PREDICTORS OF TIMELY DOCTORAL STUDENT COMPLETIONS
BY TYPE OF ATTENDANCE: THE UTILITY OF A PRAGMATIC
APPROACH

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Predictors of timely doctoral student completions by type of attendance: The utility of a pragmatic approach

Abstract
This paper analyses key indicators of timely doctoral completion. The aim is to inform the allocation of institutional resources in a manner which improves the likelihood of timely doctoral completions and highlights a process that can also be used for analyses of attrition and other key indicators of doctoral progress. The most important variable for timely completion was attendance (full- versus part-time), where in terms of full-time equivalent (FTE) years of study, part-time students were far more likely to complete quickly than full-time students. For the full-time students the key predictors of timely completion were residency, field of study and English-speaking background (ESB). Part-time students were more likely to complete in the standard target FTE time if they were younger and/or had an honours degree. However, when the target time is tightened the key predictors are field of study and ESB. This study confirms that there is considerable variation by discipline for timely doctoral completions. The pragmatic application and prospective test of the derived models present a variety of opportunities for research student administrators. For example, those full-time students scoring highly represented a concentration of timely graduates more than 7.5 times higher than the lowest-scoring group – almost an order of magnitude of difference.

Introduction
Time to completion of a higher degree by research (HDR) has been growing concern across many countries, including Canada, the UK, the USA and Australia (e.g. see Becher et al., 1994; Lovitts, 2001; Martin et al., 2001; McAlpine & Norton, 2006; Sheridan & Pyke, 1994).
Completion rates and times are also long standing concerns of national governments. In Australia, federal government concern with completion and the quality of the research experience can be traced back to the 1960s (Martin, 1964; West, 1998; Kemp, 1999). These concerns have grown as the increase in students undertaking doctoral degrees has quadrupled from 9,298 in 1990 to 37,685 in 2004 (DETYA, 1999; DEST 2005). In an effort to force universities to focus more closely on completions the research White Paper (Kemp, 1999) announced the far-reaching decision to include research student completions as a key measure in calculating the institutional research block grant and Research Training Scheme (RTS).

It can be argued that government focus on funding the products of research reflects a more market-based economic model of higher education research training (McCormack, 2004). However, at the same time, the labour market context presents alleged demographic challenges for the supply of academics in higher education (Booth & Satchel, 1995), despite, and yet due to, a substantially increased number of HDR students in the system. Subsequently, the literature has shown enthusiastic support for changes to postgraduate education, where even modest improvements in completion rates and time-to-degree would dramatically increase the number of doctoral graduates (Latona & Browne, 2001).

University priorities, plans and policies have subsequently focused their attention on trying to manage attrition rates, completion rates, time to completion and the quality of HDR supervision (Latona & Browne, 2001; McCormack, 2004). The key indicator of completion times implicitly reflects the rate of attrition of students and explicitly considers the time-to-completion for those students that do complete. Further, the financial and personal costs of either not completing or delayed completion represent substantial costs to the individual candidates (Bourke et al., 2004) as well as to universities. Thus, since the introduction of the RTS many universities have
tightly on their HDR student selection processes as a way of improving completion rates (Lovitts, 2001; Neumann, 2003), processes that almost represent a risk analysis approach to student selection (Manathunga, 2005; Neumann, forthcoming; 2003).

This paper presents a set of analyses that aim for a more supportive risk management approach focusing on the time-to-degree of doctoral students. The interpretation and application of the results will emphasise the development of customised support systems and seek to avoid the “selective admissions myth.” The selective admissions myth proposes that graduate schools and faculty believe “that the admission process identifies the best students and that attrition is minimal and based on the student’s choice not to continue” (Lovitts, 2001, p. 21, emphasis in original). That is, the selective admissions myth places the burden of responsibility on the student – not the university and faculty, even though the graduate school and dynamics of graduate study may be more at the heart of the completions problem (as argued by Lovitts, 2001). The aim of this paper is to inform the placement of institutional resources for improving the likelihood of timely completion of the doctorate and to highlight a process that can also be used for analyses of attrition and other key indicators of HDR progress. This is achieved through analysis of doctoral graduates 2000-2005 in a medium sized Australian research intensive university.

**Prospective Variables**

Throughout this paper the main emphasis is on a pragmatic prospective approach to the analysis of predictors of timely completion for doctorates. The intention is to use existing data readily available to universities to assist them in understanding and improving doctoral completions. The results of these analyses can be used to establish institutional support systems and prompt further investigations. In seeking to inform the creation of these support systems,
only those issues that are known about the student at the time of their enrolment can be used, thereby simulating the amount of information known at the earliest possible time in the student’s enrolment. Other issues that may be important in predicting more of the variance of target variables, such as time to completion, may not be known in advance and are more appropriately addressed by adaptive candidature support systems and ongoing monitoring.

