

RELATIONSHIPS OF PhD CANDIDATE, CANDIDATURE AND EXAMINATION CHARACTERISTICS WITH THESIS OUTCOMES

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ABSTRACT

This paper provides information relevant to the increasing interest in studies of PhD candidates, candidature and thesis examination in Australia in the past five years. The introduction of the research training scheme and more general funding pressures on universities has meant that myths and claims about relative success of higher degree research candidatures are increasingly likely to drive university and government policies, without the benefit of supporting evidence. The paper provides data in support or denial of various claims made.

The characteristics of 804 completed PhD candidates across eight universities included here are age on commencement, gender, whether a scholarship was held, whether a local or overseas candidate, and English proficiency. Candidature information includes discipline, entry qualification, nature of enrolment, number of supervisors, and two measures of enrolment time – total elapsed time and candidature time expressed in equivalent full-time semesters of enrolment. Examination information consists of the number and locations of examiners, and the length of examiner reports. Thesis outcomes are assessed by examiner recommendations and the university's decision on the thesis. Relationships of candidate, candidature and examination characteristics with thesis outcomes are considered.

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Introduction

The picture of PhD candidates that most Australians would have in mind is perhaps a young male, fresh from his honours year. He would be undertaking full-time study with a view to taking up an academic career upon successful completion of his PhD and probably some post-doctoral research and tertiary teaching experience.

This person exists of course, but our national study of PhD candidates, candidatures and thesis examination suggests he is not the norm. This paper sketches our sample of 804 PhD candidates across eight Australian universities who submitted a thesis for examination between 2001 and 2004. We were conscious of possible differences by discipline area and collected information on candidates in each of the 10 DEST Broad Fields of Study. However, the very small numbers of PhD candidates in a few fields caused us to collapse these into some of the major fields. Thus Law and legal studies were incorporated with Business and Economics, Architecture was included with Engineering and the Built Environment, and Veterinary Science was included with Science and Information Technology. Where discipline is reported in this chapter we have used seven areas:

- Agriculture
- Arts, Humanities and Social Sciences
- Business and Economics (including Law)
- Education
- Engineering and the Built Environment (including Architecture)
- Health
- Science and IT (including Veterinary Science)

The distribution of the sample of candidates obtained, compared with the national distribution of PhD candidates in 2003 is shown in Table 1. It will be noted that the sample included proportionally less Arts candidates and more Science candidates than the national figures would suggest. Of course, here we are comparing completing candidates in the sample with ongoing candidates in the national statistics.

Although there was no significant difference between universities in the decisions made on PhD theses, we were aware of a few candidate and candidature differences between universities. There were three main groupings included in the sample of universities obtained. Three universities were of the Group of Eight, the second group consisted of two Innovative Research Universities (IRU), and one 'unaligned' university, and the third group was made up of two New Generation universities.

For the uninitiated, the Group of Eight may be otherwise described as the traditional (perhaps sandstone), research-intensive universities with the highest concentrations of PhD candidates, and thus were over-sampled so that we could more closely represent the population of PhD candidates in Australia. The IRU universities are newer institutions (although established pre-1980s) but with an explicit research thrust (sometime unkindly referred to as the 'wannabes'). The unaligned university is similar to the IRU universities in being of medium research intensiveness. The New Generation

universities are more recent again than the IRU group, having been established in the late 1980s out of the amalgamations of previous teachers and other higher education colleges. The New Generation universities can be considered as of low research intensiveness, and have considerably fewer PhD candidates than the IRU group. A small grouping of universities (ATN) with a technological focus was not represented in the sample. Again this group is similar to the IRU group in being of medium research intensiveness.

