Doctoral production in South Africa: Statistics, challenges and responses[1]

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The past few years have witnessed new interest in doctoral production in South Africa. In the first section of the article, it is argued that this new interest has its roots in various higher education policy documents over the past decade. The second part of the article presents some of the most recent statistics on various aspects of doctoral production: trends in enrolments and graduations, completion and attrition rates as well as the supervisory capacity in the system. In the final section it is argued that the policy discourse, together with the analysis of the statistical data, gave rise to four challenges. These are the goals to expand the volume of doctoral graduates being produced as well as the supervisory capacity in the system and the demands to improve the efficiency and quality of doctoral production. In the ensuing discussion of these challenges, it is argued that various factors mitigate against the easy attainment of the first three goals. Although it remains important that these goals are pursued, it is argued that more emphasis should be afforded to considerations about the quality of doctoral training.

The policy context: The new focus on doctoral production in South Africa

The current discourse on incentives to increase doctoral production in South Africa has its roots in a series of policy documents introduced over the past decade. In this section of the article the evolution of the discourse on doctoral production in these documents is traced. The main aim of this discussion is to show how the current emphasis on quantitative concerns, especially on the volume of doctoral graduates, emerged.

In June 2000 the Council for Higher Education provided the Minister of Education with a set of concrete proposals with regard to the restructuring of the higher education landscape as advocated in Education White Paper 3 of 1997. The recommendations implied far-reaching consequences for the entire higher education system and included specific recommendation on increasing the production of postgraduate students. In a concurrent development, a new *Human Resource Development Strategy for South Africa* (2001) was published. This document identified the four pillars of human resource development as (i) school-level general education and training (GET); supported by early childhood development (ECD) and adult basic education and training (ABET); (ii) further education and training (FET) and higher education; (iii) employers generating and articulating demand for skills; and (iv) the National System of Innovation (NSI). Consequently, it formulated five national objectives and associated performance indicators for human resource development. Of specific relevance to the issue of postgraduate production is objective 2: "improving the supply of high-quality skills (particularly scarce skills) which are more responsive to societal and economic needs" (National Departments of Education and Labour, 2001:26). Indicators for this objective included higher education (and FET) participation rates, learner/student enrolments in SET disciplines and employment rates for FET and higher education graduates.

However, the most specific and relevant document for this article was the *National Plan for Higher Education*, which was published in February 2001. Under the heading of "research" a number of goals were included, for example, a specific recommendation to increase the outputs of postgraduate students, especially at master's and doctoral levels. Other related recommendations referred to the goal to achieve increased research outputs, to build new centres of research excellence and to facilitate more collaboration between research and post-graduate work.

In a logical development to these policy initiatives, the Ministry of Education in November 2003 published a new funding model for public higher education, in accordance with the Higher Education Act of 1997 and in line with the National Plan for Higher Education of 2001. The starting point for the new model was not institutional costs as it was in the past, but affordability linked to achievement of national

policy goals and objectives, which meant that funding allocations would be directly linked to academic (teaching and research) activity and especially output. The model consisted of two components, namely (i) undesignated block grants and (ii) earmarked grants (Ministry of Education, 2003). Block grants are determined mainly by institutional research outputs (publication units and research master's and doctoral graduates), teaching outputs (completed non-research degrees and diplomas) and teaching inputs (full-time equivalent student enrolments). Block grants also contain a development component with regard to the specific research and teaching needs of each institution. In a bold move – and quite unique in terms of international practice – acceptance of the new model would mean that the production of (research) master's and doctoral students would be rewarded in a similar manner to other research outputs (such as papers in peer-reviewed journals). The fact that the monetary value attached to a doctoral degree was set at three times the value of the research paper was interpreted as a clear signal to the universities to incentivise doctoral production.

The policy and strategic initiatives outlined above were soon echoed in the strategic plans of the Department of Science and Technology (DST) and the National Research Foundation (NRF). The DST's *Ten-year Innovation Plan* of 2007 was arguably the most influential NSI strategy published in the period 2004 to 2008, particularly as regards doctoral education. The strategy states that "… the NSI must become more focused on long-range objectives, including urgently confronting … our inadequate production (in both a qualitative and quantitative sense) of knowledge workers capable of building a globally competitive economy" (DST, 2007a:vii). It contextualises this need in terms of a human capital pipeline as a professional development path starting with postgraduate students and delivering world-class researchers. It acknowledges the limited capacity of the higher education system to enrol postgraduate students and to provide them with supervision and, consequently, it specifically and emphatically prioritises strategies that would effectively increase production of doctoral graduates by the higher education sector.

Another tangible result of the national prioritisation of doctoral education noted above was the launch of the South African PhD Project by the NRF (in partnership with the DST) in November 2007 (DST, 2007b). This project's stated aim was to intensify the strength and diversity of the South African academic, corporate and public sectors by increasing the number and diversity of appropriately skilled PhD graduates (NRF, 2007). To this end, it would provide marketing, information and support to students, supervisors and mentors, funders and sponsors, and training partners. The project stated that the target would be to increase the current number of graduates (1 274 in 2007) fivefold by 2024 (NRF, 2009), i.e. to a target of approximately 6 000 PhDs.

In its more recent *Corporate Strategy 2009/10,* and in line with the new Medium Term Strategic Framework, the DST sets the development of appropriate human resources for research, development and innovation as one of its five strategic goals. This goal is addressed mainly under the Human Capital and Knowledge Systems programme. Of particular relevance to FET and higher education are strategies to:

- increase school-level learner participation in science and improve mathematics and science teaching;

- increase the number of publicly funded postgraduate students and improve postgraduate throughput rates;

- increase participation of master's and doctoral graduates in accelerated research professional development at science councils; and

- increase the number of postdoctoral fellows at higher education institutions (DST, 2009).

In the remainder of this article, I focus first on presenting and discussing the most recent statistics on doctoral production in the country, and second, on the main challenges that SA universities face against the background of the policy imperatives and the current state of affairs.

