Doctoral Education in South Africa

Policy, Discourse and Data

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Preface

This book draws on a large number of studies conducted by the Centre for Higher Education Trust (CHET) and the Centre for Research on Evaluation, Science and Technology (CREST) over the past decade. In addition to these historical studies, primary research was also undertaken specifically to produce the evidence base for the statistical data referred to in the book. The historical studies focused on a range of issues that affect the growth, efficiency, quality and transformation of the doctorate in South Africa, doctoral supervision, and doctoral tracer studies as well as drawing on studies from the rest of Africa and the world.

Although CREST's first study on postgraduate studies dates back to 2001 when it did a case study of doctoral graduates at Stellenbosch University, its first major investigation into the state of the doctorate in South Africa began in 2008 when it was commissioned by the Academy of Science of South Africa to conduct five studies on the doctorate: (1) a study on systemic blockages in postgraduate education and training; (2) a statistical profile of doctoral students in South Africa; (3) an employer study; (4) a study on doctoral attrition; and (5) a destination study of doctoral students. These five studies would eventually be integrated into a consensus report ('The PhD: An evidence-based study on how to meet the demands for high-level skills in an emerging economy') which was published in 2010 (ASSAf 2010). The CREST reports were the result of a team effort of CREST staff but special mention should be made of the inputs of Nelius Boshoff, Lynn Lorenzen and Rein Treptow.

At about the same time, a series of dialogue sessions and roundtable discussions were organised by CHET with the participation of the Council on Higher Education (CHE) and a number of researchers working on higher education policy issues. These dialogues resulted in two funded projects that became intertwined to form CHET's first major study on the doctorate in South Africa: (1) 'The successful cultivation of social science and humanities doctoral scholarship in South Africa' supported by the Ford Foundation (2009–2011) and (2) 'Toward national and regional policy dialogues for higher education experts and policy-makers in South Africa' funded by Carnegie Corporation of New York (2009–2013). Credit must go to John Butler-Adam (Ford Foundation) and Claudia Frittelli (Carnegie Corporation New York) for their systematic support. Both became more than funders – they were valued participants in the project.

Professor Cheryl de la Rey chaired the initial project on the social sciences and humanities doctoral scholarship, first while she was chief

executive officer of the CHE and then as vice-chancellor of the University of Pretoria. The project began in 2009 with the following aims:

- To provide a clear typology of PhD training and productivity in South Africa;
- To ensure that reliable and valid empirical data would be collected and analysed to stimulate an informed debate on the future of doctoral training in South Africa amongst higher-education leaders, policy-makers and funders; and
- To include a specific focus on the social sciences and humanities.

One of the first outputs of these two projects was a publication titled 'A Literature Review on Models of the PhD' by Professors Johann Louw and Johan Muller,[1] which helped to inform the methodology of the research presented in this book. The findings of this first CHET study were also reworked and written up by Johan Louw (University of Cape Town), with Gillian Godsell (University of the Witwatersrand) conducting the interviews and providing the analysis. Other outputs from CHET's initial work on the doctorate in South Africa included several seminars and the collection of data that led to CHET's second major study.

The second CHET study, with support from CREST, was an analysis of the Higher Education Management Information System (HEMIS) database for all records from 1996 to 2012. (For details about classification of fields and the methodology of calculating completion rates and obtaining data on international students, see Appendix 1.) Acknowledgement must be given to Ms Jean Skene, Mr Jacques Appelgryn and Mr Richard Nempandoni of the Management Information Directorate in the Department of Higher Education and Training for their assistance in preparing and providing the data sets for analysis.

A third separate project that provided data and information about the broader context of the South African system was also funded by the Ford Foundation in 2012. The project was titled 'To develop a differentiation methodology in diversifying the higher education system to meet the needs of society, the economy and students'.[2] Professor Ian Bunting is the project coordinator and CHET has been an active participant in the differentiation debate in South Africa (and in Africa). This project, initially in collaboration with the Center for Higher Education Policy Studies (CHEPS) in the Netherlands and a group of researchers and institutional planners, produced performance indicators of which doctoral enrolment and graduation growth and efficiency were key components. Data and analysis were discussed at several seminars on the issue and it contributed to the Minister's 2010 Higher Education Summit[3] and the *National Development Plan Diagnostic Report* (2011).[4]

CREST's involvement in doctoral scholarship received further impetus when it was commissioned by the Department of Science and Technology (DST) at the beginning of 2014 to conduct a study of the progression and retention rates of South African postgraduate students. The methodology for this study is outlined in Appendix 1. Special mention should be made of the very insightful comments and feedback on earlier versions of the final report of this study by Dr Thomas auf der Heyde, deputy-director general in DST.

Given this wide range of studies separately and jointly conducted by CHET and CREST, it is not surprising that we decided in 2014 to work together to publish a book that would combine the accumulative findings and insights generated by these various studies.

During a seminar in May 2014 entitled 'The Doctorate in South Africa: Policies, Discourses and Statistics' (held in Cape Town),[5] 60 participants met to discuss the conceptual framework of the book (the discourses on growth, efficiency, quality and transformation and their influence on doctoral education in South Africa). The research group also presented selected data and short reports on the qualitative study of departments in the social sciences and humanities, and results from a national survey of supervision practices (see Appendix 1 on methodology).

The research group invited a number of comments from experts who are familiar with the South African higher education context and have themselves been involved in PhD supervision. Professor De la Rey and Professor Badat (then vice-chancellor of Rhodes University) are both former chief executive officers of the South African Council on Higher Education, and Dr Butler-Adam (a former deputy vice-chancellor and the Ford Foundation programme officer) funded this research project. Professor Moja (New York University), Professor Langa (Eduardo Mondlane and University of the Western Cape), and Professors Stensaker and Maassen (University of Oslo) are involved in doctoral education in their own countries and internationally. While the first three commentators mainly focused on the research project itself, the latter four are more concerned with different approaches to doctoral education from different country experiences. This seminar was invaluable to the final conceptualisation of the book and also provided an impetus towards publication. Edited transcriptions of the commentators' presentations are found in Appendix 2.

The authors have, over the past year, presented the main arguments and findings of the book at various forums in South Africa. We wish to thank all those who gave us feedback and raised interesting issues at these meetings. In particular, we'd like to acknowledge the constructive inputs of Professor Johan Muller, Professor Ian Bunting and Professor Jan Botha on the final chapters of this book.

Finally, our thanks go to Angela Mias (CHET) and Kathy Graham and Marlene Titus (Cape Higher Education Consortium) for their administrative support; to Linda Benwell and Letitia Muller at Millennium Travel for handling all the travel and seminar arrangements; to Karen McGregor of *University World News* for her ongoing reportage on HERANA projects and meetings; to African Minds and the publishing team (François van Schalkwyk, Fran Ritchie, Philanie Jooste and Jill Sloan) for their support; and to all the staff at CREST – Astrid Valentine, Lynn Lorenzen, Marthie van Niekerk, Milandre van Lill, Nelius Boshoff, Megan James and Rein Treptow – for their invaluable contributions to the studies conducted over the years and for the logistical support in making this book possible.

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October 2015

Notes

1 http://www.chet.org.za/papers/literature-review-models-phd

2 http://chet.org.za/research-areas/differentiation

3 http://www.chet.org.za/resources/higher-education-summit-march-2010-institutional-differentiation

4 http://www.chet.org.za/papers/higher-education-contribution-npc%E2%80%99s-national-development-plan

5 http://chet.org.za/files/resources/CoE%20CHET%20Crest%20PhD%20Seminar%2016%20May%202014%20Programme%20FINAL.pdf?download=1

About the authors

Nico Cloete is the Director of the Centre for Higher Education Trust (CHET) (a partner in the DST-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy [SciSTIP]) and Coordinator of the Higher Education Research and Advocacy Network in Africa (HERANA). He is also a Guest Professor at the University of Oslo, an Extraordinary Professor at the Institute for Post-School Studies at the University of the Western Cape and Extraordinary Professor in the Centre for Research on Evaluation, Science and Technology at Stellenbosch University. He has published in psychology, sociology and higher education policy. His latest books are *Universities and Economic Development in Africa* (2011) and *Knowledge Production and Contradictory Functions in African Higher Education* (2015).

Johann Mouton is Director of the Centre for Research on Evaluation, Science and Technology (CREST) and the DST-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy (SciSTIP). He is on the editorial board of five international journals including the *Journal of Mixed Methods Research*; *Science and Public Policy*; *Science, Technology and Society*; and *Minerva*. He has authored or co-authored ten monographs including *Understanding Social Research* (1996), *The Practice of Social Research* (2002) and *How to Succeed in your Masters and Doctoral Studies* (2001). He has also edited or co-edited nine books, published 90 articles in peer-reviewed journals and chapters in books, written more than 100 contract and technical reports and given more than 200 papers at national and international conferences and seminars. He has presented more than 60 workshops on research methodology and postgraduate supervision and supervised 72 doctoral and master's students over the past 20 years. In 2012 he was elected to the Council of the Academy of Science of South Africa.

Charles Sheppard is the Director of Management Information at the Nelson Mandela Metropolitan University in South Africa. He has extensive knowledge and experience working with post-school information systems and performance indicators, as well as in the areas of higher education planning, higher education funding frameworks and financial modelling. Some of his recent work includes data work for the Report of the Task Team on Undergraduate Curriculum Structure in the CHE publication *A Proposal for Undergraduate Reform in South Africa* (2013). He also recently prepared a technical paper titled 'Funding of the South African Further Education and Training (FET) Sector' (2013) for the Financial and Fiscal Commission.

List of frequently used acronyms

ASSAf	Academy of Science for South Africa
CHE	Council on Higher Education
CHET	Centre for Higher Education Trust
CREST	Centre for Research on Evaluation, Science and Technology
DHET	Department of Higher Education and Training
DoE	Department of Education
DST	Department of Science and Technology
HEMIS	Higher Education Management Information System
HERANA	Higher Education Research and Advocacy Network in Africa
IAU	International Association of Universities
MoE	Ministry of Education
NCHE	National Commission on Higher Education
NDP	National Development Plan
NMMU	Nelson Mandela Metropolitan University
NPC	National Planning Commission
NQF	National Qualifications Framework
NRF	National Research Foundation
NWU	North-West University
OECD	Organisation for Economic Co-operation and Development
PQM	programme and qualifications mix
RU	Rhodes University
SADC	South African Development Community
SET	science, engineering and technology
SU	Stellenbosch University
TUT	Tshwane University of Technology
UCT	University of Cape Town
UFH	University of Fort Hare
UFS	University of the Free State
UJ	University of Johannesburg
UKZN	University of KwaZulu-Natal
UNISA	University of South Africa
Univen	University of Venda
Unizulu	University of Zululand
UP	University of Pretoria
UWC	University of the Western Cape
WEF	World Economic Forum
Wits	University of the Witwatersrand
WSU	Walter Sisulu University

Chapter 1

The demand for a doctorate: Global, African and South African contexts

- Introduction
  - Internationally: An increasing number of PhDs?
- Africa needs tens of thousands more PhDs
  - Trends in doctoral enrolment numbers
  - Trends in doctoral graduation numbers
  - Pipeline of graduates against enrolments
  - Innovation in doctoral education
- South Africa: More PhDs to solve the quality problem
  - Debates and discourse
  - Different pressures on PhD production: A framework
    - Growth
    - Efficiency
    - Transformation
    - Quality
- Dynamics of doctorate production
- The structure of this book

Introduction

Worldwide, in Africa and in South Africa, the importance of the doctorate has increased disproportionately in relation to its share of the overall graduate output over the last decade. This heightened attention has not been predominantly concerned with the traditional role of the PhD, namely the provision of a future supply of academics. Rather, it has focused on the increasingly important role that higher education – particularly high-level skills – is perceived to play in the knowledge economy.

In a literature review on doctoral studies, Louw and Muller (2014) state that it is common knowledge that the 1990s brought an upsurge of interest in the doctorate. This upsurge has become frenzied in recent years. For example, during 2013 alone, *University World News* (UWN) published more than 30 articles on the doctorate, covering the need for more or fewer PhDs, the importance of the doctorate in the knowledge economy, competition for talent, international mobility and changing models of PhD programmes, to mention but a few issues (see Appendix 3). In South Africa, the *National Development Plan* (NDP) (2012) has prioritised an increase in doctoral output from 1 876 in 2012 to 5 000 by 2030. And at a meeting on the doctorate in October 2013, sponsored by the National Research Foundation (NRF) and Carnegie Corporation of New York, there was broad agreement that Africa needs tens of thousands more PhDs in order to renew an ageing professoriate, staff the rapidly expanding higher education field, boost research and generate the high-level skills growing economies need (MacGregor 2013b).

This chapter will provide brief comments on the debates internationally, in Africa, and in South Africa. These comments cover broader policy debates and issues, including the renewed interest in the doctorate. We address international trends first, then recent attempts in Africa to address this issue and, lastly, some South African developments.

Internationally: An increasing number of PhDs?

Probably the most comprehensive global overview of doctoral production to date, 'The PhD factory' was published in *Nature* in 2011 (Cyranoski et al. 2011). Raising debate with the subtitle, 'The world is producing more PhDs than ever before. Is it time to stop?', the article begins by reporting that in Organisation for Economic Co-operation and Development (OECD) countries, the number of science doctorates grew, between 1998 and 2008, by nearly 40% to some 34 000. The authors noted that this growth showed no sign of slowing: most countries are building up their higher education systems because they see educated workers as a key to economic growth.

During the 1990s, there were indications of a correspondence between the acceptance of the notion of the knowledge economy and society, on the one hand, and the rise of the doctorate, on the other. In 1991, as part of his 'university-as-the-engine-of-development' paper delivered at a World Bank seminar in Kuala Lumpur, Manuel Castells (1991) argued that new modes of economic production were increasingly reliant on knowledge and information technology. Knowledge and 'informationalism' had become central to globalisation and development (Castells and Cloete 2011). The sources of productivity and competitiveness were increasingly dependent on knowledge and information being applied to productivity. The increasing generation and accessing of knowledge has led to what is now commonly

referred to as the knowledge society (Castells 1991) or the knowledge economy (Jessop 2007).

On the one hand, some people still question the notion of the knowledge economy; in recent times, Jessop (2007) described it as a fictitious commodity. On the other hand, the OECD, the World Bank and many governments often use it as kind of ideology to promote certain economic and education policies. Nonetheless, there is a substantial body of evidence about the importance of knowledge in economies linked into the global information society.

Econometric studies carried out during the early 1990s started showing a statistical relationship between diffusion of information technology, productivity and competition for countries, regions, industries and firms (Monk 1989; Landau and Rosenberg 1986; Castells 1991). A decade later, a World Bank calculation showed that the knowledge sector added more value than the business process to a product (Serageldin 2000). This position was taken a few steps further by Schwab (2012), founder of the World Economic Forum (WEF), who, reflecting on the 2012 WEF meeting, suggested that 'talentism' is the new capitalism.

Confirming the valuing of talent in today's global economy, the Mercer Talent Survey shows that chief executive officers understand that talent is a primary source of competitive advantage: whether entering a new market, innovating existing processes, developing a product or expanding service lines, it is an essential element of every core business function (Mercer 2013).

If knowledge and information are the new electricity of the economy, then it is a reasonable assumption that the university – as the main knowledge institution in society – will become increasingly important and that its apex training product, the PhD, will appear on the skills radar (*Times Literary Supplement* 2013).

A number of initiatives were launched during the past two decades to examine doctoral education and training more closely, with the aim of reforming it in yet-to-be-determined ways. In Europe, perhaps the best-known policy changes are those instituted via the Bologna Declaration of 1999 (Joint Declaration of the European Ministers of Education 1999), with its harmonisation of the higher education landscape, as well as the Lisbon Strategy of 2000 to create a European Research and Innovation Area (Lisbon European Council 2000). In North America, a number of investigations were launched, such as by the United States Council of Graduate Schools' PhD Completion Project (Council of Graduate Schools 2008), the Woodrow Wilson National Fellowship Foundation's Responsive PhD Initiative (Woodrow Wilson National Fellowship Foundation 2005), the Carnegie Initiative on the Doctorate (Golde and Walker 2006) and the Graduate Education Initiative funded by the Andrew W Mellon Foundation (Ehrenberg et al. 2010). Writing in the mid-2000s, Pearson (2005: 119)

described doctoral education as an 'emergent field of study' characterised by great vigour and a breadth of interest.

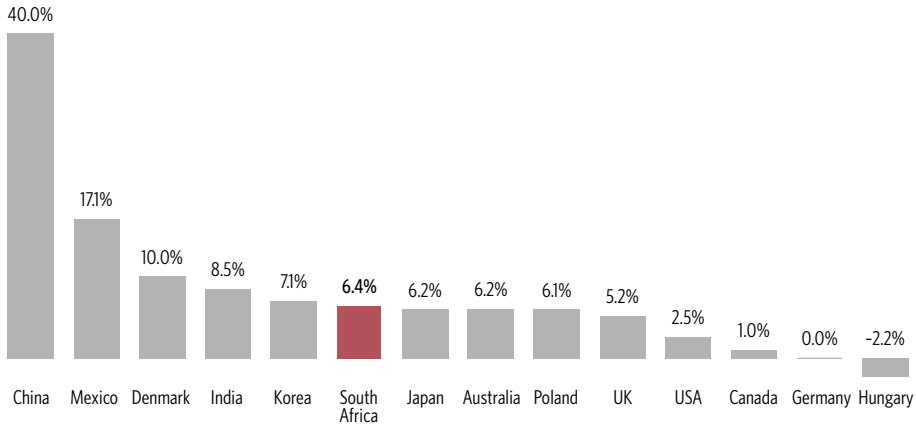
Despite this emerging interest, growth in PhD production is not uniform across the world and there is considerable debate about whether it is an unambiguously positive development. Figure 1.1 tells a differentiated story. Countries that already have high levels of doctorate production (Germany, Canada, the United States and the United Kingdom) have an output that is growing at around 5% or less, while fast-developing countries are growing doctoral output at more than 7%, with Mexico (17%) and China (40%) increasing at astronomical rates. An exception amongst developed countries is Denmark (10%), which adopted a comprehensive knowledge economy development growth path and increased spending on higher education after the 2008 global financial crisis.

Cyranoski et al. (2011) summarise the Chinese phenomenon as follows:

> *The number of PhD holders in China is going through the roof, with some 50 000 people graduating with doctorates across all disciplines in 2009 – and by some counts it now surpasses all other countries. The main problem is the low quality of many graduates.* (Cyranoski et al. 2011: 1)

It is widely known that China's policy of developing world-class universities is underpinned by its view that education providing for high-level skills is central to economic growth (Shen 2013). Other countries that are following massive expansion policies are Singapore ('growth in all directions'), which has experienced a 60% growth over a five-year period, and India

Figure 1.1: The rise of the doctorate: Percentage growth in doctoral output (1998–2006)



Source: Cyranoski et al. 2011

('PhDs wanted'), which is planning to grow much faster than the current 8.5% (Cyranoski et al. 2011: 277). Many Asian countries – but particularly Korea, Thailand and Malaysia – are following radical PhD expansion policies.

While the US is now, for the first time since the 1950s, the world's second-largest producer of PhDs after China, there is considerable debate about continuing growth. Paula Stephan, an economist who studies PhD trends, charges that it is 'scandalous that US politicians continue to speak of a PhD shortage [...] unless Congress wants to put money into creating jobs for these people rather than just creating supply' (Stephan 2011, in Cyranoski et al. 2011: 277).

In the US, the proportion of people with science PhDs who get tenured academic positions in the sciences has been dropping steadily and industry does not appear to be fully absorbing the surplus. In 1973, 55% of US doctorates in the biological sciences secured tenure-track positions within six years of completing their PhDs, with only 2% being in a postdoctoral or another untenured academic position. By 2006, this figure had decreased to only 15% holding tenured positions six years after graduating and increasing numbers of PhD graduates taking jobs that did not require a PhD (Stephan 2011, in Cyranoski et al. 2011: 277). Stephan argues that it is a waste of resources to spend money on training students who get jobs for which they are not well matched (Stephan 2011, in Cyranoski et al. 2011).

Hacker and Dreifus (2011) concur that PhD production has far outstripped the demand for university lecturers. They report that while the US produced more than 100 000 PhDs between 2005 and 2009, only 16 000 new professorships became available. Furthermore, the use of PhD students to do much of the undergraduate teaching has reduced the number of full-time academic jobs.

The 2013 Postgraduate Research Experience Survey (Bennett and Turner 2013) covered 122 UK universities and received 4 500 responses and it found that 40% of doctoral students were aiming for an academic career and 27% for a research or professional career outside higher education. The career pathways survey of 2010 graduates showed that 2% were unemployed, 20% were in higher education research occupations, and 25% in higher education teaching and lecturing, with 15% in research not in the higher-education sector and 25% in other doctoral occupations.

The issue is not only oversupply for the academic market but also relevant skills for the non-academic market. *The Economist* (2010) claims that many organisations that pay for doctorates with research skills have realised that significant numbers of PhD graduates find it tough to transfer their skills to the job market. For example, writing lab reports, preparing academic presentations and conducting six-month-long literature reviews do not translate directly into skills required in the business world, where

technical knowledge has to be assimilated quickly and presented in simple terms to a wider audience. In responding to this problem, some universities are offering their PhD students training in soft skills that may be useful in the labour market, such as communication and teamwork. In Britain, a four-year New Route PhD claims to develop such skills in graduates (*The Economist* 2010).

The position that doctoral training is undertaken either for traditional academic purposes or for commercial labour markets does not take into consideration the fact that the process of doctoral training in the US is integral to the global knowledge economy. For example, the PhD arena in the US is no longer a male-dominated enterprise benefiting US citizens alone. In 1966, US-born white males received 71% of science and engineering PhDs, US-born females earned 6% of those degrees and foreign-born students received 23% (Bound et al. 2009). By the year 2000, US-born white males received just 35% of science and engineering PhDs, while 25% of such doctorates were awarded to females and 39% to foreign-born students (Bound et al. 2009). In 2003, doctorate recipients from outside the United States accounted for 50% of PhDs awarded in the physical sciences, 67% in engineering and 68% in economics (Bound et al. 2009). Linked to this, Anna-Lee Saxenian estimates that approximately 35% of all start-up companies in Silicon Valley are owned by East Asian and Eastern European students who came to the California higher-education system for postgraduate studies linked to the Silicon Valley research and innovation ecosystem, which has been a magnet for the 'best and the brightest' from all over the US, and increasingly from abroad, for more than a half a century (Saxenian, in Castells and Himanen 2014).

What percentage of foreign students qualifying in the US return to their home countries? In the areas of science and engineering, the US 1999 cohort remained in the country at a stay rate of 68% two years after graduation and ten years later the stay rate was still relatively stable at 60%. A similar study in 2004 revealed almost exactly the same percentage (66%), which declined over five years to 62% in 2009 (National Science Foundation 2012). There was an increase in foreign students returning to their countries of origin after the 2008 financial crash but by 2011 patterns had returned to pre-2008 levels (National Science Foundation 2012). New York Mayor Bloomberg, joining influential chief executive officers from the Partnership for a New American Economy, said, 'I can't think of any ways to destroy this country quite as direct and impactful as our immigration policy [...] We educate the best and the brightest, and then we don't give them a green card' (Packer 2010: online). Furthermore, a study by the Council of Graduate Schools (2008) showed that foreign students completed their studies at a faster rate than US students. Overall the cumulative ten-year completion rate for foreign students was 67% against

54% for domestic students. In mathematics and physical science, the difference was even bigger at 68% versus 51%.

But the PhD is not just a possible contributor to talent in the knowledge economy – it is also regarded as crucial for improving quality in the university system. In an article entitled 'The rise and rise of PhDs as standard', Morgan quotes Wendy Piatt, Director-General of the Russell Group (UK) of larger research-intensive universities:

> *The vast majority of (our) academics [...] have doctorates. There may be some slight variation according to discipline, but academics without a doctorate would be very much in a tiny minority. This has been the case at Russell Group universities for many years. Providing a first-class teaching and learning experience is vitally important to our universities.* (Piatt 2011, in Morgan 2011: 1)

Germany is widely regarded as having one of the best vocational or artisan systems in the world. According to the review in *Nature* (Cyranoski et al. 2011), it is not only Europe's biggest producer of doctoral graduates, but has also made significant progress in solving the oversupply problem through a major redesign of its doctoral education programmes over the past 20 years. Under the traditional mentorship model, supervisors recruit PhD students and train them to become academics, with little oversight from the university or research institution. The application of this traditional model has changed in Germany in that the institution now plays much more of an active role in student recruitment and development, with many students following structured courses outside the lab, including classes in presenting, report-writing and other transferable skills. Just fewer than 6% of PhD graduates in science eventually go into full-time academic positions, while most will find research jobs in industry. As summed up by Wihelmy, 'The long way to a professorship in Germany and the relatively low income of German academic staff makes leaving the university after the PhD a good option' (2011, in Cyranoski et al. 2011: 278).

Latin America has not demonstrated the same urgency as other regions to expand, with the exception of Mexico (see Figure 1.1) and Brazil, which have begun to take the knowledge economy very seriously. In its recent strategy to boost its economy's scientific base, Brazil offered 75 000 grants in 2011 – to be allocated by the end of 2014 – to science students keen to study abroad (Hennigan 2011). The aim of this Science Without Frontiers programme is to increase the number of Brazilian pre- and post-doctoral students in leading foreign institutions (Hennigan 2011). President Dilma Rousseff stated at the launch of the programme that the objective was 'not to produce "75 000 Einsteins"' but instead to build 'a knowledge base in the country; that these students return and with their capacity and training and

transform the know-how and innovation of the country' (Rousseff 2011, in Hennigan 2011: online).

In addition to the 75 000 publicly funded grants, Brazil's Secretariat of Strategic Affairs aims to raise financing from the private sector for a further 25 000 grants (Hennigan 2011). Of the 100 000 fellowships in the four-year programme, around 10% are earmarked for doctoral studies. Another 10% allocated to postdoctoral fellowships will benefit young Brazilian professors on sabbatical, spending a year in a university abroad (Schwartzman 2013).

The doctoral fellowships described above will be in the format of sandwich programmes in which Brazilian doctoral students go abroad for a year to do some work in a high-capacity foreign university before returning to complete their doctoral programme at home. The time spent abroad is sandwiched between two periods of studying in Brazil (Schwartzman 2013). This approach emphasises a trend to reduce the number of four-year doctoral fellowships and to increase the number of short-term fellowships.

At a convention on the doctorate in November 2013, organised jointly by the Carnegie Corporation of New York and South Africa's NRF, Professor Ribeiro of the University of São Paulo presented the Brazilian experience on expanding doctoral training while putting quality control measures in place to ensure excellence. He reported that Brazil raised its doctoral production from 800 to 10 000 graduates per annum in less than thirty years (1984 to 2010). Current doctoral production stands at 12 000 per annum (Ribeiro, in Namuddu 2014).

Africa needs tens of thousands more PhDs

Africa is certainly not left out of the debate about the importance of the doctorate. During 2012 alone, discussion on doctoral education took place through an International Association of Universities (IAU) and Catalan Association of Public Universities (ACUP) international seminar entitled 'Innovative approaches to doctoral education and research training in sub-Saharan Africa' (IAU and the Catalan Association of Public Universities 2012), the Southern African Regional Universities Association (SARUA) leadership dialogue, 'Doctoral education: Renewing the academy' (SARUA 2012) and the IAU's 'Changing nature of doctoral studies in sub-Saharan Africa' (IAU 2012).

In Africa the zeitgeist is perhaps best summed up by Prof. Is-haq Oloyede who, speaking as chair of the IAU Task Force, highlighted the direct link between doctoral studies and research for the development of Africa (IAU-ACUP 2012). He stressed the importance of supervision and career development for university and national advancement, and called for more synergy and collaboration to broaden the development of doctoral

education in African universities. The importance of doctoral education and its relevance for African higher education institutions (HEIs) was not questioned (IAU-ACUP 2012).

In summing up the challenges in developing and promoting doctoral education, the main issues that the IAU-ACUP report (IAU-ACUP 2012: 6) lists are:

- Shortage of funding (for students and institutions);
- Low institutional capacity;
- Diversity and duplication of programmes;
- Poor quality supervision;
- Inadequate responsiveness to national, social and economic needs;
- Weak links to industry;
- Lack of academic freedom; and
- Lack of international information-sharing.

Interestingly, the report concludes by stating that 'while the status of the PhD is recognised in Africa, African society does not know how to evaluate the competencies of PhD holders nor the relevance of what they can contribute to society' (IAU-ACUP 2012: 20).

The IAU-ACUP report is partially informed by an IAU study that looked at six universities: Kenyatta in Kenya, Doula in Cameroon, Ilorin in Nigeria, Science and Technology of Benin (USTB), Gaston Berger (UGB) in Senegal and the National University of Rwanda (NUR). The report provided a broad overview and comparisons of the listed institutions in terms of programmes, enrolments, graduation and funding. The main conclusion of the study was the following:

> *The project was found to be a valuable experience and an 'eye opener' to participating institutional teams and university leadership as well. Indeed if most leaders and main doctoral programme actors thought they knew what was at stake, many reported to have been surprised by what the self-assessment exercise and interim report brought to the fore. Many reported that they thought that their doctoral programmes were doing well and realize that there is considerable space for improvement.* (IAU 2012: 43)

In making recommendations to address the doctoral challenges, the conference proposed, amongst others, the following (IAU-ACUP 2012: 19–20):

- *Strategy*: Strong national research strategies, innovative approaches, research and doctoral studies synergies and improved data collection;

- *Quality*: Rethinking access strategies, improved supervision, structured evaluation systems, flagship universities and centres of excellence;
- *Funding*: Increased government support for research and for staff incentives to secure proper supervision;
- *Networking*: Increased sharing of good practices; and
- *Alternative modes of delivery*: Different models of doctoral education, creative mechanisms to attract highly skilled individuals from the diaspora and better employment opportunities.

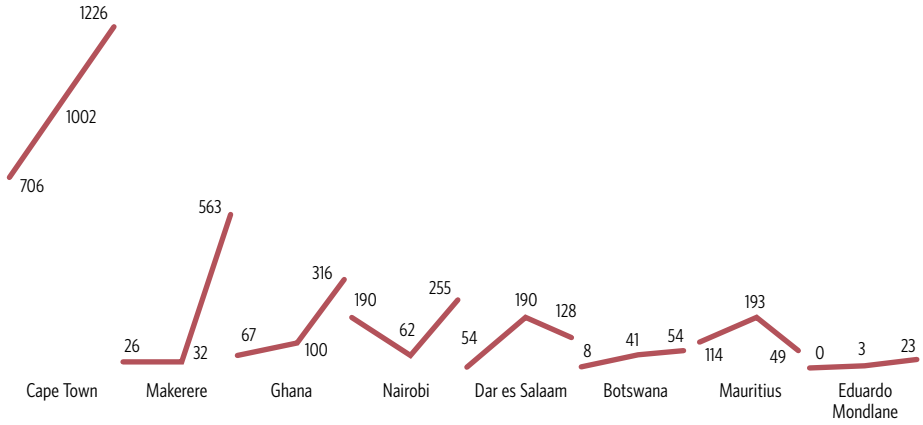
At the aforementioned NRF/Carnegie convention on the doctorate in 2014, the chairperson of the African Union Commission, Dr Nkosazana Dlamini Zuma, said, 'Your discussions on looking at ways to train thousands more PhD students on the continent, in addition to the ones we send to train elsewhere, is therefore needed now more than ever before' (Zuma, in Namuddu 2014: 7). Reporting for *University World News*, Karen MacGregor summed up the meeting as follows: 'There is a conundrum. In order to produce more doctoral graduates, more PhD supervisors are needed: but in order to have more supervisors, more PhDs are needed' (McGregor (2013b: online).