TABLE 1: DISTRIBUTION OF SAMPLE BY BFOS, COMPARED WITH THE NATIONAL DISTRIBUTION OF CANDIDATES

BFOS	UNIVERSITY								
	1	2	3	4	5	6	7	8	ALL
Agriculture Sample N (Sample %) National % 2003	0 (0%)	21 (21%)	12 (12%)	1 (1%)	4 (4%)	3 (3%)	0 (0%)	0 (0%)	41 (5%) 4%
Arts, Hum, SS Sample N (Sample %) National % 2003	20 (20%)	23 (23%)	15 (15%)	29 (29%)	22 (22%)	17 (17%)	29 (29%)	28 (27%)	183 (23%) 29%
Business, Law Sample N (Sample %) National % 2003	2 (2%)	20 (20%)	3 (3%)	4 (4%)	6 (6%)	3 (3%)	19 (19%)	21 (20%)	78 (10%) 9%
Education Sample N (Sample %) National % 2003	18 (18%)	7 (7%)	3 (3%)	11 (11%)	7 (7%)	4 (4%)	11 (11%)	23 (22%)	84 (10%) 10%
Engineer, Archit Sample N (Sample %) National % 2003	21 (21%)	1 (1%)	6 (6%)	0 (0%)	14 (14%)	16 (16%)	7 (7%)	6 (6%)	71 (9%) 11%
Health Sample N (Sample %) National % 2003	20 (20%)	8 (8%)	25 (25%)	15 (15%)	28 (28%)	17 (17%)	8 (8%)	10 (10%)	131 (16%) 14%
Science, IT, VetS Sample N (Sample %) National % 2003	20 (20%)	20 (20%)	36 (36%)	40 (40%)	19 (19%)	40 (40%)	26 (26%)	15 (15%)	216 (27%) 22%
ALL BFOS (N)	101	100	100	100	100	100	100	103	804

There are clear differences in the distributions of BFOS across the three university groups of differing research intensity (see Table 2). The high research intensiveness universities had proportionally fewer Arts, Business and Education candidates than the other universities and more Engineering, Health and Science candidates. The low research intensiveness group had a greater concentration of Business candidates than the other two groups. Where differences between universities were marked in terms of their PhD candidate or candidature characteristics, we have provided this information by university.

TABLE 2: DISTRIBUTION OF SAMPLE BY RESEARCH INTENSIVENESS

BFOS	RESEARCH INTENSIVENESS			ALL
	HIGH	MED	LOW	
Agriculture Sample N (Sample %) National % 2003	19 (6%)	22 (7%)	0 (0%)	41 (5%) 4%
Arts, Hum, SocSc Sample N (Sample %) National % 2003	54 (18%)	72 (24%)	57 (28%)	183 (23%) 29%
Business, Law Sample N (Sample %) National % 2003	12 (4%)	26 (9%)	40 (20%)	78 (10%) 9%
Education Sample N (Sample %) National % 2003	14 (5%)	36 (12%)	34 (17%)	84 (10%) 10%
Engineer, Archit Sample N (Sample %) National % 2003	36 (12%)	22 (7%)	13 (6%)	71 (9%) 11%
Health Sample N (Sample %) National % 2003	70 (23%)	43 (14%)	18 (9%)	131 (16%) 14%
Science, IT, VetS Sample N (Sample %) National % 2003	95 (32%)	80 (27%)	41 (20%)	216 (27%) 22%
ALL BFOS (N)	300	301	203	804

When the proportions for the research intensiveness categories across all BFOS were compared with national statistics, the high intensiveness group was under-sampled and the other two groups were over-sampled (see Table 3). The under-sampling of the high intensiveness group is particularly noted when the number of examiner reports obtained for analysis is considered rather than the number of candidates. As these universities used two rather than three examiners for each thesis, the proportion of examiner reports falls to 28 per cent of the total sample.

TABLE 3: DISTRIBUTION OF THE TOTAL SAMPLE BY UNIVERSITY RESEARCH INTENSIVENESS COMPARED WITH DEST NATIONAL STATISTICS

%	RESEARCH INTENSIVENESS			(Total No.)
	HIGH	MEDIUM	LOW	
<i>Sample (N)</i>	<i>(300)</i>	<i>(301)</i>	<i>(203)</i>	<i>(804)</i>
Candidate	37	37	25	
Examiner report	28	43	29	
National 1999*	53	32	14	~ 26,000
National 2003	50	35	15	~ 35,000

- The study was designed in 1999.

There was no relationship between the research intensiveness of universities and the decisions made on PhD theses. Although there were differences in length of candidature for individual universities (see below), there was no difference related to research intensiveness.

We now move to a consideration of personal characteristics of candidates then to aspects of their candidature and a little about their supervision.

Personal characteristics

We begin with average age of PhD candidates and the percentages of female candidates, noting differences by discipline area (see Table 4).

Candidate commencing age

When comparing average commencing ages by discipline, candidates in Engineering, Science, Agriculture and Health formed the youngest grouping, with ages in these disciplines ranging from 29 to 34 years. This first grouping overlapped with the second which included Health, Arts and Business (with an average age range of 34 to 37 years). The second group again overlapped with the third which included Arts, Business and Education (36 to 40 years). The differences between the three groups were statistically significantly different. The discipline areas with the largest variance in age were Arts and Health. Thus even for the Engineering and Science discipline areas, an average commencing age of 29 years suggests that the assumption that these candidates were fresh from an honours degree is largely untrue, and certainly much less likely to be the case for candidates in the other discipline areas.