A variety of issues have been found to be related to doctoral completion and most of the variables useful for prospective analyses can be grouped into the two categories of being about (a) characteristics of the candidate and (b) characteristics of the candidature. A common third category of variables, regarding supervision - such as satisfaction with supervisor, can only be determined after the student is a substantial distance down the path to study. The variables that are most commonly available at the time of enrolment of a doctoral student, regarding the candidate are: sex, age, ethnicity especially whether from a non-English speaking background, and previous qualification. The known candidature variables are: field of study, attendance, and mode. This study focuses on completion and time to degree.

Candidate variables

The higher education sector has been proposed to be permeated by traditional male values and practices and that these values may work against female doctoral students (Mastekaasa, 2005). Many studies have found gender-based differences in doctoral completion rates. Some argue that men complete faster in all subject areas (Abedi & Benkin, 1987; Booth & Satchel, 1995), or that women are as likely to complete their degrees but take longer (Moses, 1994), or that women take longer to complete their degrees than men and have higher non-completion rates (Baker, 1998; OECD, 1987).
When examined in more detail, research has found differences in completion for gender by field of study, particularly in fields with predominantly male faculty and students (Berg & Ferber, 1983; Konrad & Pfeffer, 1991), usually with slight gender differences in completion rates in science and engineering, even after controlling for certain candidate and candidature characteristics (Baker, 1998). In contrast, a recent study found that women progress faster than men in engineering, whereas men progress more quickly in the social sciences (Millett & Nettles, 2006).

Other researchers have found no significant gender difference in time to complete for doctoral students (Ehrenberg & Mavros, 1995; Martin et al., 2001; Mastekaasa, 2005; Seagram, Gould & Pyke, 1998; Solmon & Hughes, 1992; Wright & Cochrane, 2000). Notably, the studies by Martin et al., (2001), Solmon and Hughes (1992), and Wright and Cochrane (2000) are based on quite large datasets. Subsequently, the potentially systematic nature of the differences in findings may be due to the large scale studies averaging-out differences by field of study and differences between institutions and individual supervisors, highlighting the implication for university administrators that the most useful systems to help HDR students are likely to be institutionally based.

The relationship between age and doctoral completion has not been clear. Completion rates have been found to generally decline as age increases (Martin et al., 2001). However, while other studies have confirmed an overall relationship between completion and age, they have also found that this relationship may be more prevalent in particular fields, such as science (Wright & Cochrane, 2000).
Residency status and whether the student is from a non-English speaking background (NESB; particularly at English-based universities) have received little attention in the doctoral completion literature. Citizenship has been found to have a clear (Sheridan & Pyke, 1994), or weak (Abedi & Benkin, 1987) effect on time to completion. Studies by racial group or international student status, have found modest effects, although these effects have also been found to vary depending on the fields of study (Millett & Nettles, 2006). The driver of the faster times to completion generally found for international students is typically attributed to the effect of the time constraint of the student visa (Millett & Nettles, 2006), although few studies have simultaneously explored the distinctions and overlap of residency and whether from a NESB.

The level of the previous highest educational qualification for doctoral studies is typically considered as being direct and based on honours studies or indirect and based on postgraduate diploma or masters’ level studies. Having the more direct entry qualification of honours has been found to have a relationship with completion overall, in both univariate and multivariate analyses, although univariate analyses on doctorates in the arts field by itself had no effect (Wright & Cochrane, 2000). Similarly, having a first-class degree increased the completion rate for women, but had no effect for men (Booth & Satchel, 1995). However, these effects could be due to variations in admission criteria and the prevalence of applicants with varying proportions of honours relative to postgraduate diplomas across different fields.

**Candidature Variables**

The form of enrolment, whether part-time or full-time, has been found to be among the most important variables in determining time to degree for doctoral students (Bourke *et al.*, 2004; Latona & Browne, 2001). Completion rates are usually higher for full-time than part-time

Doctoral completion by attendance type
students (Martin et al., 2001), although there have been some caveats to this finding. For example, part-time enrolment has been found to have a negative effect on completion only for males (Booth & Satchel, 1995).