Africa is littered with anecdotal studies, followed by high-profile conferences with grand declarations and recommendations. Considering the general development-aid funding context, the challenge is to do more systematic, research-informed studies to diagnose problems in a way that avoids hasty prescriptions. The lack of implemented reform in Africa is often lamented as a problem not of good policy but of poor implementation, which is then attributed to a lack of capacity or funds. However, the difficulty actually originates with superficial understandings of the problem, followed by declarations rather than policy, as well as a lack of consensus on what to do. All of this gives rise to inevitable disappointment.

Trends in doctoral enrolment numbers

A bleak picture of doctoral education emerged from an eleven-year study on eight sub-Saharan African universities carried out by the Higher Education Research and Advocacy Network in Africa (HERANA) project at the Centre for Higher Education Trust (CHET) (Bunting et al. 2014). The total doctoral enrolment for eight sub-Saharan African flagship universities in 2011 was only 2 614, with the University of Cape Town (UCT) enrolling 1 226 and the other seven universities in the study only 1 388 collectively (see Figure 1.2). While the University of Botswana, Makerere University and the University of Ghana showed strong growth – albeit from a low base – doctoral enrolments at the University of Mauritius actually declined, and inconsistent performance at midpoints

Figure 1.2: Doctoral enrolments at eight sub-Saharan African universities (2001, 2007, 2011)



Source: Bunting et al. 2014

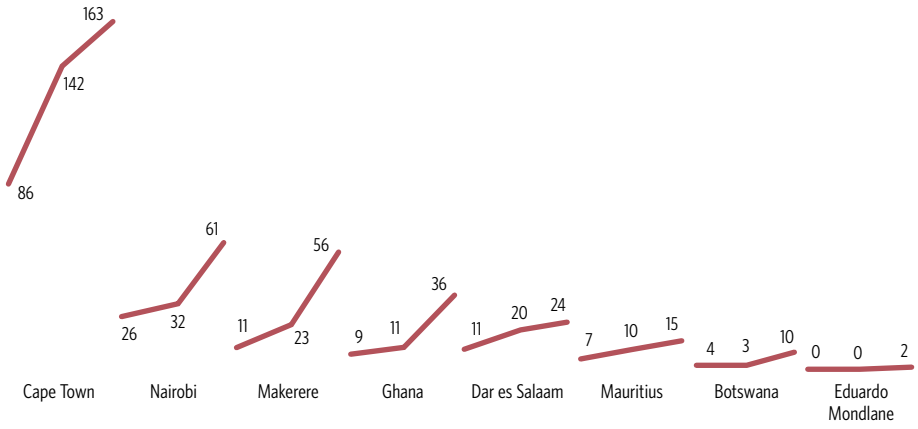
during the period are evident in the doctoral enrolment figures for the Universities of Dar es Salaam and Nairobi (Bunting et al. 2014).

The slow growth in doctoral enrolments illustrated in Figure 1.2 is in sharp contrast to the explosion in masters enrolments at certain universities. At the University of Nairobi, masters enrolments increased by 12% annually (from 3 937 in 2001 to 11 807 in 2011) and at Ghana by 13% (1 198 in 2001 to 4 280 in 2011). While Mauritius and Botswana grew at over 10% per annum, it is of interest to note that UCT and Makerere grew at around 3% (Bunting et al. 2014).

Trends in doctoral graduation numbers

The picture regarding doctoral graduates, as illustrated in Figure 1.3, is even more alarming than that for doctoral enrolments (Bunting et al. 2014). The combined doctoral graduate total at the eight universities increased from 154 in 2001 to 367 in 2011. UCT, Nairobi and Makerere produced 80% of the 2001 doctoral graduate total in 2001, 82% of the total in 2007 and 76% in 2011. Over the same period, the University of Sao Paolo in Brazil produced over 1 000 doctoral graduates, a figure which virtually matches the combined output of all 23 South African universities in 2011 (Badsha and Cloete 2011). The average annual increases at sub-Saharan African universities are also well below 10%, with the exception of institutions such as Ghana, Makerere and Botswana, all of which started from very low bases in 2001 (Bunting et al. 2014).

Figure 1.3: Doctoral graduates at eight sub-Saharan African universities (2001, 2007, 2011)

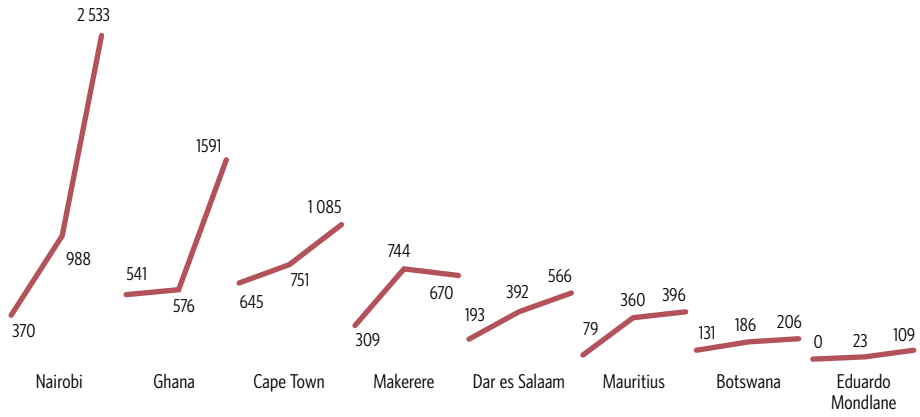


Source: Bunting et al. 2014

Pipeline of graduates against enrolments

Figure 1.4 shows how masters graduate totals increased from 2001 to 2011 (Bunting et al. 2014). The masters graduate total of the eight universities increased at an average annual rate of 12% over the period (from 2 268 in 2001 to 7 156 in 2011). Two universities were responsible for 66% of the overall increase of 4 888 in 2011 compared to 2001: Nairobi, which showed a six-fold increase from 370 in 2001 to 2 533 in 2011, and Ghana, which had a masters graduate total trebling from 541 in 2001 to 1 591 in 2011.

Figure 1.4: Masters graduates at eight sub-Saharan African universities (2001, 2007, 2011)



Source: Bunting et al. 2014

However, a major problem in Africa is the extremely low conversion rate from masters to doctoral enrolment. At UCT and Makerere the ratio was 3:1 in 2011, meaning that for every three masters students there was one doctoral student. However, at Nairobi the ratio was 46:1 in the same year, while at Eduardo Mondlane it was 56:1 (Bunting et al. 2014).

Innovation in doctoral education

In addition to the pipeline problem in Africa, it also appears that there has not been much innovation in forms of doctoral education. Mentz (2013) argues that in response to the emergence of knowledge societies with the concomitant shifting labour-market needs, institutions in developed and developing nations alike have begun to re-engineer their doctoral programmes to address these shifts.

But a review of doctoral programmes undertaken in sub-Saharan Africa by Szanton and Manyika in 2002 revealed that most doctorates take the form of a research dissertation that is guided by one supervisor (Szanton and Manyika 2002). They reported that factors that discourage use of other forms of the doctorate are the limits on supervisor options, the lack of funding for collaborative projects and even restrictions posed by the regulatory environment. This review also showed that these same factors serve to drive African postgraduates to follow funded-scholarship opportunities available at universities on other continents.

The HERANA study (Bunting et al. 2014) looked at factors that affect the production of doctorates in Africa. In addition to a lack of national and institutional policies and funding promoting doctoral education, there are other factors intrinsic to academia in Africa that could have detrimental effects. A PhD study by Langa (2010), linked to the HERANA project, suggested that having a strong academic network link, along with publications, is a key entry point to academics being allocated consultancy contracts. Langa found that it is not that academics choose research and supervision over consultancy; instead, some do a balancing act between research and consultancy, while others seem to gravitate towards and become deeply involved in consultancy and foreign aid networks.

Discussions with interview respondents during the HERANA study indicated that another factor that distracted academics from knowledge production was supplementary teaching. On the one hand, the new method of raising third-stream income – namely, the innovation of private and public students in the same institution, with additional remuneration received for teaching of private students – has resulted in academics taking on heavier teaching loads in order to supplement their incomes. On the other hand, the proliferation of private higher education institutions, some

literally within walking distance of public institutions, means that large numbers of senior academics are triple-teaching.

Within a context where the candidate in all likelihood does not have funds for full-time study and where there are no extrinsic institutional rewards, PhD supervision is a poor competitor for the time of triple-teaching academics. The same applies to the rigorous research required for international peer-reviewed publication: it is much easier and far more rewarding to triple-teach and to carry out consultancies than to engage in intensive research reviewing or doctoral supervision (Cloete et al. 2011).

In a study conducted in 2008 in the SADC region, the Centre for Research on Evaluation, Science and Technology (CREST) broke new ground in generating empirical evidence of the extent of consultancy work by academics at the universities in 14 African countries (Mouton et al. 2008). As far as the extent of consultancy work is concerned, the majority of CREST's survey respondents (62%) indicated that they were involved in consultancy of some kind. The proportion of respondents by country who indicated that they engaged in consultancy ranged from 50% (Lesotho) to 72% (Malawi and Zimbabwe).

On the question of what type of consultancy respondents were involved in, follow-up responses indicated that clients using their services were:

- Governments in their own countries (36%);
- The industry sector in their own countries (30%);
- Academics in their own countries (21%);
- Academics in other African countries (8%);
- Academics in non-African countries (7%);
- Governments of other African countries (8%); and
- Industry in other African countries (4%) (Mouton et al. 2008).

The main reasons that respondents provided for engaging in consultancy were also analysed. In a comparison of South African and other SADC responses, there were some noticeable and statistically significant differences. Two areas in which there seemed to be very little difference were the fact that consultancy was undertaken because the respondent enjoyed the variety of topics that this brought (87% vs 82%) and that consultancy was done because of the demand in the market (32% vs 38%). Other reasons given demonstrate large differences between South African and other respondents:

- Inadequate salary: South Africa (54%) vs SADC (69%);
- Consultancy advanced the respondent's network and career: South Africa (39%) vs SADC (72%);

- Respondents' research interests were not addressed by their own institutions: South Africa (18%) vs SADC (47%); and
- Consultancy improved respondents' knowledge and skills: South Africa (78%) vs SADC (92%) (Mouton et al. 2008).

A further breakdown by scientific field revealed significant field differences, but mostly in the expected direction. Respondents in highly applied fields (where there were close links with industry and also government) such as applied sciences and technologies, earth sciences, engineering, material sciences, as well as social sciences (with policy work) reported high percentages of consultancy engagement. In fields such as mathematical sciences, few consultancy opportunities existed (Mouton et al. 2008).

The implications of the above are that the lack of knowledge production at some of Africa's flagship universities does not simply arise from a lack of capacity and resources, but that there are also complex and contradictory rewards within a resource-scarce environment. These factors contribute to the absence of a strong, output-orientated culture of research and doctoral production at these universities.

South Africa: More PhDs to solve the quality problem

In the 1990s, the dominant debate in higher education in South Africa was about access and equity, particularly how to increase the number of high-school graduates entering universities and how to address racial and gender imbalances. The policy debate leaned sharply towards equity and methods of changing the racial composition of higher education. Access, in this context, was not seen as massification or as part of a development model, but rather as a mechanism for redressing the imbalances of the past by using a model of planned growth. This approach succeeded in increasing the percentage of black[1] students in universities (from 53% in 1996 to 69% in 2011) but it hardly affected the overall gross participation rates of African students, which only increased from 10% to 16% (Cloete 2014b).

Following the publication of the *National Development Plan* (NDP), the focus of the national debate in South Africa shifted from equity to development (National Planning Commission [NPC] 2012). This was motivated by the fact that equity as redress alone was running counter to the demands for economic growth and youth employment. Mounting evidence indicated that the country needed a drastic review of its education policies. The WEF rated the South African education and training system 140th out of 144 countries, declaring that the greatest impediment to doing business in South Africa was an inadequately skilled workforce (WEF 2012: 13).

Using assessments of the South African system by the Harvard panel on ASGISA (Dube et al. 2007), a World Bank project (Fisher and Scott 2011) and CHET's recent work on differentiation (Cloete 2011a), the South African higher-education system can be characterised as 'medium knowledge producing and differentiated; with low participation and high attrition rates; with insufficient capacity for adequate skills production; and with a small, chronically-in-crisis, sub-sector (mainly institutions from the historically disadvantaged universities)' (Badsha and Cloete 2011: 5). The two central issues requiring new approaches and new policies are knowledge production – mainly the production of doctoral graduates and publications listed in the Thomson Reuters Web of Science database – and participation rates (the proportion of those between 18 to 24 years of age who are in tertiary education).

The shift in discourse from equity to development was perhaps most clearly articulated during the South African Planning Ministry's national development planning process and subsequent proposals. Central to a highly productive, globally connected economy are high-level skills and extensive participation in higher education. The first draft of the NDP embraced the knowledge-economy argument (NPC 2011); in fact, it was so enthusiastic about knowledge production that it declared that 'knowledge production is the rationale of higher education' (NPC 2011: 271). This is indeed a radical departure from the traditional rationale of higher education in Africa, being the dissemination, through teaching, of knowledge from elsewhere. As indicated earlier, it is also a significant departure from the post-1994 focus in South Africa, where higher education was seen mainly as an equity instrument providing for mobility of the historically disadvantaged (Cloete et al. 2011).

The NDP draft report (NPC 2011) accepted the characterisation of the South African system as described above (Badsha and Cloete 2011). It proposed a dramatic increase in post-secondary school enrolments, mainly in the further education and training (FET) college sector. It also proposed the strengthening of knowledge production that would entail, amongst other things:

- Improving coordination, especially between the Department of Higher Education and Training (DHET) and Department of Science and Technology (DST);
- Increasing the proportion of postgraduate enrolments, outputs and postdocs; and
- Improving existing and designing new incentive structures, particularly for increasing doctoral output. This is necessary not only for research and development, but also to increase the proportion of academic staff

with doctorates and the increasing demand for 'professional' PhDs in the financial and services sectors (Badsha and Cloete 2011).

However, there is a significant shift discernible between the NPC's draft proposal of November 2011 and its final report in August 2012. In a review comparing the two versions, Muller comments that there is a 'marked moderation in the Plan [2012] compared to the assertiveness of the Draft [2011]. It is clear that it is the product of multiple suggestions from different stakeholders, and that the drafters have tried to juggle competing priorities' (Muller 2013: 1). A priority that shifted to the forefront in the writing of the final plan was the target of increasing the percentage of academic staff with a PhD from the 2010 level of 34% to 70% by 2030.

The main reason for this major change between the draft and final plans is the quality ascribed to be at the heart of poor performance in the sector: 'The most important factor that determines quality is the qualifications of staff' (NPC 2012: 318). The basic argument underlying the finalised NDP runs as follows: raise the qualifications of staff – in other words, increase the number of academics with PhDs – and the quality of the student outcomes will improve. This will also significantly improve throughput, the capacity to supervise higher degrees and, ultimately, the research productivity of the sector. In short, 'quality defined as having a PhD is seen by the NDP as being the key that will unlock a virtuous cycle of effects' (Muller 2013: 2). In Chapter 6 of this book, we provide quotes from supervisors who argue that a major problem is the quality – or under-preparedness – of students and it is not only about increasing the number of academic staff with PhDs (Mouton et al. 2015).

The NDP went further by setting a national target of producing more than 100 doctoral graduates per one million of the population by 2030 (NPC 2012). Roughly speaking, this means that the annual production of doctoral graduates will have to increase from 2 051 per annum (in 2013) to 5 000 per annum in 2030. In reality, it nearly tripled from 5 152 in 1996 to 13 965 in 2012 , showing a 6.4% per annum increase, while the number of graduates also nearly tripled, from 685 to 1 879, being a 6.5% per annum increase (DHET 2013a). The more worrisome aspect in South Africa is that the average graduation (completion rate) over three cohorts (2003, 2004 and 2005) is only 35% after five years and 41% after six years. And the 2006 and 2007 cohorts (at 41% and 39% respectively) show essentially the same trend (DHET 2013a).

The NDP acknowledged that there was 'a shortage of academics' (NPC 2012: 317), and that just over a third possessed a PhD, which qualified them to supervise a PhD. Where will this extra supervisory capacity come from, let alone the increased number of PhD students? The NDP indentifies three new sources:

1. Local institutions with 'embedded research capacity' that should, in return for recognition of this niche, assist with supervision at other universities that only 'focus on teaching and learning';
2. Partnerships with industry and commerce; and
3. Partnerships and exchanges with international universities (NPC 2012: 319).

Achievement of the target of more than 100 doctoral graduates per million of the population by 2030 will only be met under stringent conditions, including an unlikely local injection of supervisory capacity. Surprisingly, the NDP does not endorse a recommendation by Badsha and Cloete (2011) that proposes extending the retirement age for certain academics or re-hiring retirees with a track record of successful supervision. The NDP did not address or make recommendations on how to deal with considerable dropout and non-completion rates. A more detailed analysis of these figures is provided in Chapter 3 of this book.

Preceding the NDP, the Academy of Science of South Africa (ASSAf) conducted an extensive study entitled *The PhD Study: An evidence-based study on how to meet the demands for high-level skills in an emerging economy* (ASSAf 2010). The main conclusion of this report (addressed in detail later in this book) was the following: 'There is a broad consensus in the science community in South Africa that not enough high-quality PhDs are being produced in relation to the developmental needs of the country' (ASSAf 2010: 15).

Debates and discourses

The international discourse on the doctorate is largely about the contribution to and place of the PhD graduate in the knowledge economy. There are two strands to this debate. One is about strengthening the university as knowledge producer. In this approach, increasing the number of doctorates is part of the link between high-level research training, disseminating new knowledge through international networks (such as conferences, journals and books) and linking to research and development in different ways through an innovation cycle. In this sense it is both about strengthening the university (and specifically the quality it produces) and contributing to the knowledge economy.

The second aspect is the doctorate as a contributor to 'talentism', meaning the global search for talent identification. In this sense, it is concerned with high-level skills, both research and analytical, outside the university, be it within industry or the public sector. The debates, rather ironically, are about whether there are too many doctoral graduates (at least in the USA) and the impact on the higher education system. But

elsewhere, such as in Europe, and particularly as exemplified in Germany, discussion centres around continued competition for doctoral students and the increasing mobility of such graduates. If the lens is focused on the PhD for academic positions primarily, then the debate addresses supply and demand in the academic labour market. However, if the focus is on the knowledge economy outside the university, then there is little concern about labour market absorption since the global market is endless.

Another feature of international debates is the uneven distribution of doctoral students (both enrolment and graduation) across the globe. This can be seen as simply reflecting the different histories of doctoral production in different parts of the world and associated differences in higher education systems. What is striking here is how developing countries are making huge investments in the knowledge economy, with increasing doctoral production being one of the conditions for membership of the knowledge economy. On analysis, two groups emerge: on the one hand, South Korea, Singapore, Taiwan and Mexico, all acknowledged members, if not leaders in the knowledge economy, and all countries where the doctoral output is already high; and then, on the other hand, the BRICS (Brazil, Russia, India, China and South Africa), particularly China, Brazil and India, whose governments are formulating targeted policies and making huge investments in increasing doctoral and research output as part of their effort to improve their positions in the global rankings by catching up within the knowledge economy.

The situation in Africa is very different. Not only do most countries on the continent not have the resources to invest hugely in doctoral production, as China and Brazil are able to, but the acceptance of the notion of the knowledge economy is not self-evident and is even contested in some circles. The HERANA study concluded that:

> *From interviews and policy documents it was evident that, with the exception of Mauritius, none of the eight countries included in the study had a clearly articulated development model or strategy [... and] the 2020 or 2030 visions were often based on 'best practice' policy borrowing from first world countries.'* (Cloete et al. 2011: 18)

An overall conclusion of the study was that, apart from Mauritius, there was no pact about a development model or about the role of the university in the development model. Interestingly, in some countries (such as Ghana and Kenya) the national government seemed more convinced about the importance of the knowledge economy than the academics, while in Uganda and Botswana, the academics were more supportive (Cloete et al. 2011: 19). It could thus be argued that in Africa the call for increasing doctoral production

is without an economic context. It is not part of an agreed-upon role for the university in economic development, and as the IAU-ACUP report concludes, while the status of the PhD is acknowledged, African society does not seem to know how to evaluate its usefulness to development (IAU-ACUP 2012: 20). This raises the question as to whether the demand for more PhDs is not based on a reference to the diaspora and the specific need to produce well-qualified academics to compensate for the brain drain.

Different pressures on PhD production: A framework

Against the background described above, we now turn our attention to the main focus of this book: the production of PhDs in South Africa. Our central thesis, which will be developed in increasing detail over the book's chapters, is that four imperatives intersect in current debates on the production of PhDs in South Africa. These four discourses concern global and national competition (the imperative for growth), efficiency, transformation and quality. Each of these is described in greater detail in the sections below.

Growth

The policy discourse about the doctorate over the past two decades has not always demonstrated a clear focus or agreement on priorities by the different ministries responsible for higher education. A recent example is to be found in the very different 2011 budget speeches of the ministers for the departments responsible for higher education in South Africa: the DHET and DST. A comparative analysis of global and national trends was entirely absent from the speech of the Minister of Higher Education and Training, who made no reference to the knowledge economy, global competitiveness, high-level research skills or knowledge production (Cloete 2011b). This speech focused on training and undergraduates, and was almost entirely inward-looking, with Africa and the rest of world hardly mentioned. In contrast, the Minister of Science and Technology led with the following bold statement emphasising quality:

> *Funding of science and technology must be improved if we are to realize our ambitious national goal of building a knowledge-based economy. One of the areas that must be addressed is increased support for postgraduate study and for senior researchers plus a more stable funding model for all our research performing institutions.* (Pandor 2011: online)

Following the DST, the NDP makes the knowledge economy a fundamental pillar if South Africa is to achieve its ambitious goals of telling a new story

of sustainable development (NPC 2012). Nonetheless, despite commitment pronounced after the acceptance of the final NDP report by both the African National Congress and Parliament, the dominant economic development approach is still firmly based on extraction (through mining) and infrastructure (Cloete and Gillwald, in Castells and Himanen 2014).

Despite the absence of a coordinated policy focus, a strong emphasis on the production of more doctoral graduates emerged in the post-2008 period. For a start, the DST set initial targets for PhD production, as described in its Ten-Year Innovation Plan: 'To build a knowledge-based economy positioned between developed and developing countries, South Africa will need to increase its PhD production rate by a factor of about five over the next 10 to 20 years' (DST 2008: 29).

In 2010, the ASSAf study proposed, amongst others, an escalation of the number of graduates, increased funding for full-time doctoral students, targeting specific institutions with capacity to produce more PhDs, and advocating for public support amongst the public for a better understanding of the value of the PhD (ASSAf 2010: 17–18).

The NDP echoes many of ASSAf's recommendations, but with much more specific targets, such as the aim of producing more than 100 doctoral graduates per one million of the population by 2030. This would translate into 5 000 per annum in 2030 (compared to the latest output of 2 051 in 2013). Both ASSAf and the NPC agree on the need for more doctoral graduates. While ASSAf focuses on proposals on how to improve output, the NDP sets specific targets, albeit without much consideration for how they would be achieved.

Efficiency

The second discourse on doctoral production relates to the imperative of efficiency. Not surprisingly, the government wants higher graduate returns on its subsidy investments in doctoral enrolments (as in other spheres of education). In debates around efficiency, high dropout and low completion rates are regarded as major indicators of inefficiency in the production of doctoral graduates. This is consistent with the macro-economic policy, Growth, Employment and Redistribution (GEAR), which was adopted in 1996 and ostensibly aimed at growth, employment and redistribution after a massive outflow of capital. GEAR's main effect was tighter fiscal policy measures that were brought about by a cut in government expenditure and attempts at a more cost-effective civil service (Knight 2001).

This led to the development of efficiency indicators and targets in the 2001 National Plan for Higher Education (Ministry of Education 2001). The work of CHET and CREST contributed significantly to the development of these efficiency indicators. However, targets set in the National Plan were unrealistically high: 75% of all students entering doctoral programmes in

universities were expected to graduate (Ministry of Education 2001). When empirical data gathered through the Higher Education Management Information System (HEMIS) began to show that only around 50% of national cohorts entering doctoral programmes would eventually graduate, the target was modified to 65%. This reduced target has been used for national enrolment-planning exercises in recent years, but has also proven to be unattainable.

Transformation

The third policy discourse is around transformation. There have been many reviews of transformation, or the lack thereof, but one of the most comprehensive theoretical and policy reviews was by Badat (2004). Starting with the National Commission on Higher Education (NCHE) in 2000, Badat listed the main areas of transformation as system and structures, equity, quality and responsiveness. He subsequently reduced his focus to two key areas, being institutional restructuring and human resources.

In this book, we will look at institutional restructuring and equity. While equity could be regarded as involving a range of issues, including race, class and gender, in DHET policy terms, it increasingly refers to race, and to Africans in particular. The Equity Index, developed by the newly appointed Transformation Oversight Committee (Qonde 2013), assumes the university to be a mirror image of the demographics of society.

The focus of Chapter 4 is on race, gender and nationality, particularly Africans who are not from South Africa. It excludes socio-economic class because of the absence of reliable statistics.

Quality

The fourth discourse concerns the quality of doctoral production. In the review of the demand for an increase in doctorates earlier in this chapter, the issue of quality is frequently raised, but not directly addressed. The competition for talent and use of the PhD as a talent indicator clearly assumes a degree of quality. The demand for different types of doctoral programmes (*The Economist* 2010) focuses on another aspect of quality, namely appropriate skills. This implies that different types of quality mechanisms or procedures could be required for different types of PhDs.

Morgan's (2011) claim – also implicit in the South African NDP approach – that teachers with doctorates will improve the quality of their teaching, assumes quality of the qualification. Yet consistently underpinning the demand for more doctorates is the concern that 'the main problem is the low quality of many graduates' (Cyranoski et al. 2011: 1).

Although the 1996 NCHE report and the 1997 *Education White Paper* stated that quality throughout the system was important, neither document discussed methods by which the quality of doctoral programmes could be assessed (NCHE 1996; Department of Education 1997). An indirect start to the quality debate was the 2000 Council on Higher Education (CHE 2000) report on the size and shape of the higher education system. The CHE report proposed a differentiation framework that placed institutions into rigid categories. By implication this was a quality control mechanism, since it was intended that these categories would determine whether or not an institution could offer doctoral programmes. Despite the requirement for ministerial approval for programme and qualifications mixes (PQMs), very few of the doctoral programmes offered by South African higher education institutions have thus far undergone detailed quality reviews by the CHE.

Instead, the Higher Education Quality Committee (HEQC) accreditation model (HEQC 2004) located responsibility for higher education programme quality with the institutions themselves and proposed that institutions should maintain in-house quality assurance mechanisms. The HEQC would review the effectiveness of associated quality assurance mechanisms within the universities and validate the institutions' own monitoring information in this regard.

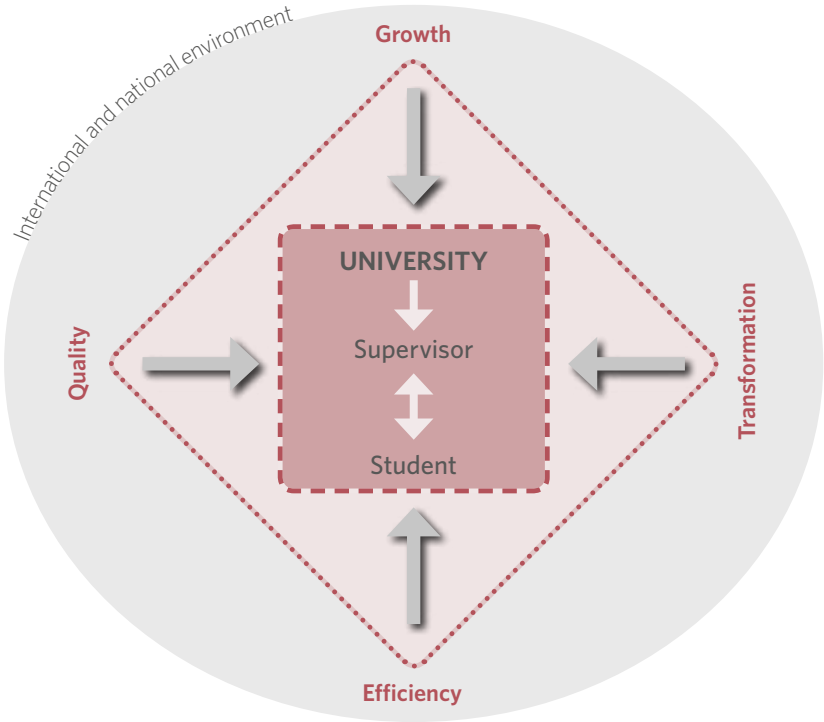
Dynamics of doctorate production

The four discources as outlined above capture the ecology (the external demand and accountability environment) of doctoral education and training in South Africa today. Figure 1.5 suggests that there are four sets of factors or forces that together create a unique demand and accountability regime that exerts various pressures on the universities, and specifically on their academic staff.

Figure 1.5 also suggests that some of these external demand factors are global and international (such as rankings), while some are more local and internal (such as the role of the DHET funding framework). In general, the factors are mutually reinforcing, which means that the end result is a powerful discourse of demand and accountability at every level of the system.

But the second part of the diagram shifts the perspective to the supply side: the university, and specifically academic staff and supervisors. From this perspective, the demands are often experienced as contradictory and unreasonable. The demand for increased output and production of doctoral students is often considered to happen at the expense of quality. In addition, there has always been a clear tension between the demands for efficiency and equity (transformation) in education discourse in South Africa.

Figure 1.5: Discourses on doctorate production in South Africa



The internal environment depicts the role of a university in doctoral education and training, and specifically the supervisor–student relationship within the university. The shift in focus to the internal environment forces us to look at institutional differences – different histories, missions and resourcing – in doctoral education and how these impact on doctoral production. And at the micro-level, it forces us to look at all the factors that impact on supervisor–student dynamics: matters related to models of doctoral supervision, supervisory styles, quality assurance and support to students.

Figure 1.5 presents two perspectives on doctoral education and training in South Africa: an 'outsider' and an 'insider' perspective (Becker 1963). The outsider perspective looks at the system and the interacting forces (international and local) that co-produce a set of demand imperatives related to quantity, quality, efficiency and transformation. The insider perspective looks at doctoral education from the perspective of the main

actors: the supervisor (embedded in a university) in relationship with a doctoral candidate.

How do universities and supervisors (and, by implication, students) experience these external demands and how do they respond? We will argue in the book – at least with regard to the demands of quantity, transformation and efficiency – that South African universities have on the whole responded positively to these demands. Most of the trends related to output, throughput and transformation are positive.

However, we will also present qualitative data demonstrating that supervisors increasingly experience supervision as a burden. The demands for increased output and throughput rates are viewed by many supervisors as compromising the quality of doctoral theses. There is also some evidence that this demand regime – which is of course embedded within the much larger, new, public-management discourse on accountability and performance monitoring – is infringing on basic academic freedoms: the supervisor's choice of student (and hence the right to reject a student), along with other areas of decision-making traditionally associated with the individual supervisor.

The structure of this book

Following this chapter that has sketched the global, the African and the South African contexts for the demand for more doctorates, Chapters 2 to 5 focus on the history, policies and particularly on the statistics (data) of doctoral production in South Africa, organised around the four main discourses of quantity, efficiency, transformation and quality. The data for this component are drawn mainly from the Department on Higher Education and Training's Higher Education Management Information System (HEMIS) as well as from CHET and CREST.

Chapter 6 analyses a qualitative study of 25 'doctoral productive' departments in the social sciences and humanities at 13 South African universities. This information is enriched by a national survey of 330 'research productive' supervisors in the South African system. This provided instructive data and insights on the initiatives, good practices and experiences within universities as they pertain to current doctoral education and training programmes, again addressing the same four discourses.

Drawing on the analyses and conclusions of the previous chapters, Chapter 7 presents an integrated synthesis of our argument and proceeds to suggest ways of strengthening the current model of doctoral education in South Africa. Our main thesis is that a paradigm shift is required in order to respond to the demands of all four imperatives/discourses and the realities of doing doctoral study and supervision in the country.