Overall, the mean commencing age of candidates in the sample was 33.5 years. This compares with an approximate mean age for all commencing research doctoral students nationally in 2003 being approximately 34 years (DEST, 2006).

TABLE 4: CANDIDATE CHARACTERISTICS BY DISCIPLINE AREA

DISCIPLINE AREA *	Number of candidates	Average age at commencement (yrs)	Female candidates (%)
Agriculture	41	31.5	32
Arts	183	36.3	53
Business	78	36.5	27
Education	84	39.5	68
Engineering	71	29.0	16
Health	131	33.6	65
Science	216	29.3	45
OVERALL	804	33.5	47

- Abbreviated discipline area names are used in tables:
 Arts includes Humanities and Social Sciences
 Business includes Economics and Law and Legal Studies
 Engineering includes Built Environment and Architecture
 Science includes Information Technology and Veterinary Science

The university committee's decision on theses did differ significantly by the commencing age of candidates. Candidates who were required to revise and resubmit their theses for further examination were older (average age over 42 years) than all other candidates (average age 32 to 34 years). Given the large average commencing age differences

between the discipline areas described above, it was necessary to check for differences in examiner recommendation by discipline area to determine if this was a potential cause of the age difference found. But it was found that there was not a significant relationship between university committee decision and discipline area.

