a longer candidacy time than male candidates. Gender was not related to elapsed time. Gender is also clearly related to some BFOS, with majorities of female candidates in Education and in Arts BFOS, and a very small percentage of female candidates in Engineering. Further analyses of this finding are intended.

BFOS of enrolment. Candidates enrolled in the Engineering disciplines generally had longer candidacy time than candidates in all other disciplines. Engineering also had the highest proportion of full-time candidature (at 90%) compared with all other BFOS with a mean proportion of full-time candidature of 74 per cent.

Other BFOS

Of note here also is the lack of relationships between other BFOS and the length of candidacy time to completion. In particular, when the proportion of full and part-time candidature is taken into account, as it is in regression analysis, candidatures in Arts, Humanities & Social Sciences were not longer than candidatures in the natural sciences and average candidacy time in Education was shorter.

This finding runs counter to previous research and to popular belief, the latter probably fostered by the simple relationships between full/part-time candidature and BFOS. The point-biserial correlations between percentage of full-time candidature and each of the BFOS indicated significant negative relationships for two BFOS, namely Arts, Humanities & Social Sciences and Education (with coefficients of the order of -0.16 to -0.18), and two significant positive relationships, for two BFOS, namely Engineering and Science (with coefficients in the range 0.14 to 0.16). Clearly, the Arts, Humanities & Social Science and Education candidates were more often enrolled part time and the Engineering and Science candidates were more often enrolled full time.

DISCUSSION AND CONCLUSIONS

The most reliable estimates of completing and withdrawing candidates from the yearly cohorts of students enrolling in a PhD was 70 and 30 per cent (respectively) after up to six years of full-time equivalent enrolment, called 'candidacy' time. It should be stressed, however, that the estimate was obtained using information from only one university. Earlier studies (eg, Wright & Cochrane, 2000; Martin *et al*, 2001; Elgar, 2003) suggesting that a higher proportion of candidates in Arts and related areas withdrew than candidates in the Sciences were supported in this study.

Candidates first enrolling from 1988 into the mid 1990s in different discipline areas at the same university also differed in candidacy time, but not in the ways described in much of the literature which consistently suggested that Arts and similar areas had longer enrolment times than the sciences. In this study, Education candidates had the shortest candidacy time, Science had the longest, and times for Arts, Humanities & Social Sciences candidates were the same as those for Engineering. This result, for candidates generally completing a PhD throughout the 1990s at one university, was generally supported by the second dataset of candidates who completed their degree from 2001 to 2003 across six universities.

The results for the one university where completion times were available over a short time span also did not support another of the earlier findings that completion times were rising (Kerlin, 1995) – the overall candidacy time remained constant at 7.4 semesters from the mid 1990s to 2001.

Also from the second, more broadly based dataset reported in this paper, there were a number of variables found to be important for completion times for PhD degrees and, taken as a set, these variables explained considerable proportions of the variation in both elapsed time (39%) and candidacy time (22%). The most important group of variables in both cases were those related to candidature – particularly full/part time enrolment, notifying a problem during candidature, and having a scholarship, with taking leave also important for candidacy time. From these results we could suggest, in a simple world, that providing more scholarships would improve completion times, identifying and attempting to solve problems earlier would help (and perhaps also reduce the need for leave), and allowing a mix of part-time candidature, presumably not on scholarship, would assist with completion times. It is perhaps fortunate that those variables which, at least in theory are alterable, are also those that have the strongest relationships with completion times.

Candidate variables – age, whether a native English speaker, and gender – as another group of variables that are important for completion times, are not alterable. We can recognise some of the complexities of relationships between these variables and others such as discipline area, entry qualification and nature of enrolment when considering these candidate variables. But, apart from noting a strong indication that age is not a barrier to completion time and thus probably should not be a factor in research student selection, there is less of use to be learned here.

Relationships between the Broad Field of Study classification used to group discipline areas and completion times suggest a re-evaluation of the common 'wisdom' that science candidates generally take shorter times to complete PhDs than humanities candidates. Although as a result of being more often part-time candidates, Arts, Humanities & Social Science candidates have a longer elapsed

time, these candidates do not have a longer candidacy time than Science candidates. Engineering candidates, who are most often enrolled full time, do have longer candidacy times.

There clearly were differences in candidacy time between the six universities involved. The picture is complex with a range of differences between the universities undoubtedly being relevant for completion. For example, universities differed in discipline mix and therefore candidate gender, proportions of full and part time candidature, numbers of scholarship students, policy on taking leave, and proportions of native English-speaking candidates. Further work is intended to explore some of these interesting intersections of candidate and candidature characteristics, discipline area and university of enrolment.

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