A statistical overview of doctoral production in South Africa

The statistical profile of doctoral production is organised according to the following themes:

- Trends in university enrolments (2000-2009);

- Trends in graduate outputs (2000-2009);

- Doctoral drop-out rates;

- The demographics of doctoral graduates; and

- The doctoral supervisory capacity.

Trends in university enrolments (2000-2009)

The South African higher education system showed substantial growth over the past decade. In 2009 the number of enrolled students stood at approximately 834 000. This constitutes a significant increase over the about 670 000 students enrolled at the turn of the century (Table 1). Student headcounts also include about 3% of occasional students who are taking courses as part of formally approved programmes but who are not registered for any formal degree or diploma. The majority of students (82%) are undergraduate students. At postgraduate level, there are 5% of master's students and 1% of doctoral students, with the remainder of students (8%) enrolled in lower postgraduate programmes (honours degrees and postgraduate diplomas).

Table 1: Headcount enrolments in public higher education institutions by programme level, 2001 to 2009

| Year | Programme level | | | | | Total |
	Occasional students	Under-graduate degrees and diplomas	Post-graduate, below master's level	Master's degrees	Doctoral degrees	
2001	23851	544183	55914	34901	6518	665367
2002	32409	537592	60840	39364	7708	677913
2003	37914	562343	65203	43953	8380	717793
2004	23175	597609	69267	45333	9104	744488
2005	19271	602612	61622	44533	9434	737472
2006	22633	607513	58510	42899	9828	741383
2007	25696	624989	59179	41172	10051	761087
2008	25474	655305	66902	41712	9994	799387
2009	24613	684419	74495	43723	10529	837779
Average annual growth rate (2001-09)	-2.3%	2.9%	1.8%	1.5%	5.4%	2.6%

Note: The average annual growth rate was estimated by fitting a linear regression trend line to the annual values after the values were converted into logarithmic values and the exponents (number of years) of these values taken.

Source: DoE (2003, 2004, 2005a, 2005b, 2006, 2008, 2009, 2010) and DBE (2010).

As far as postgraduate trends are concerned, the average annual growth rate for student headcounts between 2001 and 2009 was 2.6% (Table 2). Doctoral and master's students respectively account for the highest and lowest annual growth rate in terms of headcounts (5.4% versus 1.5% growth).

   The distribution of postgraduate students by scientific field reveals big differences: approximately 44% of all student headcounts are in the broad field of education and the humanities (of which 16% alone are in education) (Figure 1). Students in science, engineering and technology constitute 28% of the total

headcount, with another 28% enrolled in business and management programmes. This breakdown is based on figures for 2009 but also applies to other years.
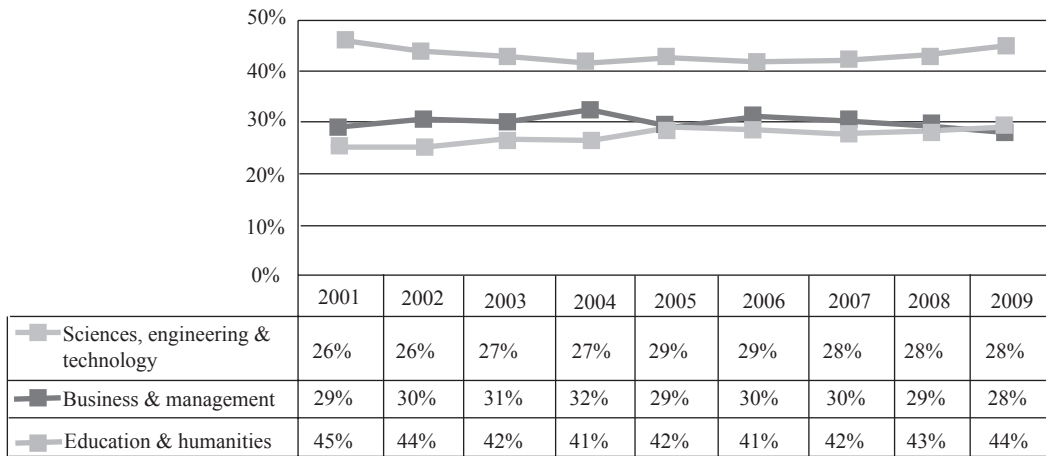

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sciences, engineering & technology	26%	26%	27%	27%	29%	29%	28%	28%	28%
Business & management	29%	30%	31%	32%	29%	30%	30%	29%	28%
Education & humanities	45%	44%	42%	41%	42%	41%	42%	43%	44%

Figure 1:   Breakdown of postgraduate student enrolments by major field of study (2001-2009)

Source: DoE (2003, 2004, 2005a, 2005b, 2006, 2008, 2009, 2010) and DBE (2010).

Approximately 93% of all students enrolled at South Africa higher education institutions are South African nationals. Students from other SADC countries account for a further 5% of the student population. The remainder (2%) is from countries outside the SADC region. These figures are based on the years 2004 to 2007 (CHE, 2009b:27).

The national participation rate[2] in higher education in South Africa, based on the years 2004 to 2007, is about 16%. Although the rate is markedly above the participation rate of 5% recorded for sub-Saharan Africa, it is nevertheless significantly below the participation rate of other developing regions. In Latin America and the Caribbean, for instance, the comparative rate is 31% and in Central Asia it is 25% (CHE, 2009b:4).