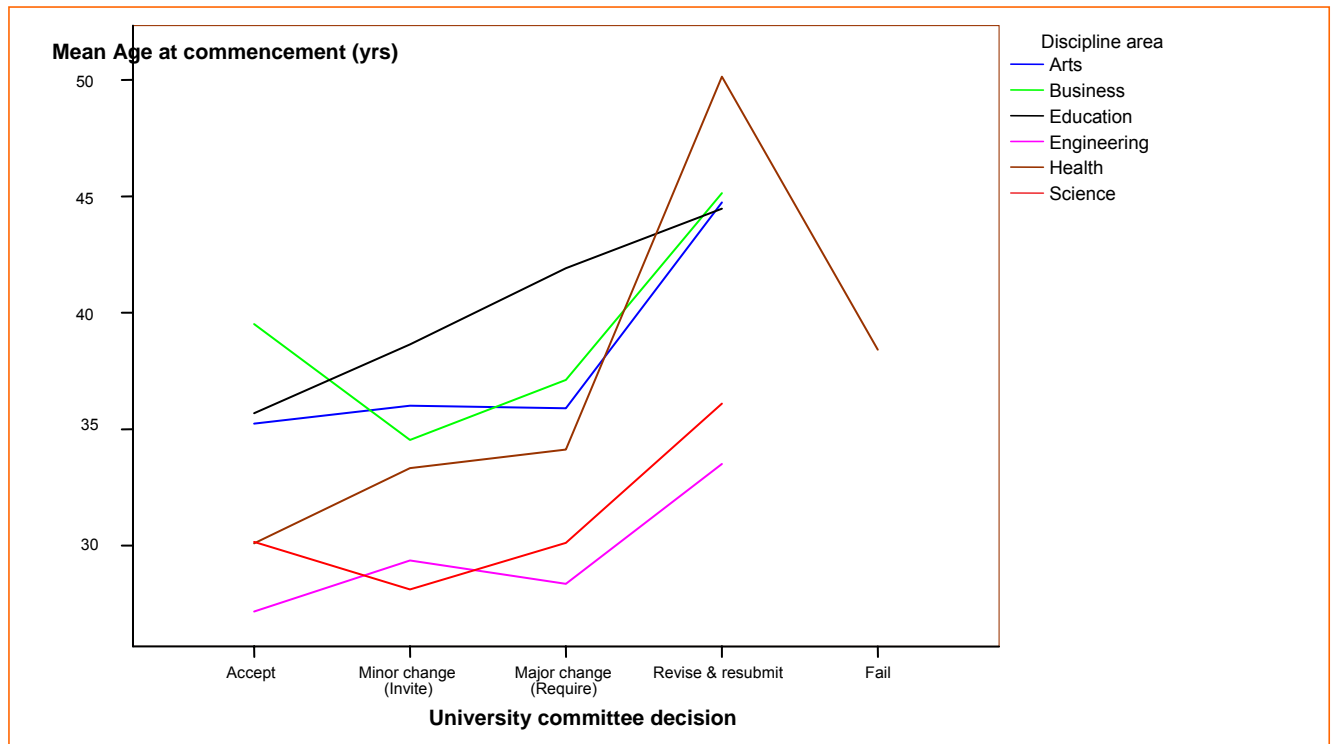


FIGURE 1: AGE BY DISCIPLINE AREA AND UNIVERSITY COMMITTEE DECISION

As shown in Figure 1, the proportions of candidates in Arts and in Science who were required to revise and resubmit their thesis (36% and 19% respectively) were higher than for the other discipline areas which generally ranged from 10 to 13 per cent. Arts and Science were also the discipline areas with the most candidates, so any relation between candidate gender in each of these areas and committee decision was investigated further. It was found that there was no such relationship for either area. So the final conclusion must be that there was a significantly higher proportion of older candidates who received a revise and resubmit decision on their thesis, and that the relationship was independent of discipline area. The line shown for the Health area shows the single thesis failure in the dataset, and should be disregarded when comparing thesis decisions by discipline areas.

Candidate age on commencement of PhD enrolment was related to candidacy time, with younger candidates taking more time in terms of full-time equivalent semesters of enrolment. Age was also related to type of enrolment (see below).

Candidate gender

For gender, differences were again significantly different between discipline areas. In particular, Engineering had by far the smallest percentage of female candidates (16%), and Education and Health had by far the largest percentages of females (of the order of two-thirds of their candidates). There was also a small majority of female candidates in Arts. Overall the gender balance was almost equal with 47 per cent of female candidates included in the sample. This compares with the national figure of females

constituting 49.2 per cent of commencing research doctoral students in 2003 (DEST, 2006).

When the relationship between the university committee decision on the thesis was compared by gender, there was no difference – in fact differences by gender were almost non-existent, including that gender was not related to length of candidature.

Other candidate information – local and overseas candidates

The proportion of overseas candidates across the sample was 17 per cent, and the range (12 to 18%) across universities was generally small with one exception. Of their 100 PhD candidates who submitted a thesis at the unaligned university, 34 per cent were overseas candidates.

Native English speakers constituted 78 per cent of the total sample. Across the eight universities, native English speakers ranged from 58 per cent at the unaligned university to 97 per cent at one of the new generation universities. The largest group of the non-native speakers (11% of all candidates) entered PhD candidature via the TOEFL/IELTS route, an additional 7 per cent through completing other English language tertiary studies, and 3 per cent met unspecified departmental/faculty English language requirements.

Neither of these variables was related to the university committee decision on the thesis, but were related to length of candidature, with Australian, native English speakers having longer candidacy times (a mean of 7.4 semesters compared with 7.1 semesters for overseas candidates).

Candidature characteristics

A range of candidature characteristics associated with entry to the PhD, type of enrolment, whether holding a scholarship and time of progress through to thesis completion are described in this section.

Entry qualifications of candidates

The most common entry qualification was the traditional one of an honours degree (46% of candidates). Again this varied across universities ranging from 27 per cent to 64 per cent. Two of the Go8 universities had higher proportions of entry via honours (59 and 64%) compared with the other universities, and the range was small for most of the remaining universities. The exception was one of the IRU group which had only 27 per cent of its PhD candidates entering through honours. The second most common entry qualification was a coursework masters degree (27%) followed by a research masters degree (17%). The exceptional IRU had 46 per cent entering through a coursework masters degree.

Although there were small variations in the proportions of candidates receiving different decisions from the committee related to their entry qualification, these were not statistically significant. However, entry qualification was related to length of candidature with those entering through honours taking longer (7.8 semesters compared with 7.2 semesters for research masters and 6.8 semesters for other candidates).

Type of enrolment

The 'typical' full-time PhD candidate throughout candidature was represented by 53 per cent of the sample. Candidates who were part-time throughout their candidature

constituted 15 per cent, and 32 per cent had been enrolled for a mix of full-time and part-time candidature. At almost one third, the mixed candidature group is sufficiently large and varied enough to suggest that we need a new measure of type of enrolment. The proportion of full-time enrolment is suggested as an appropriate measure – we suggest the proportion of candidature for which enrolment status is full-time. For this sample, the average proportion of full-time enrolment was 72 per cent, and was notably higher for the three Go8 universities (all more than 80%).