We conclude the book by raising three different (but related) policy issues. Our intention is not to be prescriptive, but to highlight and further articulate the key policy issues and challenges that will have to be addressed at the continental, national and institutional levels.

Notes

1 We use the terms 'African', 'coloured', 'Indian' and 'white' as designators of race in the book. We use the term 'black' as an umbrella term to include 'African', 'coloured' and 'Indian'.

Chapter 2

The demand to increase doctorates

- The early years of doctoral production in South Africa
- Post-apartheid policy on doctoral education
  - Differentiation
- Trends in doctoral enrolments since 1996
  - The postgraduate pipeline
  - Doctoral enrolments by field of study
  - Doctoral enrolments by institution type
  - Reasons for enrolment
  - Salient trends in doctoral enrolment since 1996
- Trends in doctoral graduations since 1996
  - Growth in doctoral graduates
  - The biggest producers of PhDs
  - Doctoral graduates by fields of study and institution type
  - Salient trends in doctoral graduations since 1996
- International comparison: How does South Africa fare?
- In conclusion

The early years of doctoral production in South Africa

As far as we could establish, one of the few long-term studies on trends in doctoral production in South Africa was undertaken by Johan Garbers (1960) who later became president of the Human Sciences Research Council (HSRC) (1979 to 1986) and director-general of the Department of National Education (1987 to 1993). As part of his doctoral study, Garbers provided the first systematic analysis of doctoral graduation trends in South Africa for the period 1920 to 1957. The goals of his thesis were to determine the percentage of students who pursued postgraduate studies through to doctoral level, and to determine whether the universities were graduating enough high-level skills for the needs of the economy. He measured the latter goal by comparing the participation of the white South African

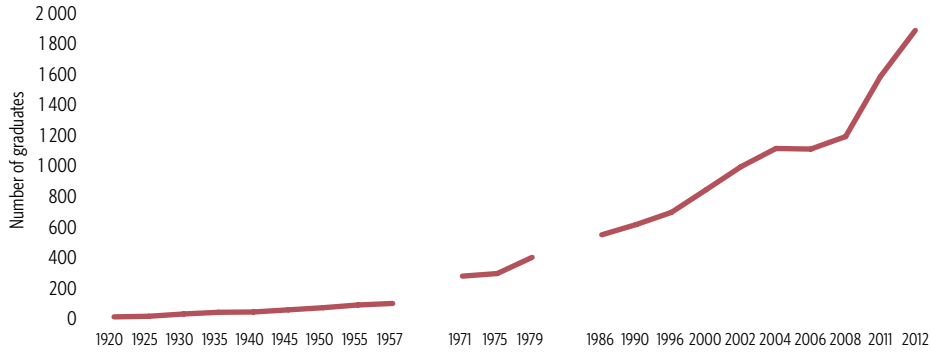
population in higher education with the participation of the populations of other countries. In the context of apartheid politics at the time, his study was only focused on whites in South Africa.

Garbers (1960) concluded that a very high proportion of white South Africans were studying (all students including doctoral) in 1957 compared to the populations of other countries. He showed that the student to population ratio for whites in South Africa was 1:99, compared to, for example, 1:71 for the USA, 1:611 for the UK and 1:305 for Australia.

Apart from the Garbers data, no single comprehensive data set is available on graduation trends before 1971. In order to get a comprehensive overview of trends since then, we consulted various data sources. The next available data set – on the qualifications awarded by the 11 historically white universities during the period 1971 to 1979 – was sourced from a statistical report compiled by the Department of National Education (1982). For the period 1980 to 1985, there is no comprehensive data set. The 21 universities and 15 technikons were controlled by eight different government departments that ceased to exist after 1994. Data for the decade 1986 to 1995 were obtained from the South African Post-Secondary Education (SAPSE) information system of the former Department of Education, which had incomplete data for the 'homeland' universities. The issue of recording stats for black students will be discussed in Chapter 4 on transformation.

Figure 2.1 is a graphical representation of the increase in PhD graduates for the period 1920 to 2013, including the two periods (1958 to 1970 and 1980 to 1985) for which no official data could be found.[1] It provides data for graduates since the data sources for the years prior to 1980 contain only graduation data.

Figure 2.1: Growth in PhD graduates in South Africa (1920–2012)



Sources: Garbers (1960), Departement van Nasionale Opvoeding (DNO) (1982), Department of Higher Education and Training (DHET) (2013a)

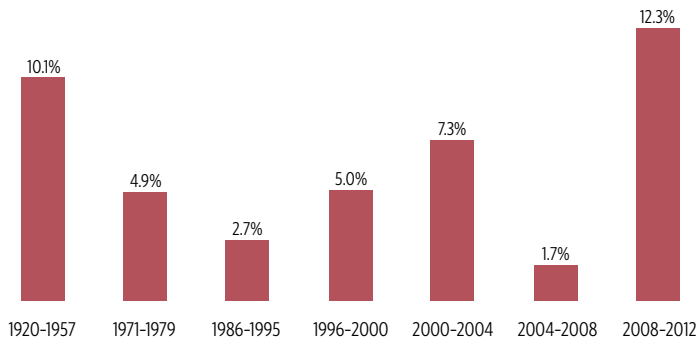
With regard to the average per annum growth of various degrees, Garbers (1960) established that during the period 1920 to 1957 the number of baccalaureus degrees awarded grew by 5.8%, first postgraduate degrees awarded by 5.5%, and doctoral degrees by 11.7%. Although the annual growth rates for doctoral graduates were the highest of the different degree levels, this growth came off very low base numbers.

Figure 2.2 presents the growth rates for doctoral degrees up to 2012. The annual average results show a steady 10% growth in PhD graduates during the 1920 to 1957 period. These growth rates would only be attained again during the post-2008 period. The periods of lowest growth in doctoral graduates, 2.7% from 1986 to 1995 and 1.7% from 2004 to 2008, occurred during periods of great uncertainty and instability in the education-political environment. During the last ten years of apartheid, with the focus on school and university anti-apartheid activism, the average tenure of a minister of education was well below two years, as the regime was occupied first with responding to mass protests and then to negotiations.

The 2004 to 2008 phase followed the uncertainty after the then Minister of Education, Kader Asmal, changed the apartheid landscape of higher education through the mergers of various institutions of higher education.[2]

The mergers had an impact on most of the comprehensive universities with the University of Johannesburg (UJ), the University of South Africa (UNISA), the University of Venda (Univen), Walter Sisulu University (WSU) and the University of Zululand (Unizulu) showing huge declines in graduates of between –16.4% and –19.5% on average per annum. The only exception was the Nelson Mandela Metropolitan University (NMMU), which had an average annual growth rate of 7.6% in graduates during the 2004 to 2008 period.

Figure 2.2: Average annual growth rate of PhD graduates (1920–2012)



Sources: Garbers (1960), DNO (1982), DoE (1999), DHET (2013a)

The picture regarding the universities that did not merge is not as clear. UCT grew at a high rate of 11.1% per annum over the 2004 to 2008 period, but Wits (3.3%) and Stellenbosch (1.1%) had very low growth rates. The low growth at Stellenbosch University was the result of a drop in doctoral graduates in engineering, philosophy, religion and theology, as well as in social sciences.

Overall, there has been a steady growth of between 5% and 12% from 1920 to 2012, except during two periods of major turmoil: in the course of the political and educational contestations from 1986 to 1995 when growth was only 2.7%, and immediately after the higher-education restructuring of 2000 to 2004 when growth was only 1.7% during the period of 2004 to 2008.

It is perhaps easier to explain the consistently high growth in doctoral graduates over the most recent period (since 2008). The revision of the DHET research subsidy framework in 2003, which came into effect in 2005, included subsidies for postgraduate students, research masters and doctoral students, for the first time. Most universities knew in 2003 already that these changes were imminent. If one keeps in mind that the average doctoral degree in South Africa takes five years to complete, it is not surprising that the first effects of the revised subsidy framework would only become clear by 2008.

It is a well-known fact that many South African universities incentivise doctoral production in the same way as they do for research publications. In some cases doctoral supervisors now receive ZAR 50 000 (approximately USD 3 800) in their research accounts for every doctoral graduate. In other cases, annual bonuses and merit awards are linked to increased doctoral production. The evidence at this point suggests that such incentives have started to have an impact on doctoral production in the country.

Post-apartheid policy on doctoral education

To get an overview of the policy and thinking around the doctorate for the period after 1994, the report of the National Commission on Higher Education (NCHE), *A Framework for Transformation* (1996), would be a good place to start, and the goals of the *National Development Plan 2030* (National Planning Commision 2012) an appropriate end-point.

The main task of the NCHE, appointed by then President Nelson Mandela early in 1995, was no less ambitious than to provide 'the government with policies to restructure fundamentally the higher-education sector' (NCHE 1996: i). The NCHE consisted of five task groups, and more than 20 technical groups and experts from the US, Europe, Africa and Australasia. Draft proposals were debated at numerous

consultative forums, some of which included up to a thousand participants (Cloete 2014b).

However, this wide range of experts was almost exclusively drawn from within the higher-education sector. The zeitgeist of the period immediately after 1994 was equity, redress and transformation. Mentions of the doctorate in the 400-page report are mainly in relation to differences in outputs and throughputs between historically white and historically black universities (NCHE 1996: 35–36). A number of the proposals dealt with how to strengthen research capacity in the historically black universities, but not with specific reference to the doctorate. The only recommendation on support for staff to improve their formal qualifications (masters and doctorates) was in relation to the incorporation of the nursing, agriculture and education colleges.

The NCHE argued for strengthening research, particularly at the historically black universities, but the focus was more on relevance than on increased output, and no connection was made between research and the doctorate. In short, producing more doctorates, more academic staff with doctorates and greater research output was not on the policy menu of the NCHE.

The importance of producing doctoral graduates to position South Africa as a significant knowledge economy was first articulated in the *Education White Paper 3* (Department of Education [DoE] 1997) and the *National Plan for Higher Education* (NPHE) (Ministry of Education [MoE] 2001). These policy documents emphasised that masters and doctoral enrolments in the system must grow because knowledge economies require increasing numbers of citizens with high-level qualifications. The *Education White Paper 3* also drew attention to the importance of increased access of black (African, coloured and Indian) and female students to masters, doctoral and postdoctoral programmes as a means of increasing the pool of researchers and improving the demographic representation of staff in higher education.

The NPHE concluded that the future sustainability of the national research system and of the higher-education system was threatened by low enrolment in postgraduate programmes (MoE 2001). Both the research and higher-education systems are dependent on the production of postgraduates for the replenishment of their academic and research ranks. To address this issue, the NPHE recommended the development of strategies at system and institution levels to make postgraduate study and academic careers more attractive options.

Skills in the fields of science, engineering and technology, and business, commerce and management are important drivers of economic development. The *Education White Paper 3* identified a key challenge facing

the South African higher-education system: enrolments and graduates in both these fields must grow, including at doctoral level (DoE 1997).

The Department of Science and Technology (DST) set initial targets for PhD production in its *Ten-Year Innovation Plan 2008–2018*: 'To build a knowledge-based economy positioned between developed and developing countries, South Africa will need to increase its PhD production rate by a factor of about five over the next 10–20 years' (DST 2008: 29).

But the real boost for linking higher education to the knowledge economy with a focus on the PhD came from South Africa's latest commission, the National Planning Commission (NPC). Located in the office of the Presidency, the commission started working on a development plan for the country called the *National Development Plan 2030: Our future, make it work* (NPC 2012). The NPC started by producing a *Diagnostic Report* (2011) and a subsequent first draft of the new *National Development Plan* (NPC 2011). From these documents it became clear that a radical shift in discourse had occurred – from equity to development. The NPC, consisting of 26 members including three vice-chancellors, focused on the country and the economy, not just the higher-education sector. The NPC embraced the new global knowledge-economy argument. In fact, it was so enthusiastic about knowledge production that it declared that 'knowledge production is the rationale of higher education' (NPC 2012: 271). While knowledge production was not even mentioned in the policy menu of the NCHE in 1996, by 2012 it had become the main rationale for universities in the *National Development Plan* (NDP).

Differentiation

Arguably the most contentious higher-education policy issue in the post-1994 period has been differentiation. Historically, apartheid is based on notions of differentiation, mainly of race, but race is linked to privilege, resulting in the complex and often obfuscating notions of historically white and black institutions, and overlaid with an even more entrenched notion of historically advantaged and historically disadvantaged universities. Badat argued that institutional restructuring was a key part of post-1994 policy discussions and the 1997 *White Paper*. Noting the shortcomings of the structure of the existing system, he was emphatic that the 'system has no alternative but to remake itself' (Badat 2004: 38).

In a 2005 review of *Transformation Tensions in Higher Education*, Cloete and Moja wrote:

> *Higher education in South Africa since 1994 is braided into the bargain struck by President F.W. De Klerk and prisoner Nelson Mandela – both in terms of the baggage it carried and the promises*

> *it offered. When the new government came to power in 1994 on the basis of the 'implicit bargain' (Gelb, 2001) reached between the National Party and the liberation movement led by the African National Congress (ANC), there was consensus in the government of national unity that higher education needed transformation. Not as clear was the nature of the tensions implicit in the compromises that had to be made and how the trade-offs would be negotiated.* (Cloete and Moja 2005: 693)

In this context there were legitimate concerns among historically black institutions that a policy of differentiation in post-1994 would perpetuate the historical patterns of disadvantaging them and benefiting the historically white institutions, especially if there were no strategies of institutional redress and developmental trajectories for historically black institutions to address the apartheid legacy, and to enable them to take on new social and educational roles.

Two different approaches that have obfuscated the debate are 'diversity' versus 'differentiation' and 'overt' versus 'covert differentiation'. 'Diversity' denotes horizontal variability, that is, variability across a 'less–more' continuum; 'differentiation' denotes vertical variability: that is, variability across a 'better–worse' continuum. The latter requires categories of vertical variability. The categories currently employed by the DHET include: undergraduate success rates; postgraduate (particularly doctorate) enrolments and throughput rates (time to completion); and research output (staff/publication ratios). 'Differentiation' is more associated with rankings and prestige than diversity.

According to Muller (2006), in Europe covert differentiation works in the following way: adopt a rhetoric of diversity, i.e. proclaim and advocate a rhetoric of horizontal variability, but practice, principally via instruments of funding, an incremental differentiation (weak to strong), moderate at the lower levels of the rank, getting steeper at the apex, where the criterion of research and innovation is the undisputed rewarded value. For example, although the Norwegian system prides itself on diversity and equality, and the policy focus is actually on strengthening the regional universities and colleges, the apex institution, the University of Oslo, was nevertheless ranked 67th by Shanghai Jiao Tong University's world academic rankings in 2012, and no other Norwegian university features in the top 500.

From the NCHE (1996) to the *Green Paper for Post-School Education and Training* (DHET 2012) and the NDP (2012), differentiation is accepted as principle and fudged in practice in terms of diversity/differentiation and covert/overt. The only policy proposal that put a clear, but stark, differentiation model on the table was the Council on Higher Education's (CHE 2000: 36) three types of institutions, with the most contentious

notion the category of a 'bedrock' university that would focus on quality undergraduate education while some comprehensive universities would have a full suite of masters and doctoral programmes with research.

The Minister of Education rejected the CHE's proposals. The 2001 *National Plan*, as a consequence, had to formulate different ways of determining institutional diversity, and of ultimately placing limits on the range of doctoral programmes that institutions could offer. In the *National Plan* the Ministry proposed that institutional diversity would be achieved through mission and programme differentiation based on the type and range of qualifications offered. As part of the merger process the *National Plan* suggested three categories of universities:

- *Universities* are mostly pre-merger universities, and are defined as institutions that offer primarily *university-type* academic programmes. These institutions are intended to be major producers of high-level knowledge, and are therefore expected to enrol substantial proportions of the doctoral students in South Africa, and to produce most of the doctoral graduates.
- *Comprehensive universities* are institutions that offer a mix of *technikon-type* and *university-type* academic programmes (four of the six institutions in this category were formed by mergers between universities and technikons, and the remaining two are universities that were given new mandates by government). Because of their programme mixes, these institutions are not expected to compete with universities as producers of high-level knowledge.
- *Universities of technology* are mostly pre-merger technikons, and are defined as institutions that offer primarily *technikon-type* academic programmes. As a consequence, they are supposed to enrol a small number of doctoral students and produce very few doctoral graduates (CHE 2002).

In terms of overt differentiation, a key moment was the March 2010 Higher Education Summit from which the *University World News* reported that:

> *Almost 16 years after 1994, at the Higher Education Summit of the Minister, a broad spectrum of the South African higher education community accepted differentiation as a strategy to bring greater diversity and mission for purpose into the system.* (MacGregor 2010)[3]

However, following the path dependency of previous debates on differentiation, the usual ambiguities appeared in the summit statements[4] and the implementation plan was deferred to the DHET's 2012 *Green Paper*.

The *Green Paper for Post-school Education and Training* (DHET 2012: 39–41) started off boldly by stating that 'the need for a differentiated system of university education has long been recognised. Not all institutions can or should fulfil the same role', and then went back to the past stating that:

> *A few relatively research intensive universities are responsible for most of the post graduates, and are engaged in cutting edge research and innovation. However, their needs must not be allowed to divert attention from the need of all universities – and particularly the poorer ones – to have sufficient resources.*

It concluded that:

> *The process through which these principles will be realised must include both the universities and the DHET, working together to define the mission and the role of each institution. In the near future the DHET will initiate such a process.*

At the beginning of 2014, no such process had appeared in print.

Following the *Green Paper*, the *White Paper for Post-school Education and Training*, approved by Parliament in November 2013 (DHET 2013c), stated that since the establishment of the DHET in 2010, the department recognised that the principle of differentiation must apply beyond the universities to the entire post-school system. The key recommendations were:

- A continuum of institutions is required in the post-school system, including universities with differentiated missions.
- Each institution must have a clearly defined mandate within the system and the level and type of research will be determined in relation to the overall mandate of the institution.
- Universities will become an integral part of the post-school system, interfacing with TVET and other vocational colleges.
- Better intergovernmental coordination will be required (DHET 2013c: 29–30).

While this formulation is indeed the strongest ever made by the national education department,[5] like the *Green Paper*, there is no implementation plan: 'The DHET will engage universities and other stakeholders to discuss higher-education differentiation in order to develop sufficient national consensus on a programme for purposeful differentiation' (DHET 2013c: 30).

The 2014 gazetted *Policy Framework on Differentiation in the South African Post-School System* (DHET 2014) does not make the necessary

distinctions between 'mandates', 'missions', 'performance goals' and 'targets', neither does it provide the programme for purposeful differentiation that was promised in the 2013 *White Paper*.

A more targeted development has been the NDP which, in Chapter 9 (Improving Education, Training and Innovation) started with an empirical, rather than an ideological, statement: 'South Africa has a differentiated system of university education, but the system does not have the capacity to meet the needs of the learners' (NPC 2012: 318). It then presented a muddled mixture of features of the system, but unlike any previous policy document, made a number of bold proposals for universities and the doctorate in particular:

- Improve the qualifications of higher-education academic staff from the current 39% to 75% (this is the number one recommendation).
- Produce more than 100 doctoral graduates per million by the year 2030. South Africa currently produces 28 per million, which is low by international standards.
- To achieve the target of 100 per million, the country needs more than 5 000 doctoral graduates per annum, as against the 2013 figure of 2 051.
- If South Africa is to be a leading innovator, most of these doctorates should be in science, engineering, technology and mathematics.
- Increase the number of masters and PhD students. By 2030, over 25% of university enrolments should be at a postgraduate level.
- Strengthen universities that have an embedded culture of research and development.
- Provide performance-based grants to develop centres or networks of excellence within and across institutions. International exchange partnerships should be encouraged (NPC 2012: 318–320).

It is clear from these statements that current government thinking on the imperative for growth in doctoral graduates can be understood to mean the following:

- It remains vital to increase the overall number of doctoral graduates but there is now an explicit target of reaching 5 000 doctorates by 2030.
- Growing doctoral output is now specifically linked to replenishing the pool of ageing academics and the need to achieve higher proportions of academic staff with PhDs (a target of 75% for all institutions by 2030). This expectation is evidently not simply about numbers, but also speaks to matters related to quality (of supervision) and hence will be addressed in Chapter 5 on quality.

- Increasing doctoral production does not seem to apply equally to all universities, but implies differentiated growth. This issue is addressed below where we present the latest data on institutional contributions to doctoral production.
- And finally, the imperative of producing more doctoral students in South Africa is further qualified by the requirement that there is an urgent need for considerably more doctorates in the fields of science and engineering.

Following this brief policy overview, the subsequent sections of this chapter will focus on the:

- Growth patterns in PhD enrolment and graduation;
- Growth in fields of study, with emphasis on enrolments and graduation in science, engineering and technology, which includes the sub-fields natural sciences, engineering and health sciences;
- Institutional differentiation in the production of PhDs; and
- International comparisons.

Periods for the trends analysis

The post-1994 period is divided into five data points of four-year intervals. The data periods are 1996, 2000, 2004, 2008 and 2012. Although somewhat arbitrary, these time periods have been selected as they followed or coincided with the release of important policies and changes in the higher-education system since the establishment of the new democratic state. The rationale for using these particular years is summarised below:

1996 The report of the National Commission on Higher Education, *A Framework for Transformation* (NCHE 1996) was published. This was also the year before the release of *Education White Paper 3: A Programme for the Transformation of Higher Education* (DoE 1997) and the promulgation of the Higher Education Act No. 101 of 1997. This forms the base year for comparative purposes, and provides data at the brink of the implementation of the huge reforms put forward in these policy documents, which were primarily aimed at achieving greater equity, efficiency and effectiveness within institutions and across the system.

2000 This was another benchmark year in which the Council on Higher Education's report, *Towards a New Higher Education Landscape: Meeting the equity, quality and social development imperatives of South Africa in the 21st century*, was released in June. The report to the

Minister of Education represented the considered proposals of the Size and Shape Task Team of the Council on Higher Education (CHE) on a new and more effective size and shape of South African higher education. In response to this report, the Ministry of Education published the *National Plan for Higher Education* in 2001 (MoE 2001). According to the Plan, the number of public higher-education institutions would be reduced from 36 to 23 through mergers. In addition to restructuring, the plan identified the need for increased access, equity of access and outcomes, diversity through mission and programme differentiation, and the need to sustain current research strength and build high-level research capacity. Since 2000 was the year before the release of the *National Plan for Higher Education* in 2001, it serves as a base year from which to track changes that have occurred since the *National Plan*.

2004 An important principle of the *National Plan for Higher Education* was that the 'effective use of funding as a steering lever requires the development of a new funding formula based on the funding principles and framework outlined in the *White Paper*' (MoE 2001: 12). The current framework was approved in the *Government Gazette* (Vol. 462, No. 25824) of 9 December 2003 (MoE 2003), and has been used for allocating grants since the 2004/05 funding year. A basic feature of the new funding framework, which came into effect in 2004/05, is that it links the awarding of government higher-education grants to national and institutional planning. Reforms of the higher-education system started mostly in 2004 through merging and incorporating smaller universities into larger institutions. The year 2004 was thus an important year because of the new funding framework and because it serves as a reference point for the mergers that came into effect on 1 January 2005.

2008 Although the current funding framework was introduced in 2003 and came into effect in 2004/05, it was only fully functional by the financial year 2007/08, as a result of a period of migration from the previous framework. The impact of the introduction of the new funding framework was smoothed by gradually implementing the new funding framework over a period of three years. This year (2008) can thus be considered as the period where the impact of the current funding framework became more evident. Following the release of the *National Plan,* the Minister appointed a National Working Group for the period 2001 to 2007 to investigate and report on programme offerings, growth of institutions, students' success rate, ratios of staff, etc. The year marked the end of the period of institutional Programme Qualification Mix (PQM) reviews by the Ministry, which impacted on the range of programmes that universities were allowed to offer. The conclusion of the PQM process removed some of the doctoral programmes from institutions that did not have the appropriate capacity to offer these programmes. The DST's *Ten-year Innovation Plan 2008–2018* (DST 2008) that

states that PhDs in science, engineering and technology must increase fivefold was also released in 2008.

2012 This year marks the latest available official Higher Education Management Information System (HEMIS) data at the time of writing. It is also benchmark information for the monitoring of trends following the publication of the *Green Paper for Post-school Education and Training* (DHET 2012) and the *National Development Plan 2030* (NPC 2012). The *White Paper for Post-School Education and Training: Building an Expanded, Effective and Integrated Post-School System* has since been released (DHET 2013c). These documents place a premium on the accelerated production of PhD graduates as a prerequisite for economic growth, innovation and a knowledge economy.

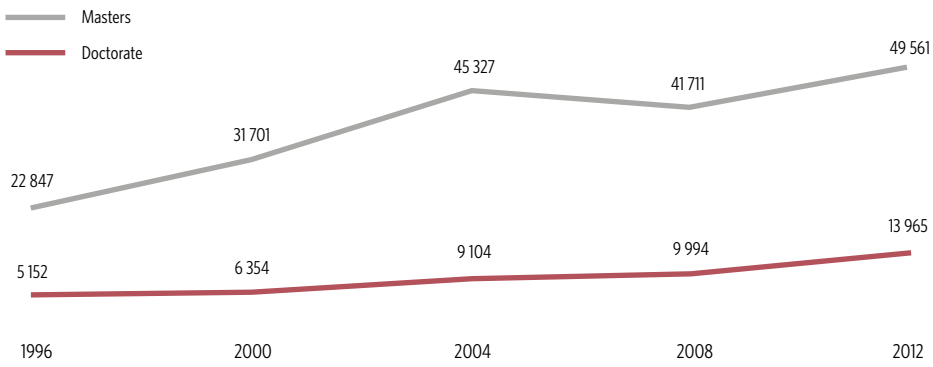
Trends in doctoral enrolments since 1996

The postgraduate pipeline

Before focusing on doctoral enrolments specifically, it is necessary to look at shifts in masters enrolments, which form the pipeline for doctoral enrolments. The general trends are evident in Figure 2.3. From 1996 to 2012 the number of masters enrolments more than doubled, while the number of doctoral enrolments increased nearly threefold.[6]

The trend for masters enrolment reveals interesting fluctuations with an increase between 2000 and 2004 followed by a subsequent, equally large, decrease. The two universities that recorded the biggest decrease in

Figure 2.3: Masters and doctoral headcount enrolments (1996–2012)



Sources: DoE (1999), DHET (2013a)

masters enrolments were UNISA (decreasing from 5 738 in 2004 to 4 153 in 2008, a reduction of 1 685) and Tshwane University of Technology (TUT) (1 567 in 2004 to 68 in 2008, a decrease of 1 499 enrolments). These decreases were mostly in the fields of education, and human and social sciences. The reason/s for the sharp reduction in the masters enrolments at UNISA could not be established, but in the case of TUT a managerial decision was made to reduce the numbers of enrolments for the masters programme in education, based on insufficient capacity to offer a quality programme, as well as the low throughput rate in the programme.

The growth in doctoral enrolments between 2004 and 2008 slowed down over this period. The total increase in doctoral enrolments in 2008 compared to 2004 was only 890 (or 10%).

The decrease in masters enrolments and the slowing down of doctoral growth could have been the result of the withdrawal of programmes from some institutions, as well as from the uncertainties generated by institutional mergers, which reduced the number of public higher-education institutions from 36 in 2000 to 23 in 2008.

The effects of the full introduction of government funding incentives that were designed to encourage postgraduate studies can be seen in the enrolment increases that occurred between 2008 and 2012. Masters enrolments increased by 7 850 (or 19%) from their 2008 low point. Doctoral enrolments increased by 3 971 (or 40%) over this same period.

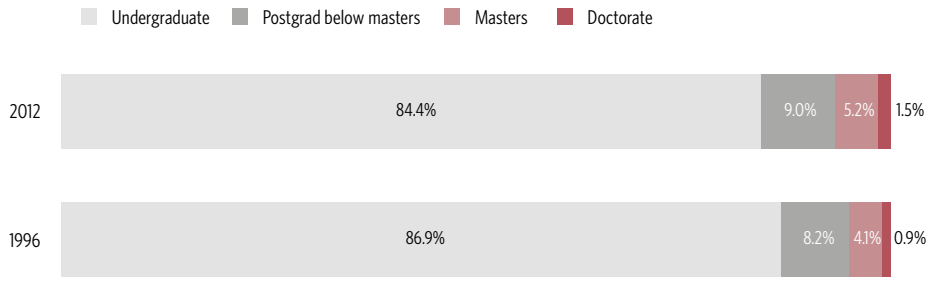
Doctoral enrolments increased from 5 152 in 1996 to 13 965 in 2012, an average annual growth rate of 6.4% over the sixteen-year period. Doctoral enrolments increased from 5 152 in 1996, which was the base year, to 6 354 in 2000, which was the year of the size-and-shape discussions. These changes account for a total increase in doctoral enrolments of 1 202 (or 23%). Masters enrolments grew by 39% over this same four-year period.

The overall picture that emerges from Figure 2.3 is that the public higher-education system has certainly responded to the 'policy imperative' to grow postgraduate numbers. One should also add that the past eight to ten years have witnessed huge increases in the number of masters and especially doctoral students from the rest of Africa, which have substantially added to these growth trajectories.

However, despite this increase in doctoral enrolments, the South African public higher-education system remained a dominantly undergraduate one. The predominance of undergraduates is shown in Figure 2.4, which compares the proportions of undergraduate and postgraduate students in the system in 1996 and 2012.

Although the proportion of postgraduate students increased from 13.1% to 15.6% between 1996 and 2012, the overall proportion of doctoral students in 2012 remains at 1.5%. This is despite the fact that the growth in doctoral

Figure 2.4: Student enrolments (1996 and 2012)



Sources: DoE (1999), DHET (2013a)

students was the highest of these categories: The growth in doctoral student enrolments was 6.4% over the period, masters 4.8% and postgraduate below masters at 3.8%. Undergraduate enrolments increased at 3.0% on average per annum.

The reality is that the South African public university system remains overwhelmingly focused on the production of undergraduate students and it is clear that the target of 25% postgraduates posited by the NDP for 2030 is unlikely to be achieved.

Doctoral enrolments by field of study

The policy imperative with regard to field of study is to increase enrolments and graduates at doctoral level, particularly in science, engineering and technology (which are analysed in terms of the sub-fields natural sciences, engineering and health sciences).

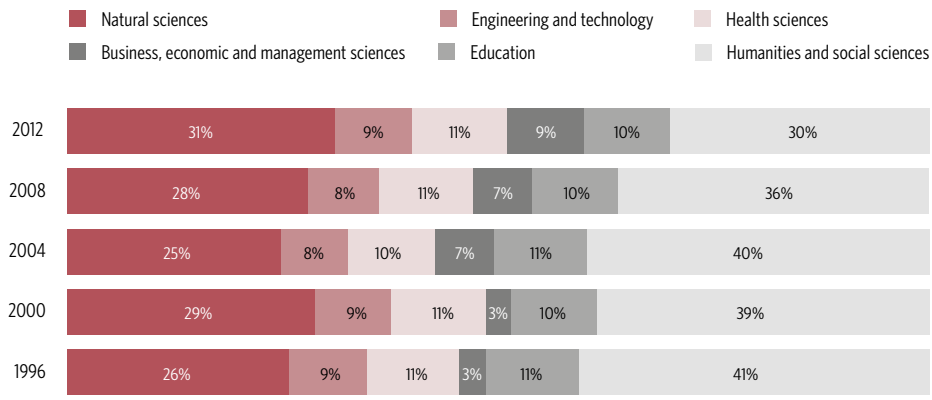
For the purpose of our analyses by field of study, we have grouped disciplines together as follows:

- *Natural sciences* include agriculture and agriculture operations, computer and information sciences, family ecology and consumer sciences, life sciences and physical sciences, mathematics and statistics.
- *Engineering and technology*, made up of engineering, architecture and the built environment.
- *Health sciences*, being health professions and related clinical sciences.
- *Business, economics and management* include accounting, auditing, economics, finance, business administration, and various management programmes.