Studies in Australia and overseas have found considerable variation in completion rates by discipline and by institution (e.g. Elgar, 2003; Lovitts, 2001; Martin et al., 2001), with average completion rates usually around 50% to 60%. The sciences are typically found to have better completion rates than other areas, for example, in Australia, (Martin et al., 2001), the US, (Bowen and Rudenstein, 1992), in Canada (Seagram et al. 1998) and the UK (Wright and Cochrane, 2000). The effect of field of study usually applies irrespective of gender, with both male and female students in the sciences completing more rapidly than in any other subject area, particularly after controlling for previous level of degree (sometimes used as an indicator of “ability”) and funding (Booth & Satchel, 1995).

Although there are consistent differences in completion times between disciplinary areas, the reasons for these differences are not clear. The most likely explanation would be a set of issues that covaries with discipline. For example, Seagram et al., (1998) noted that potential covariates with discipline field included making an early start on the dissertation, maintaining the same topic and frequent meetings with supervisors. These covariates may explain the differences in completion times.

The growing awareness of these covariates and the implementation of policies and programs to address differences by field may be beginning to lessen the differences in completion rates by field. For example, a recent Australian study found that science doctorates had longer
candidacy times than social science, arts and humanities doctorates, although the science doctorates did have a shorter elapsed time (Bourke et al., 2004).

**Time to degree**

Completion time for research higher degrees can be calculated in a number of ways. The most direct measure would be to examine the simple elapsed time from enrolment to completion (e.g. see Millett & Nettles, 2006). However, the use of such simple measures could lead to results that need clarification, such as where differences by field of study, effectively act as proxies for attendance (full- vs part-time). Weighting the elapsed time to account for the impact of full- versus part-time attendance, translates the measure into a full-time equivalent (FTE) measure of time-to-degree (TTD). A more accurate measure of the sheer workload that has gone into the degree would be to adjust the FTE measure of TTD by excluding time taken for leave to derive a measure of candidacy time (e.g. see Bourke et al., 2004), if this level of detail is available.

The discussion has focused on the two categories of information readily available to institutions for prospective analyses in relation to characteristics of (a) the candidate and (b) the candidature. The commonly available variables at the time of enrolment of a doctoral student are: sex, age, NESB and previous qualification, while available variables about the candidature are: field of study, attendance and mode. These variables will be analysed to explore their ability to predict a FTE-weighted measure of TTD. The interpretation of the results will emphasise the development of customised support systems.
Method

Sample

The sample used in this study are the respondents to the Graduate Destination Survey (GDS) for those students graduating with a PhD from a mid-sized (approx. 20,000 students) comprehensive university on the east coast of Australia for the years 2000 to 2005 inclusive. It is typical of comprehensive universities with an annual enrolment of 1300-1800 research students. The majority (approximately 75%) of enrolled research students are PhD students and in the period 2000-2005 there were around 100 annual PhD completions. The annual PhD completion numbers are also typical of similar universities. A single university was chosen to highlight the process of the analyses and to control for university-specific factors, which have been found to explain a significant proportion of the variation in doctoral completion rates (Martin et al., 2001). Similarly, a mid-sized, comprehensive, non-elite university was chosen so as to avoid critiques such as that of Baker (1998) criticizing Ehrenberg and Mavros (1995) for being based on students at an elite research university, which may constrain the variance of some variables (e.g. selective Graduate Record Examination entrance scores in excess of 700).

The GDS has been conducted annually by the Graduate Careers Council of Australia (GCCA) since 1972. All students completing the requirements for award of a relevant degree in the first six months of the calendar year are surveyed as close as possible to 31 October of that year and all students graduating in the second half of the calendar year are surveyed as close as possible to 30 April of the following year. Follow-up surveys of non-respondents are conducted three months after the end of the first survey month. The responses to the October and April surveys that relate to a given calendar year are combined. Subsequently, the graduates of 2000 through to 2005 had their responses collated in 2001 through to mid-2006. Full details of the GDS process are documented in the relevant manuals, such as GCCA, 2006. The GDS is a voluntary
survey and national response rate at the graduate research student level varies between 20-75%. This university averaged around 50% in most years.

Measures

Candidate. The previous qualification was obtained from the answer to “[L]evel of that [highest] previous qualification (tick one box only)”, from the choices of: (1) “[P]ostgraduate degree or diploma”, (2) “[B]achelor (pass or honours)”, (3) “[U]ndergraduate diploma”, (4) “[C]ompleted high school”, (5) “[O]ther” or (9) “[N]o previous qualification”. The sex variable was derived from the item “[S]ex: Male [ ] 1 Female [ ] 2”, and age was derived from “[A]ge at [official survey date]: [ ] [ ] years”. The student’s residency was determined from “[A]re you a permanent resident of Australia?”, scored yes/no and the variable English-speaking background (ESB) was based on “[M]ain language spoken at home: English [ ] 1 Other [ ] 2”.