Approximately 7 per cent of candidates enrolled full-time for approximately half their candidature and, slightly more commonly, about 10 per cent had at least three quarters of their candidature full-time. The latter group probably consisted of at least two sub-groups: candidates who initially enrolled part-time in order to test the water or to strengthen their subsequent application for a scholarship, and candidates who were running out of time and who then enrolled part-time to stretch their candidature towards the end. There were probably others with mixed candidature who were being strategic by enrolling full-time when they needed to – perhaps during intensive experimentation or data collection, and in the final stages of writing up their thesis – and between these time they were working while enrolled part-time.

There was no significant relationship between the proportion of full-time enrolment and the university committee decision on the thesis. But there was a relationship between type of enrolment and length of candidature, with full-time candidates having longer candidacy times.

Holding a scholarship

Normally only full-time candidates receive PhD scholarships, and 59 per cent of the total sample held a scholarship for at least part of their candidature. In relation to the university committee decision on the thesis, 63 per cent of scholarship holders' theses required no more than minor correction compared with 55 per cent of other theses. The difference was significant and should be expected given that scholarships are awarded on merit. In most cases scholarships are awarded only to a group selected from among full-time candidates with first class honours or equivalent.

Given other relationships with length of candidature, it is not surprising that candidates who had held a scholarship had longer candidacy times (7.6 semesters compared with 6.9 semesters for those who had not).

Time to completion

We have written previously about the measurement of time to submission of a PhD thesis (Bourke *et al*, 2004), and presented argument that elapsed time from first enrolment to thesis submission is not a reasonable measure of time for PhD candidature. Elapsed time includes any leave that might have been taken and fails to distinguish between full-time and part-time enrolment. In terms of the resources, both staff and equipment, taken up by the candidature these should be distinguished.

Elapsed time

However, elapsed time remains of interest for universities because of the Research Training Scheme financial incentives to universities for completions. Clearly earlier completion is beneficial financially, and elapsed time is a useful measure of enrolment time for that reason alone.

Overall, average elapsed time was 5 years or 10.0 semesters, with a range across the eight universities from 9.1 semesters at one of the new generation universities to 11.1 semesters at one of the IRU group.

Candidacy time

For time to completion we have recommended a measure calculated as the number of equivalent full-time semesters enrolled, and called it candidacy time. In this, part-time enrolment counts as one half of full-time enrolment, and any leave is not counted at all.

Mean candidacy time for the sample was 7.9 semesters and ranged between 1 and 18 semesters, with 12 candidates having had less than 3 semesters. These 12 candidates had transferred from another university. There were also 13 candidates who had more than 12 semesters of full-time equivalent candidacy. Although candidacy time was not related to the university committee decision on the thesis, there were some differences in candidacy time by university and by discipline area.

Candidacy time by university

As a total group, candidacy time was not related to university attended. One of the IRU group and one of the Go8 universities had the shortest average candidacy times of 7.4 and 7.5 semesters respectively. Another Go8 university had the longest average time at 8.6 semesters. These universities were the only ones that were significantly different from one another with respect to candidacy time.

Candidacy time by discipline area

Education had the lowest average candidacy time at 7.0 semesters, and Engineering the highest at 8.4 semesters (see Table 5). With the exceptions of Arts and Agriculture, the percentages of full-time enrolment for each discipline area matched candidacy time (again see Table 5), suggesting that part-time enrolment was more efficient in terms of use of university resources over the period of PhD candidature.

TABLE 5: DISCIPLINE AREAS BY MEAN CANDIDACY TIME (IN ASCENDING ORDER) AND PERCENTAGE OF EQUIVALENT FULL-TIME ENROLMENT

DISCIPLINE AREA	NO. CANDIDATES	CANDIDACY TIME (SEMESTERS)	% FT ENROLMENT
Education	87	7.0	49
Business	78	7.4	65
Health	131	7.6	73
Science	216	8.1	83
Arts	180	8.2	67
Agriculture	41	8.3	77
Engineering	71	8.4	87
ALL DISCIPLINES	804	7.9	72

Over all disciplines, the average candidacy time was 6.3 semesters for students whose whole period of PhD candidature enrolment was part-time, 8.7 semesters for students whose candidature had been a mix of part-time and full-time enrolment, and 7.8 semesters for students whose whole candidature had been full-time. These differences were statistically significant, and provide a further indication that intentional part-time enrolment is efficient, probably because part-time candidates put in more than the half the time and effort of full-time candidates, and that many of the candidates with mixed enrolments have moved from full-time to part-time enrolment because they were running out of time to complete their thesis.