Trends in graduate outputs (2000-2009)

In 2009 the South African higher education system produced almost 145 000 graduates, a figure that was preceded by persistent linear growth in earlier years (e.g. from just over 95 000 graduates in 2001 to about 120 000 in 2005) (Table 2). The highest growth rate for postgraduates is associated with doctoral graduates (an average annual growth rate of 5.5% over the period 2001 to 2009, compared to 2.3% and 3.3% for master's and lower-postgraduates respectively). The actual number of doctoral graduates, however, dropped between 2007 and 2008 (from 1 329 to 1 182) before rising to 1 380 in 2009. The number of master's graduates, on the other hand, has been consistently declining between 2005 (8 018) and 2008 (7 513). It is only in the most recent year (2009) that this trend is reversed again (8 112).
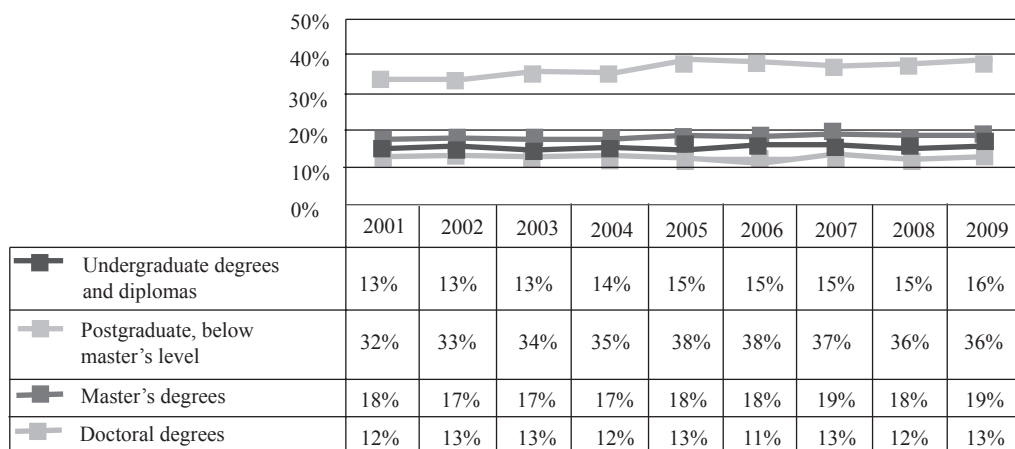
Table 2: Graduates in public higher education institutions by programme level, 2001 to 2009

Year	Programme level				Total
	Undergraduate degrees and diplomas	Postgraduate, below master's level	Master's degrees	Doctoral degrees	
2001	70155	18130	6242	802	95329
2002	72425	19961	6882	974	100242
2003	74167	22420	7516	1052	105155
2004	83650	24109	7922	1116	116797
2005	87652	23204	8018	1189	120063
2006	93707	21985	7879	1100	124671
2007	95806	22190	7829	1329	127154
2008	100523	23845	7513	1182	133063
2009	108769	26591	8112	1380	144852
Average annual growth rate (2001-09)	5.8%	3.3%	2.3%	5.5%	5.1%

Note: The average annual growth rate was estimated by fitting a linear regression trend line to the annual values after the values were converted into logarithmic values and the exponents (number of years) of these values taken.

Source: DoE (2003, 2004, 2005a, 2005b, 2006, 2008, 2009, 2010) and DBE (2010).

Graduation rates are often used as proxies for throughput rates, and are calculated by dividing the total number of graduates at an institution by the total number of students enrolled at that institution in the same year. Although the graduation rate for doctoral students remained more or less constant at 12 to 13% between 2001 and 2009, some increases can be observed for undergraduates (from 13% in 2001 to 16% in 2009) and lower postgraduates (from 32% to 36% between 2001 and 2009) (Figure 2).

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Undergraduate degrees and diplomas	13%	13%	13%	14%	15%	15%	15%	15%	16%
Postgraduate, below master's level	32%	33%	34%	35%	38%	38%	37%	36%	36%
Master's degrees	18%	17%	17%	17%	18%	18%	19%	18%	19%
Doctoral degrees	12%	13%	13%	12%	13%	11%	13%	12%	13%

Figure 2:   Graduation rates by programme level, 2001 to 2009

Source: DoE (2003, 2004, 2005a, 2005b, 2006, 2008, 2009, 2010) and DBE (2010).

SA Higher Education has produced 6 000 new doctorates between 2005 and 2009 and nearly 10 800 over the past decade (Figure 3). But the average annual growth in graduates of 6% means that it will take more than 10 years to reach a target of approximately 3000 PhDs per year. Even this target may be unattainable, as the growth in new doctoral enrolments over the past three years have started to flatten off despite the continuing increase (33% by 2009) in the numbers of foreign students (mostly from other African countries).

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Enrolments	6419	6996	7716	8315	9104	9104	9776	10007	9951	10319
Graduates	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
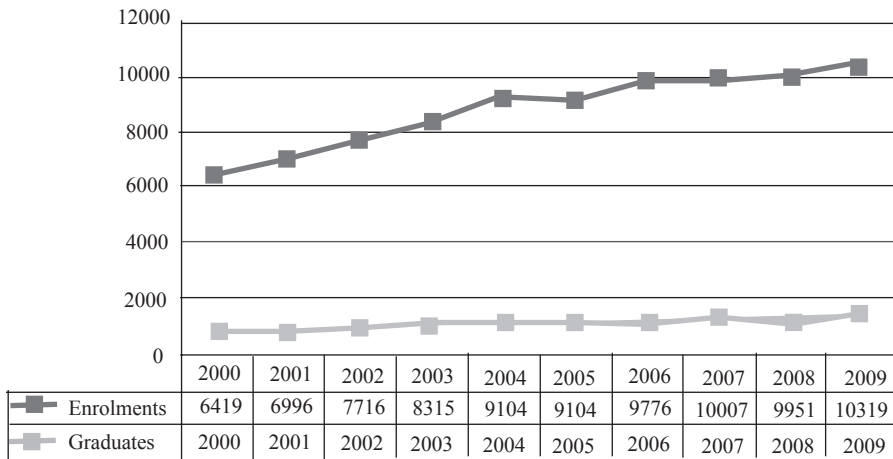
Figure 3: Doctoral enrolments and graduates (2001 to 2009)