Candidature. The year of commencement was determined by asking “[I]n what year did you commence this award?” Attendance was based on the answer to the question “[T]ype of attendance for the award you have just completed (please tick one only)”, where the choices were (1) “[W]hole or mainly full-time”, or (2) “[W]hole or mainly part-time.” The students’ mode of study was obtained from the answers to “[M]ode of study for the award you have just completed (please tick one only)”, where the options presented were “[W]hole or mainly internal”, or “[W]hole or mainly external.” Credit or advanced standing was based on the answer to “[D]id you receive any credit or advanced standing toward the award you have just completed? (please tick one only)”, where the available responses were: “[N]o” and “[Y]es, for study at TAFE”, “[Y]es, from another institution”, “[Y]es, for other reasons.” The year of

1 Financial support has been found to predict time to completion (e.g. Ehrenberg & Mavros, 1995) and while a similar variable is on the GDS, the coding and scores obtained in the dataset did not reflect patterns of student enrolments or completions at the institution, shown by other sources and could indicate that students did not understand the question (e.g. many domestic PhD students may not be aware of whether or not they pay HECS, because many universities automatically provide a HECS scholarship). Subsequently, the financial support variable was not used in the analyses.
graduation was coded based on the survey completed. The target variable, FTE time to degree (TTD) was calculated as (year of graduation – year of commencement) multiplied by 0.5 if attendance mainly or wholly part-time, or unadjusted if attendance was mainly or wholly full-time. Field of study was derived from the responses to the question “[W]hat were your major fields of study” and codes were applied from the lists of fields created by the federal Department of Education Science and Training (i.e. ASCED codes, see GCCA, 2006). All of the analyses had five sets of Field of Study in common. The sets were: Humanities and Law (consisting of Humanities, Visual/Performing Arts and Law), Social Sciences (Social Sciences, Psychology, Business Studies, Economics, Education – Initial), Languages (Languages), Hard Sciences (Electrical Engineering, Computer Science, Mathematics, Chemistry, Physical Science and Geology), and Life Sciences (Life Sciences and Agriculture).

Results

The initial analyses of the data highlighted the substantial differences by type of attendance on the FTE-weighted graduation times, as shown in Table 1. The differences were substantial enough to warrant analysing the two groups of students separately; otherwise any analyses on the differences between timely and untimely completions would effectively be analysing differences between full- and part-time students. Subsequently, all of the inferential analyses below are based on the full- and part-time students separately.

Similarly, the graduates that had studied in an external mode had an unusual pattern of completion times by attendance and were often surprisingly fast in their completions (in sharp contrast to Martin et al., 2001). Follow-up investigations appear to confirm the author’s suspicion that the very successful external students may have been the result of unmeasured systemic issues. Examples of these systemic issues that could be biasing the data for the
external students include: full-time staff enrolling externally to reduce student fees, students who were staff at another university, students transferring with their supervisor – a new staff member to the university, or possibly some other factor (Dean of HDR, 2006, pers. comm.). For example, there were four external students that enrolled full-time but did not complete in four years or less, whereas 14 of the 23 part-time external students completed in four years or less. This pattern of results would inappropriately bias the analyses focussing on part- versus full-time attendances respectively and are subsequently excluded from the analyses below. Further, 15 cases given credit for prior studies were excluded because the nature and extent of that credit was unknown and two cases that had a FTE TTD of less than one year were also excluded because they could also bias the results of the analyses.

Table 1. The numbers and proportions of graduating students by attendance and timeliness category.

<table>
<thead>
<tr>
<th>Type of Attendance</th>
<th>Graduation in FTE years</th>
<th>&gt;4</th>
<th>&lt;=4</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainly Full-time</td>
<td></td>
<td>136</td>
<td>33</td>
<td>169</td>
</tr>
<tr>
<td>% of full-time</td>
<td></td>
<td>80.5%</td>
<td>19.5%</td>
<td>100%</td>
</tr>
<tr>
<td>Mainly part-time</td>
<td></td>
<td>49</td>
<td>129</td>
<td>178</td>
</tr>
<tr>
<td>% of part-time</td>
<td></td>
<td>27.5%</td>
<td>72.5%</td>
<td>100%</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td>185</td>
<td>162</td>
<td>347</td>
</tr>
<tr>
<td>% of overall</td>
<td></td>
<td>53.3%</td>
<td>46.7%</td>
<td>100%</td>
</tr>
</tbody>
</table>