Leave from candidature

There was considerable variation in the proportion of candidates being granted leave from their PhD candidature across the universities in the sample. The range was from 9 to 54 per cent, with a mean of 27 per cent of candidates being recorded as taking leave. In part, at least, this huge difference resulted from different university requirements and practices.

Clearly some universities had more demanding and/or more accurate systems of recognising and recording candidate leave. There were also a range of policies for granting and recording leave – some universities recognising only full semesters of leave, others half semesters, and some apparently weekly. There was no relationship between leave taken and the university committee decision on the thesis. However, candidates who had taken leave had longer candidacy times (8.5 semesters compared with 7.7 semesters for those who had not taken leave).

The reasons for leave recorded by universities are shown in Table 6. Where multiple reasons were given, only the first reason was recorded. Work commitment was the most common reason given, although taking an overseas trip was almost as common. The former was expected but the prevalence of the latter reason was a surprise. The fifth most prevalent reason (financial) could perhaps be reasonably added to work as a reason for leave because it is often related to the same issue.

TABLE 6: REASONS GIVEN FOR TAKING LEAVE: FIRST REASON GIVEN

REASON FOR LEAVE	NUMBER OF CANDIDATES	% OF TOTAL
Work	64	8
Overseas trip	56	7
Family	37	5
Health	25	3
Financial	11	1
Supervisor absence	3	0
Other	21	3
No reason recorded	6	1
TOTAL NUMBER TAKING LEAVE	223	28
NUMBER NOT TAKING LEAVE	581	72

Number of supervisors, supervisor experience and change

Number of supervisors

Each candidate had an average of 1.6 supervisors for each semester of their candidature, and the number of supervisors ranged from less than one to more than four for individual candidates. This figure was calculated by summing the total number of semesters each supervisor was associated with the candidate. In doing this, whether the candidate was enrolled as full time or part time semester-by-semester was ignored.

There were significant differences in the mean number of supervisors per semester between BFOS with Education candidates having the lowest average (1.4 supervisors) and Agriculture having the highest (2.0). There were also significant differences between universities, with one of the IRU having an average of 1.3 supervisors, two of the Go8 having 1.7 and 1.8 supervisors, and one of the New Generation universities having an average of 2.2 supervisors. The number of supervisors was not related at all

to the outcome for the thesis, but was related to candidacy time (on average, those with one supervisor taking 7.0 semesters and those with more taking 7.5 semesters).

Supervisor experience

Supervisor experience was recorded as having supervised more than five candidates to completion (very experienced), having supervised between two and five candidates (some experience) and having previously supervised no more than one PhD candidate to completion (inexperienced).

There were no significant relationships between supervisor experience and the committee decision on a thesis, or length of candidature. However, there was a significant correlation between the experience of any additional or replacement supervisors and length of candidature. For example, when a fourth supervisor was added (as happened with 40 candidates in total), a higher experience level of the additional supervisor was associated with longer candidature ($r = 0.317$). We have interpreted this as meaning that, in many of these cases, a more experienced supervisor was added for students who were having problems, either conceptually with their project or in finishing their thesis.

Candidates with more experienced supervisors took longer (mean candidacy time was 7.5 semesters) compared with candidates whose supervisor(s) had a little experience (7.0 semesters) and those with inexperienced supervision (6.3 semesters).

Supervision change

Supervision arrangements changed at least once during candidature for 30 per cent of candidates. However, a reason for the change was available for only two-thirds of these. Loss of supervisor, either through the supervisor leaving the university or the supervisor being on leave, accounted for most of these changes (see Table 7). There was no relationship between change of supervision arrangements and the university committee decision on the thesis.

Candidates who had experienced a change to their supervision arrangements, for whatever reason, had shorter candidacy times on average (6.8 semesters compared with 7.6 semesters for those who had not).

TABLE 7: CHANGE OF SUPERVISION: FIRST REASON GIVEN

REASON FOR CHANGE OF SUPERVISOR	NUMBER OF CANDIDATES	PERCENT OF TOTAL
No reason given	79	10
Supervisor resigned	61	8
Supervisor on leave	53	7
Candidate request only	13	2
Change of Department	10	1
Consultant expertise required	9	1
Change of topic	5	1
Supervisor promotion	2	0
Incompatibility candidate/supervisor	2	0
Other personal reason	2	0
TOTAL NUMBER WHO CHANGED	236	30
NUMBER WHO DID NOT CHANGE	555	70
TOTAL NUMBER OF RESPONSES	791	100

Candidature problems notified

Approximately one third of all candidates had an official notification of a problem recorded on their candidature file. Most of these problems (that is, 71%) had been notified by the candidate themselves. Of course there may well have been other problems that were not raised at all and other problems that were raised, either formally or informally, at department level but were not recorded.