Doctoral drop-out rates

Any assessment of the state of doctoral enrolment and graduation rates in a country is incomplete if one does not take the entire pipeline, and especially drop-out or attrition rates, into consideration. Drop-out or attrition rates refer to students who enrol for doctoral studies but who never complete and cease their studies for some reason. The drop-out rate is best calculated by following a particular cohort over the ensuing years. Such a calculation was recently done on the 2001 doctoral cohort in South Africa. As Figure 4 shows, 46% of the students across all disciplines enrolled in 2001 never completed their studies. The field differences are significant: ranging from 36% in the natural, health and engineering sciences to 53% in the humanities. An interesting result, which correlates with overseas studies, was that the biggest attrition occurs during the first two years after enrolment. Across all fields, 29% of students dropped out during the first two years. This proportion is the highest for students in the business and management sciences (39%).
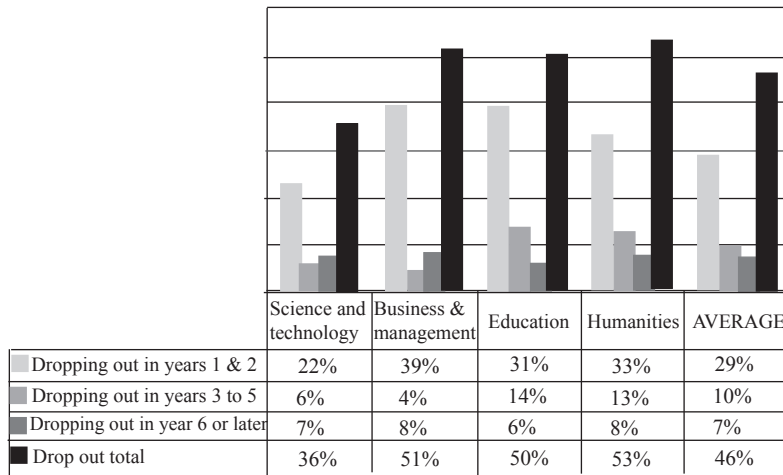
	Science and technology	Business & management	Education	Humanities	AVERAGE
Dropping out in years 1 & 2	22%	39%	31%	33%	29%
Dropping out in years 3 to 5	6%	4%	14%	13%	10%
Dropping out in year 6 or later	7%	8%	6%	8%	7%
Drop out total	36%	51%	50%	53%	46%

Figure 4:   Drop-out rates of doctoral students (2001 cohort)

Source: Statistics produced by Charles Sheppard for a joint CREST-CHET project on doctoral productions in the social sciences and humanities in South Africa

There is an extensive body of knowledge on doctoral attrition rates (Gilliam & Kritsonis, 2006; Golde, 2005; Lovitts, 1996; Lovitts & Nelson, 2000; Nerad & Sands Miller, 1996; Sheridan & Pyke, 1994 and Smith, Brownell, Simpson & Deshler, 1993). But arguably one of the most comprehensive studies in this fielkd was undertaken by the US Council of Graduate Schools in 2007. Results were produced for more than 400 doctoral programmes (in which more than 50 000 doctoral students were enrolled). The resultant drop-out rates for different disciplines are presented in Figure 5. Although the typical PhD in the USA commences after completion of a Bachelor's degree, it still makes sense to compare the drop-out rates over the longer period of 10 years as the same patterns are evident when compared with doctoral programmes which follow after completion of a master's degree.
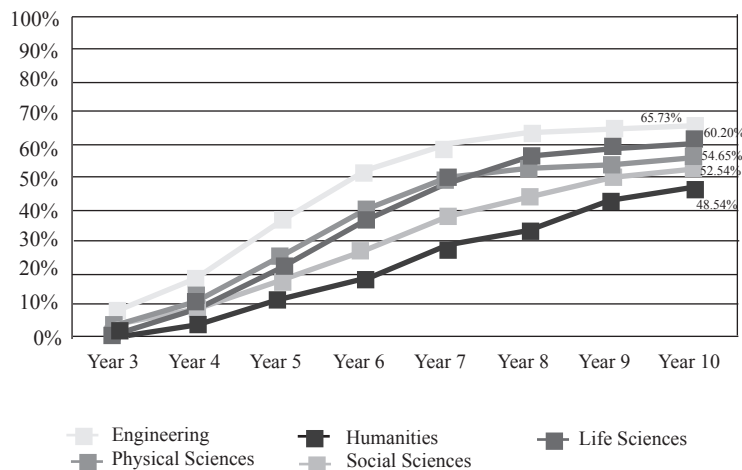

Figure 5:   Doctoral drop-out rates in the USA (2007 data)

Source: Council for Graduate Studies

The demographics of doctoral graduates

An analysis of time to degree revealed that the average doctoral student takes about 5 years to complete their degrees (CHE, 2009a:35). This, together with the fact that most doctoral candidates are between 33 (natural and agricultural sciences) and 41 (social sciences and humanities) years of age when they first enrol for a doctoral degree, often results in most South African doctoral graduates being relatively mature when eventually awarded a doctoral degree: the average age of doctoral students at graduation was 42 years in 2007 (Figure 6). In a report released by the NSF (2006), it was reported that the median age of doctoral graduates in the USA in that year was 33.3 years. This points to one of the huge differences between our system and that of many other countries. In countries such as the USA, Canada, the UK and other European countries, there is sufficient funding to support doctoral students to study full time. Graduating at age 33 is therefore the norm. In the South African case it is estimated that between 65 and 70% of all doctoral students study part time (while working). This fact, together with the interrupted nature of their studies, results in the average age at graduation being 42.
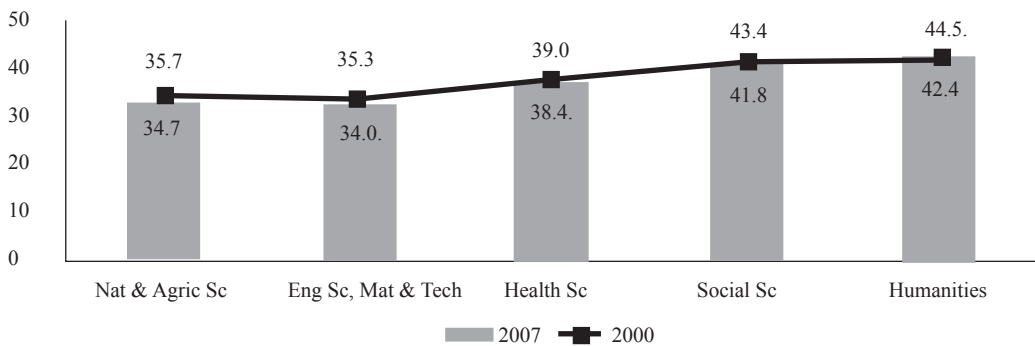