In the main analyses below the split of FTE TTD at the point of four FTE years or less is common to both the part-time and full-time analyses. More challenging and statistically informative targets are also used for the respective attendance groups. For the full-time students the reasonable expected completion time, as per the RTS, allowing for extra time due to delays with examiners and delays between full completion and graduation due to the scheduling of graduation ceremonies throughout the year, gives a challenge target of five FTE years. This target allows a larger proportion to have completed faster than the target time, enabling more robust statistical analyses and more meaningful results. For the part-time students the data seems to support the idea that part-time students work at slightly faster than half the speed of
full-time students (for at least those who graduate) and subsequently the most appropriate target
to use for the part-time students appears to be based on a cut-off point of 3.25 FTE years.

The frequencies and initial chi-squared analyses for both the common and challenge targets
are presented in Table 2. The full-time students graduating in more than four years had an
average (standard deviation) age of 37.6 (8.87) years, which was not significantly ($F(1,$
144)=2.617, $p=.108$) different from those graduating in four years or less (mean = 34.5,
SD=9.68). Similarly, the full-time students graduating in more than five years had an average
(standard deviation) age of 38.5 (8.46) years, which was not significantly different from those
graduating in five years or less (mean = 35.8, SD=9.43), although there was a tendency for an
age difference between the two groups ($F(1, 144)=3.423, p=.066$). Throughout these analyses
$p<.10$ is noted due to the relatively low number of cases used in some of the analyses and that
under those conditions $p<.10$ may be informative.

Table 2. The frequencies and chi-squared tests for the full-time students.

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>$\chi^2$</th>
<th>p</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities &amp; Law</td>
<td>2.69</td>
<td>NS</td>
<td>5.62</td>
<td>NS</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>2.12</td>
<td>NS</td>
<td>3.92</td>
<td>NS</td>
</tr>
<tr>
<td>Languages</td>
<td>0.81</td>
<td>NS</td>
<td>1.45</td>
<td>NS</td>
</tr>
<tr>
<td>Hard Sciences</td>
<td>1.22</td>
<td>NS</td>
<td>2.12</td>
<td>NS</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>0.76</td>
<td>NS</td>
<td>1.45</td>
<td>NS</td>
</tr>
<tr>
<td>Residency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>7.02</td>
<td>&lt;.01</td>
<td>4.54</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Overseas</td>
<td>0.001</td>
<td>NS</td>
<td>0.001</td>
<td>NS</td>
</tr>
<tr>
<td>Previous qualification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate or Diploma</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelors (Pass or Honours)</td>
<td>0.22</td>
<td>NS</td>
<td>0.018</td>
<td>NS</td>
</tr>
<tr>
<td>Main Language Spoken At Home</td>
<td>0.02</td>
<td>NS</td>
<td>2.24</td>
<td>NS</td>
</tr>
<tr>
<td>English</td>
<td>0.67</td>
<td>NS</td>
<td>0.012</td>
<td>NS</td>
</tr>
<tr>
<td>Not English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.81</td>
<td>NS</td>
<td>3.92</td>
<td>NS</td>
</tr>
<tr>
<td>Female</td>
<td>0.001</td>
<td>NS</td>
<td>0.001</td>
<td>NS</td>
</tr>
</tbody>
</table>

Doctoral completion by attendance type

15
The part-time students graduating in more than four years had an average (standard deviation) age of 47.3 (8.87) years, which was significantly ($F(1, 138)=6.387, p=.013$) different from those graduating in four years or less (mean = 42.7, SD=9.96). In contrast, the part-time students graduating in more than 3.25 years had an average (standard deviation) age of 45.2 (9.20) years, which was not significantly ($F(1, 138)=2.695, p=.103$) different from those graduating in less than 3.25 FTE years (mean = 42.4, SD=10.53).

Table 3. The frequencies and chi-squared tests for the part-time students.