By far the most common problem was related to a need to request an extension of candidature, presumably reasons given for such a request. The types of problems identified are listed in Table 8 in descending order of frequency. Following extensions and resources, supervision problems of one kind or another were experienced by about three percent of all candidates and about nine percent of the candidates with any kind of problem notified. There was a significant relationship between a problem being notified and recorded and the university committee decision on the thesis. For a thesis being accepted with no more than minor amendments, the difference was small (56% of cases when a problem had been reported, compared with 60% of theses in cases where this had not happened). However, when a problem had been reported during candidature, seven per cent of theses required re-submission, against only two per cent where a problem had not been reported.

As would be expected, candidacy times were longer when a problem had been notified varying between 8.5 semesters in this case to 7.6 semesters otherwise.

TABLE 8: PROBLEMS NOTIFIED CONCERNING CANDIDATURE:
(First problem only when multiple notifications)

PROBLEM TYPE	NUMBER OF CANDIDATES	% OF TOTAL
Need to extend candidature	110	14
Resources for study: lack or delay	32	4
Work commitments	19	2
Supervision problems: unspecified	18	2
Need to re-submit the thesis	15	2
Financial difficulties	9	1
Delay in supervisor feedback	7	1
Change of Dept: Organizational change	4	1
Change of Dept: Topic change	4	1
New publications changed the project	2	0
Other	5	1
Type of problem not recorded	42	5
TOTAL NOTIFYING A PROBLEM	269	34
NUMBER NOT NOTIFYING PROBLEM	531	67
TOTAL NUMBER OF RESPONSES	800	100

Thesis examiners

Of the eight Australian universities in the sample, two universities normally used two external, independent examiners, one was in transition during the data collection phase of this study from using three to using two examiners, and the remaining five universities normally used three examiners. In every case there was the possibility of additional examiners being used, particularly when there was disagreement between

examiner recommendations, although this was not common. The total number of examiner reports received for the 804 candidates was 2121, although not all were usable across all aspects of the study.

One of the most robust features of the Australian university PhD examination system is the common practice of using independent, external examiners for theses. With respect to independence, depending on the university, either two or three examiners provide independent reports on the thesis under examination. Although in a few cases it is possible that examiners confer before making their assessments of the thesis being examined, in most cases this does not occur either through examiner choice or because the identities of other examiners is not known until the examination process has concluded. With respect to examiners being external to the university, this removes suspicion that special treatment (either positively or negatively) may be given by an examiner who works with the candidate's supervisor.

A second strength is the high usage of overseas examiners. Almost half the PhD examiners in this study currently resided outside Australia. If we claim that our universities are internationally competitive this is one way to test such a claim. These features, separately and collectively, contribute strongly to the confidence one can place in the assessment of Australian PhD theses, and to the high regard in which these Australian theses are held internationally.

The proportion of Australian examiners overall was 53 per cent, ranging from 42 per cent for one of the research intensive universities to 62 per cent for the unaligned university. The second largest group of examiners was from the USA, constituting 19 per cent of all examiners overall and ranged from 13 to 23 per cent. There were smaller percentages of examiners from the UK (9%), Other Europe (7%), Canada and Asia (each 4%), New Zealand (3%) and Other countries (South and Central America, Africa, the Middle East, Papua/New Guinea, totaling 2%).

There were differences in examiner location between BFOS with the major differences being that Engineering candidates had a lower proportion of examiners located in Australia (45%), and a higher proportion of Asian examiners (8%). Health and Agriculture candidates had higher proportions of Canadian examiners (both 8%), and Agriculture also had higher and lower proportions of New Zealand and UK examiners (respectively 8% and 1%).

There were also clear differences in the level of examiner recommendations on theses made by examiners from different countries or regions. New Zealand and Australian examiners made less favourable recommendations (averaging between minor and major corrections being required) than examiners in Asia, Other Europe, the USA and Other countries (with recommendations averaging between minor corrections and accepting the thesis as submitted). Most notably, there was a significant difference in recommendations by examiners in the two largest cohorts – Australia and the USA, with examiners from the USA making much more favourable recommendations. For example, the Australian examiners required major corrections to more than twice the proportion of theses they examined compared with the USA examiners (36 % compared with 16%).