Figure 6: Average age of doctoral graduates at time of graduation by broad field, 2007

Although the average time to degree (TTD) for the South African doctorate is 4.8 years, a substantial 13% of all doctoral graduates take more than 6 years to complete their studies. A breakdown of age at graduation by time to degree (Table 4) reveals, perhaps not surprisingly, a strong negative correlation between these two variables. Students who are below the age of 30 when they graduate take, on average, 3.6 years (in 2007) to complete their doctoral degree. Students in the oldest category (over the age of 50) take, on average, 5.7 years to complete their degree. It is worth pointing out that a third factor – the field of study – should also be taken into account in interpreting these trends as the majority of students in the higher age categories are in the social sciences and humanities (and especially in the fields of education and theology).
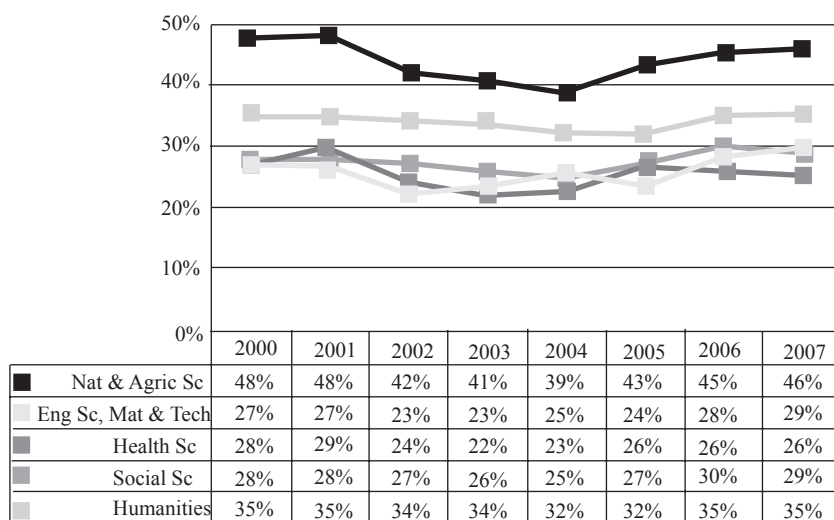
Table 4: Time to degree of doctoral students by age category

	2000		2007	
	Average yrs	N	Average yrs	N
<30	3.7	89	3.6	145
30-39	4.5	251	4.7	458
40-49	5.0	171	4.9	340
50+	5.6	77	5.7	220
All	4.6	822	4.8	1274

The doctoral supervisory capacity in the system

A key issue in any discussion of doctoral production is the capacity of the higher education system to supervise and produce more doctoral students. Since it is a requirement that a doctoral supervisor must have a doctoral degree, the "theoretical supervisory capacity" in the system is determined by the number of academics who have a PhD. The statistics for the period 2006 to 2008 show that only about one third of all permanent academic staff members have a doctoral degree as their highest qualification. This means that there is limited doctoral supervisory capacity in the system. Such capacity (as measured by the share of doctorate staff) is highest in the field of the natural and agricultural sciences where almost half of permanent academic staff members (46%) have a doctoral degree (Figure 4). The field of the humanities also has a relatively larger share of doctorate staff (35%), compared to the other fields (less than 30%).

It should also be kept in mind that the supervisory capacity in the system is spread over 23 universities, although it is concentrated in the 15 universities (rather than universities of technology). However, the six most productive universities produce more than 63% and the twelve most productive universities in the system produce more than 93% of all doctoral students, which also implies that the "burden" of supervision will be higher at these institutions.

	2000	2001	2002	2003	2004	2005	2006	2007
■ Nat & Agric Sc	48%	48%	42%	41%	39%	43%	45%	46%
□ Eng Sc, Mat & Tech	27%	27%	23%	23%	25%	24%	28%	29%
▣ Health Sc	28%	29%	24%	22%	23%	26%	26%	26%
▣ Social Sc	28%	28%	27%	26%	25%	27%	30%	29%
▣ Humanities	35%	35%	34%	34%	32%	32%	35%	35%

Figure 7: Share of permanent academic staff with a doctorate by broad field, 2000 to 2007

In 2010 CREST started compiling a database of doctoral studies in South Africa. The database, which covers the period from 2000 onwards, includes bibliographic information on the doctoral dissertation (student name, title, year, university, key field) as well as supervisor details. This allowed a calculation of how many doctoral students are supervised by a particular supervisor. The results show that, during the period 2000-2009, a small proportion (9.7%) of supervisors supervised more than 10 students. If one adds those who supervised between 6 and 9 students, it is clear that the most productive supervisors in the system (22%) produce, on average, one doctoral graduate per year.
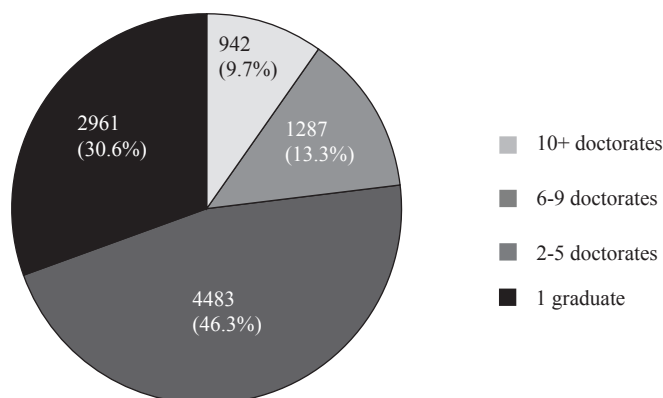
Figure 8: Total number of doctoral graduates per supervisor (n = 9763)

If one keeps in mind that the average doctoral student takes, on average, 4.8 years to complete and also the fact that about half of all doctoral students eventually drop out, these figures imply that the most productive doctoral supervisors are probably supervising between 4 and 6 doctoral students at any given time (to allow for attrition and time to degree). This is a huge supervisory load, especially given the fact that most of these supervisors are likely to also be supervising significant numbers of master's students.