- *Education*, made up of studies in pre-primary, primary, secondary and post-school education, and the training of teachers at all levels.
- *Humanities and social sciences*, being fine arts, music and drama, communication and journalism studies, languages and literature, law, public management and services, psychology, sociology and anthropology, history, political sciences, military sciences, philosophy and religious studies.

Figure 2.5 disaggregates the headcount doctoral-enrolment totals for the period 1996 to 2012 according to broad fields of study. The proportion of doctoral students in science, engineering and technology increased from 46% in 1996 to 51% in 2012, with a low point of 43% in 2004. In contrast, the share of doctoral enrolments in the humanities and social sciences doctoral enrolments fell from 41% in 1996, to 40% in 2004 and 30% in 2012. The higher-than-average growth rate of doctoral students in business, economics and management science (but from a small base) ensured that its share of enrolments tripled, albeit from a low base (from 3% in 1996 to 9% in 2012). The share of doctoral enrolments in education declined marginally (from 11% in 1996 to 10% in 2012).

Figure 2.5: Average shares of the doctoral enrolments in the various fields of study (1996–2012)



	Natural sciences	Engineering and technology	Health sciences	Business, economic and management sciences	Education	Humanities and social sciences	Total
2012	4 284	1 240	1 485	1 311	1 455	4 190	13 965
1996	1 352	445	541	158	563	2 093	5 152

Sources: DoE (1999), DHET (2013a)

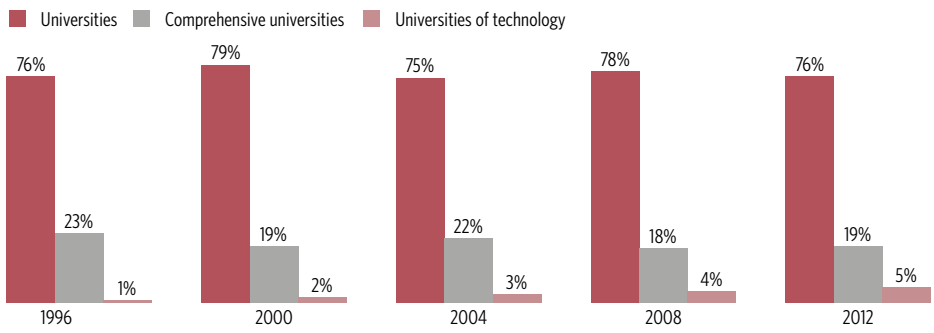
In policy terms it means that the intention of the *National Plan* (2001) and the NDP that the 'majority' of enrolments must be in SET has been achieved. The 'decline' of the humanities and social sciences (from 52% to 40%) could also be regarded as a 'correction' from over-enrolments in these fields during the 1980s and 1990s. A more detailed analysis of changes in subject fields is required for a better understanding of these shifts, and whether it points to a more permanent trend.

Doctoral enrolments by institution type

In 2005, the higher-education institutions merged to create the three types of university institutions that are currently in place. In line with this, and in order to determine trends, data were mapped from the former 36 universities and technikons for the years 1996 to 2004 to each of the eleven universities, six comprehensive universities and six universities of technology that were formed through the 2005 mergers.

Table 2.1 and Figure 2.6 present the doctoral enrolments per individual university and Figure 2.6 presents the same data by type of institution collectively for the three types of institutions for the period 1996 to 2012. Over this period, the eleven traditional universities enrolled the most doctoral students (10 621 or 76% in 2012). Far fewer doctoral students were enrolled at the six comprehensive universities (2 638 in 2012), with only a marginal number (706) enrolling at the six universities of technology in 2012. At universities of technology, however, doctoral enrolments grew at an average annual rate of 20.0% between 1996 and 2010 (but from a small base). This is considerably higher than the 5.1% growth of the comprehensives, and 6.4% of all the universities over the same period. Compared to 1996, enrolments in doctoral programmes at traditional universities in 2012 had

Figure 2.6: The distribution of doctoral enrolments by institution type (1996–2012)



Sources: DoE (1999), DHET (2013a)

Table 2.1: PhD enrolments per institution type (1996–2012)

	1996	2000	2004	2008	2012	Average annual growth rate (1996–2012)
Universities						
Fort Hare	1	27	30	216	284	42.3%
Limpopo	36	76	143	136	189	10.9%
Western Cape	132	170	304	386	603	10.0%
North West	247	327	615	758	1 048	9.5%
Rhodes	130	181	216	245	420	7.6%
KwaZulu-Natal	517	684	1 115	1 095	1 626	7.4%
Stellenbosch	529	708	780	880	1 308	5.8%
Witwatersrand	574	605	643	988	1 424	5.8%
Cape Town	571	698	898	1 030	1 328	5.4%
Pretoria	848	1 143	1 597	1 458	1 860	5.0%
Free State	339	429	520	580	531	2.8%
Subtotal: Universities	3 924	5 048	6 861	7 772	10 621	6.4%
Comprehensive universities						
Venda	3	12	39	50	140	27.1%
Walter Sisulu	2	4	1	15	34	19.4%
Zululand	22	89	151	153	179	14.0%
Nelson Mandela	138	140	263	337	452	7.7%
South Africa	593	533	908	778	1 173	4.4%
Johannesburg	432	417	611	502	660	2.7%
Subtotal: Comprehensives	1 190	1 195	1 973	1 835	2 638	5.1%
Universities of technology						
Tshwane	6	45	101	143	308	27.9%
Durban	2	25	30	51	99	27.6%
Central	2	19	70	58	85	26.4%
Vaal	1	5	19	29	17	19.4%
Cape Peninsula	27	17	50	106	197	13.2%
Mangosuthu	0	0	0	0	0	0.0%
Subtotal: U of technology	38	111	270	387	706	20.0%
Total	**5 152**	**6 354**	**9 104**	**9 994**	**13 965**	**6.4%**

Sources: DoE (1999), SAPSE, DHET (2013a), HEMIS data (2000–2012)

almost tripled and at comprehensive universities had more than doubled, while universities of technology were enrolling almost 19 times the number of doctoral students they had in 1996. However, whether these changes in enrolments resulted in commensurable increases in graduates in the three institution types will be analysed and discussed later in this chapter.

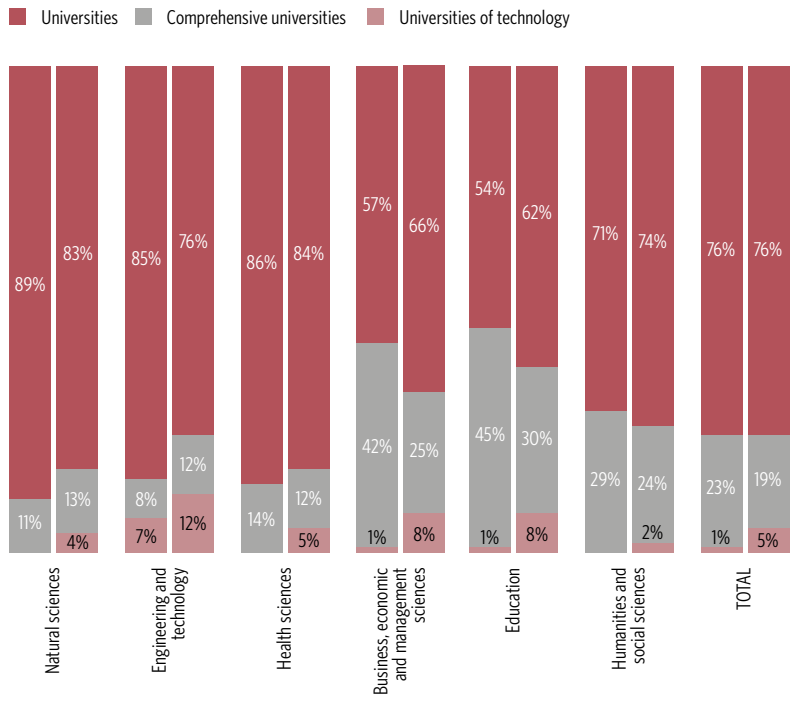
The differential growth rate of doctoral students within the three categories has had a small effect on the overall shares of doctoral students. The university category's share of doctoral enrolments increased from 76% in 1996 to 79% in 2000 and then decreased again to 76% in 2012. The share of universities of technology increased from 1% in 1996 to 5% in 2012, and that of comprehensive universities declined from 23% to 19%.

Figure 2.7 illustrates how the doctoral-enrolment proportions in the major fields of study changed between 1996 and 2012 for the three institution types (also see Table A1 in Appendix 5). It shows that the universities lost some of their share of doctoral students in the natural sciences, engineering and technology and health sciences to the comprehensive universities and universities of technology, which in turn show an increased share in these fields. But the traditional universities gained in business and management enrolments (from 57% to 66%), mainly at the expense of the comprehensive universities (42% to 25%). The biggest change in the universities of technology group was an increase from 1% to 8% in both the business, economics and management sciences, and in education doctoral enrolments between 1996 and 2012.

Reasons for enrolment

In a 2014 study conducted nationally (see Study 3 in Appendix 1), currently enrolled honours, masters and doctoral students were asked to respond to

Figure 2.7: Distribution of doctoral enrolments across major fields of study and institution categories (1996 compared to 2012)



Sources: DoE (1999) DHET (2013a)

24 statements about their choice of their current academic programme. Respondents were asked to rate the importance of each statement on a scale of (1) very important, (2) important, (3) neutral, (4) not important, to (5) not important at all. The results are presented in Table 2.2 for all doctoral, masters and honours students.

The five most important reasons affecting respondents' choice to enrol in their selected programmes are highlighted across the three groups of students. The results differ very slightly among the groups, with honours students deeming the encouragement from family etc. to be more important than that of lecturers, whereas the opposite was the case for masters and doctoral students. This might be due to the fact that the cohort of honours respondents is younger than that of masters and doctoral students. The sampled honours students were also more concerned with meeting the entry requirements of the study programme.

The most important finding for our purpose is the fact that doctoral students rated (1) the relationship with their academic supervisors and (2) the academic reputation of the university as the most important factors in making their decision on where to pursue their studies.

Table 2.2: 'Top 5' factors influencing students' choice of their current degree programmes

	Honours	Masters	Doctoral
Course content	95%	90%	#
Academic reputation of the university	90%	91%	88%
Employment prospects on completion of the programme	85%	81%	#
Meeting the entry requirements	83%	#	#
Encouragement from family (parents, guardians, spouse, etc.)	80%	#	#
Relationship with academic supervisor	#	83%	90%
Encouragement from lecturers/tutors	#	77%	81%
Scholarship/funding/bursary provided	#	#	82%
Availability of scholarships or bursaries	#	#	81%

 # = not part of 'top 5'
Source: Mouton 2014

Salient trends in doctoral enrolments since 1996

- Doctoral enrolments at South African universities increased faster than any other category of students over the 16-year period up until 2012.
- The increase in doctoral enrolments are more pronounced over recent years and may reflect the impact of the revised research output subsidy framework that came into effect in 2005.
- The traditional university sector remains the largest contributor to doctoral education in the country (75%).

- Doctoral enrolments in science and engineering fields increased more than in any other fields – most notably overtaking the social sciences and humanities.

Trends in doctoral graduations since 1996

Growth in doctoral graduates

As mentioned in the first section of the chapter, doctoral graduates increased by 174% between 1996 and 2012 (from 685 to 1 879). This represents an average annual growth rate of 6.5% over this period.

The politically uncertain pre-1994 period showed a low growth (2.7%), which may account for the immediate post-1994 growth rate, more than doubling to 7.3% during the uncertain 2000 to 2004 period. The post-merger period (after 2005) showed the lowest growth rate in the entire history of the doctorate from 1920 (1.7%). By 2008 the new landscape had stabilised, and the new post-2004 funding regime had become fully operational. This period saw the highest growth rate (12.3%) since 1996.

In terms of incentives from the national government, the South African Post-Secondary Education (SAPSE) funding framework, implemented between 1983 and 2003, provided no direct financial incentives for the enrolment and graduation of doctoral students (DoE 1999). Up until 2004, government funding of doctorates was based on 'effective subsidy students', which were projected numbers established on a mix of 50% enrolled full-time equivalents and 50% completed full-time equivalents. The current funding framework, which was introduced in 2003, came into effect in 2004/05 and was fully operational by 2008, links the awarding of government higher-education grants to national and institutional planning.

The funding–planning link makes the current framework essentially a goal-oriented mechanism for the distribution of government grants to individual institutions, in accordance with (a) national planning and policy priorities, (b) the quantum of funds made available in the national higher-education budget, and (c) the approved plans of individual institutions. The funding framework places doctoral enrolments and graduates into different funding categories, with a weight of four for level, which means that the enrolled full-time equivalents for doctoral students get four times the funding of the undergraduate enrolments in the same field of study. Doctoral research graduates are regarded as a research output unit with a weight of three, which means one doctoral graduate 'earns' three times the subsidy of an accredited journal article for a university (approximately ZAR 360 000 [USD 36 000] in 2012). In essence, doctoral enrolments and graduates are highly funded in the current funding framework. Depending on the average number of years that doctoral students take to graduate, and changes in the

rand values of the subsidy components from year to year, a university in 2012 could have received between ZAR 447 000 (USD 44 700) and ZAR 664 000 (USD 66 400) (depending on funding group) for a full-time doctoral graduate, of which 46% would have been teaching input and 54% research output subsidy. In addition, universities receive the annual fee income from the students for each year of registration (see Appendix 4 for more detail on how the production of doctoral graduates is steered through the funding framework, the programme approval process as well as the enrolment planning processes).

It could be argued that the combination of a more stable system and a goal-directed funding framework with substantial rewards for enrolling and graduating PhDs contributed to the sevenfold increase in growth rates of doctoral graduates from the preceding unstable period. However, we will also comment – in Chapter 4 – on the huge impact that doctoral students from other African countries have had on South Africa's enrolment and graduation statistics.

Table 2.3: Total number of doctoral graduates per institution (2012)

Universities		2012 doctorate graduates	Accumulative total	Accumulative percentage
Stellenbosch	TOP 7 68%	240	240	13%
Pretoria		200	440	23%
Cape Town		199	639	34%
KwaZulu-Natal		177	816	43%
North-West		154	970	52%
South Africa		152	1 122	60%
Witwatersrand		150	1 272	68%
Johannesburg	TOP 12 91%	109	1 381	73%
Free State		94	1 475	78%
Nelson Mandela		86	1 561	83%
Western Cape		75	1 636	87%
Rhodes		67	1 703	91%
Tshwane	BOTTOM 11 8%	44	1 747	93%
Fort Hare		43	1 790	95%
Zululand		28	1 818	97%
Cape Peninsula		24	1 842	98%
Limpopo		17	1 859	99%
Durban	BOTTOM 6 1%	6	1 865	99%
Central		5	1 870	100%
Venda		4	1 874	100%
Walter Sisulu		3	1 877	100%
Vaal		2	1 879	100%
Mangosuthu		0	1 879	100%

Source: DHET (2013a)

The biggest producers of PhDs

In terms of differentiation (see Table 2.3) seven of the 23 universities (all of which are traditional, historically disadvantaged institutions) produced 68%, while 12 of the 23 universities produced 91% of the doctoral graduates in 2012. Newly merged universities such as UKZN, North-West, UNISA and Johannesburg also did well. However, the previous technikons, now universities of technology, were small contributors to doctoral production in the country.

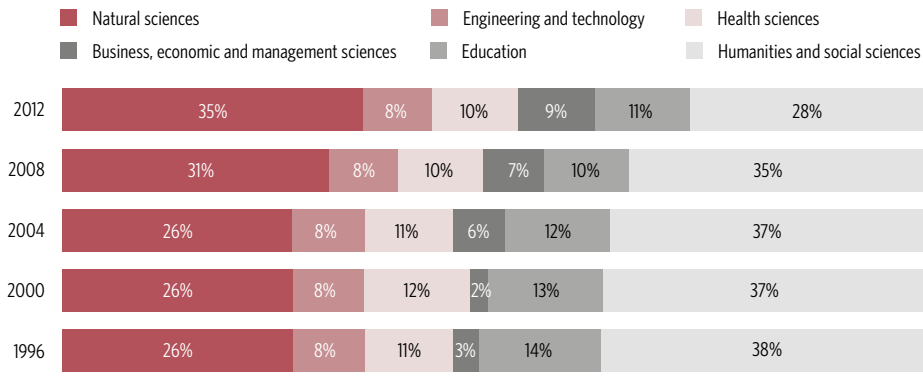
Doctoral graduates by fields of study and institution type

This section addresses the distribution of graduates across the institution types and the broad fields of study for the years 1996 to 2012.

Figure 2.8 illustrates a number of changes in the graduates according to field of study during the period 1996 to 2012:

- The percentage of graduates in natural sciences, engineering and technology (SET) increased from 45% in 1996 to 53% in 2012. The biggest contribution to the increase was in the field of natural sciences where the share of graduates gained nine percentage points, increasing from 26% in 1996 to 35% in 2012. The share of graduates in the SET subfield of engineering and technology remained constant at 8% from 1996 to 2012, while the health sciences showed a drop of 1% (from 11% to 10%) over this period.
- Doctoral graduates in business, economic and management sciences increased from 3% in 1996 to 9% in 2012.

Figure 2.8: Average shares of the doctoral graduates in the various fields of study (1996–2012)



Sources: DoE (1999), DHET (2013a)

- The share of doctoral graduates in education dropped from 14% to 11%.
- The largest decrease in the number of doctoral graduates was in the humanities and social sciences: from 38% in 1996 to 28% in 2012.

The *National Development Plan 2030* statement that 'if South Africa is to be a leading innovator most of the doctorates should be in science, engineering, technology and mathematics' (NPC 2012: 319) has almost been achieved. By 2012 53% of South Africa's doctoral graduates were in these fields. However, neither the NDP nor the ministries of higher education or science and technology have ever specified which percentage is considered 'most'.

In terms of institutional differentiation, it is important to look how doctoral graduate totals by fields of study were shared between the three institution types (see Table 2.4 below and Table A2 in Appendix 2):

- The group of traditional universities increased their total share of doctoral graduates from 74% in 1996 to 75% in 2012. The comprehensive universities as a group showed a decline from 25% in 1996 to 20% in 2012, while universities of technology increased their share from 1% in 1996 to 4% in 2012.

Table 2.4: Distribution of doctoral graduates per institution type and field of study (1996–2012)

1996							
	Natural sciences	Engineering and technology	Health sciences	Business, economic and management sciences	Education	Humanities and social sciences	Total
Universities	89%	98%	90%	55%	42%	67%	74%
Comprehensive universities	9%	2%	8%	45%	58%	33%	25%
Universities of technology	2%	0%	1%	0%	0%	0%	1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
2012							
	Natural sciences	Engineering and technology	Health sciences	Business, economic and management sciences	Education	Humanities and social sciences	Total
Universities	85%	71%	84%	49%	63%	74%	75%
Comprehensive universities	12%	13%	10%	38%	35%	25%	20%
Universities of technology	3%	16%	5%	13%	3%	1%	4%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

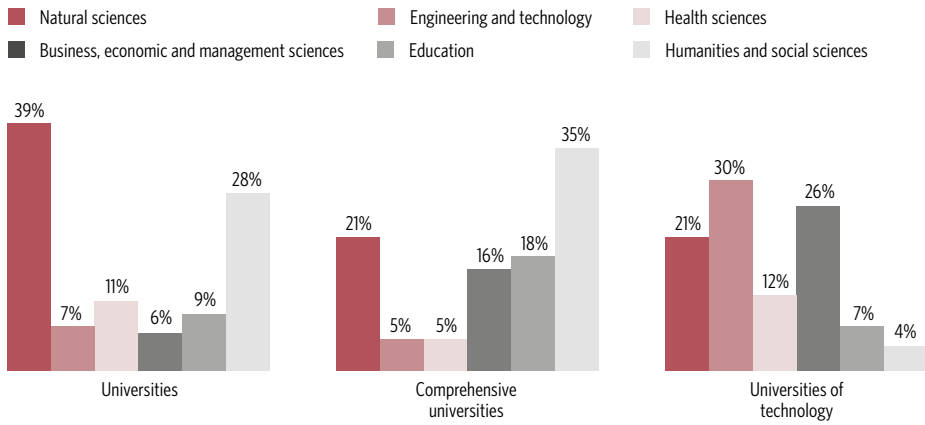
Note: Percentages may not add up to 100% due to rounding.
Sources: DoE (1999), DHET (2013a)

- There were considerable shifts in the shares of engineering and technology and health sciences (sub-sets of SET) graduates from 1996 to 2012. The share of universities in engineering and technology graduates decreased from 98% to 71%, while comprehensive universities showed an increase from 2% to 13%, and universities of technology expanded their graduates from 0% to 16%. Similar changes took place with health sciences graduates: at traditional universities this declined from 90% to 84%; comprehensive universities increased their share from 8% to 10%; and universities of technology improved their quota from 1% to 5% between 1996 and 2012.
- Universities and comprehensive universities showed substantial losses in their doctoral graduate shares in business, economic and management sciences (55% to 49% for universities, and 45% to 38% for comprehensive universities).
- Universities boosted their share in education doctoral graduates (from 42% to 63%) and in humanities and social sciences (from 67% to 74%) during the 1996 to 2012 period. Comprehensive universities experienced a major decrease in education (from 58% to 35%) and in humanities and social sciences (from 33% to 25%) doctoral graduates over the 1996 to 2012 period.
- Universities of technology produced 4% of all doctoral graduates in 2012. They improved their portion of doctoral graduates in the natural sciences slightly from 2% to 3%. Their number of doctoral graduates increased in all fields of study, with the highest growth in engineering and technology (from 0% to 16%) and in business, economic and management sciences (from 0% to 13%) between 1996 and 2012.

Salient trends in doctoral graduations since 1996

- The number of doctoral graduates more than doubled from 685 in 1996 to 1 878 in 2012 (and 2 051 in 2013). The annual growth rate (6.5%) compares favourably with the 6.4% average annual growth rate of in the number of enrolments. This – as we will argue in Chapter 3 – can be interpreted as a proxy measure of efficiency in the system. The simple fact that the consistent growth in doctoral enrolments has not come at the cost of a commensurable decline in growth of doctoral graduations suggests that the universities have mobilised additional resources and capacity to deal with the increasing burden of supervision (without a concomitant increase in their own supervisory capacity).
- The production of doctoral graduates is heavily skewed in the sector, with 12 universities producing nine out of every 10 graduates in 2012. This, we believe, is not unexpected, as doctoral students worldwide are attracted to the best universities (or at least the universities they believe

Figure 2.9: Percentage distribution of doctoral graduates per institution type and field of study with SET subdivided further (2012)



Source: DHET (2013a)

to be the best) and to doctoral supervisors with the best reputations. In a recent survey of doctoral (and other postgraduate) students in South Africa we were able to 'test' this claim.

International comparison: How does South Africa fare?

The NPC in 2011 had similar concerns to those of Johan Garbers in the late 1950s. Its *Diagnostic Report* (NPC 2011) raised concerns about how South Africa fares internationally in terms of doctorate production, and whether sufficient numbers of doctoral graduates are being produced to fuel the knowledge economy. The report compares South Africa (with a population of 51 million) to Norway (with a population of 5 million people). At the time, South Africa had 19 000 full-time researchers and 28 PhDs per million, as opposed to Norway's 25 000 full-time researchers and 151 PhDs per million (NPC 2011: 273). (The report does not provide a reason for the comparison with Norway.)

While it is evident that international comparisons and rankings are to be read with caution, the pressure to be globally competitive and, by implication, comparable is a worldwide phenomenon. The most systematic comparative data available to assess the performance of South Africa's graduation of PhDs against other countries is that of the Organisation for Economic Co-operation and Development (OECD) countries. Table 2.5 shows how South Africa's PhD graduation compares with a number of selected OECD countries for the years 2000 and 2011.[7]

Table 2.5: Comparison of PhD production in South Africa with a number of selected OECD countries (2000 and 2011)

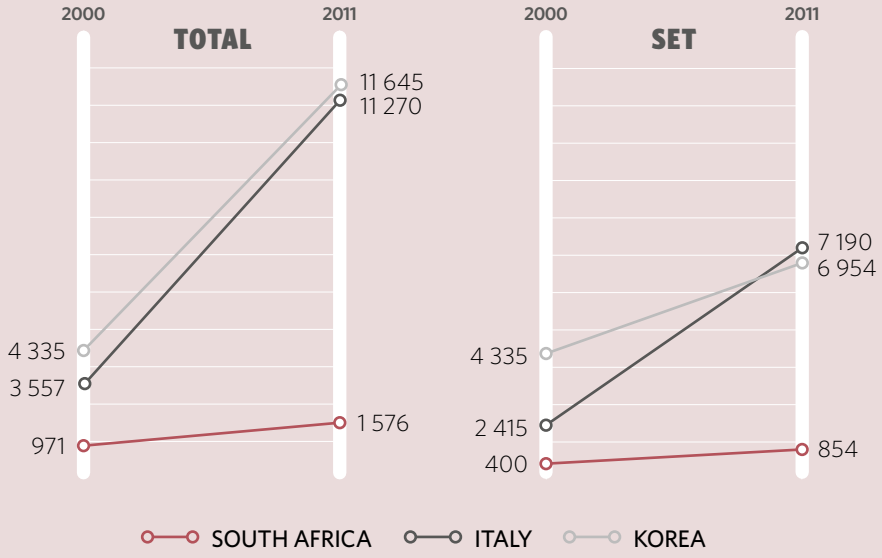
Country	PhD graduates in SET		Average annual growth rate in SET PhDs 2000–2011	2011 SET PhD graduates as % of all 2011 PhD graduates	Total PhD graduates		Average annual growth rate in total PhDs 2000–2011	Population	2011 SET PhD graduates per 100 000 of 2011 population	2011 total PhD graduates per 100 000 of 2011 population
	2000	2011			2000	2011		2011		
Australia	2 326	3 553	3.9%	58.4%	3 687	6 079	4.7%	22 324 000	15.9	27.2
Canada	2 156	3 563	4.7%	62.8%	3 978	5 673	3.3%	34 483 980	10.3	16.5
Germany	19 355	19 835	0.2%	72.5%	25 780	27 354	0.5%	81 797 670	24.2	33.4
Italy	2 415	7 190	10.4%	63.8%	3 557	11 270	11.1%	60 723 570	11.8	18.6
Korea	4 355	6 954	4.3%	59.7%	6 143	11 645	6.0%	49 779 440	14.0	23.4
Norway	274	829	10.6%	63.9%	658	1 297	6.4%	4 953 000	16.7	26.2
Portugal	747	1 205	4.4%	52.1%	1 586	2 314	3.5%	10 557 560	11.4	21.9
Switzerland	2 042	2 385	1.4%	68.5%	2 733	3 484	2.2%	7 912 398	30.1	44.0
United Kingdom	8 088	12 027	3.7%	59.9%	11 568	20 076	5.1%	61 761 000	19.5	32.5
United States	19 932	40 450	6.6%	55.4%	44 808	73 041	4.5%	311 591 900	13.0	23.4
South Africa	**400**	**854**	**7.1%**	**54.2%**	**971**	**1576**	**4.5%**	**51 770 560**	**1.6**	**3.0**

Source: OECD (2013) (data extracted on 4 July 2013)

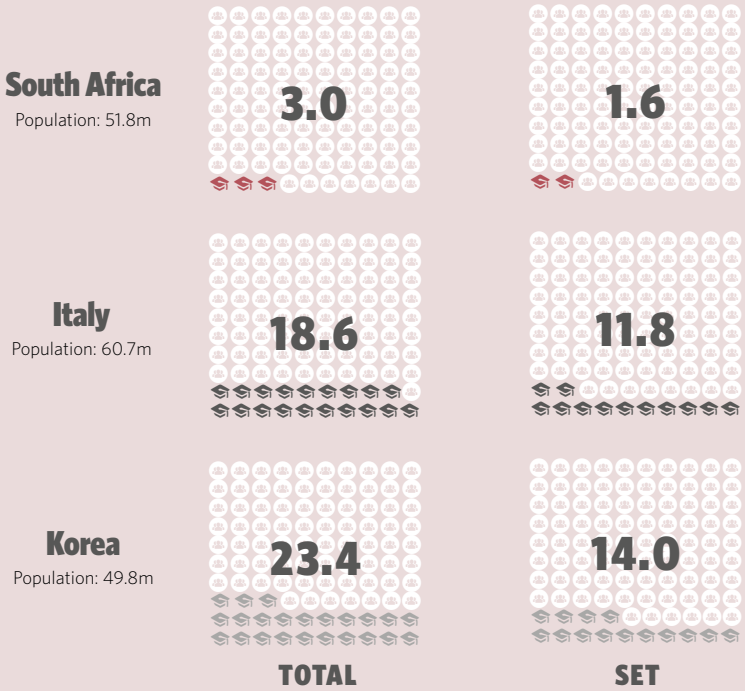
Note: SET (science, engineering and technology) has been defined for purposes of this analysis as all graduates in the fields of (a) agriculture, which includes agriculture, forestry and fishery, and veterinary, (b) engineering, manufacturing and construction, which includes engineering and engineering trades, manufacturing and processing, and architecture and building, and (c) science, which includes life sciences, physical sciences, mathematics and statistics, and computing.

DOCTORAL GRADUATES

INCREASE 2000–2011



PER 100 000 OF 2011 POPULATION



Source: Table 2.5: Comparison of PhD production in South Africa with a number of selected OECD countries (2000 and 2011)

If the factors of population size and GDP ranking are combined, Korea (50 million, 15 GDP), Italy (60 million, 9 GDP) and Turkey (74 million, 17 GDP) are closest to South Africa (51 million, 28 GDP) (World Bank 2012). In terms of total number of PhD graduates, Turkey (4 653) outperformed South Africa (1 576) by three times, and Korea (11 645) and Italy (11 270) each produced seven times more graduates than South Africa. The same applies to the proportion of doctorates in science, engineering and technology. When it comes to SET PhD graduates per 100 000 of the population, South Africa produced 3.0 per annum, Turkey 6.3, Italy 18.6 and Korea 23.4.

To compound this picture, when South Africa is compared to much smaller countries, with much lower GDP rankings, it also performs poorly. For example, the Slovak Republic, with a GDP ranking of 62 and a population of 5 million, produced around 100 more PhDs (1 672) per annum than South Africa, while the Czech Republic, with 10 million people and a GDP ranked 50, produced 1 000 more doctorates than South Africa in 2011.

The comparison becomes far worse when South Africa is compared to the top-ranked GDP country, the United States, where the population is six times greater (310 million) than South Africa: the US turned out 73 000 doctorates – 46 times more than South Africa – in 2011.

When compared to OECD countries, South Africa not only fares poorly against countries with a similar population size and GDP ranking, but even does so when compared to much smaller countries with lower GDP rankings, and fares considerably worse when compared to top-ranked GDP countries.

In conclusion

The public higher-education system in South Africa has evidently responded to the imperative for growth. Both doctoral enrolments and graduations increased significantly between 1996 and 2012/13 and at higher rates than any other degree level. The resultant growth in doctoral enrolments and graduations is clearly the result of a variety of demand-side factors (new demands from the labour market; the demand created by the increase in students from other African countries who choose South Africa as a destination for postgraduate students), as well as supply-side factors (new masters and PhD programme offerings, increased supervisory capacity at most universities, increased funding for doctoral studies, as well as the effect of the new incentive and reward strategies of universities).

Universities as a group have also been more successful in achieving the aim of increasing the number of doctoral graduates in specific fields. The proportions of doctoral graduates in science, engineering and technology, and in the business, economic and management sciences have improved

considerably over the 1996 to 2012 period, and clearly the system is making progress in delivering more graduates in these fields.

The explicit targets of the NDP and the DST's Ten-year Innovation Plan 2008–2018 for doctoral enrolments and graduates in science, engineering and technology, reinforced by financial incentives since the introduction of the current funding framework (for example, these doctoral enrolments are funded at 3.5 times the level of enrolments in education) could have played a role in stimulating the elevated growth in these fields.