One possible explanation for this is that supervisors may tend not to expose what they consider to be weaker theses to overseas examiners, who they believe may be more demanding. This theory required testing. Theses that had been sent to at least one

examiner in each of Australia and the USA were identified, and the recommendations made (on a five-point scale) for each of these 152 theses by these two groups of examiners were compared using a paired-samples t-test. The difference, although not great in absolute terms, was statistically significant ($t = 3.35$, $df = 151$, $p = 0.001$) with the USA examiners making more favourable recommendations than Australian examiners made on the same set of theses. From this it may be concluded that there was no evidence of bias towards sending stronger theses to overseas examiners.

Length of examiner reports

The 2121 examiner reports ranged in length from one line to 1272 lines (although only 3% of reports were more than 400 lines), with a mean of 132 lines and a median length of 101 lines.¹ Report length was strongly related to the examiner recommendation ($r_s = -0.438$) with longer reports being associated with less-favourable recommendations. Examiners being critical of a thesis seemed to have more points to make in their reports and required more explanation and argument to support their criticisms than examiners who found relatively little fault with a thesis. On average examiners wrote 84 lines when recommending a thesis be accepted as submitted, but 222 lines when recommending a thesis be revised and resubmitted for further examination. Interestingly, the 15 examiners who recommended a thesis be failed outright wrote an average of only 178 lines, suggesting there was less to say in these circumstances than when a thesis was retrievable in the opinion of the examiner.

Considering the extremes, if we look at the 'top' 62 theses (151 examiner reports) the median report length was 67 lines. For the 40 'marginal' theses (107 examiner reports) the median report length was more than double this at 158 lines. Overall, it is clear that report length was closely related to thesis quality as seen by the examiners, and by the university committee making a decision on the thesis. But if there is a causal direction to this relationship, it could be only that weaker theses gave rise to longer examiner reports.

Other relationships with thesis outcomes

Another paper in this symposium takes up relationships between what examiners in different discipline areas write in their reports on PhD theses, and the relationships with their recommendations on the thesis (Holbrook *et al*, 2006). Earlier papers produced from this same set of studies have provided more general coverage of relationships between examiner comments and their recommendation (see, for example, Holbrook *et al*, 2004a, 2004b & 2004c).

In summary

The results reported above are summarized first in terms of relationships of candidate and candidature characteristics with thesis quality then length of candidature.

Thesis quality

With respect to the quality of the PhD thesis produced by each candidate, as judged by the examiners and the decision of the university committee charged with this responsibility, there was no relationship with discipline area, or type of university attended. There were also no relationships of quality with candidate gender, whether a

¹ It would be reasonable to prefer the median as a measure of central tendency in these circumstances.

native English speaker, qualifications on entry to the PhD program, whether enrolled full-time or part-time or a mixture of both, leave taken, number of supervisors, supervisor experience, and change to supervision arrangements.

However, there were relationships between thesis quality and whether the candidate held a scholarship (judged as higher quality), and whether a problem had been notified during candidature (lower quality), in the expected directions. Examiner location internationally was also related to examiner recommendation, with Australian (and New Zealand) examiners being the least satisfied with the theses they examined. We have argued above that the Australian PhD examination regime is clearly what might be termed 'world's best practice', based on examiner independence and externality.

Length of candidature

Relationships of candidate and candidature variables with length of candidature were much more common. Longer candidacy times were related to discipline, younger age, being a native English speaker, entering PhD candidature through an honours degree, being enrolled full-time, having held a scholarship, taking leave, having more than one supervisor, having more experienced supervision, having no change in supervision arrangements and having had a problem during candidature. However, many of these relationships were complex rather than simple.

Length of candidature in full-time equivalent terms was not related to the research intensiveness of the university attended and candidate gender.

With greater pressure on universities to improve the 'effectiveness and efficiency' of research training in terms of thesis quality, and candidate completion rates and completion times, there is increasing interest in possible or actual tightening of entry and selection requirements to PhD candidature. There is the accompanying danger that PhD selection may be based on preconceptions of the characteristics of candidates and their candidature, which may or may not be accurate. The intent of this paper has been to address this issue by providing information on candidates and some aspects of candidature based on a large-scale national study of 804 PhD candidates across all discipline areas at eight Australian universities in the early 21st Century.

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