This concludes the presentation of the most recent statistical data on doctoral production in South Africa. In the final section I discuss the key challenges that have emerged in the current discussion of doctoral production.

Four challenges

Current discourses on doctoral production centre around four challenges: The first two concern issues related to the size of the system; the second two relate to matters of quality.

* increasing the volume of doctoral graduates;

* expanding the supervisory capacity in the system;

* improving the efficiency of doctoral production; and

* improving the quality of doctoral production.

Increasing the volume of doctoral graduates

The first challenge is usually phrased in terms of the volume of output and the necessity to increase overall doctoral output. The review of policy documents in the first section illustrated how this debate developed over the past decade. There is no question that South Africa's production of doctoral graduates needs to

increase. If one takes the 2007 figures as benchmark, a comparison with other countries shows that we lag behind many of them. The 2007 figure of 1 274 graduates translates into 26 PhD graduates for every million of total population. Out of a list of 34 countries, South Africa is placed 33rd. The top country on the list, Portugal, produces a massive 569 PhDs for every million of total population. Switzerland (454), Sweden (427), Finland (375) and Germany (297), complete the top five countries on the international list. Other significant achievers are the United Kingdom (288), Australia (264), Norway (208), the United States (201), France (172) and Japan (132). The final five countries on the list, all with scores of under 50 PhDs per million of total population are Turkey (48), Iceland (32), Mexico (28), South Africa (26) and Chile (13).

The targets that have been set by the DST of reaching 6 000 doctoral graduates by 2024 would mean that South Africa – given the current growth in population – come closer to producing around 100-120 PhDs per million of total population. However, it is highly unlikely that this target will be achieved. There are two main reasons for this:

- History is against this being achieved: The system has not doubled doctoral output over the past decade despite the fact that there has been significant growth in master's and doctoral enrolments. The major problem lies in the "size" of the pipeline. We have simply not "converted" sufficient numbers of undergraduate students to continue to postgraduate studies, or honours students to enrol for master's studies and, ultimately, enough master's students to take up doctoral studies.

- Enrolments in recent years, and especially first or new doctoral enrolments, have started to grow at a slower rate (even declining between 2006 and 2008, Figure 9). There is little evidence that the pipeline for potential doctoral candidates are, in fact, expanding in any consistent manner. This rather bleak picture would have been even worse if it had not been for the fact that South Africa has received an increasing numbers of doctoral enrolments from other African countries in recent years. By 2009, 18% of all new doctoral graduates were from another African country.
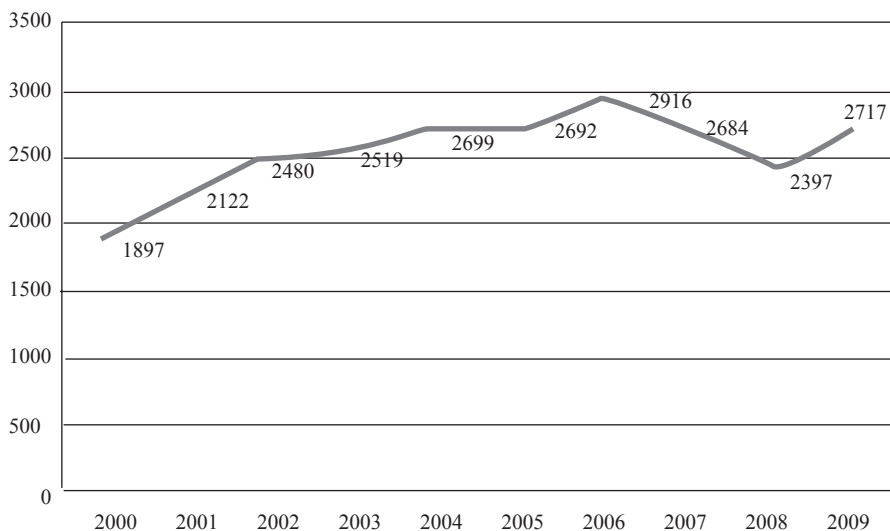

Figure 9:   Trends in first enrolments

Expanding the supervisory capacity in the system

The second challenge is also formulated in quantitative terms: to expand the supervisory capacity in the system. In my view, the current supervisory capacity in the system is already strained (cf. below) and would need to grow faster in order to be able to cope with larger doctoral graduates. A simple calculation: we

currently have about 4 000 academics with doctoral degrees supervising 10 000 doctoral students (an average of 2.5 per academic). In order to increase the absolute output over the next ten years to around 5 000-6 000 students, we would need to have approximately 30 000 doctoral students enrolled at any given time (given attrition rates and more efficient throughput rates). This could conceivably be achieved if each supervisor would supervise 5 students at any given time (which implies doubling the current ratio) as well as having approximately 6 000 academics with doctoral degrees (which means an expansion of 50% in the supervisory capacity in the system). This is a huge challenge which, even if achievable, would require immense resources to ensure that the current supervisory capacity is not merely replenished but, in fact, expanded.

Given that both of the "quantitative" challenges are unlikely to be met, it is not surprising that the question has been raised as to whether doctoral production in the system is efficient.

Improving the efficiency of doctoral production

There are two ways to increase the efficiency of doctoral production: reduce the time to degree (TTD) of those students who do complete successfully and reducing the drop-out rates (or attrition rate) so that more students remain in the system.

In a previous paper (Mouton, 2007), I showed that the TTD of South African students (on average 4.8 years in 2007) compares quite favourably with many other countries. For example, Elgar (2003) cites statistics from the Canadian Association of Graduate Schools which shows that the mean time for completion is about 3 years for master's programmes and 4 to 5 years for doctoral programmes. In their study in Australia, Bourke, Holbrook, Lovat and Farley (2004) found that the median age of "candidacy time" (the time actually spent on doctoral studies) varied between 4.0 and 5.2 (with a median of 4.4) across different fields of study.