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Years FTE</th>
<th>$\chi^2$</th>
<th>p</th>
<th>Years FTE</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities &amp; Law</td>
<td>&gt;4</td>
<td>5.16</td>
<td>NS</td>
<td>&lt;=4</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>17</td>
<td>34</td>
<td>28</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Languages</td>
<td>7</td>
<td>14</td>
<td>14</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard Sciences</td>
<td>6</td>
<td>14</td>
<td>12</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Sciences</td>
<td>1</td>
<td>15</td>
<td>6</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Previous qualification</th>
<th>Years FTE</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postgraduate or Diploma</td>
<td>21</td>
<td>62</td>
<td>1.02</td>
</tr>
<tr>
<td>Bachelor (Pass or Honours)</td>
<td>13</td>
<td>25</td>
<td>0.85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main Language Spoken At Home</th>
<th>Years FTE</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>8</td>
<td>31</td>
<td>1.42</td>
</tr>
<tr>
<td>Not English</td>
<td>30</td>
<td>68</td>
<td>5.63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Years FTE</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>22</td>
<td>48</td>
<td>0.89</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>53</td>
<td>39</td>
</tr>
</tbody>
</table>

Backward stepwise binary logistic regressions were conducted using the prospective candidate and candidature characteristics discussed above for each of the target periods respectively for each of the full- and part-time groups. Variables reflecting many of the potential interactions indicated by the literature were also included in follow-up analyses and are discussed below as appropriate.
For all of the analyses variations on the coding of the Field of Study were also explored. The five sets of Field of Study were grouped by the similarities of their proportions of students meeting the target for each of the respective target variables and, where significant, are shown in full in the tables.

The key predictors for the full-time students

The only variable that significantly predicted graduation by full-time students in four years or less was whether or not the student was an Australian resident. The negative loading indicates that Australian residents were less likely to graduate in the target time than non-Australian residents.

Table 4. The significant predictors of graduation in four years or less for full-time students.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residency</td>
<td>-1.336</td>
<td>.490</td>
<td>.006</td>
<td>.263</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.642</td>
<td>.391</td>
<td>.100</td>
<td>.526</td>
</tr>
</tbody>
</table>

For the regression analyses of the full-time students completing in five years or less the significant predictors are the respective grouped Fields of Study, residency and whether from an ESB or not. Follow-up analyses determined that the significant ESB variable is caused by an ESB by Sex interaction, where ESB Males were less likely to have completed in less than five FTE years than the other cells of the interaction, especially the non-ESB males. However, the significance of the interactions could be caused by low numbers in some of the resultant cells (which is also a form of over-training on the data available). Subsequently, for prospective tests, the use of the equation without the interactions would be recommended and is presented in these results.
Table 5. The significant predictors of graduation in five years or less for full-time students.

<table>
<thead>
<tr>
<th>Grouped Field of Study*</th>
<th>B</th>
<th>S.E.</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Sciences &amp; Languages</td>
<td>-1.244</td>
<td>.561</td>
<td>.027</td>
<td>.288</td>
</tr>
<tr>
<td>Hard Sciences, Humanities &amp; Law</td>
<td>-0.517</td>
<td>.533</td>
<td>.333</td>
<td>.597</td>
</tr>
<tr>
<td>Residency</td>
<td>-1.345</td>
<td>.502</td>
<td>.007</td>
<td>.261</td>
</tr>
<tr>
<td>ESB</td>
<td>-0.909</td>
<td>.401</td>
<td>.023</td>
<td>.403</td>
</tr>
<tr>
<td>Constant</td>
<td>2.252</td>
<td>.738</td>
<td>.002</td>
<td>9.508</td>
</tr>
</tbody>
</table>

Note: * The output of the logistic regressions does not indicate the comparison field. For example, for the grouped field of study variable, the comparison score is Life Sciences, which would receive a default score of zero (i.e. a higher weighting than the other groups of field of study presented here).

The key predictors for the part-time students

Initial analyses of the part-time students indicated that one of the variables, residency, was dominating the regression equations. Keeping in the spirit of the pragmatic theme of this study, it would be recommended that all of the part-time students without permanent residency be investigated as a distinct, separate group by the institution. In the case of this study, for those students indicating that they did not have residency, all nine completed in four FTE years or less and eight of the nine completed in less than 3.25 FTE years. The part-time non-residents are clearly a very successful, distinct group (and in this case, all indicated an ESB).

Table 6. The significant predictors of graduation in four FTE years or less for part-time students.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Exp(B)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.049</td>
<td>.023</td>
<td>.952</td>
<td>.036</td>
</tr>
<tr>
<td>Previous qualification</td>
<td>0.793</td>
<td>.469</td>
<td>2.210</td>
<td>.091</td>
</tr>
<tr>
<td>Constant</td>
<td>2.635</td>
<td>1.021</td>
<td>13.937</td>
<td>.010</td>
</tr>
</tbody>
</table>

Age and level of previous qualification were significant or near significant predictors of whether part-time students graduated in four FTE years or less. That is, younger part-time
students were more likely to complete in a timely fashion and there was a tendency for 
Diploma students to be more likely to complete in time, after taking out the effects of age.