There has been considerable progress towards achieving government expectations of increased enrolments in science, engineering and technology and business, economics and management, to the extent that science, engineering and technology candidates now constitute 51% of all doctoral enrolments. Enrolments and graduates in these fields expanded at higher average annual growth rates than in the fields of education and in humanities and social sciences.

The Global DBA Survey 2014 (Graf 2014: 1) found that the need for professional doctorates in management has increased worldwide and that the strongest demand comes from Asia, the Middle East and Africa, followed by Europe and Latin America. This trend contributed to the increased enrolments and graduates in business, economics and management. Kyvik and Olsen (2013: 5) referenced various studies that found that the completion rates across countries are lower in the humanities and social sciences than in the natural sciences and technology. This can mostly be attributed to the longer period often needed to undertake research for a thesis in the humanities and social sciences, because students mostly choose their own topic, unlike in the natural sciences and technology fields, where doctoral students are frequently part of a research team, with a closer supervisory relationship, and co-publishing with supervisors is more common.

When comparing South Africa's yield of PhDs to other countries worldwide, the data corroborates the finding of the ASSAf (2010) PhD study that the country's production of PhD graduates is too low, and that South Africa is near the bottom of the list of PhD-producing countries worldwide. For South Africa to be a serious competitor in the global knowledge economy and to achieve standards that are internationally comparable, the quantity of PhDs needs to be expanded dramatically. This is clearly recognised by government (in both the NDP and in a speech by DST Minister Naledi Pandor in 2014). The question is whether the target of 5 000 PhDs by 2030 is achievable. A projection of growth will be discussed in the concluding chapter.

Despite the generally positive picture that we have presented in this chapter on trends in growth, the question remains whether even higher growth rates could have been achieved. Our focus thus far has been on national policy imperatives (and targets) and the response to these (and other

demand factors) by the universities. But as our discussion in Chapter 1 argued, we should not lose sight of two other major actors: the doctoral student and the doctoral supervisor.

As far as the doctoral student is concerned we will present evidence in the following chapter that points to some of the socio-economic realities that currently constrain further growth in the postgraduate pipeline. We will show how the lack of financing for full-time doctoral studies has arguably become the single biggest constraint to increasing the progression, retention and completion rates of all students, but black students in particular. We will argue there (within the context of a discussion about efficiency gains) that any expectation of substantial growth must be tempered by these constraints.

Where the doctoral supervisor is concerned, we will devote a separate discussion to the realities faced by many supervisors in the country in Chapter 5 on quality. We will show – based on a survey of experienced supervisors – that there is an increasing burden (even stress) on doctoral supervisors that acts both as a barrier to further growth (the top supervisors are already supervising too many students) as well as a serious challenge to maintain current standards of quality (increasing numbers of supervisors are taking on students outside their main area of expertise and are expected to do more remedial and support work in ensuring that a quality doctoral thesis is produced).

In summary, it is our considered view that universities have responded admirably to the demands and imperatives to grow doctoral production. This growth has exceeded the growth for any other postgraduate degree and has also slowly shifted to those fields that are aligned with national science policy goals. We will also see in Chapter 4 that this growth has occurred alongside a significant transformation in student demographics.

Notes

1 Two comments about missing data are in order. Firstly, in theory it is possible to fill the gaps for the missing years through individual data-collection at South African universities that would (presumably) have kept records of all their doctoral students. We did not have the resources to undertake such a check. Secondly, the information presented here does not include any statistics on the number of South African students who went overseas for their doctoral studies. The graph is intended to show only doctoral graduates at South African universities, but it would be useful to have a comprehensive picture of all South African doctoral graduates for these periods. (Such a study is not available as far as we know, but see our discussion in Chapter 4 on black students who went to the USA during the apartheid years.)

2 Of course, the low growth rates between 1986 and 1995 can also be explained with reference to the political situation at the time. Two related trends – the 'white flight' of the early 1990s and the fact that many people went into exile to study abroad – would explain these low growth rates.

3 For further reading see Van Vught (2008) at www.chet.org.za/files/resources/UWN_Special_Edn_1_Jan_08.pdf and http://chet.org.za/research-areas/differentiation.

4 See www.chet.org.za/resources/higher-education-summit-march-2010-institutional-differentiation.

5 After saying that there is broad agreement that South Africa needs a diverse university sector that is purposefully differentiated in order to meet a range of social, economic and educational requirements, the *White Paper* stated emphatically: 'We consider differentiation in a positive light' (DHET 2013c: 29).

6 A the time of finalising this manuscript the 2013 statistics became available. The number of masters enrolments in 2013 reached 62 110 and the number of doctoral enrolments 16 039. The growth at both levels continues.

7 There are at least two limiting factors that underpin comparisons such as these. Any comparison of doctoral production across countries has to recognise the big differences in the structure of doctoral education in these countries. The South African system still reflects its Anglo-Saxon heritage with the inclusion of the honours degree and masters as intermediary degrees. In many countries, doctoral students can enrol for doctoral studies with an extended bachelors degree. Comparisons such as these also have to take into account the fact the differences between proportions of full-time (residential) and part-time (including distance) students. In the South African system we estimate that between 60% and 65% of all doctoral students study while they work. They are in fact part-time students. In many countries in Europe and North America, full-time, residential students make up the bulk of doctoral students. Taken together, these two facts mean that comparisons across countries have to focus on large patterns and trends rather than finer differences.

Chapter 3

The demand for improved efficiency

- The tension between equity and efficiency in policy guidelines
- On defining efficiency
- The relationship between enrolment and graduation in efficiency
- Cohort tracking as a measure of doctoral graduate output efficiency
  - Methodology
  - Graduation rates five and six years after registration
  - Throughput by field of study
  - Throughput by institution type
- International PhD completion rates: How does South Africa fare?
- The postgraduate pipeline: Progression and completion rates
  - Progression and completion from bachelors to honours
  - Progression and completion from honours to masters
  - Progression and completion from masters to doctorate
- Low progression and retention rates are mainly due to the part-time nature of studies (which is related to the lack of funding for full-time studies)
- Students in the natural sciences (where larger proportions study full-time) have significantly higher progression and completion rates
- Efficiency defined as supervisor productivity
- In conclusion

The policy discourse after the first democratic election in 1994 was dominated to such an extent by concerns about equity, and racial equity in particular, that the important issue of efficiency was ignored. Badat (2004) identified equity versus development as the main tension in the post-apartheid era, but it could be argued that the real strain that emerged was between equity and efficiency. It is often forgotten that the apartheid regime, in addition to racial differentiation, was also deeply inefficient and corrupt. Separate development policies required enormous amounts of

duplicated funding – for example, the fact that a university was developed and funded in every homeland – whether it was viable or not (Cloete and Moja 2005).

The tension between equity and efficiency in policy guidelines

The newly elected democratic government was immediately faced with the twin problems of bringing about greater equity and also greater efficiency, even though the public and policy debates focused on equity. The first major national framework policy, the Reconstruction and Development Programme (RDP) (ANC 1994), emphasised equity and democratisation. However, the jolt of the 1996 fiscal crisis re-emphasised the need for an overall improvement in efficiency and higher education was not exempt from this. These shifts in emphasis in the policy documents can be read as an indication of the move towards efficiency after the formulation of the Growth, Employment, and Redistribution (GEAR) macroeconomic policy in 1996 (Department of Finance 1996). GEAR was a package of mainly macroeconomic measures that included faster fiscal deficit reduction, budget reform, consistent monetary policy, stable and coordinated policies, and a strong emphasis on efficiency and restraint on government spending (Department of Finance 1996). The main aims were to stimulate growth through foreign investment, improved competitiveness and efficiency.

The National Commission on Higher Education's *A Framework for Transformation* (NCHE 1996) and the 1997 *White Paper* (DoE 1997) together laid the first stone of equity as the foremost transformation principle. In contrast, the Council on Higher Education report *Towards a New Higher Education Landscape: Meeting the equity, quality and social development imperatives of South Africa in the 21st century* (CHE 2000) listed effectiveness and efficiency challenges before mentioning equity, and the *National Plan for Higher Education* (NPHE) (DoE 2001) began its discussion on the challenges facing higher education with the need for human resource development (Cloete and Moja 2005).

The most clearly articulated efficiency policy initiative was the implementation of a new funding and planning framework. To do this the Department of Education (2005c) engaged in a system-wide student enrolment planning exercise (2005 to 2007) aimed at facilitating the implementation of the new funding formula. This strongly guided approach by the Department of Education was partially to address the wastage diagnosed from student dropout and failure rates. An analysis of the cohort completion rates for the 2006 first-time entering students showed a completion rate of 48% for all three- and four-year qualifications after a period of five years for contact universities (CHE 2013: 45). The former Ministry of Education had had a more efficient target of 67% (Bunting and

Cloete 2004) in mind, but there were great institutional variations, ranging from an annual pass rate of less than 30% in some institutions to over 80% in others (Department of Education 2005c). But these figures pertained to undergraduate throughput rates. No argument was put forward about the efficiency of postgraduate throughput.

The DoE's objective therefore was to improve the graduate output by ensuring that the growth in graduates was higher than that of enrolments. This should result in systematic improvement in throughput rates and the graduation numbers should then advance at a higher rate than enrolments for a period, and improve the historically low levels of graduate output. The *White Paper for Post-school Education and Training* (DHET 2013c: 34) expressed the urgent need to explore ways of ensuring a greater enrolment and through-flow of postgraduate students from whose ranks academics and researchers could be drawn. The *National Development Plan 2030* subsequently argued that throughput rates of programmes should be increased to more than 75% (NPC 2012).

The National Planning Commission (NPC) also voiced concern about inefficiencies in the higher-education system and said that the low numbers of postgraduates had to be addressed if universities were to deliver the skills needed for development. Furthermore, the report argues that the quality of research outputs should also be improved and the number of masters and doctoral graduates increased dramatically to accelerate knowledge production and the innovation needed for the development of the country (NPC 2012).

In this chapter, four indicators of efficiency are explored. The chapter concludes with a comparison of South Africa's completion rates with those of Norway, the United States, Canada and the United Kingdom.

On defining efficiency

Although there are different ways of defining 'efficiency' within higher-education studies, we have settled on the following definitions in this chapter:

- The system is efficient when optimal numbers of students progress from lower degree levels to doctoral studies (progression rates).
- The system is efficient when optimal numbers of students are retained in the system (retention rates).
- The system is efficient when optimal numbers of students enrolled for a degree complete within acceptable time-frames (completion rates).
- The system is efficient when academic staff holding doctorates produce (on average) increasing numbers of doctoral graduates (productivity rates).

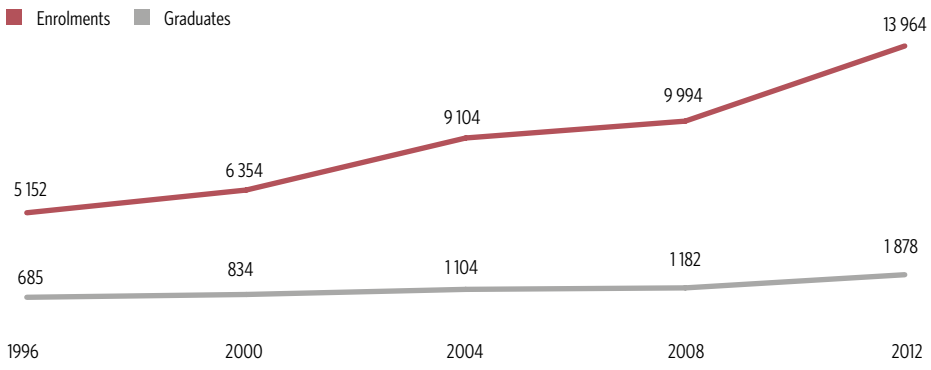
We will show in the statistical analysis below that efficiency (in terms of all of these definitions) varies by institution. Similarly, we will also show that efficiency varies across scientific fields. This may be the result of various other factors, including differences in proportions of full-time versus part-time students across different fields, but also because there are differences in the models of doctoral studies across different fields. There is increasing evidence that students in some fields – especially the natural and health sciences fields – are following the route of doing a PhD by publication. This, in itself, is often highly correlated with higher retention and completion rates. But, again, we will also show that efficiency (at least as far as progression and completion rates are concerned) is influenced by the deep structure of the socio-economic realities of doctoral education in South Africa. This translates into differential progression and completion rates for different subgroups of students (as disaggregated by race, gender and age).

The relationship between enrolment and graduation in efficiency

While enrolment and graduation numbers rose marginally between 1996 and 2006, there was a sharp increase in both enrolments and graduates during the period 2008 to 2012 (see Figure 3.1). Over this period, doctoral enrolments increased from 5 152 in 1996 to 13 964 in 2012 (a 171% increase), with an average annual growth rate of 6.4%.

The number of doctoral graduates increased from 685 in 1996 to 1 878 in 2012, a growth of 174%, and the average annual increase over the period was 6.5%. Graduates have thus grown more or less at the same annual rate

Figure 3.1: Comparison of doctoral enrolments and graduates (1996–2012)



Source: DoE (1999), DHET (2013a)

as enrolments. At the same time we should note that relatively large proportions of enrolled doctoral students (around 45%) dropped out before graduating. This will be illustrated through the cohort analyses later in this chapter. If the growth rate in graduates is higher than that of enrolments it signals an improvement in efficiency.

The data for graduate output and efficiency for the three institution types show that:

- The universities displayed a slight improvement in efficiency with an average annual increase in graduates of 6.5%, compared to 6.4% in enrolments;
- The comprehensive universities increased their doctoral enrolments as well as graduates by 5.1% on average per annum over the period 1996 to 2012. These universities have thus not improved their efficiency over this period; and
- Doctoral enrolments in universities of technology grew on average by 20.0% per annum, whilst their graduates increased by 20.7%, which signals a small increase in efficiency (see Table 2.2 and Table 2.3 in Chapter 2).

Cohort tracking as a measure of doctoral graduate output efficiency

The cohort-analysis methodology was applied to individual student records extracted from the Higher Education Management Information System (HEMIS) database, which is maintained by the Department of Higher Education and Training. Enrolments and graduates have been linked through cohort tracking since 2003 (DHET 2013a). This allows for accurate measures and comparisons of the proportion of doctoral students who drop out before completing their studies, and the share of students who eventually graduate.

Methodology

The cohort data were analysed as follows for each of the 23 public universities (across the categories of universities, comprehensive universities and universities of technology):

- Students who enrolled for doctoral studies for the first time in 2003 to 2007 were identified in the student record systems of each of the 23 public universities. These students were then tracked through each university's student record system for each year from 2003 to 2012. If a student registered for doctoral study, for example, in 2003 and was not registered in any subsequent year up to 2012, then he or she was

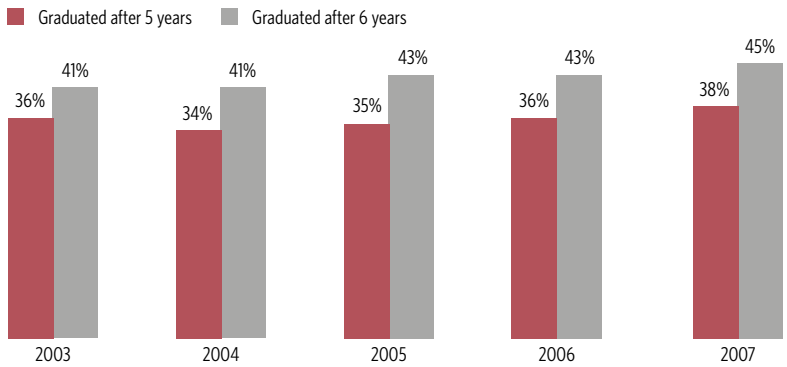
counted as a dropout. However, if a student who registered for the first time in the same year was not registered for a number of subsequent years, but then re-emerged in the student record system some years after initial registration, and then remained registered until 2012, he or she was reinstated in the cohort count and eventually recorded either as a graduate or with 'studies incomplete'.

- The same procedures were followed for students who enrolled for doctoral studies for the first time in 2004 to 2007. They were also tracked through the student record systems of each of the 23 public universities, and were counted as dropouts (a) if they discontinued their registration, and (b) if they were not reinstated at any time before 2012. The dates on which they finally graduated were also recorded.

Graduation rates five and six years after registration

Figure 3.2 shows that throughput rates improved marginally for the new cohorts over the period 2003 to 2007. A comparative analysis of the 2003, 2004 and 2005 cohorts illustrated similar trends with an average graduation rate of 35% after five years and 42% after seven years. The 2006 cohort had a 43% completion rate after six years, whilst the 2007 cohort showed a 45% completion rate after the same period. The percentage of new enrolments who graduated after five years grew from 36% for the 2003 cohort to 38% in 2007. The percentage of new enrolments who graduated after six years increased slightly from 41% for the 2003 cohort to 45% in 2007. Although the percentage of the doctoral cohort who graduate is still low, these increases show there were improvements in doctoral graduation rates.

Figure 3.2: Percentages of new doctoral intakes who graduated after five and six years respectively (2003–2007)

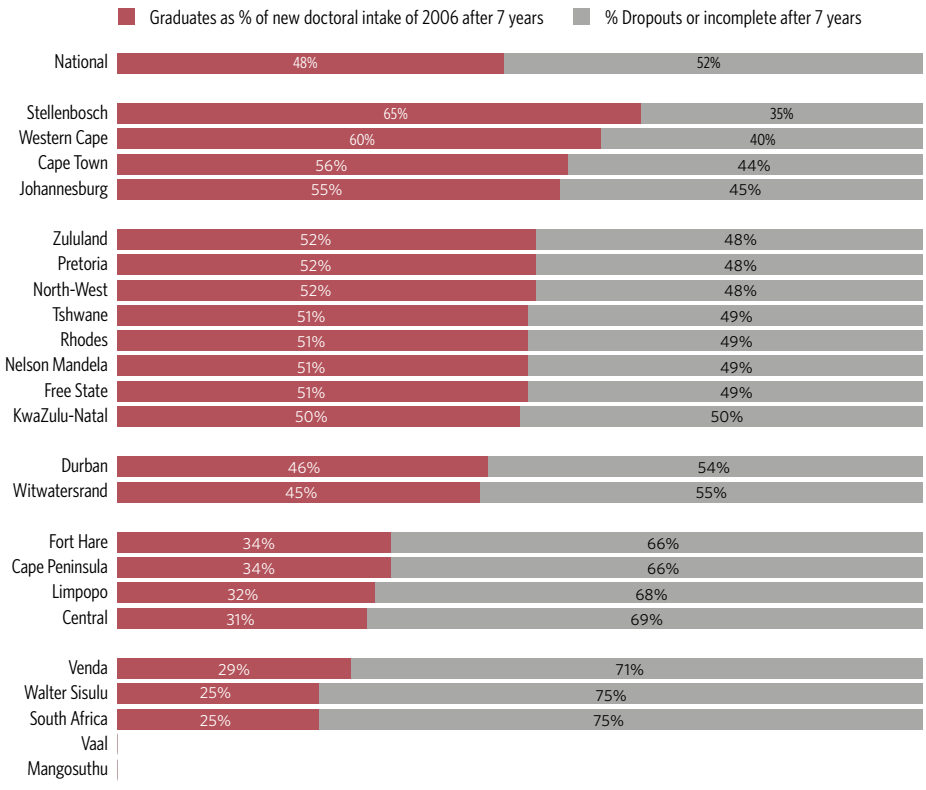


Source: DHET and CHE Cohort Analysis 2014

Figure 3.3 provides a summary by institution of the progress made after seven years by the new doctoral intake of 2006. This cohort was selected for analysis because it includes enrolment and graduation data for a full seven-year period (2006–2012) and it was the cohort with the most stable data following the 2005 mergers. The main trends observed from the analysis of progress are: (1) two universities, Stellenbosch and Western Cape, had throughput rates above 60%; and (2) 12 of the 23 institutions had a throughput rate of 50% or higher for the 2006 new doctoral intake.

While 12 institutions graduated 50% or more of the new 2006 doctoral intake, six institutions graduated between 30 and 50% of the intake, and three graduated less than 30 per cent of their intake. Stellenbosch University had the highest throughput rate (65%) of all universities in the country. The Mangosuthu and Vaal Universities of Technology had no new doctoral students for the 2006 period.

Figure 3.3: Progress of 2006 intake of new doctoral students after seven years by bands of performance



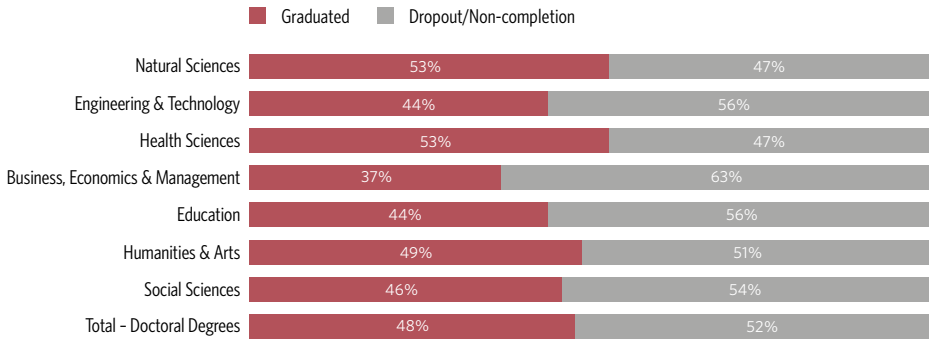
Source: DHET and CHE Cohort Analysis 2014

Throughput by field of study

Analysis for the 2006 new doctoral intake per field of study (Figure 3.4) reveals that doctoral students in natural sciences and health sciences had the highest throughput rate (53%), followed by doctoral students in humanities and arts (49%). Doctoral students in social sciences and in education had a throughput rate of 46% and 44% respectively. Doctoral students in business, economics and management had the lowest rate of 37%, as well as a high incomplete and dropout rate of 63% after seven years.

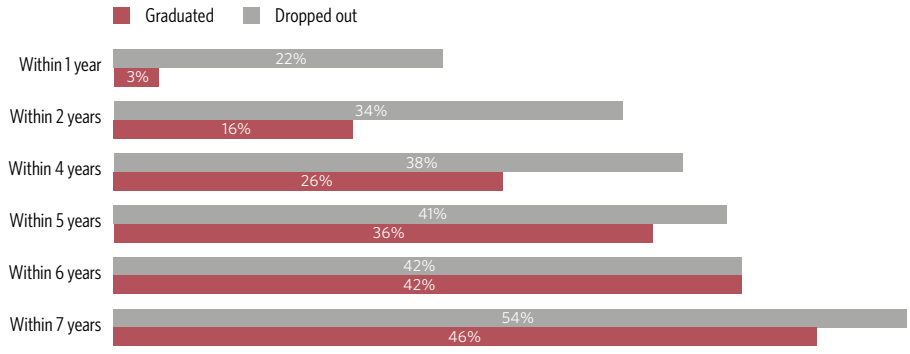
Figure 3.5 illustrates that if doctoral students of the 2006 cohort were to drop out, most did so in their first year of study (22%), and that 46% of all the doctoral students enrolled in 2006 graduated within seven years.

Figure 3.4: Progress of 2006 intake of new doctoral students after seven years by fields of study



Source: DHET and CHE Cohort Analysis 2014

Figure 3.5: Dropout and completion rates of the 2006 new entering doctoral cohort



Source: DHET and CHE Cohort Analysis 2014

Throughput by institution type

In terms of differentiation, there are not only major distinctions within institution types, but also between universities, comprehensive universities and universities of technology.

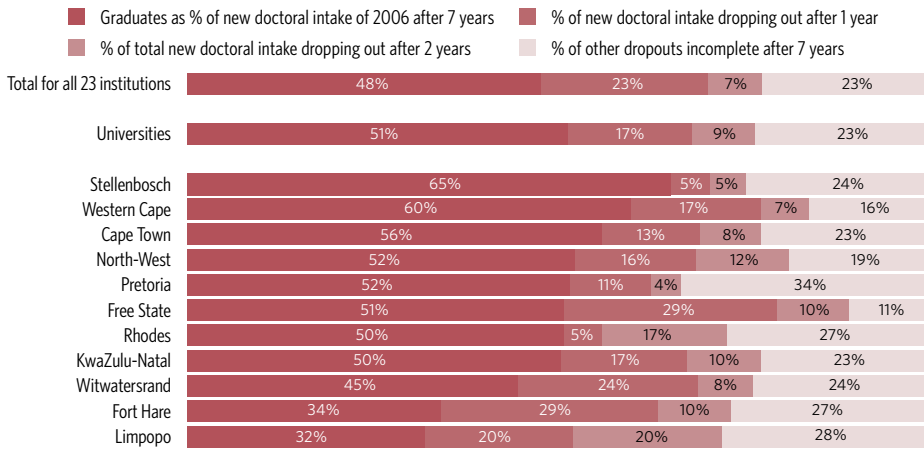
Figures 3.6, 3.7 and 3.8 reveal that, of the three groups, the universities group was most successful in terms of completion rates (51%), with two universities (Stellenbosch and Western Cape) graduating 65% and 60% of their 2006 new doctoral entrants by 2012. Six universities (Cape Town, North-West, Pretoria, Free State, Rhodes and KwaZulu-Natal) graduated between 50% and 56% of their 2006 enrolments within seven years.

Comprehensive universities as a group were less successful than universities, and recorded a completion rate of 38% for their 2006 enrolments for the period 2006 to 2012. Three of the comprehensive universities – Johannesburg (55%), Zululand (52%) and Nelson Mandela Metropolitan (51%) – graduated more than the average percentage for their group.

Universities of technology also graduated 38% of their 2006 new doctoral intakes. The Tshwane and Cape Peninsula Universities of Technology graduated higher-than-average percentages of their 2006 doctoral intake during the seven years of analysis (51% and 46% respectively).

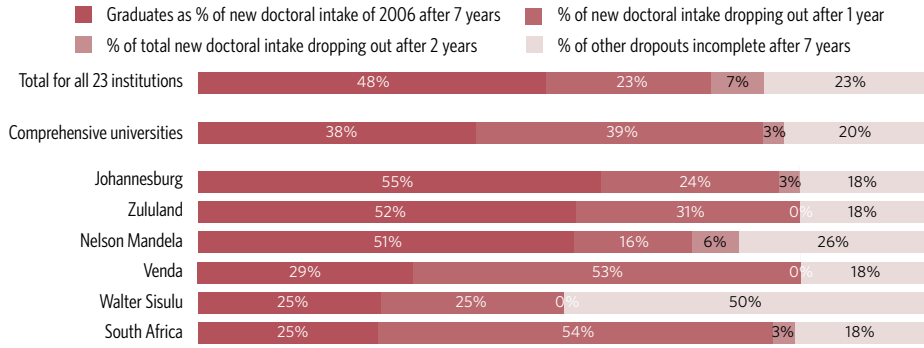
Dropout rates were the highest after the first year of study, with the national average at 23%. The highest dropout rate after a year was in the comprehensive universities group (39%), followed by the universities of technology (28%) and the universities group (17%).

Figure 3.6: Progress of 2006 intake of new doctoral students at universities after seven years



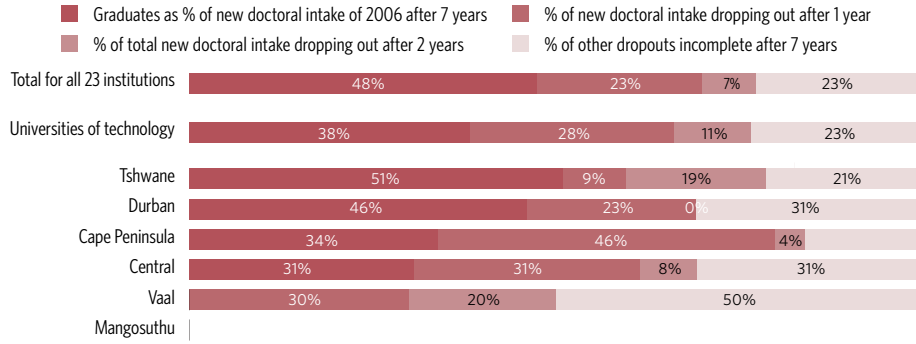
Source: DHET and CHE Cohort Analysis 2014

Figure 3.7: Progress of 2006 intake of new doctoral students at comprehensive universities after seven years



Source: DHET and CHE Cohort Analysis 2014

Figure 3.8: Progress of 2006 intake of new doctoral students at universities of technology after seven years



Source: DHET and CHE Cohort Analysis 2014
Note: The Vaal University of Technology had ten students, all of whom dropped out or did not complete their degrees. Mangosuthu University of Technology had no new doctoral student registrations in 2006.

International PhD completion rates: How does South Africa fare?

This section compares South African doctoral-completion rates with selected countries. Comparisons could only be made with information from similar studies in other countries and comparative completion-rate data were limited to Norway, the United States, Canada and the United Kingdom. The comparisons are restricted because data for different cohorts of different years and for different periods are juxtaposed. Data for the United States and South Africa were available by nationality, and for the

United Kingdom data were obtainable separately for full-time and part-time study.

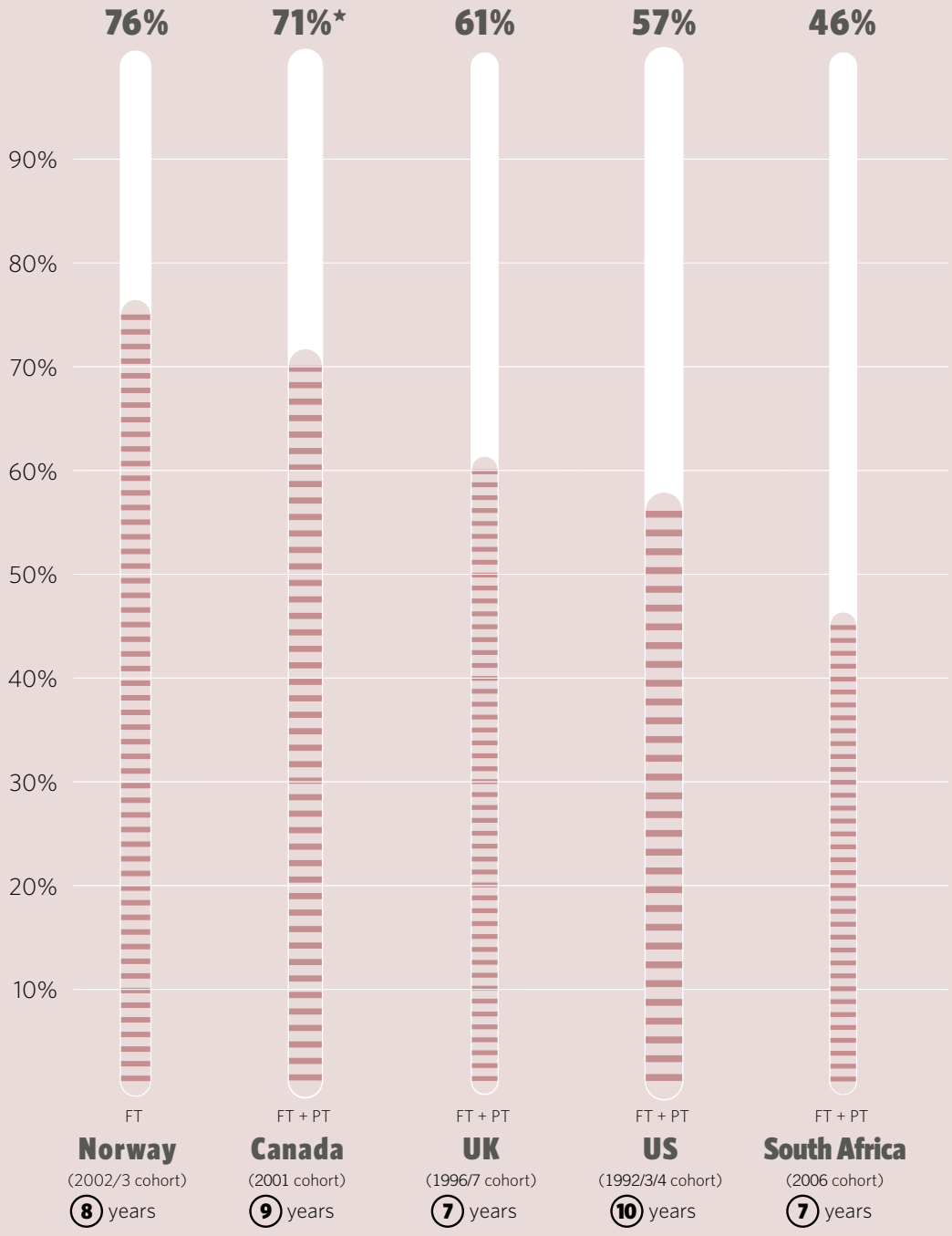
The infographic on page 70 presents international comparative information on completion rates. According to Studies in Higher Education (2013: 7–8) the completion rates for recent cohorts (2002/3) of fellowship-holders (about two-thirds of all doctoral students) in Norwegian doctoral training, 59% had graduated after five years and 76% after eight years. The completion rates between the various fields of study differed. Of the 2002/3 cohorts, 84% of the doctoral candidates in the natural sciences had graduated with a PhD within eight years, compared to 82% in medical sciences, 78% in agricultural sciences, 76% in the humanities, 71% in technology and 67% in the social sciences.