As the majority of South African doctoral students study part time (while working), a TTD of approximately 5 years is, in fact, quite competitive. The evidence suggests that students who study full time complete in 4 years or less (as is the case for some students in the natural sciences). One way to meet the challenge to reduce TTD, therefore, would be to invest more money into supporting doctoral students with full-time studies. Current initiatives by HESA and the NRF along these lines should thus be supported. However, it needs to be pointed out that, even if sufficient funds are available to support every doctoral student to study full time, this would, at most, translate into a possible growth in annual output of approximately 20% (reducing the TTD from 5 to 4 years). A much more feasible scenario could see about 50% of doctoral students being supported full time, which could result in an additional 10% (130 students in current figures) to graduate sooner.

The second part of the efficiency argument speaks to reducing drop-out rates. The comparison with data from the US Council of Graduates (Figure 4) shows that South Africa's drop-out rate of 46% compares very favourably with the American data[3]. Our drop-out rate is, in fact, not significantly higher than that of the USA. Results from various other studies (Bourke *et al*., 2004; Chiswick, Larsen & Pieper, 2010; D'Andrea, 2002; Elgar, 2003) have confirmed that doctoral attrition rates vary between 40 and 45%.

Some studies have suggested that attrition rates vary by discipline or field. A recent study in Canada indicated that discipline area was important for completion, with completion rates varying from 45% in the arts and humanities to 70% in life sciences, with science completions being generally in the high 60% range (Elgar, 2003). However, Bourke *et al*. (2004) argue that the results are not as straightforward as these studies usually do not take into account whether students studied full time or part time. When one corrects for these differences, they argue, there is little difference in actual time to completion (what they refer to as "doctoral candidacy time") across disciplines.

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 (Bourke *et al*., 2004: 13).

Different studies, initiatives and programmes have found that there is no one reason why doctoral students discontinue their studies (Gardner, 2009:97). Different authors (Golde, 2000; Lovitts, 2001; Nerad, 2004) acknowledge the complex nature of doctoral attrition, and have examined the reason for attrition through many different lenses.

In an attempt to demystify the contributing factors of doctoral attrition, authors (Golde, 2000; Nerad, 2004) have investigated the decision-making process from the perspectives of students. Other studies focusing on the institutional point of view have found that the causes of doctoral attrition have been generally unknown by faculty and administrators due to a number of structural reasons. Some of these reasons given by Lovitts (2001) include:

- The bigger value that departments place on enrolment numbers compared to retention numbers, which causes departments to collect data on enrolments and graduate rates rather than on attrition.

- Many academics believe that students who leave are "not the best"; thus, they do not constitute points of concern. In many instances, these "less qualified students" are expected to leave once they have served as teaching assistants in undesirable courses for the faculty to teach.

- It was also found, that faculty members did not seem to feel responsible for advising pre-dissertation students, which fosters a lack of communication between departing pre-dissertation students and the faculty.

- Students usually leave silently without discussing the reasons why they leave (Mandoza, 2004:4).

In 2009 Gardner (2009:100) published a paper which combined current students' impressions of doctoral student attrition along with faculty members' impressions on this topic; thus, creating a more holistic picture of student attrition in doctoral programmes. For the purposes of the study, 34 faculty members were interviewed. The faculty members highlighted three main themes related to doctoral student departure in their departments: (a) student lacking; (b) student should not have come in the first place; and (c) personal problems. A lack of ability factored greatly into the faculty members' attributions of student departure (Gardner, 2009:103-104). These themes are also highlighted by Golde (2000) who indicates that faculty members and deans often attribute attrition to a single factor, such as lack of money, talent or commitment. Instead, it needs to be recognised that attrition is the shared responsibility of both student and department (Golde, 2000:202).

In the same study, Gardner (2009) interviewed 60 doctoral students. The three main themes that students attributed to a departure in their programmes were: (a) personal problems; (b) departmental issues; and (c) wrong fit for the programme or institution (Gardner, 2009:105). Indeed, the majority of the personal problems that the students discussed as a reason for student departure related to marriage, children or family responsibilities (Gardner, 2009:106). Specifically, students pointed to several main programmatic issues related to their decision to leave, including bad advising, a lack of financial support, faculty attrition and departmental politics (Gardner, 2009:106).

Thus, although universities are continuously attempting to reduce attrition rates (through various measures), the available scholarship suggests that fairly high attrition rates at this level (around 40%) are simply a reality of doctoral studies and that whatever one does to address this will, at best, have limited effect. The reasons for this state of affairs are not too difficult to understand as the studies cited above have shown that the primary reasons behind doctoral students dropping out are predominantly related to work factors, family matters (divorce, starting a family) and other personal reasons (such as a lack of funding). Factors related to institutional support (or the lack thereof) and poor supervision are not the dominant reasons that are cited for high drop-out rates.

The discussion thus far has focused on strategies that would increase doctoral production in the country: expanding the pipeline and improving efficiency. All attempts to expand the pipeline (which starts with a fresh look at the conversion rates from the Bachelor's degree forward) in order to support more students to do their doctoral studies full time and to increase the efficiency of doctoral production need to

be supported. At the same time, it should be recognised that one cannot focus on these "quantitative" goals only, especially not if these come at the expense of a concern for the quality of our doctoral training.

Improving the quality of doctoral training

One of the outcomes of the "casualisation" of postgraduate studies – specifically the "interrupted non-accumulative" nature of the postgraduates studies trajectory – are that new demands are placed on doctoral training and supervision. In my view, there is no question that it is much more difficult to supervise students who study part time than those who study full time, to supervise doctoral students in their mid-thirties who need to be "retrained" in theory and method, and to supervise students at a distance (which is a reality in South Africa) rather than in face-to-face situations.

The response from many South African universities in recent years has been the increasing *structuration* of postgraduate training and education. In closing, I argue that this structuration trend manifests itself in two mutually reinforcing responses: The shift towards greater "management" of doctoral training and, in particular, models of doctoral supervision. In this respect the shift has been from a kind of "laissez-faire" approach to supervision to increasingly "directorial and transactional" modes of supervision (Gatfield, 2005). A concurrent shift is evident towards more elaborate doctoral training models.