Table 7. The significant predictors of graduation in 3.25 FTE years or less for part-time 

<table>
<thead>
<tr>
<th>Grouped Field of Study</th>
<th>B</th>
<th>S.E.</th>
<th>Exp(B)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languages, Humanities &amp; Law</td>
<td>-2.015</td>
<td>.754</td>
<td>.133</td>
<td>.008</td>
</tr>
<tr>
<td>Social &amp; Hard Sciences</td>
<td>-1.712</td>
<td>.721</td>
<td>.180</td>
<td>.018</td>
</tr>
<tr>
<td>ESB</td>
<td>1.083</td>
<td>.442</td>
<td>2.954</td>
<td>.014</td>
</tr>
<tr>
<td>Constant</td>
<td>1.010</td>
<td>.669</td>
<td>2.745</td>
<td>.131</td>
</tr>
</tbody>
</table>

The significant ESB variable is due to the ESB by combined Social and Hard Sciences Field 
interaction. That is, ESB students in the hard and social sciences were more likely to have 
completed in less than 3.25 FTE years, and there is a tendency for non-English speaking 
background students in the Life Sciences to have completed faster (although this part of the 
interaction may be unstable due to low numbers of cases in the specific cells).

Demonstrating prospective tests using the full-time model

Tests of the prospective utility of these models were conducted for the respective challenge 
targets. The prospective test for the full-time students was conducted on the 2005 graduates. 
The 2005 graduates that studied mainly or wholly full-time were scored using the graduation in 
less than five FTE years model, ranked from the highest to the lowest scores and then grouped 
by their scores. For each of these groups the proportion of that 2005 group that graduated in 
less than five FTE years is shown in Figure 1.

2 The test for the part-time students was on the 2004 and 2005 graduates (there were only 10 PT graduates in 2005 – an 
insufficient number to test the model). Only the results from the full-time analyses are presented here, because the part-time 
prospective tests includes 2004 data – data upon which the model had been built, which could lead to positively biased results.

For both the full-time and part-time prospective tests the use of the equations without the interaction terms was more accurate – 
highlighting the potential trap in the pragmatic use of such models in that they can often “over-train” on irregularities in the 
dataset upon which they were created (e.g. a group of two or three particularly brilliant students lured to the university by one-
off scholarships in a particular field) – which weakens their prospective utility given that the conditions leading to those 
irregularities may be unlikely to occur again.
For each of the groups a ratio can then be constructed of the proportion of graduations in target
time for that group relative to the average proportion of graduations in target time for all of the
2005 full-time graduates (35.7%). The resulting ratio gives an idea of the “amplification” or
“concentration effect” obtained by the model and is shown in Figure 2.
Discussion

The variable found to be the most important for completion analyses was the type of attendance – whether full-time or part-time. This result concurs with Bourke et al., (2004). However, while completion rates are usually higher for full-time than part-time students (Martin et al., 2001), when the time-to-degree is examined, especially in terms of FTE years, this study found that part-time students were far more likely to complete quickly than full-time students. Indeed, the differences were so large that the later analyses had to be conducted for each type of attendance separately.

For the full-time students the key predictor of timely completion (<=4 years) was residency. When the target completion time was loosened to five years residency was joined by field of study and ESB. Full-time students were more likely to complete in five years or less if they were overseas residents, in the life sciences, or if not life sciences, were in the hard sciences, humanities and law, and did not speak English at home.
These results highlight the need for more research on residency and doctoral completion, especially for full-time students, usually on a student visa. The results of this study appear to support the proposition of Millet and Nettles (2006) that the driver of the faster times to completion generally found for international students is attributable to the effect of the time constraint of the student visa. Notably, a key caveat on this relationship between residency and TTD that has usually been implicit in the literature is that it only applies for full-time students, both statistically, as found in this study, and because government rules regarding study visas often require that the study be conducted full-time.

For the part-time students the key predictor of timely completion (<=4 FTE years) was age, with a tendency for differences by level of previous qualification. Part-time students were more likely to complete in the standard target FTE time if they were younger and/or had an honours degree. However, when the target time is tightened the key predictors are field of study and ESB. Part-time students were more likely to complete in the faster FTE time if they were in the Life Sciences and/or came from an ESB.