Data for PhD completion rates in the United States were taken from studies by the PhD Completion Project, which captured data submitted by 24 universities (mostly US) for 19 000 students who entered doctoral programmes in 1992–93 to 1994–95 (Council of Graduate Schools 2008). The study found that the overall cumulative ten-year completion rate for the students was 57%. The completion rate for men (58%) was 3% higher than that for women (55%). The study also found that the overall cumulative ten-year completion rate for international students was 67%, compared with 54% for domestic students. In terms of race, whites scored highest in completion rates at 55%, compared with 51% for Hispanic Americans, 50% for Asian Americans, and 47% for African Americans. The completion rates by field of study also varied considerably, with a ten-year cumulative completion rate of 64% in engineering, followed by life sciences (62%). Physical science and mathematics and social sciences doctoral students had a ten-year cumulative completion rate of 55%, while humanities students trailed with 47%.

The latest data on completion rates and periods compiled by Canada's 15 research-intensive universities (also known as the U15) revealed that 70.6% of the students who entered PhD studies in 2001 successfully completed within nine years across disciplines. Among the 2001 cohort, the highest cumulative completion rate was in the health sciences (78.3%), while completion rates in physical sciences averaged 75.4%, with 65.1% for those in the social sciences. The lowest completion rate was in the humanities (55.8%).

The Higher Education Funding Council for England (HEFCE) examined the completion rates of a cohort of research students who started their PhD degrees in higher education institutions in the academic year 1996–97 for a period of seven years up to 2002–03. Data were drawn from the Higher Education Statistics Agency. The study found that after seven years, 71% of full-time PhD students had completed their studies compared to 34% of part-time students. The cumulative completion rate was 61% for all PhD

DOCTORAL COMPLETION RATES
INTERNATIONAL COMPARISON



30%
20%
10%
= % complete within period of analysis

1 = 1-year period of analysis
5 = 5-year period of analysis

FT = Full-time PT = part-time PhD graduates

** The 2001 cohort was comprised of students from a select number of Canadian research-intensive universities*

Sources: Council of Graduate Schools (2008), DHET and CHE Cohort Analysis (2014), Higher Education Funding Council for England (2005), Studies in Higher Education (2013), Tamburri (2013)

students. They also found that students from the natural sciences, medicine and veterinary sciences had the highest completion rates. Social studies and business studies students showed considerably lower completion rates (HEFCE 2005).The best completion rates for full-time students were in the biological and physical sciences, both with 81% completion rates. Social sciences doctoral students had a 61% completion rate and business studies 54%, with the lowest for architecture (54%). Part-time students had the best completion rate for medicine and veterinary sciences (53%) and the worst for architecture (22%). In the social sciences part-time students had a 29% completion rate, compared to 28% for business students. The HEFCE (2005: 34) related the relatively low completion rates in the social sciences to the fact that:

> *fields of research in 'Social sciences and humanities' are not always as well established as in the natural sciences, and methodologies may still be disputed. Sometimes it may be difficult to identify topics, which can yield substantial results through a PhD research programme.*

The HEFCE (2005: 20) also found that international students (non-EU and EU) had a higher completion rate than UK students. The study found that gender affected the completion rates minimally, with men finishing slightly faster than women. In the case of full-time students, 72% of men completed compared to 70% of the women, and for part-time students, 34% of men completed compared to 35% of women (2005: 22). The study also concluded that the younger the student age group, the better the completion rates, with older students dropping out more frequently in both full-time and part-time programmes.

A confounding factor for completion rates is whether students study full-time or part-time, and this is evident from the United Kingdom data which revealed that more than double the percentage of full-time doctoral students graduated (71%) compared to part-time students (34%). Unfortunately, it was not possible to do a comparison between full-time and part-time study for South Africa because this data field had not been populated by institutions for the majority of students. However, some conclusions could be drawn from the 2006 new-entrant completion rate of the University of South Africa (UNISA), a distance-education institution. The completion rate for UNISA was 25% after seven years, while the average for the contact universities for the same period was 51%, despite a substantial portion of enrolments (mostly staff members) also studying part-time. Furthermore, the country with the highest completion rate is Norway, where doctoral studies are full-time posts (for four years) with students being paid the equivalent of a junior lecturer.

International comparisons show that South Africa is underperforming in terms of number of PhDs produced, but when it comes to efficiency the picture is not as clear.

In South Africa, 48% of the 2006 cohort graduated after seven years, while the country that came closest, the United States, had a 57% completion rate, but after ten years. Studies in the United Kingdom presented a 71% completion rate for full-time doctoral students after seven years, but only 34% for part-time studies after seven years. Two countries that proved more efficient than South Africa were Canada with a 71% completion rate after nine years, and Norway with 76% of students graduating after eight years, but these are full-time students. So what is perhaps more clear is that South Africa has too many part-time students, and in terms of part-time students, South Africa does not seem to be more inefficient than the UK. What is also clear is that South Africa has to start gathering data on PhD study that distinguishes between the type of registration – full-time or part-time.

Another very clear finding is that there is considerable differentiation in the production of PhDs, between both different types of institutions and between different fields of study. The cohort tracking showed that at the institutional level, clear bands were revealed for the period 2006 to 2012: two universities graduated 60% or more of their students, 12 of the universities had a throughput rate of 50% or higher, six had a completion rate of between 30% and 50%, and three graduated less than 30% of their intake.

In terms of the three institution types, the universities group performed better in terms of completion rates (51% in seven years for the 2006 new entrants). Comprehensive universities and the universities of technology were less successful, with a completion rate of 38% for their 2006 new-entrant doctoral students for the period 2006 to 2012.

A cohort analysis by field of study showed that after seven years doctoral students in the natural sciences and health sciences had the highest completion rate (53%), with the lowest graduation levels in business, economics and management (37%), and education and the social sciences (44%).

The postgraduate pipeline: Progression and completion rates

In this section we discuss the postgraduate pipeline in more detail, with an emphasis on the progression to doctoral studies. The data for this section were collected as part of a study commissioned by the Department of Science and Technology in 2014, which was completed in May 2015 (Study 3 in Appendix 1). The study consisted of two main components: a secondary analysis of the micro-student records in the HEMIS database from 2001 to 2013, and a national survey of postgraduate students currently enrolled at

South African universities. Some of the findings from this survey are used in the following section of the chapter, where we report on the results of the HEMIS analyses.

The first set of results was for the retention and completion rates of postgraduate students in South Africa, and specifically about the 'leaking' pipeline. It is imperative that we 'follow' the retention of postgraduate students as they progress throughout the entire pipeline from honours to doctoral studies, and analyse the completion rates at each level. The illustrations below show quite clearly why the results point to a 'leaky pipeline'.

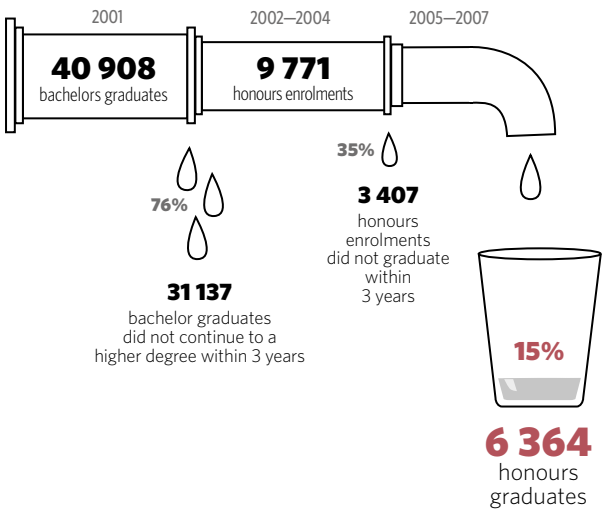
Progression and completion from bachelors to honours

Just less than a quarter (24%) of bachelors students enrolled for an honours degree within three years, and 29% of these did so within five years after graduation.

But the really interesting trends emerge when we disaggregate by key demographic variables. The analysis shows that the progression rates of bachelors to honours for the following sub-groups significantly exceeded the national average (which is 28%):

- Students in the natural sciences (41.6%);
- Students in business, economic and management sciences (36.8%);
- White students (34%); and
- Students younger than 25 (33.9%).

Progress of 2001 bachelor graduates to honours graduates (6 years)



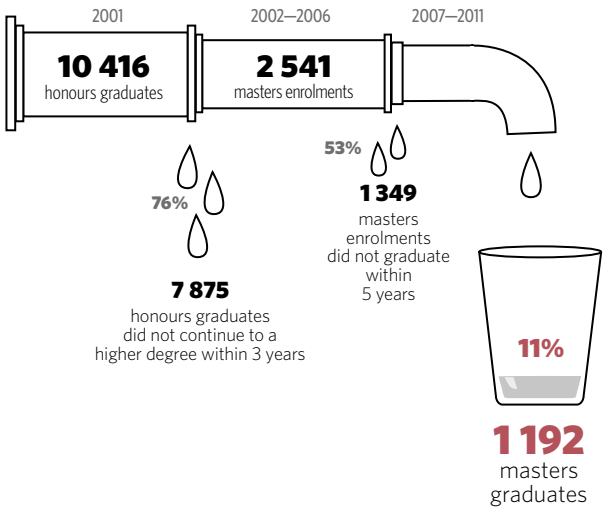
Progression and completion from honours to masters

In terms of progression from honours to masters, on average, 24% had enrolled for a masters programme within three years after graduation. The corresponding average for honours graduates who did so within five years after graduation is 27%.

The disaggregation by demographic variables shows that the progression rates of honours to masters students for the following sub-groups significantly exceeded the national average (which is 26%):

- Students in the natural sciences (49.1%);
- Students in engineering and technology (43.4%);
- Students in health sciences (39.2%);
- Students in the humanities and social sciences (34.9%);
- Students from elsewhere in Africa (34.1%);
- Male students (30.5%); and
- Students younger than 30 (29.7%).

Progress of 2001 honours graduates to masters graduates (10 years)



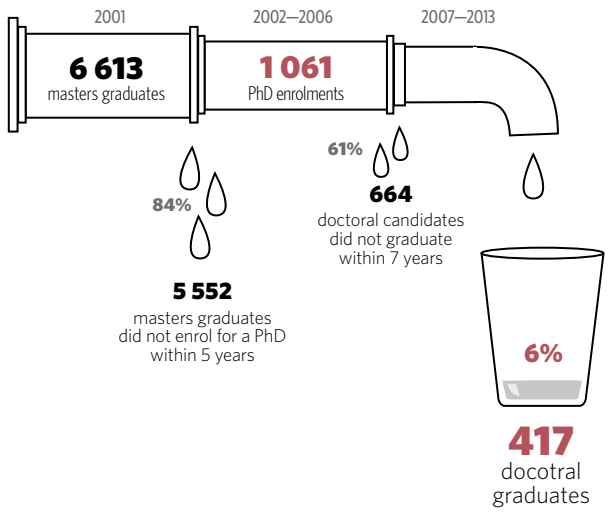
Progression and completion from masters to doctorate

Of those enrolled for a PhD, on average 16% had graduated with a masters degree in the previous three years, and 15% within the previous five years.

The analysis by demographic variables shows that the progression rates of masters to doctoral students for the following sub-groups significantly exceeded the national average (which is 16%):

- Students in education (27.4%);
- Students in the natural sciences (26.2%) (mainly those younger than 35 and older than 40);
- Students older than 40 (21.3%);
- Indian students (20.3%); and
- Coloured students (19.7%).

Progress of 2001 masters graduates to doctoral graduates (12 years)



These progression trends reveal a very worrying picture of regular interruptions of studies. As the figures show, the typical study trajectory from a completed bachelors to a completed doctoral degree can be anywhere between 12 (minimum period) and 25 years (average maximum). *But the problem is not merely a leaking pipeline at every level of the system. The pipeline is also progressively shrinking at what may be regarded as an alarming rate.*

In an attempt to gain a more qualitative understanding of the factors that affect progression and completion rates, we conducted a national survey of postgraduate students enrolled at South African universities during 2014. The total number of completed questionnaires was 5 700. In the following paragraphs we present the salient findings of this survey.

Low progression and retention rates are mainly due to the part-time nature of studies (which is related to the lack of funding for full-time studies)

All the evidence generated by the survey points to the fact that the most dominant factor that explains low progression and retention rates is that between 60% and 70% of South African students study part-time (study while they work). This conclusion is supported by a number of specific findings from the survey:

- The most commonly cited reason for students interrupting their studies was that of employment conditions or work obligations. This reflects the fact that the majority of students work while studying.
- The progression rates for younger students (both at the honours and masters levels) are higher than for older age cohorts, who are more likely to be working while studying.
- Additionally, among the top three reasons given for considering dropping out, across all three levels of study, are challenges to find sufficient time for studies, for example, the challenge of balancing work with studies. This is particularly pertinent to masters and doctoral students, as well as students older than 30.
- Doctoral students who study full-time complete their studies on average in half of the time (just over three years) that it takes part-time students to complete their studies (just over five years).

Students in the natural sciences (where larger proportions study full-time) have significantly higher progression and completion rates

The effect of part-time studies is also evident when we compare progression and completion rates across different scientific fields. Again, the evidence for this conclusion is provided from a number of specific survey findings:

- The progression and completion rates for bachelors to honours students are better for students enrolled in the natural sciences and business, economic and management sciences than in other fields of study. This is also true for honours and masters students, as students enrolled in the natural sciences' progression and completion rates are almost 15% higher than for the humanities and social sciences.
- The natural sciences consistently record better progression and completion rates across all three levels of study. Students enrolled in the social sciences and humanities emphasised the challenge of coping with study demands and finding sufficient time for studies, whereas this was not the case with students enrolled in the natural sciences.

- A greater percentage of the latter (together with students in engineering and the health sciences) also indicated that they intended to enrol immediately for another university degree after completing their current degree whereas this intention was not as prominent among students in the social sciences and humanities.
- A look at the average age of South African honours students in 2013 reveals that students in the natural sciences, engineering and business, economics and management sciences were on average younger than students enrolled in other sciences. The average age of honours students in education was significantly higher.
- These age differences, as well as differences in progression and completion rates, also correlate clearly with the fact that larger proportions of students in the social sciences and humanities are enrolled part-time, and therefore take longer to complete, are older, and often struggle with the demands of their studies.

Efficiency defined as supervisor productivity

We conclude this chapter with a brief discussion on another indicator of efficiency: the number of doctoral graduates produced by staff members with PhDs. In Table 3.1 we present the data – by university – for the years 2011 to 2013.

Over this period, the national ratio of doctoral graduates to staff holding doctorates at all South African universities has increased from 0.25 (2011) to 0.28 (2013). This means that – on average – every staff member at a South African university with a PhD 'delivers' a PhD in about three and a half years. But again we see that there are huge institutional differences. At the best performing ('most efficient') universities in 2013 (Stellenbosch, Western Cape, Pretoria, Rhodes and Wits) each staff member with a doctorate is producing a PhD in fewer than three years.

In conclusion

Our discussion in this chapter focused on different ways of measuring efficiency in doctoral production. We used four measures:

- The ratio of graduations to enrolments;
- Cohort analyses of graduating students;
- Progression and completion rates of doctoral students; and
- The ratio of PhD students to academic staff with doctorates.

As to the first measure (*ratio of graduations to enrolments*), South African universities displayed a slight improvement in efficiency, with an average

Table 3.1: Number of PhDs and staff with doctorates by university (2011–2013)

	2011			2012			2013		
University	Staff PhD	PhD Grad	Grad:Staff	Staff PhD	PhD Grad	Grad:Staff	Staff PhD	PhD Grad	Grad:Staff
SU	521	150	0.29	516	240	0.47	614	225	**0.37**
UP	616	206	0.33	623	200	0.32	658	242	**0.37**
UWC	283	80	0.28	290	75	0.26	301	111	**0.37**
RU	174	57	0.33	171	67	0.39	198	70	**0.35**
WITS	560	169	0.30	595	150	0.25	639	221	**0.35**
UNISA	455	93	0.20	611	152	0.25	625	201	**0.32**
UKZN	606	154	0.25	663	177	0.27	688	207	**0.30**
NMMU	212	59	0.28	226	86	0.38	245	74	**0.30**
UCT	667	163	0.24	699	198	0.28	725	205	**0.28**
NWU	582	115	0.20	624	154	0.25	634	168	**0.26**
CPUT	91	13	0.14	106	24	0.23	113	28	**0.25**
UFH	102	44	0.43	119	43	0.36	124	30	**0.24**
UFS	349	107	0.31	374	94	0.25	393	91	**0.23**
TUT	136	28	0.21	144	44	0.31	150	32	**0.21**
DUT	73	14	0.19	88	6	0.07	97	18	**0.19**
CUT	60	5	0.08	60	5	0.08	71	12	**0.17**
UJ	287	68	0.24	294	109	0.37	451	78	**0.17**
UZ	82	19	0.23	79	28	0.35	92	14	**0.15**
UL	147	17	0.12	132	17	0.13	139	14	**0.10**
VUT	44	2	0.05	41	2	0.05	42	4	**0.10**
WSU	73	4	0.05	69	3	0.04	76	3	**0.04**
UV	103	9	0.09	103	4	0.04	116	3	**0.03**
MUT	16	0	0.00	16	0	0.00	18	0	**0.00**
National	**6 239**	**1 576**	**0.25**	**6 643**	**1 878**	**0.28**	**7 209**	**2 051**	**0.28**

Source: DHET 2013a

annual increase in graduates of 6.5% compared to 6.4% in enrolments between 1996 and 2012.

The results of the *cohort analyses* for the 2003, 2004 and 2005 cohorts showed that the average graduation rate of 35% after five years increased to 42% after seven years. The 2006 cohort had a 43% completion rate after six years, whilst the 2007 cohort showed a 45% completion rate after the same period of time. The percentage of new entrants that graduated after five

years grew from 36% for the 2003 cohort to 38% in 2007. The percentage of new entrants that graduated after six years increased slightly more from 41% for the 2003 cohort to 45% in 2007. Although the percentage of doctoral cohorts who graduate is still low, these increases show improvements in doctoral graduation rates.

The main finding from our analysis of the *progression and completion rates* relates to the effect of part-time studying on progression and completion rates. The fact that more than 60% of South African students – across all scientific disciplines – study while they work has far-reaching effects on all aspects of doctoral production. This is very clear when we compare students in the natural sciences (where larger proportions study full-time) with students in other fields. For the former, progression and completion rates are significantly higher: students in these fields (or students who are able to study full-time) progress faster from honours to masters to doctoral studies *and* complete their studies at each level in shorter times. We also found clear evidence of the effect of socio-economic realities on these rates. Black students (and especially African students) have far fewer resources to support their postgraduate studies. This also translates into longer progression and completion times for this subgroup.

Our final measure (*ratio of PhDs produced by academic staff with doctorates*) shows that there has been an increase in the overall efficiency in the system in the recent past. We have again found evidence of huge institutional differences, with the best-performing institutions demonstrating significantly higher ratios of PhDs produced by academic staff with doctorates. These ratios have also increased steadily over the recent past.

Our analyses of the efficiency of doctoral education have produced a mixed picture. The analysis of the doctoral pipeline reveals low progression rates: only 24% of bachelor students enrolled for an honours degree after five years and 35% did not graduate within three years. From honours to masters only 24% registered within three years and 53% did not graduate within five years. Only 16% of masters students enrolled for doctoral study within five years of graduating, and 61% did not complete their doctoral studies within seven years. The end result is that the pipeline is not only leaky but also very long. From a systems perspective, this is indicative of a very inefficient system.

However, despite the lack of sufficient funding for doctoral studies, regular interruptions of studies for work- and employment-related reasons, and hence an older-than-average doctoral cohort (compared to the age of students completing in Europe and North America), completion rates compare favourably with international benchmarks. Despite high teaching loads and the increasing 'burden of supervision', academic staff at the top South African universities have increased their PhD per capita output in recent years. This suggests that South African universities and supervisors

are quite efficient in the production of graduates that are in the system. Thus, university support to and supervision of doctoral students is not the major problem in the system. These structures and mechanisms are by themselves quite effective and efficient – particularly for the throughput and completion rates of the top research universities. The efficiency challenge seems quite obvious: we need to ensure that larger proportions of postgraduate students are able to study full-time (with sufficient funding) and there should not be interruptions to their studies.

Chapter 4

The demand for transformation

- Race, gender and nationality: The policy discourses
  - Charges of no or slow transformation
  - Doctoral enrolments and graduates prior to 1996
  - The internationalisation discourse
- Race of doctoral students: Trends in enrolments and graduations
- Gender of doctoral students: Trends in enrolments and graduations
- Nationality of doctoral students: Trends in enrolments and graduations
- The intersection of race, gender and nationality: Who counts for transformation?
- Transformation revisited
  - Introducing participation rates
- In conclusion

There have been many reviews of transformation or the lack thereof in higher education institutions, but one of the most comprehensive theoretical and policy reviews was by Badat (2004) who, starting with the National Commission on Higher Education (NCHE), listed the main areas requiring change as system and structures, equity, quality and responsiveness, and then reduced these to two key areas: institutional restructuring and human resources. Institutional restructuring was addressed in Chapter 2 under Differentiation. This chapter focuses on human resources, and particularly the demographics of human resources.

Race, gender and nationality: The policy discourses

As was pointed out in Chapter 3, the 1994 policy debates (pre- and immediately post-NCHE) were primarily about equity, race and gender, but

in the context of apartheid, the focus is on race. In post-apartheid South Africa, a common South African practice is to use transformation as a euphemism for racial issues, despite its many interpretations and meanings. Govinder et al. (2014: 1) illustrate this well in the following quote:

> *In the South African context, transformation refers more specifically to change that addresses the imbalances of the past (apartheid) era. It has many facets, including demographic and systemic change. However, regardless of the different components and qualitative measures for transformation, the ultimate (and most important) indicator is that of demographics.*

Although lack of equity was dominant in the NCHE report, there was no unanimity on how to redress it. One redress proposal discussed in the NCHE was to award a 'disadvantage' subsidy from the government block grant for each black student enrolled. This would serve as an incentive for historically advantaged universities to enrol more black students and offset some of their loss of tuition fees. Furthermore, for the historically disadvantaged universities whose enrolments were almost 100% black, a disadvantage subsidy would have served as a redress bonus. The group supporting this in the NCHE even made financial projections based on different scenarios; it seemed a simple-to-implement and affordable redress mechanism (Cloete 2014a).

At the same time, a group led by historically black university vice-chancellors in the NCHE was pushing for institutional rather than individual redress. The disadvantage subsidy group, noting that their proposal did not carry the support of the Department of Education's leadership (headed by a government minister who was also a former historically black university vice-chancellor), withdrew its proposal. The Education Minister had not anticipated the eventual outcome: that the Ministry of Finance would not support the institutional redress position. Treasury rejected the institutional redress proposal. Some of the reasons for this were the 1996 currency crisis and little confidence in the absorptive capacity of the historically black universities at institutional level (Cloete and Muller 1998).

Furthermore, the Department of Education has yet to implement a policy plan to incentivise or sanction the enrolment of black students in South African universities, despite all its rhetorical or 'symbolic' policies (Jansen 2001). In overall figures, the rather remarkable increase in the enrolments of African students has been achieved through the interplay of the *government's symbolic policies, societal pressure and individual institutional strategies*. This was aided by the first recommendation of the NCHE, which was to establish a national student financial aid scheme, along with the substantial expansion of the funding scheme by the Department of Higher

Education and Training and the inclusion of further education and training (FET) colleges in the funding scheme.

In terms of the overall system, the interaction between policy pressure (without specific material incentives) and institutional responsiveness led to dramatic changes in the post-1994 period. Regarding the composition of the entire student body – a largely undergraduate population – Cooper and Subotzky (2001) declared that South Africa had experienced a 'revolution'. The proportion of African students within total university enrolment increased from 41% in 1994 to 60% in 2003. In fact, by 1999, African students already made up the majority (59%) of all students in the higher education system. If Indian and coloured students are added to the number of African students, then 74% of all higher education students by 2013 were black (DoE 1999; DHET 2013a).

In terms of formal policy, the *Education White Paper 3* (DoE 1997: 2.91, 2.94) emphasised the importance of increasing the access of black (African, coloured and Indian) and female students to masters, doctoral and postdoctoral programmes as a means of enlarging the pool of national researchers and improving the demographic representation of staff in higher education. Recommendations in the *National Development Plan* (NDP) also included increasing the number of African and female postgraduates, especially at doctoral level, to improve the research and innovation capacity and to normalise staff demographics (National Planning Commission [NPC] 2012: 327). The NDP also envisaged South Africa establishing itself as a regional hub for higher education and training, capable of attracting a significant share of the international student population (NPC 2012: 319).

Charges of no or slow transformation

Despite all the policy attention on equity, in 2013 there was once again a heated debate, called 'passionate commentaries' by Govinder et al. (2014) in the *South African Journal of Science* and the national press about the lack of transformation. The Equity Index, which the authors proposed, attempted to assess the racial and gender demographics of each university against national demographics, using a mathematical formula to attribute numerical distances between pairs of points in a multidimensional space (Govinder et al. 2014). One of the numerous critics called it simply a 'demographic divergence' index (Dunne 2014: 1). For the actual scores (rankings) of institutions regarding student enrolment and graduation, and staff categories, see Govinder et al. (2014: 2–3). But whatever the mathematical shortcomings of the formula, the picture that emerged is one of very slow change in racial and gender demographics, particularly at staff level, at some of South Africa's high-performing universities.

In their conclusion Govinder et al. (2014) asked whether the reasons behind the slow progress in transformation of higher education are passive resistance, denial, the abuse of autonomy or an abhorrence of accountability. The assumption that the lack of transformation is simply the result of a bad attitude is a common South African form of accusatory politics.

The Equity Index was about students and staff in the sector, not the doctorate specifically. But relevant to the doctorate was the accusation by a UCT professor who charged that there was 'no transformation' in higher education institutions and that there was not a single black South African woman who was a full professor at UCT in 2013 (Mangcu 2014). His main evidence for this 'no transformation' assessment was that 20 years into democracy only 4% of South Africa's 4 000 professors are black, and only 0.85% are black women. In a similar vein Lesiba Seshoka (2014) charged that universities have failed to transform and implement the knowledge project. In a defensive response, the vice-chancellor of UCT (Price 2014) conceded that there is 'frustration' with the slow progress of transformation, but pointed out that it takes about 20 years after the completion of a doctorate to become a professor. He ended with an appeal to recognise UCT's global excellence in spite of this.

Van Wyk (2014) provided data from the DHET which shows that in 2012 there were 2 174 full professors, of whom 534 (26%) were women, 303 (14%) were black and 43 (2%) were black females. Even if Mangcu's data were not accurate, the ratios remain most disappointing.

This recent debate concerned the lack of transformation of academic staff. Our focus in this book is on the PhD and hence different. But of course the connection is obvious: unless we produce enough doctorates, and particularly black and female doctorates, the pool from which to transform the academic capacity in the country will remain constrained. We return to the central question of this chapter: Has the doctorate in South Africa changed fundamentally in terms of race and gender representation?

Doctoral enrolments and graduates prior to 1996

There is no comprehensive South African data set that reflects race and gender in doctoral graduation trends before 1986. The only data set that is available is Garbers' doctoral thesis (1960) on graduation trends between 1918 and 1957, which focused only on white students. As it is common knowledge that very few students from other racial groups were awarded doctoral degrees during this period, we maintain no accurate figures exist.

The former *Departement van Nasionale Opvoeding* (DNO) had data for the period 1971 to 1979 (see Table 4.1). During this period, the 11 'autonomous' universities produced a total of 3 coloured, 12 Indian and 15 African doctoral

Table 4.1: Doctoral graduates by race and gender (1971–1979)

	White	Coloured	Indian	African	Black %*	Total	Male	Female	Female %
1971	266	0	0	1	0.4%	**267**	243	24	9%
1972	300	0	1	0	0.3%	**301**	284	17	6%
1973	296	0	2	2	1.4%	**300**	273	27	9%
1974	318	1	0	3	1.3%	**322**	293	29	9%
1975	281	1	1	1	1.1%	**284**	258	26	9%
1976	336	0	0	1	0.3%	**337**	297	40	12%
1977	365	0	2	1	0.8%	**368**	323	45	12%
1978	344	0	3	1	1.2%	**348**	300	48	14%
1979	381	1	3	5	2.4%	**390**	334	56	14%

** Includes coloured and Indian students*
Source: DNO (1982)

graduates, compared to 2 887 white doctoral graduates. African doctorates increased from 0% in 1971 to just over 1% by the end of the 1970s. Male doctoral graduates increased on average at 4.1% per annum, while total doctoral graduates increased by 4.9% on average per annum. The share of male doctoral graduates (against overall figures) decreased from 91% in 1971 to 86% in 1979. This period was marked by significant growth in female doctoral graduates, with an average annual growth rate of 11.2%.

Systematic data could not be obtained for the period 1980 to 1985. Data for the decade between 1986 and 1995 were acquired from the South African Post-Secondary Education (SAPSE) information system of the former Department of Education (DoE 1999). This data included all universities and is thus a comprehensive set of official data. Table 4.2 summarises data for doctoral graduates for the period 1986 to 1995 according to race and gender. This period experienced a 3% average annual increase in doctoral graduates, with a total of 681 doctoral graduates in 1995.

Table 4.2: Doctoral graduates by race and gender (1986–1995)

	White	Coloured	Indian	African	Black %*	Total	Male	Female	Female %
1986	524	2	3	9	3%	**538**	412	126	23%
1987	516	6	7	10	4%	**539**	415	124	23%
1988	574	9	15	22	7%	**620**	470	150	24%
1989	606	8	18	22	7%	**654**	499	155	24%
1990	566	4	18	18	7%	**606**	461	145	24%
1991	603	10	24	19	8%	**656**	463	193	29%
1992	594	15	20	30	10%	**659**	480	179	27%
1993	635	12	15	32	9%	**694**	484	210	30%
1994	667	13	29	29	10%	**738**	518	219	30%
1995	595	24	22	40	13%	**681**	469	212	31%

** Includes coloured and Indian students*
Source: DoE (1999)

It is during this period that the demographics of doctoral graduates started to show substantial changes. White students still accounted for the vast majority of doctoral degrees awarded during the period 1980 to 1995, but from 1986 shifts in the racial demographics started showing, with 13% of doctoral degrees being awarded to black students (Africans, coloureds and Indians) by 1995, compared to only 3% in 1986. White doctoral graduates increased by only 1.6% on average per annum, which was much lower than the total 3% average annual growth rate of doctoral graduates. Coloured doctoral graduates increased from only 2 in 1986 to 24 in 1995, Indians from 3 to 22, and Africans from 9 to 40.