My basic proposition is that doctoral training in South Africa has traditionally conformed to what is referred to as the "thin" model of doctoral training (Figure 10).
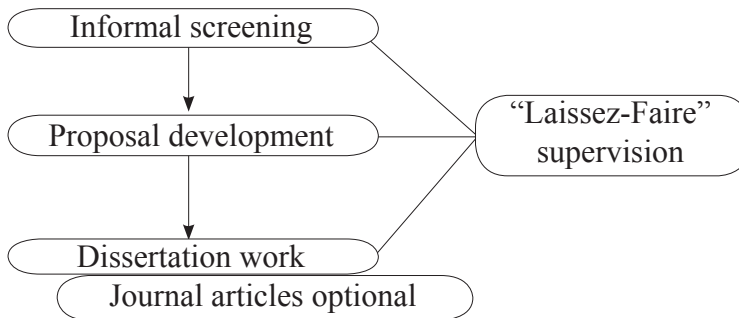

Figure 10: The "thin" model of doctoral training

In the "thin model" of doctoral training, which was the norm in the 1980s and 1990s, there was no formal screening of doctoral candidates, very little structured proposal development (and defence) and no required coursework. The relationship between the supervisor and the doctoral student conformed to what Gatfield (2005) calls "laissez-faire supervision" where there is very little structure and direction on the part of the supervisor.

Over the past decade many departments in South African universities have increasingly resorted to what I refer to as "thick models" of doctoral training (Figure 11). The key features of this model are the following:

- Very structured and rigorous forms of screening that would typically involve potential candidates submitting their CVs as well as other supporting documents (including copies of their master's theses) as well as being interviewed and sometimes even required to take an aptitude test.

- Coursework, especially in theory and research methods, have become compulsory components in many doctoral programmes and in some cases are formally assessed. A case in point is the DBA programme at the Gordon Institute of Business Science where doctoral candidates have to pass a

formal examination in theory and methods before being allowed to proceed with the development of their doctoral proposals.

• The development of the doctoral research proposal is now managed as a very structured process which usually involves screening of such proposals by departmental admissions committees and final approval by faculty boards. In some cases, such proposals are now even being sent for external "examination" before final approval is given.

• The predominant mode of supervision is much more "directorial" (giving clear and specific directions to the candidate on what to do and how to proceed, and even "transactional" (supervising the student in conformance with the design and methodology stipulated in the doctoral proposal). In such a structured supervisory process, much more emphasis is put on continuous monitoring of doctoral performance (at some universities students are required to complete monitoring forms every six months).

• Finally, given the current reward structure in South Africa for doctoral and research outputs, it is not surprising that doctoral students are encouraged, and in an increasing number of cases, required to publish one or two papers based on their theses.
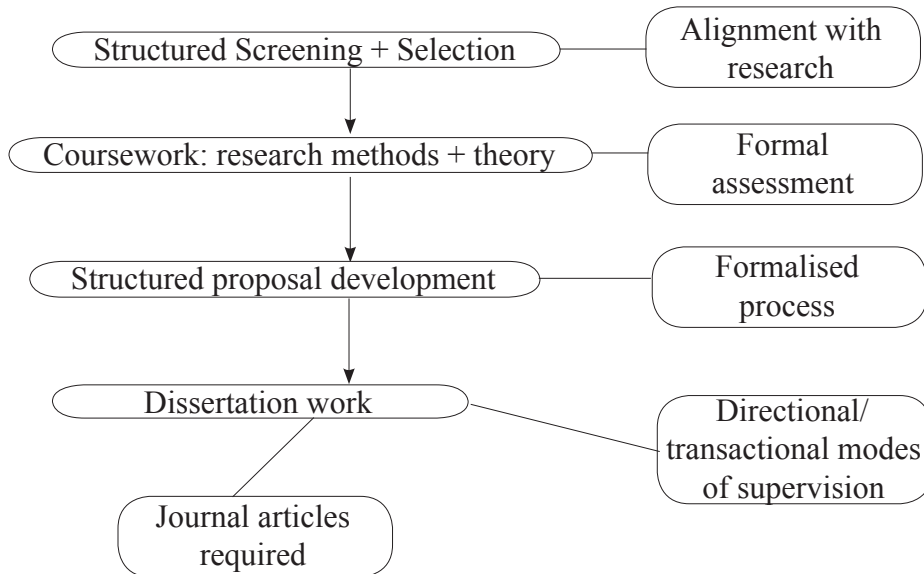

Figure 11: The "thick" model of doctoral training

Conclusions

The increasing attention that doctoral production has received in South Africa in recent years is long overdue and must be applauded. There is no question that the South African economy and society need many more well-qualified and skilled doctoral graduates. In a global knowledge economy the doctoral graduate is perhaps the most important "commodity".

The aim of this article has been to argue that our knowledge of the trends in doctoral production in the country has increased significantly over the past 3-5 years. However, I have also argued that there has been, and continues to be, an over-emphasis on the quantitative goals of doctoral production – how to increase the number of doctoral graduates and to reduce time to degree and attrition rates. These concerns, as I have shown, have their origins in a number of policy developments (most notably a new research

funding framework which came into effect in 2005) as well as strategic planning documents, which have set rather unrealistic targets for doctoral outputs.

In the final section of the article, I argued that, although it remains important to think of strategies to expand doctoral outputs in the country, we also need to apply our minds equally to concerns of quality in doctoral training. In this regard I briefly discussed an evident shift towards "thicker" models of doctoral training, which are indeed aimed at addressing matters related to doctoral and supervisory quality. We do need more research, especially of a qualitative kind, to assess whether these "thicker" models of doctoral training will, in fact, improve the quality of our doctoral candidates and make them more employable and prepared for the new demands of a competitive knowledge society. This kind of research is as important as the need to think of creative solutions to the wide range of challenges that the country faces in producing more and better quality doctoral graduates.

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(Endnotes)

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2. The participation rate divides the total number of student enrolments in the age group 20-24 years by the number of people in the country within the same age group.

3. Although most studies on the American doctorate investigated the traditional time to completion between obtaining a Bachelor's degree and the PhD, this does not materially affect the calculation of the attrition rates of students.