Both the full- and part-time students found that field of study had an impact on TTD. Unfortunately, in one respect, the results of this study add to the considerable variation that has been found in the literature regarding completion rates by discipline and by institution (e.g. Elgar, 2003; Lovitts, 2001; Martin et al., 2001), or at least, this study confirms that there is considerable variation by discipline both for completion rates and TTD.

In examining the data for a possible explanation, the main result that comes forward is the clear negative result for the part-time students. That is, part-time students studying languages, humanities and law were considerably less likely to complete in a fast FTE time than the other
fields. The connections could be that part-time attendance is not conducive to the relative “immersion” in those kinds of fields that is required to gain deep mastery of a particular topic area and, perhaps, timely completion within four years in those fields requires substantially more contact and interaction.

Conversely, the consistently positive finding that PhD candidates in the life sciences completed faster, whether full- or part-time is probably due to the nature of study in that field. For example, it would be worthwhile for the subject institution to explore the structure of the studies in that area, or other elements that may explain the impact of the field of study. Lessons learnt could then be transferred to other fields of study. This line of investigation is similar to that of Seagram et al., (1998) where the issues that co-vary with field of study, such as making an early start on the dissertation, maintaining the same topic and frequent meetings with supervisors, may explain the differences in completion times. Faculty management and research cultures may also contribute to the differences.

More broadly, one could make the case from the results above that the science fields were more conducive to faster completions than other fields, thereby supporting the findings of Martin et al., (2001), Bowen and Rudenstein (1992), Seagram, Gould and Pyke (1998) and Wright and Cochrane (2000). However, the lead once held by the sciences may be eroded (a result also found by Bourke et al., 2004) with humanities and law showing an impact on completion time comparable to the hard sciences for full-time students and the social sciences having an impact on TTD comparable to the hard sciences for part-time students.

When the results for the full- and part-time students are considered together, they present an interesting pattern when examining their FTE TTD. For example, using the metaphor of the
innovation curve (Rogers, 2003) the results appear to indicate different drivers for students likely to be at different stages in the innovation curve. The analyses of TTD when the cut-off was four years for the full-time students would therefore represent the issues that are different between the early adopters and the early majority. The issues that are different for the full-time students when using the five year cut-off highlights the different drivers for the early majority relative to the late majority. Similarly, for the part-time students the four year FTE cut-off separates the late majority and the laggards and the 3.25 FTE year cut-off the difference between the early and late majorities. This staged approach may present an interesting avenue for future research on a larger scale.

Limitations

The data used in this study focused on the TTD of doctoral students that completed and elected to participate in the GDS. Subsequently, the results may be constrained due to the data being right-censored, with many doctoral candidates still studying. This constraint is less of an issue in this study due to its pragmatic approach and focus on TTD rather than attrition. Further, GCA research on non-respondents found no bias at national or institutional levels in GDS survey participants (Coates, Tilbrook, Guthrie and Bryant, 2006).

The form and conduct of the GDS were outside the authors’ control and subsequently could represent an unknown source of bias. Further, the questions available in the GDS limited the range and nature of variables that could be tested. Future versions of the GDS may want to include questions on contemporary issues such as the details of any coursework completed, whether the student took leave during their enrolment and how much leave, the month of the submission of the thesis, and/or completion of the program and the month of enrolment. These
and other changes could improve the utility of the GDS for research student administrators and managers as well as better reflect the HDR process.

**Conclusion**

The application of the models derived in this study in a prospective test represents a variety of opportunities for HDR administrators. For example, as shown in Figure 2, the full-time model, those students scoring highly represented a concentration of timely graduates more than 7.5 times higher than the lowest-scoring group – almost an order of magnitude of difference.

None of the significant variables found above represent issues that are alterable in the usual direct sense. The main avenue for using the above results is to target institutional support systems for students at different stages and for students meeting different criteria. The application of the results must emphasise the development of customised support systems and seek to avoid the “selective admissions myth” that places the burden of responsibility on the student – not the university and faculty (Lovitts, 2001). Both candidate and candidature variables were important in predicting TTD for doctoral students, although a particular candidature characteristic – type of attendance sets the context. Future research may also want to further explore an area that has not received much attention, namely the mechanisms of residency status.

Overall, we concur with Martin *et al.*, (2001) that the high non-completion rates of doctorates must be a cause for concern and represent a considerable waste of resources. Subsequently, a future application of the model-based approach to building customised systems may want to explore the drivers of attrition. The spirit of the literature indicates that the key driver at that point may be supervision, but the results of the analyses here can be used to build the
foundations upon which supervisor practices can build and institutional support systems can improve.

References