Gender demographics for 1986 to 1995 also displayed major changes. In the early years (1918 to 1957), the number of females who obtained doctoral degrees was exceptionally small, but by 1995 females accounted for 31% of the doctoral degrees awarded. In 1986, male doctoral graduates had a share of 77%, which decreased to 69% in 1995 as a result of a low average annual increase in males of 1.6% over the period 1986 to 1995. Female doctoral graduates grew at 6.7% on average per annum and increased their share from 23% in 1986 to 31% in 1995.

The impact of apartheid policies and the build-up to the first democratic elections are clearly reflected in the data trends. In contrast to earlier years, data was at least now available by race group, which was a huge improvement from the Garbers study that focused only on white students. Although slight increases in black (African, coloured and Indian) doctoral graduates occurred over the 1971 to 1979 period, still only a mere 9 of the 390 doctoral graduates in 1979 were black. In the same year, 56 of the 390 doctoral graduates were women. The period 1986 to 1995, which includes the years leading up to the first democratic elections in 1994, showed accelerated demographic shifts with the share of black doctoral graduates increasing to 13% and the share of female doctoral graduates increasing to 31%. This is a substantial shift and became a trend that continued into the post-1994 period.

An opportunity for black South Africans to obtain PhDs outside of the apartheid system was provided by the US government's Fulbright exchange programme. From the about 260 participants in the programme many became prominent academics (five vice chancellors, two presidents of science councils, and many artists and writers) (see Coetsee [2015] for a brief report on South African Fullbright scholars).

The internationalisation discourse

Although not as prominent as the discourse on race and gender, the internationalisation of postgraduate enrolments has been advocated in various policy documents. The *National Plan for Higher Education* (MoE 2001: 2.8.1.2) recommended that institutions increase their recruitment of students

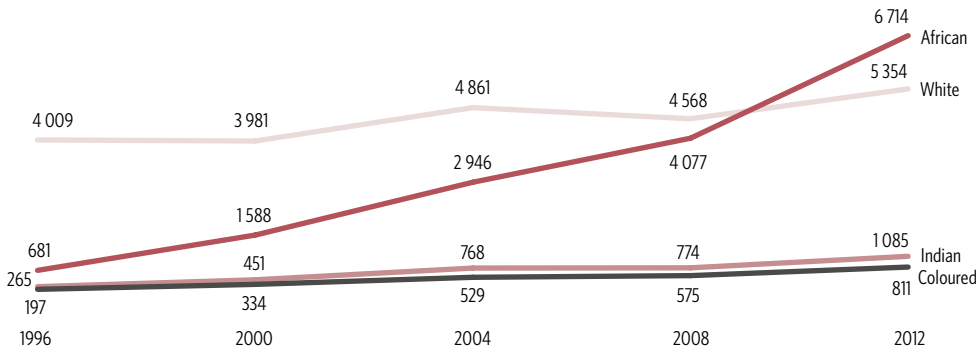
from the South African Development Community (SADC), especially at the postgraduate level. The *National Development Plan* envisaged South Africa establishing itself as a hub for higher education and training in the region, capable of attracting a significant share of the international student population (National Planning Commision 2012). The *White Paper for Post-school Education and Training* (DHET 2013c: 40) noted that hosting large numbers of international students, especially SADC students, would be a major contribution by South Africa to the development of the sub-continent. It also highlighted the fact that all the countries in the SADC region are interdependent and that the strengthening of Southern African economies would inevitably result in the improvement of South Africa's own economy. The simple reality is that if the South African higher education system wants even remotely to achieve the target of 5 000 or more PhD graduates per annum, then the system will have to enrol and graduate more students – from South Africa, the rest of Africa and the rest of the world.[1]

Against this background we decided also to analyse the doctoral enrolment and graduation statistics by the nationality of the student. And although 'nationality' is seen as a proxy of trends in internationalisation (inflows of foreign students to South Africa in this case), we will show, later in the chapter, how the nationality of students became an issue of contestation in recent debates about transformation in higher education in South Africa.

Race of doctoral students: Trends in enrolments and graduations

This section focuses on trends in enrolments and graduations for the period 1996 to 2012 disaggregated by race of student. Figure 4.1 presents the trends in doctoral enrolments disaggregated by race. The most salient change is evident: African doctoral enrolments increased over this period

Figure 4.1: Doctoral enrolments by race (1996–2012)

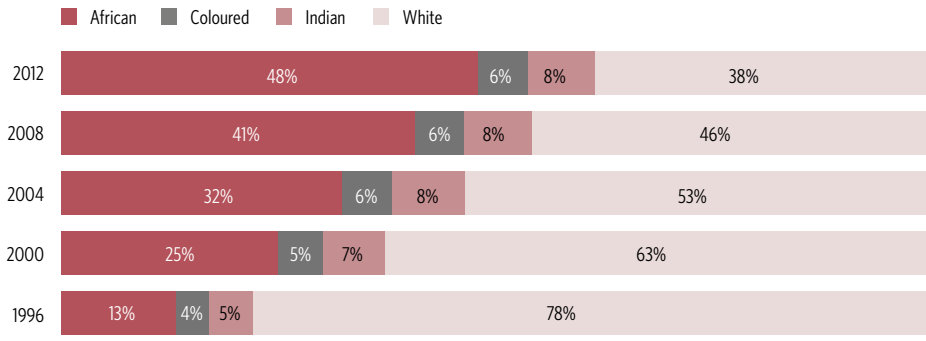


Sources: DoE (1999), DHET (2013a)

from 681 in 1996 to 5 065 in 2010 when, for the first time in the history of South Africa, African doctoral enrolments exceeded that of white enrolments (4 853 in 2010). By the year 2012, 6 714 African and 5 354 white students were enrolled in doctoral programmes, followed by 1 085 Indian students and 811 coloured students.

Figure 4.2 illustrates how the proportional shares of the different race groups for doctoral enrolments changed between 1996 and 2012. Again, the steep growth in African student numbers is clearly illustrated: African doctoral students increased their share from 13% in 1996 to 32% in 2004, and to 48% in 2012. Similarly, the share of coloured doctoral enrolments increased from 4% to 6%, and the share of Indian doctoral students from 5% to 8%. By contrast, the proportion of white doctoral enrolments dropped from 78% in 1996 to 38% in 2012. In 2010, for the first time in South Africa's history, there were more African than white doctoral students.

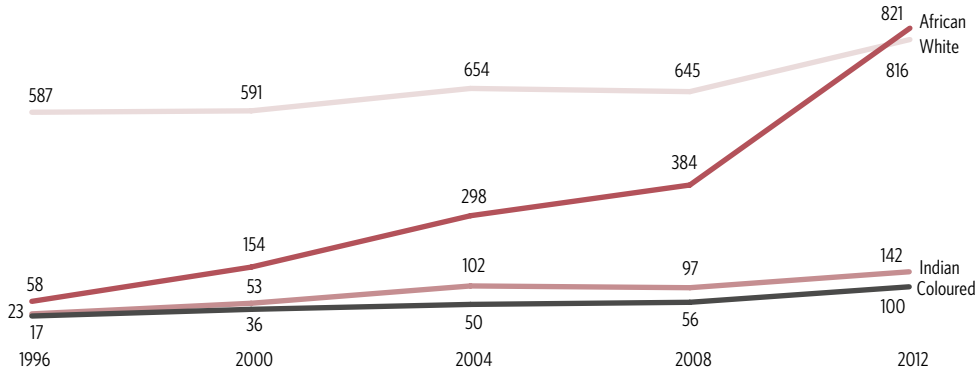
Figure 4.2: Percentage of doctoral enrolments by race (1996–2012)



Sources: DoE (1999), DHET (2013a)

The more interesting question, perhaps, is whether the trends in greater racial parity in enrolment statistics have translated into similar trends for doctoral graduates. Figure 4.3 presents the data for graduates. The major change here has been in the number of African graduates, which increased from only 58 in 1996 to 821 in 2012. This is the first year in which there were more African than white graduates. Although the number of white doctoral graduates also increased over this time (from 587 to 816), the proportional increase is significantly lower. The increases in the number of Indian and coloured graduates are also substantial, but come off a very low base.

Figure 4.3: Doctoral graduates by race (1996–2012)

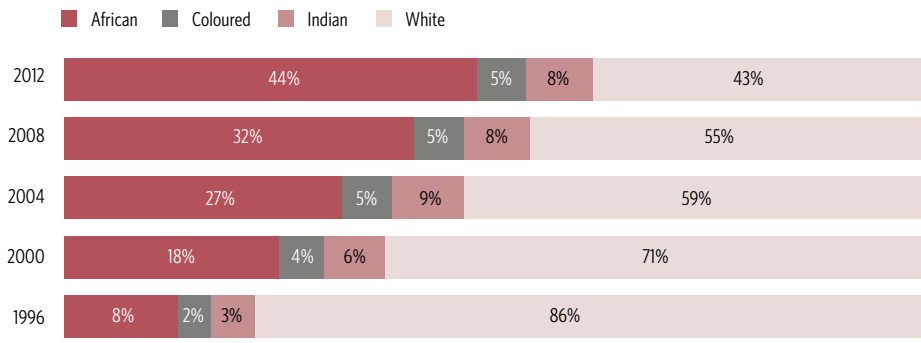


Sources: DoE (1999), DHET (2013a)

During the period 1996 to 2012, the proportion of African doctoral graduates increased from 8% to 44% while the proportion of whites declined from 86% to 43% (see Figure 4.4).

If transformation is understood purely in racial terms (whether defined as 'black' or more specifically as 'African'), the trends are clear. Black and specifically African student enrolments and graduations have increased dramatically. This is perhaps best summarised as follows: in 1996, one in nine doctoral enrolments was African; by 2012, every second doctoral enrolment was African. For graduates, in 1996, one in twelve graduates was African; in 2012, this had changed to two out of every five graduates.

Figure 4.4: Percentage of doctoral graduates by race (1996–2012)

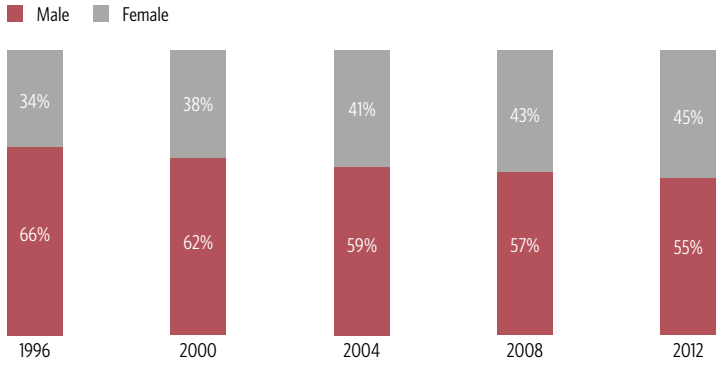


Sources: DoE (1999), DHET (2013a)

Gender of doctoral students: Trends in enrolments and graduations

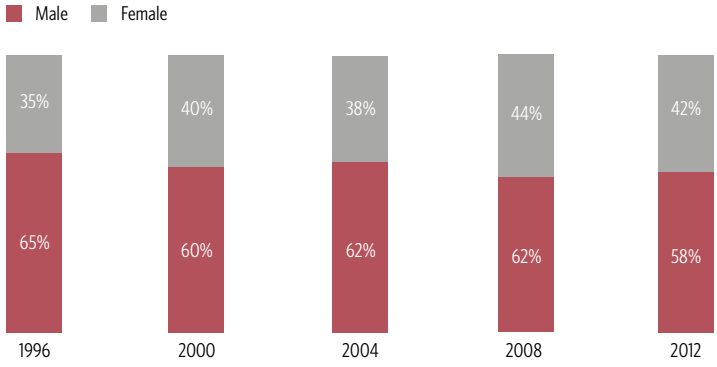
We now turn to trends in doctoral enrolments by gender. Figure 4.5 shows a steady closing of the gap between male and female doctoral enrolments since 1996. The change in gender profile for graduates (Figure 4.6) was more gradual, but still significant, with the proportion of women growing from 35% in 1996 to 42% in 2012.

Figure 4.5: Percentage of doctoral enrolments by gender (1996–2012)



Sources: DoE (1999), DHET (2013a)

Figure 4.6: Graduates by gender (1996–2012)



Sources: DoE (1999), DHET (2013a)

The substantial and sustained growth in doctoral enrolments and graduations in South Africa since 1996 can be attributed to two main factors: the increase in African students and the increase in female students. These increases occurred due to consistent and sustained annual growth rates: 15% for African students and 8% for female enrolments, as compared to the average annual growth rate of 6% across all categories. But the increase in the proportions of African students does not, of course, refer to South African African students only. The past decade has witnessed huge increases in the enrolments and graduations of African doctoral students from the rest of Africa. In the next section we present a more detailed analysis of these trends.

Nationality of doctoral students: Trends in enrolments and graduations

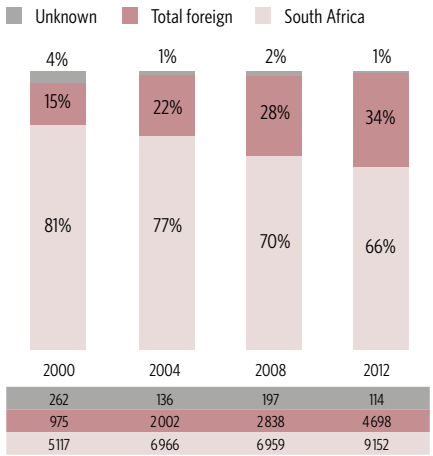
Attracting (postgraduate) students from elsewhere on the African continent has been advocated in various South African policy documents. Of course, policy imperatives on their own do not necessarily translate into specific outcomes. The growth of students from the rest of the continent is undoubtedly also fuelled by straightforward financial considerations. We have argued elsewhere (Cloete et al. 2015; Chapter 5), that relatively speaking, South Africa is an inexpensive destination for PhD candidates from other African countries. In the United Kingdom, the average tuition fees for a full-time research PhD in education or the social sciences at Bath University are USD 6 600 for UK and European Union residents and USD 21 450 for students from other countries. With living costs at around USD 18 000 per annum, the total comes to around USD 46 050. In the United States, at the University of California – Berkeley, the fee for non-residential students in the humanities and social sciences is USD 31 397, and in law and engineering USD 57 000. With living costs around USD 23 000, the total comes to USD 54 388. The first year of a PhD in education at New York University starts with tuition at USD 41 303, USD 3 500 for health costs and a USD 25 687 cost-of-living stipend, bringing the total to USD 70 490.

By contrast, from the perspective of PhD students from the rest of Africa, South Africa is a bargain. In the five South African universities that produce 61% of the graduates from the rest of Africa, the cost in terms of tuition (full-time in the social sciences) is on average USD 2 000, plus another USD 1 000 for foreign student fees, medical aid, etc. The cost of living is estimated to be around USD 10 000 per annum, bringing the total to around USD 13 000. The total cost at a top South African university for the first year of a PhD in the social sciences or education is (at USD 13 000) four times cheaper than at the prestigious, high-competition University of California – Berkeley; three-and-a-half times cheaper than fees at Bath

University; and five-and-a-half times cheaper than at a top private institution such as New York University.

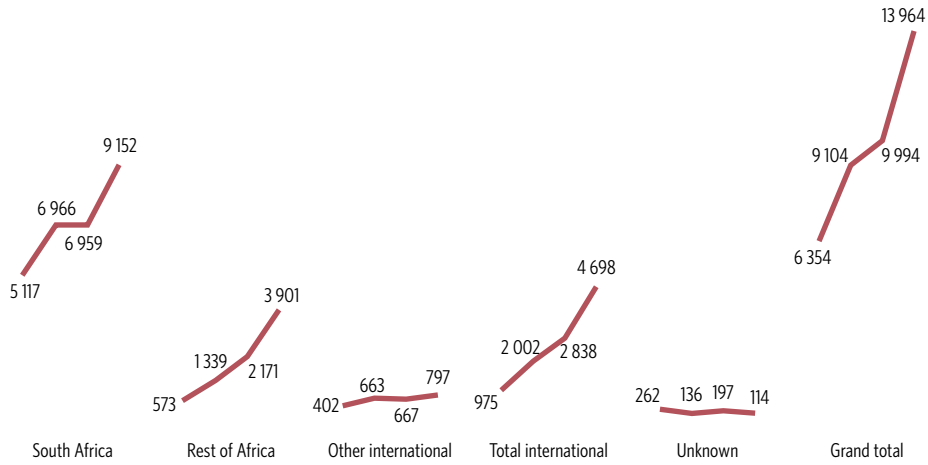
The huge increase in doctoral enrolments from other countries over the past 13 years is clearly shown in Figure 4.7. In 2000, foreign students constituted 15% of all enrolments. By 2012 this had increased to 34%.

Figure 4.7: PhD enrolments by nationality: Foreign vs South African (2000–2012)



Source: DHET 2013a

Figure 4.8: PhD enrolments by nationality: Rest of Africa, international and South African (2000, 2004, 2008, 2012)

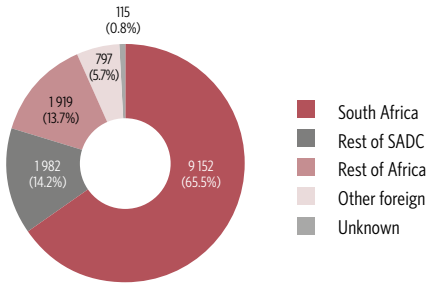


Source: DHET 2013a

Disaggregation of foreign enrolments from the rest of Africa and the rest of the world (Figure 4.9) shows that the major reason for the huge increase in foreign enrolments is to be found in the large inflow of doctoral candidates from the rest of the continent. In 2000 they constituted just over half (59%) of all foreign students. By 2012 this had changed radically with 83% of all foreign doctoral enrolments coming from the rest of Africa (3 901 students from SADC and the rest of Africa out of a total of 4698 foreign students).

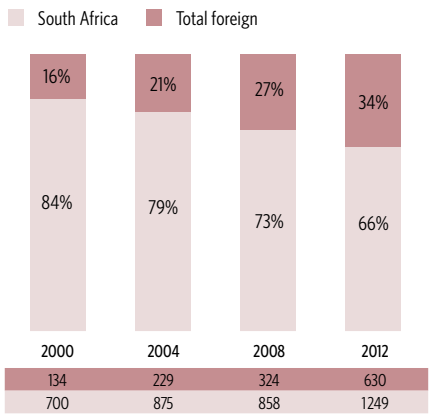
One way of emphasising how dramatic this change has been is to focus on the latest statistics (the 2012 cohort). Figure 4.10 shows that approximately two-thirds of all graduates in 2012 were from South Africa. Students from the rest of Africa constituted a further 28% in 2012 (with equal proportions from the SADC and the rest of Africa). The remainder were students from other foreign countries.

Figure 4.9: Disaggregation of PhD enrolments by nationality (2012)



Source: DHET 2013a

Figure 4.10: Proportion of PhD graduates by nationality: Foreign vs South African (2000, 2004, 2008, 2012)



Source: DHET 2013a

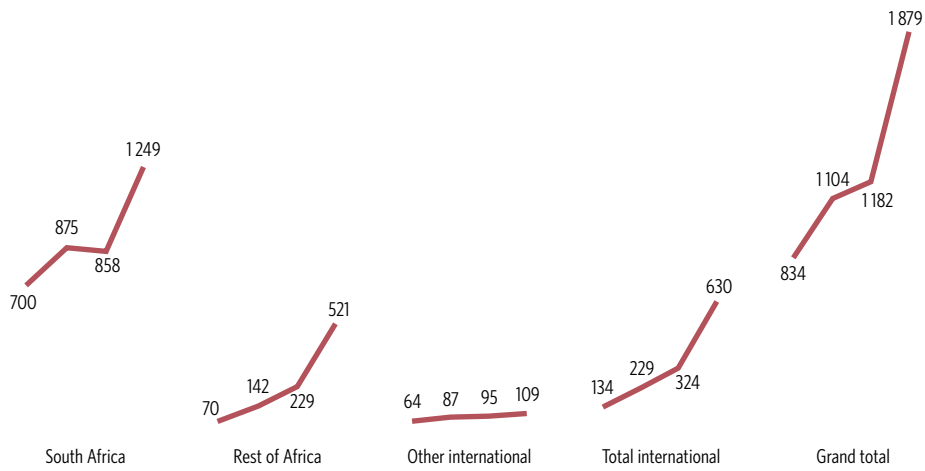
Not surprisingly, the trends found in terms of the growth in foreign doctoral student enrolments are mirrored when we look at trends in doctoral graduations. Figure 4.11 shows how the doctoral graduate cohort in South Africa has become more international. In 2000 foreign students constituted only 16% (or 134) of the total number of graduates. By 2012 this has increased to 34% (or 630).

In Figure 4.11 we further disaggregated the subgroup of foreign students into 'rest of Africa' and 'other international'. The impact of the inflow of doctoral students from the rest of Africa is clearly visible. In 2000 students from the rest of Africa constituted about half (52%) of all foreign students. By 2012 this had increased to 83%. These trends are summarised in Figure 4.12, which reports on the differences in the average annual growth rates of the different subgroups. The average annual growth rate in doctoral graduates from the rest of Africa over this period was more than three times that of students from South Africa and from other countries.

An analysis of doctoral graduates by nationality for 2012 (see Figure 4.13) illustrates that South Africans of all races constituted 66% (1 249) of all doctoral graduates, while international students had a 34% (630) share.

Although African doctoral graduates (from South Africa and the rest of Africa combined) constituted the biggest proportion of all students in 2012, the picture changes when one considers South African nationals only. In this case white students made up the biggest share of 39.0% (733) of the South African graduates in 2012, followed by South African-African students (26%).

Figure 4.11: PhD graduates by nationality (2000, 2004, 2008, 2012)

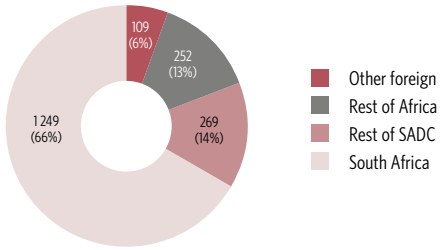


Source: DHET 2013a

Figure 4.12: Average annual growth rates by nationality and gender (2000–2012)

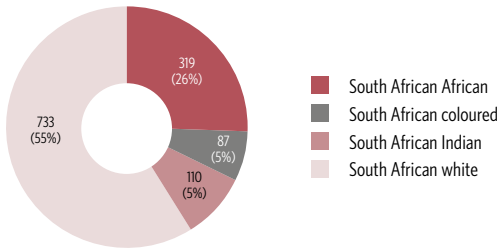
Source: DHET 2013a

Figure 4.13: Doctoral graduates by nationality (2012)



Source: DHET 2013a

Figure 4.14: South African doctoral graduates by race (2012)



Source: DHET 2013a

The previous three sections have presented data on enrolments and graduations of doctoral students separately by race, gender and nationality. But 'race' and 'nationality' are systematically confounded in the term 'African' and hence we need to address this.

The intersection of race and nationality: Who counts for transformation?

The African doctoral students in South Africa come from the continent as a whole and not just South Africa. Our focus in this section is on African students only.

In 2000 the number of South African-African enrolments (990) was almost double that of the rest of Africa (526). But by 2012, there were 750 more enrolments and 171 more graduates from the rest of Africa than there were from South African-Africans. A notable change happened in the period between 2004 and 2008: the South African-African enrolments increased by 258 (15%) and the rest-of-Africa enrolments by 844 (71%).

These trends are quite clearly illustrated in Figures 4.15 and 4.16 that present the changes in enrolment and graduation numbers of African doctoral students since 2000.

Figure 4.15: African doctoral enrolments by nationality and gender (2000 and 2012)

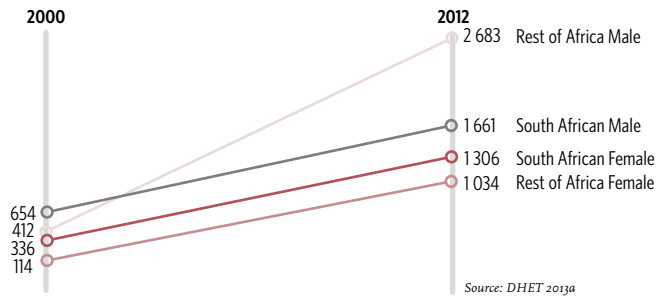
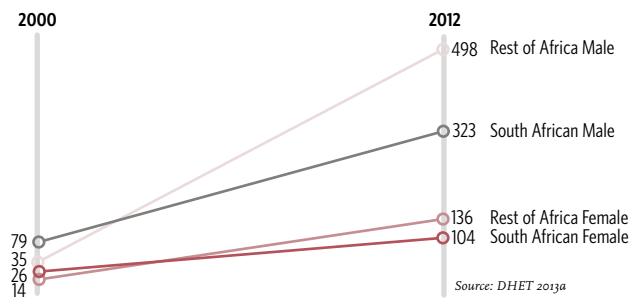


Figure 4.16: African doctoral graduates by nationality and gender (2000 and 2012)



A comparison of the growth rates for the different subgroups (Table 4.3) shows that doctoral enrolments of students from the rest of Africa grew at 17.7% and graduates at 21.3%. These rates are more than double the rate for South African African students for which the average annual growth rates were 9.6% for enrolments and 9.9% for graduations respectively.

Do we count African students from the rest of Africa when we ask questions about transformation? Or should we limit our analyses to South African doctoral students only (irrespective of race) when assessing the pace of transformation? A similar question could be raised about gender. Table 4.3 shows that the growth rates of African female students from other African countries also outstripped the growth rates of African female students from South Africa (as far as both enrolments and graduations are concerned).

Table 4.3: African doctoral enrolments and graduates from South Africa and the rest of Africa by gender (2000–2012)

Nationality	2000			2012			Average annual growth rate 2000–2012		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
Enrolments									
South Africa	336	654	990	1 306	1 661	2 967	**12.0%**	**8.1%**	**9.6%**
Rest of Africa	114	412	526	1 034	2 683	3 717	**20.2%**	**16.9%**	**17.7%**
Total	450	1 066	1 516	2 340	4 344	6 684	**14.7%**	**12.4%**	**13.2%**
Graduates									
South Africa	26	79	105	104	219	323	**12.2%**	**8.9%**	**9.8%**
Rest of Africa	14	35	49	136	362	498	**20.9%**	**21.5%**	**21.3%**
Total	40	114	154	240	581	821	**16.1%**	**14.5%**	**15.0%**

Transformation revisited

When transformation is understood solely within an equity and redress discourse and the focus is on changing the demographics of race and gender, then one could argue that the doctorate in South Africa has transformed. Whether one looks at absolute increases in the number of black and female students or annual growth rates, the verdict is the same: there are now (in 2013) substantially more black and female doctoral enrolments and graduates at South African institutions. And we have highlighted the fact that these increases are not insubstantial.

However, the discussion about transformation in terms of a racial definition becomes more problematic when we introduce 'nationality' into the equation. As we have seen, the increases in African male and female students (enrolments and graduates) in particular were the result of the huge influx of students from the rest of Africa. We have offered some

explanations of why this happened and continues to happen – a combination of supply and demand factors. But the reality is that the South African doctorate would not have changed (transformed) to the extent that it did, without the injection of large numbers of students from the rest of the continent. And, of course, it raises the question whether this constitutes 'transformation' as it was (originally) intended by policy-makers and government. Or are we simply confusing two very different notions of 'African': a 'racial' definition with a 'geographical' one?

Introducing participation rates

One way to clarify the issue is to focus on South African students only and the shifts in their *participation* rates as opposed to *growth* rates. And now the transformation question is reformulated: are larger proportions of South African African students participating in doctoral studies today than 13 years ago? The statistics in Table 4.4 show that in terms of participation, the rate for African students (male and female) increased from 0.84 to 3.61 students per 100 000 of the age-relevant population group. This constitutes a fourfold increase in participation rates. But this substantial increase must be seen in relation to the same statistics for white students: whereas the share of white enrolments declined over the same period, their participation rates increased from 45 to 63 per 100 000 of the population. In fact, the participation rate for white students compares well with developed countries.

Table 4.4: African and white doctoral graduates 1996 and 2012 compared to 30-to-49-year-old age cohort

Year	African females	African males	Total	White females	White males	Total
1996 South African graduates	10	48	58	219	368	587
2012 South African graduates	106	219	325	449	367	816
2012 Rest of Africa	134	362	496	–	–	–
30-to-49-year-old population – 1996 ('000)	3 333	3 606	6 939	634	658	1 292
30-to-49-year-old population – 2012 ('000)	4 470	4 545	9 015	449	456	905
% increase for South African graduates – 2012 vs 1996	960%	356%	460%	105%	0%	39%
% change in the 30-to-49-year age cohort	34%	26%	30%	-29%	-31%	-30%
1996 graduates per 100 000 of the 30-to-49-year-old population cohort	0.30	1.33	0.84	34.54	55.93	45.43
2012 graduates per 100 000 of the 30-to-49-year-old population cohort	2.37	4.82	3.61	100.00	80.48	63.16

Sources: DHET (2013a) Higher Education Management Information System. Pretoria: DHET; Statistics South Africa (2004) Census 2001. Primary Tables South Africa. Census '96 and 2001 compared. Report No. 03-02-04 (2001). Pretoria: Statistics South Africa; Statistics South Africa (2013) General household survey 2012. Revised: 4 October 2013. Statistical release P 0318. Pretoria: Statistics South Africa

Increase in doctoral graduates: White vs African South Africans

Source: Table 4.4: African and white doctoral graduates 1996 and 2012 compared to 30-to-49-year-old age cohort

The rate of participation must be assessed in terms of the size of the overall system and in relation to population changes. South Africa's overall higher education participation rate is low – around 20%. This means that with the current size of the system, even if all the students in the university system are African, the participation rate will not be higher than 20% (Cloete 2014b). With regard to population growth, the white population for enrolments in the 20-to-24-year age cohort declined from 349 102 in 1996 to 316 000 in 2012 – an overall decline of 9%. In contrast, the African population for enrolments in this age cohort increased by 974 918 (31%), from 3 153 082 to 4 128 000. All of this means that for South African African students to equal the participation rates of their white counterparts, a total of 5 688 African doctoral graduates would have been required in 2012, which is 17.5 times more than the 325 African doctorate graduates for that year.

For African students to attain similar participation rates to white students seems unattainable in the current South African, developing-country context.

In conclusion

If transformation is understood solely within an equity and redress discourse, then one could argue that the doctorate in South Africa has transformed. African doctoral enrolments increased by 886% while white enrolments increased by only 34% and African female graduates increased by 960% while white males remained static. But if transformation is viewed as number of graduates per 100 000 of the population of 30- to 50-year-olds, then the participation rate of white females is 40 times higher than for African females, and although white male graduates did not increase between 1996 and 2012, their participation rate is still 16 times higher than for African males.

The discussion about transformation in terms of a racial definition becomes more problematic when 'nationality' is brought into the equation. The increase in African students (enrolments and graduates) is bolstered by the influx of students from the rest of Africa. In 2000, students from the rest of Africa constituted 32% of the African group, by 2012 it was 60% and their annual growth rate was 21%, which is more than double the growth rate (10%) for South African Africans.

The multiple meanings of the term 'transformation' raises the question as to whether the term is useful, particularly as a concept for research. It is clear that as a political discourse it has traction, particularly in accusatory politics.

Notes

1 For a more detailed discussion of South Africa's foreign student polices, see Cloete et al. 2015.

Chapter 5

Improve the quality of doctoral education

- Policy in support of quality
- Measuring quality in doctoral education
- Quality of the doctoral candidate
  - Level of preparedness
  - Screening and selection for quality
- Quality of the doctoral supervisor
- Quality of the supervisory process
- Quality of the doctoral graduate
- Degree of employability
  - Preparation for work
- In conclusion

Internationally the increasing demand for doctorates is often accompanied by concerns about the quality of many of the new graduates. In a recent study on PhD holders in China, Cyranoski et al. (2011: 277) argued that although the number of doctoral graduates has gone through the roof, the quality of these qualifications remains a problem.

In a recent paper on doctoral success and quality in South Africa, Bitzer (2012: 1183) refers to two 'incidents'.

An Associated Press article (Fox and Daniel 2011) reported that research submitted by former Haitian president Jean-Bertrand Aristide for a doctoral degree in African Languages at the University of South Africa in 2007 was labelled by scholars in the field as 'a piece of rubbish'. It was also disclosed that the professor who supervised Aristide's dissertation headed the committee that heard him defend the thesis. Leading African linguists who questioned the research found, amongst other things, misspelt Zulu words and claimed that his work 'made a mockery of African Languages' (Fox and Daniel 2011: 1). *The Independent* (Magome 2011) reported that the acting vice-

chancellor of Tshwane University of Technology in Pretoria allegedly included a fake doctoral degree as part of his CV when applying for the post. The University Council consequently took the appointment of a new vice-chancellor into revision and launched an investigation into the matter.

These examples might not typify everyday problems in the average university faculty or department in South Africa or elsewhere, but they do illustrate that the quality and legitimacy of doctoral degrees might be compromised if appropriate measures – and, more importantly – ethical behaviour and quality control are not put in place.

Anecdotal evidence points to increasing numbers of doctoral theses being returned for further examination and the quality of theses produced by certain departments and universities increasingly being questioned. We would argue that the imperative for high-quality doctoral graduates and theses needs to be constantly restated and re-affirmed. Policy directives (see below) that require excellence in doctoral education have to be translated into best practices to ensure that we continue to produce high-quality doctoral graduates who can make a contribution to the knowledge society.

Policy in support of quality

The National Commission on Higher Education (NCHE 1996) concluded from an international survey that there are certain commonalities amongst most established quality assurance systems. First, the majority include a self-evaluation process followed by an external peer assessment of the results and process of self-evaluation. Second, through self-evaluation and peer review, the higher education system 'owns' the quality system. Third, an independent body usually coordinates the external peer review process, which is conducted according to more or less standardised criteria. The NCHE proposed that a developmentally based quality assurance system be established that would address institutional auditing, programme accreditation and quality promotion. The institutions responsible for this would be the newly established (1998) Council on Higher Education (CHE), which included the Higher Education Quality Committee (HEQC). Both these bodies are recognised by the South African Qualifications Authority (Cloete 1998).

While many institutional audits have been carried out, with external peer reviews, they never focused on the doctorate, which has been left 'untouched' with the traditional practice of one internal and two external examiners. In some institutions at least one of the externals must be from outside the country.

Chapter 1 alluded to the fact that concerns around the quality of doctoral programmes were raised as general principles (ambitions) by both the

1996 National Commission on Higher Education (NCHE) and the 1997 *Education White Paper 3*. The first indirect attempt at addressing doctoral quality in terms of a strategy was the 2000 CHE report on the size and shape of the higher education system. Their proposal for a differentiated system consisting of *bedrock* (mainly undergraduate), *extensive masters and selective doctoral* institutions and *comprehensive postgraduate and research institutions* amounted to an indirect quality assurance mechanism. It proposed that the comprehensives, which are not conceptualised in the same way as the later (2004) three institutional types, would offer quality undergraduate programmes and a wide range of programmes at both masters and doctoral levels. These institutions would also be permitted to exercise their research capabilities across a broad range of areas, i.e. function as research universities.

A majority of higher education institutions reacted strongly and negatively to the CHE's three categories. The proposals were not seen as steps towards improving either the efficiency or the quality of doctoral programmes. Rather, they were interpreted as ways of entrenching the disadvantages that historically black institutions had experienced under apartheid. Decisions on the offering of doctoral programmes, it was argued, could not be based in a simplistic way on the rigid boxes into which institutions were positioned and no public higher education institutions should be excluded from the offering of doctoral programmes. The Minister of Education rejected the CHE's proposals.

Consequently the 2001 *National Plan* had to formulate different ways of determining institutional diversity, and ultimately of placing limits on the range of doctoral programmes that institutions could offer. The *National Plan* said that the Ministry of Education would determine the programme mix at particular institutions, based on their programme profile and their demonstrated capacity, which meant that institutions would not necessarily be allowed to offer all the programmes that are contained in the (national) programme grid.

The final, detailed edition of the programme and qualifications mix (PQM) of each institution was submitted to the Minister of Education in June 2006. The Minister approved, in terms of the Higher Education Act No. 101 of 1997, these PQMs as formal listings of the qualifications that each institution was entitled to offer, and of the fields of study in which they were permitted to be active. However, these final PQMs could not be regarded as certifications of the quality of institutional programmes as very few of the doctoral programmes offered by South African higher education institutions have undergone detailed quality reviews by the CHE.

The various doctoral programmes that appear on the ministerial approved PQMs cannot be taken to be indications that the quality of these programmes has been certified.

The HEQC accreditation model located responsibility for higher education programme quality with the institutions themselves and proposed that institutions should maintain in-house quality assurance mechanisms. The extent of the external HEQC accreditation system would be to set the institutional criteria for monitoring the quality of programmes and the effectiveness of associated quality assurance mechanisms within the higher education institutions, and to validate the institutions' own monitoring information in this regard (CHE 2004; Mouton 2009).

A revised *Higher Education Qualifications Sub-Framework* (HEQSF) was published in August 2013, in accordance with *Education White Paper 3* of 1997, and following the CHE's *New Academic Policy* of 2002 and the *Higher Education Qualifications Framework* (HEQF) of 2008. The HEQSF applies to both private and public institutions and was implemented from 13 August 2013. The revised framework has 11 qualification types (five undergraduate and six postgraduate), mapped onto the top six levels of the National Qualifications Framework[1] (NQF), which elucidates the path from further education and training through higher education towards the attainment of a doctoral qualification. It also allows for alternative routes towards the doctoral degree via undergraduate certificate and diploma programmes, providing access for matriculants who have not attained the minimum achievement required to progress directly to an undergraduate degree programme (DoE 2005a, 2005b). It makes provision for two types of qualifications – a doctoral degree as well as a professional doctoral degree. It also stipulates the requirements, purpose and characteristics of a doctoral degree very clearly as follows:

> *The doctorate provides training for an academic career. It requires a candidate to undertake research at the most advanced academic levels culminating in the submission, assessment and acceptance of a thesis. Course work may be required as preparation or value addition to the research, but does not contribute to the credit value of the qualification. The defining characteristic of this qualification is that the candidate is required to demonstrate high-level research capability and make a significant and original academic contribution at the frontiers of a discipline or field. The work must be of a quality to satisfy peer review and merit publication. The degree may be earned through pure discipline-based or multidisciplinary research or applied research. This degree requires a minimum of two years' full-time study, usually after completing a Master's Degree. A graduate must be able to supervise and evaluate the research of others in the area of specialisation concerned.* (CHE 2007: 40)

The professional doctorate is a newly introduced qualification type in South Africa. Its requirements, purpose and characteristics are:

> *The professional Doctorate provides education and training for a career in the professions and/or industry and is designed around the development of high level performance and innovation in a professional context. Candidates are required to undertake a combination of coursework and advanced research leading to the submission, assessment and acceptance of a research component comprising an original thesis or another form of research that is commensurate with the nature of the discipline or field and the specific area of enquiry. The research component should comprise at least 60% of the degree. Professional Doctorates may also include appropriate forms of work-integrated learning. The defining characteristic of this qualification is that in addition to the demonstration of high level research capability it requires the ability to integrate theory with practice through the application of theoretical knowledge to highly complex problems in a wide range of professional contexts.* (CHE 2007: 41)

The HEQC and the revised HEQSF provides the necessary regulatory context for understanding what high-quality doctoral programmes mean. But quality in doctoral education goes beyond the quality of the programme and, more importantly, we need appropriate and rigorous measures to asses quality in a more comprehensive sense.

Measuring quality in doctoral education

There is general agreement (Blackburn et al. 1973; Comad et al. 1985; Holdaway 1997; Phillips 1993) that measuring the quality of teaching and learning – which includes doctoral education – is one of the more persistent challenges in higher education studies.

More than 40 years ago, in their comprehensive study of this topic, Blackburn et al. (1973) identified five categories of studies that are typically employed to measure different aspects of quality in doctoral education. These are: reputational studies (which include some form of peer evaluation by scholars or a department's graduate programme); scholarly productivity (when a critical objective is the production of new knowledge it makes sense that any research products that emanate from the doctoral thesis would be regarded as an indirect measure of quality); student quality (which is assessed by analysing undergraduate performance and even graduate records); efficiency as an index of quality (a focus on throughput and completion rates); and, finally, client satisfaction ratings (ratings by the

'consumers' of doctoral education are sourced through employer surveys and the like).

Since this study, other scholars have proposed a range of measures – direct and indirect – to measure the quality of doctoral programmes and graduates. Increasing numbers of studies have focused on the (publication) output of doctoral graduates by analysing the productivity and citation impact of such papers (Hasselback and Reinstein 1995). Similarly, the number of destination or tracer studies of doctoral graduates have also increased (for a review of South African destination studies, see Botha 2015). We have also, in more recent years, seen an increase in the number of studies that have gained access to doctoral examiner reports and analysed these (Powell & McCauley 2002; Holbrook et al. 2004).

However, it is fair to say that most of these studies focus on how examiners interpret doctoral theses and what they look for when making judgements about final acceptance. In this regard the paper by Kiley and Mullings (2004) ('Examining the examiners: How inexperienced examiners approach the assessment of research theses') provides an interesting new perspective on quality assurance as they compare how inexperienced examiners approach the examination of a thesis somewhat differently from experienced examiners. The biggest differences found were that inexperienced examiners pay more attention to institutional guidelines, tend to be uncertain about benchmarking, especially in regard to marginal theses, and have less experience of being a supervisor and hence display a tendency to hark back to their own postgraduate experience.

'Quality' of doctoral education is an elusive and complex construct. In order to get closer to an operational definition, it is necessary that we 'unpack' its constituent dimensions. For the purposes of our discussion in the chapter, we propose a framework that distinguishes between seven dimensions of quality:

- The quality of the doctoral candidate (at entry level);
- The quality of the doctoral programme;
- The quality of the doctoral supervisor;
- The quality of the supervisory process;
- The quality of the doctoral graduate (at exit);
- The quality of the doctoral thesis; and
- The quality of any journal paper or presentation emanating from the doctoral thesis.

It is important to emphasise that most of these dimensions are interdependent. The quality of the doctoral candidate (at entry level) is arguably the best predictor of the quality of the doctoral graduate (at exit level). The quality of the supervisory process is arguably a direct function of

the quality of the supervisor. The quality of the doctoral thesis and subsequent publications is a function of the quality of the doctoral supervisor and supervisory process and so on.

Even at first glance, it is obvious that it is either impossible or very difficult to apply direct measures in the assessment of all of these dimensions. In the table below we elaborate on each of these dimensions and also indicate where there are available direct (D) or indirect (I) measures for each.

Dimension	Elaboration/interpretation	Nature of available measures
Quality of doctoral candidate	Prior training and academic record of doctoral candidate Level of preparedness of candidate for doctoral studies	Academic records (D) Curricula vitae (D) Selection and screening processes of candidates (D) Feedback from supervisors (D)
Quality of doctoral programme	Consistency with NQF requirements	Accreditation of programme by SAQA and HEQC (D) Regular peer review results (D)
Quality of doctoral supervisor	Academic reputation and standing of supervisor Experience as doctoral supervisor	Curriculum vitae of supervisor (I)
Quality of supervisory process	Degree of guidance and support given to candidate Management of the supervisory process The burden of supervision	Feedback reports from doctoral students (I) Surveys of doctoral students (I)
Quality of the doctoral graduate	Employability of the graduate	Proportion of doctoral candidates employed on completion of studies (I)
Quality of doctoral thesis	Quality of the contents and argumentation of the thesis Contribution to the body of knowledge	Examiners' reports (D) Possibility of getting thesis published as a monograph (I)
Quality of doctoral publications	Quality of articles and presentations emanating from thesis	Quality of journals in which papers are published (I) Citation impact of papers (I) Invitations to present results of doctoral study at national and international conferences (I)

This table – which is not exhaustive – begins to demonstrate the nature of the challenge to measure the quality of doctoral education. Not only would one have to employ a whole range of measures to comprehensively measure and assess the quality of doctoral education in any system or institution, it is also the case that many of the possible (conceivable) measures are indirect (or proxy) measures. This means that they are invariably weaker measures of the construct being measured. In addition, where we are able to identify direct measures (such as examiners' reports of doctoral theses), considerations related to ethics and confidentiality would probably mean that access to such measures is impossible or highly restricted.

In our discussion in the remainder of the chapter we focus on the following four dimensions of quality for which there were readily available data in the South African system.

Dimension	Specific measures selected	Data sources
Quality of doctoral candidate	Level of candidate preparedness Screening and selection processes of doctoral candidates	• HEMIS data (DHET 2013a) • HEMIS data on progression trajectories (see Study 3 in Appendix 1) • Supervisor experience (see Study 4 in Appendix 1) • CHET/CREST study of productive departments (see Study 2 in Appendix 1) • Student reports (Mouton and Hunter 2001) • CREST survey and other studies (Mouton et al. 2009; Mouton et al. 2012)
Quality of doctoral supervisor	Qualifications of supervisor	
Quality of supervisory process	Degree of guidance and support given to candidate Management of the supervisory process The burden of supervision	
Quality of the doctoral graduate	Employability	

We do not discuss the quality of the doctoral progamme, as the national process of accreditation of doctoral programmes is a stringent and transparent process and it is generally assumed that doctoral programmes meet the requirements as stated in the NQFS framework. As for the quality of doctoral theses and doctoral publications, we are not aware of any available evidence on these dimensions in South Africa.

Quality of the doctoral candidate

Our focus here is on two dimensions of the quality of the doctoral candidate only: the level of preparedness of doctoral candidates and the nature of the screening and selection process. In both cases we rely on self-reporting data.

Level of preparedness

In our discussion on efficiency in Chapter 3 we reported on the typical trajectories of postgraduate students in South Africa. Given that between 60% and 70% of all honours, masters and doctoral students in South Africa study part-time (they work while they study), we highlighted the fact that large proportions of students invariably interrupt their studies. We showed that the typical study trajectory from a completed bachelors to a completed doctoral degree can be anywhere between 12 (minimum period) and 25 years (average maximum). This fact explains why the average age of doctoral graduates in 2013 was 41 and the average time to completion of doctoral degree remains close to five years.[2]

Our survey of doctoral enrolments in 2014 revealed that the most commonly cited reason for students interrupting their studies was that of employment conditions or work obligations followed by financial reasons. We also found that the progression rates for younger students (both at the honours and masters levels) are higher than for older-age cohorts, who are

more likely to be working while studying. And finally, among the top three reasons given for considering dropping out, across all three levels of study, are challenges to find sufficient time for studies, for example, the challenge of balancing work with studies. This is particularly pertinent to masters and doctoral students, as well as students older than 30.

All of this adds up to a picture in which large proportions of South African doctoral students would – by the time that they enrol for their doctoral degree – have typically interrupted their study career a number of times. Instead of an ideal trajectory where the student progresses quite quickly from undergraduate to lower and higher postgraduate levels, the typical South African doctoral student (with the possible exceptions of students in some of the natural sciences) enrols for doctoral studies after a number of gaps and interruptions between honours and masters and between masters and doctorate.

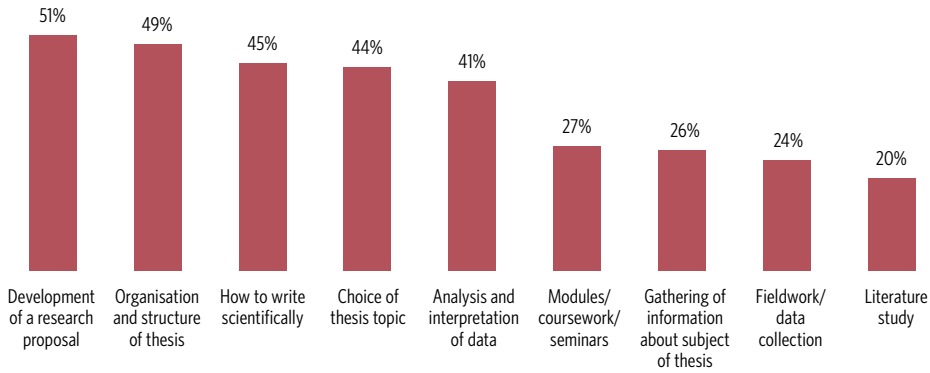
The inevitable result is that many doctoral students have to relearn basic research skills: skills related to research methodology as well as basic skills in searching electronic databases and doing literature reviews (see also the discussion on 'student preparedness' in Chapter 6).

Evidence from many workshops on doctoral supervision at most South African universities (the second author has facilitated more than 40 such workshops over the past ten years), clearly shows that supervisors are not only finding the increased numbers of students to supervise challenging, but – even more importantly – also the reality that a large number of prospective doctoral candidates are woefully underprepared for doctoral studies. Supervisors complain that many of their doctoral students cannot write scientifically, do not know how to search the literature, lack the required quantitative and qualitative skills to do proper data analysis, and so on. In cases where doctoral students are underprepared for the specific demands of doctoral studies, the doctoral supervisor has to devote more time to guiding the student through the doctoral research process.

In a survey of Stellenbosch doctoral students conducted in 2000, Mouton and Hunter (2001) asked doctoral graduates a number of questions about their doctoral experience. One of the sets of questions was aimed at establishing the extent to which the students have required a little, some or a lot of guidance from their supervisors.

The results were quite revealing as large proportions of students said that they required a *lot* of guidance with regard to the development of their research proposal (51%), the organisation of their thesis (49%), how to write scientifically (45%) and even in choosing their thesis topic (44%). In an ideal world, the doctoral candidate should be reasonably well prepared for most of these tasks. This is evidently not the case even at one of the top universities in the country.

Figure 5.1: Responses on supervisor guidance (2000)



Source: Mouton and Hunter 2001

Screening and selection for quality

It is generally accepted that rigorous screening and selection of doctoral candidates is an essential condition for effective and efficient supervision and a necessary condition to ensure quality in the process. Students with the required academic abilities, dedication and passion for scholarship are less likely to discontinue their studies.

However, the possibility of screening – through validating prior academic performance, personal interviewing and even psychometric testing of prospective candidates – is not always an option. Anecdotal evidence gained from supervision workshops conducted by the second author at most South African universities over the past seven years suggests that different rules and practices for screening and selection are used. In some cases, academic departments may not have the right to turn prospective candidates away, due to institutional policies or directives. Within some academic departments, the individual supervisors may also not have this right on account of departmental policies or a lack of adequate supervisory capacity. The question of how screening and selection is done in every specific case is the result of a complex interplay between the demand side (how many students apply to study at a specific department), the supply side (the available supervisory capacity in the department) and institutional and faculty policies, rules and targets about the ideal number of students to be accepted for doctoral studies.

In a survey of doctoral supervisors (Mouton and Hunter 2001), we put three options to our sample (the percentage of responses in each category appears in brackets):

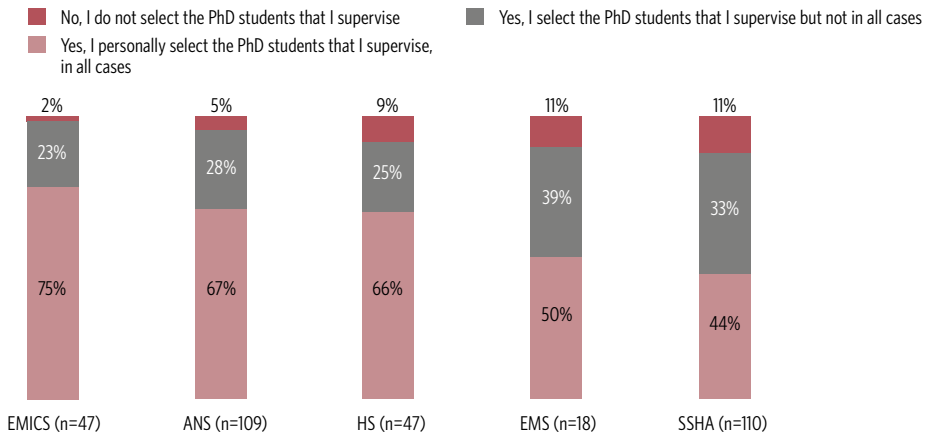
- Yes, I personally select the PhD students that I supervise in all cases (60%);
- Yes, I personally select the PhD students that I supervise, but not in all cases (33%); and
- No, I do not personally select the PhD students that I supervise (7%).

Although it is encouraging that the majority (60%) of respondents indicate that they are able personally to select all their doctoral students, it is cause for concern that the remaining 40% indicate that they are not permitted or able to do so in all cases or at all.

There are large and statistically significant differences in the responses of supervisors from different scientific fields (Figure 5.2). Supervisors in the Social Sciences, Humanities and Arts (SSHA) as well as Economic and Management Sciences (EMS) seem in general terms to have less choice in the selection of their doctoral students than their counterparts in the science, technology, engineering and mathematics (STEM) fields. This may be a consequence of the greater demand for doctoral studies in these fields and smaller numbers of staff with doctoral qualifications in these fields. But this specific issue clearly requires further investigation.

We were also interested in establishing which criteria are being used for student selection. It is interesting (Figure 5.3) that the two academic criteria

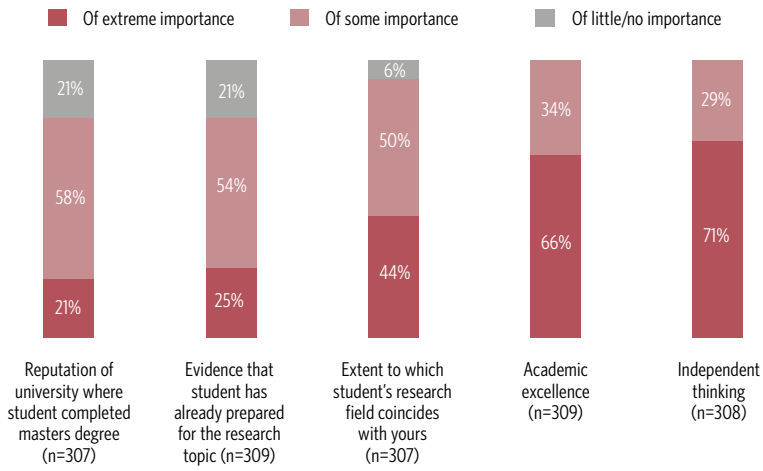
Figure 5.2: Selection methods of PhD students supervised, by scientific field (2000)



Note: Statistically significant relationship: $x^2 = 20.76$, $p < .05$.
EMICS = Engineering and Mathematical Sciences
ANS = Agriculture and Natural Sciences
HS = Health Sciences
EMS = Economic and Management Sciences
SSHA = Social Sciences, Humanities and Arts

Source: Mouton and Hunter 2001

Figure 5.3: Perceived importance of specified criteria for the selection of PhD students (2000)



Source: Mouton and Hunter 2001

(independent thinking and academic excellence) in the survey were consistently rated as being the most important. Other criteria, such as the alignment of the student's interest with that of the supervisor and the degree of preparedness of the student, were rated much lower.

As we only reported on two dimensions of the quality of the doctoral candidate it is impossible to draw big conclusions. As to the level of preparedness of the student, evidence from our doctoral supervisor study, our progression and retention survey and more anecdotal evidence (albeit from a large number of interactions with supervisors) would tend to suggest that many doctoral students are not adequately prepared for doctoral studies. As to the matter of screening and selection of only the best doctoral candidates, again the evidence seems to point to a variable picture where rigorous screening may be the practice at some universities and within some departments, but it does not seem to apply across the board. Our first conclusions already point to areas of concern as far as the quality of doctoral education is concerned.

Quality of the doctoral supervisor

At all South African universities it is required that a supervisor of a doctoral candidate must himself or herself be in possession of a doctoral degree. Ideally one would prefer a situation where the supervisor does not only have a doctoral degree, but is also an experienced scholar and a supervisor

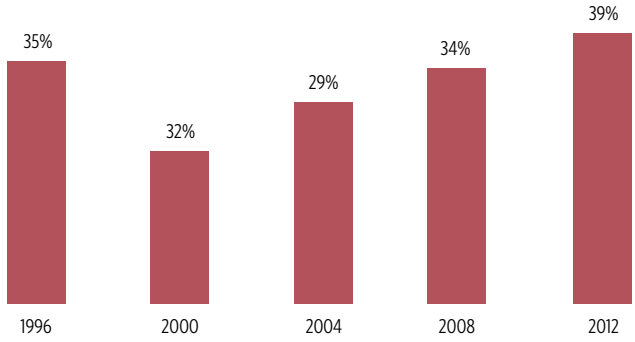
with some experience. However, given the huge growth in numbers of doctoral enrolments and in the increasing burden of supervision, it is now commonplace that academic staff find themselves in the situation where they have to supervise their first doctoral candidate very soon after completing their own doctoral degree.

It is therefore not surprising that – at the systemic level – concerns are expressed about the available pool of doctoral supervisors in the country. According to the *National Development Plan* (NPC 2012), having staff with doctorates is a prerequisite for the acceleration of knowledge and research outputs, and for the improvement of the qualification levels of academic staff at universities.

Although this is clearly also an efficiency issue, we have decided to present the data on the available supervisory capacity in this chapter for the simple reason that having enough properly qualified supervisors constitutes a first and necessary condition for high-quality doctoral education in any country. In the remainder of the section we present an overview of the existing supervisory capacity in the system.

Figure 5.4 shows the proportions of academic staff with doctorates for the period 1996 to 2012. It is evident that the qualification levels of academic staff first declined as a result of the rapid expansion of the system and the consequent appointment of a large number of academic staff without doctorates. During the period 1996 to 2004, 1 974 additional permanent academic staff members were appointed, but over the same period the number of permanent academic staff with doctorates declined by 162. Since 2004 this trend has been reversed and the percentage of permanent academic staff with doctorates increased from 29% in 2004 to 39% in 2012.

Figure 5.4: Percentage of academic staff with doctorates (1996–2012)



Source: DoE (1999), DHET (2013a)

Table 5.1 provides an overview of the supervisory capacity of the system through the ratio of doctoral enrolments and graduates to academic staff with doctoral degrees. The analysis reveals that the number of doctoral enrolments in relation to staff with doctoral qualifications has increased from 1.1 to 2.1 between 1996 and 2012. In practice, not all academic staff with doctorates supervise doctoral students.

The available number of academic staff with doctoral qualifications is of utmost importance for the supervision of doctoral students. Table 5.1 provides information about the number and percentages of academic staff with doctoral degrees, the ratios of doctoral enrolments to academic staff with doctorates, and the ratio of doctoral graduates to academic staff. Table 5.2 gives the same information according to institution type groupings.

Having a PhD should of course be a prerequisite for supervising a doctoral candidate. But it is at best only a necessary, and not a sufficient, condition for ensuring quality in the doctoral supervision process. The quality of the supervisory process – the degree of guidance and leadership given to the student, the attention to detail, the quality of feedback and many other aspects – is equally important to ensure quality of the final products – the graduate and the thesis.

Quality of the supervisory process

The burden of increasingly large numbers of doctoral students to supervise will manifest itself in different ways during the supervisory process. A survey of doctoral supervisors by Mouton et al. (2012; also see Study 4 in Appendix 1), addressed two specific questions: Firstly, what would the effect of large numbers be on the *alignment* between the expertise of the supervisor and the expectations and demands of the student? Secondly, what effect would the large numbers have on the time and attention that the supervisor can devote to each student?

As to the first issue, supervisors were asked whether they sometimes have to accept students who work outside their own area of expertise. This is an important issue because it is generally accepted that there is a big difference between how supervision is conducted where the supervisor is supervising students in his/her area of expertise and areas where the supervisor would not claim any expertise. When supervising students in one's own area of expertise (areas where the supervisor has published, given presentations and is generally recognised as an expert by his/her peers), the supervisory process is much more straightforward. On the other hand, when one has to supervise a doctoral student in areas outside one's own expertise, the supervisor needs to put in much more effort to keep abreast with developments and trends in that field, and also with the student, as the

Table 5.1: Academic staff with doctoral degrees and ratios of academic staff to doctoral students and graduates (1996–2012)

Year	Total academic staff	Academic staff with doctorates	Doctoral student enrolments	Doctoral student graduates	% academic staff with doctorates	Ratio of doctoral enrolments to academic staff with doctorates	Ratio of doctoral graduates to academic staff with doctorates
1996	13 449	4 647	5 152	684	35%	1.1	0.15
2000	14 184	4 561	6 354	834	32%	1.4	0.18
2004	15 423	4 485	9 104	1 104	29%	2.0	0.25
2008	15 936	5 403	9 994	1 182	34%	1.8	0.22
2012	17 451	6 744	13 964	1 879	39%	2.1	0.28

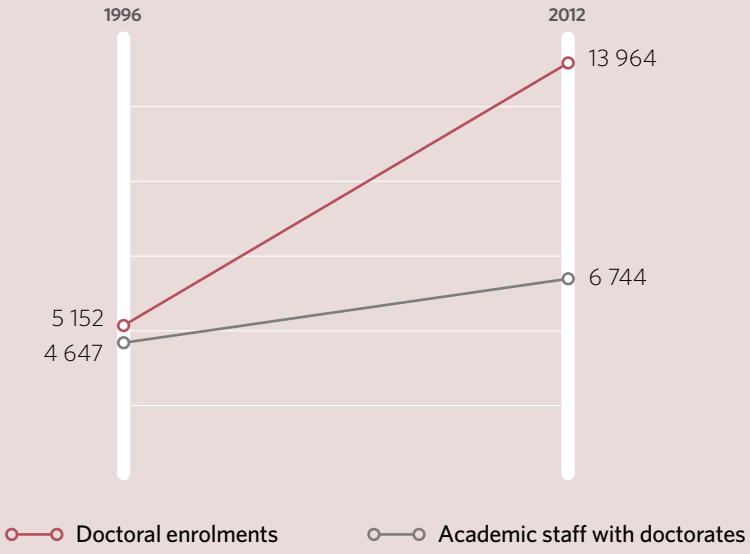
Source: DoE (1999), DHET (2013a)

Table 5.2: Academic staff with doctoral degrees and ratios of academic staff to doctoral graduates by institutional type (2012)

	2012 academic staff	2012 academic staff with doctorates	2012 doctoral graduates	% academic staff with doctorates	Ratio of doctoral graduates to academic staff	Ratio of doctoral graduates to academic staff with doctorates
Universities						
Stellenbosch	973	518	240	53%	0.25	0.46
Rhodes	336	171	67	51%	0.2	0.39
Fort Hare	315	119	43	38%	0.14	0.36
Pretoria	1 281	627	200	49%	0.16	0.32
Cape Town	1 077	699	199	65%	0.18	0.28
KwaZulu-Natal	1 399	663	177	47%	0.13	0.27
Western Cape	559	290	75	52%	0.13	0.26
Free State	949	380	94	40%	0.1	0.25
North West	1 248	628	154	50%	0.12	0.25
Witwatersrand	1 074	595	150	55%	0.14	0.25
Limpopo	825	132	17	16%	0.02	0.13
Subtotal: Universities	10 036	4 822	1 416	48%	0.14	0.29
Comprehensive universities						
Johannesburg	1 009	294	109	29%	0.11	0.37
Nelson Mandela	596	242	86	41%	0.14	0.36
Zululand	298	79	28	27%	0.09	0.35
South Africa	1 588	612	152	39%	0.1	0.25
Venda	328	103	4	31%	0.01	0.04
Walter Sisulu	583	70	3	12%	0.01	0.04
Subtotal: Comprehensives	4 402	1 400	382	32%	0.09	0.27
Universities of technology						
Tshwane	855	178	44	21%	0.05	0.25
Cape Peninsula	765	124	24	16%	0.03	0.19
Central	274	72	5	26%	0.02	0.07
Durban	599	88	6	15%	0.01	0.07
Vaal	341	44	2	13%	0.01	0.05
Mangosuthu	179	16	0	9%	0	0
Subtotal: Universities of technology	3 013	522	81	17%	0.03	0.16
Total	**17 451**	**6 744**	**1 879**	**39%**	**0.11**	**0.28**

Source: DHET 2013a

The burden of supervision



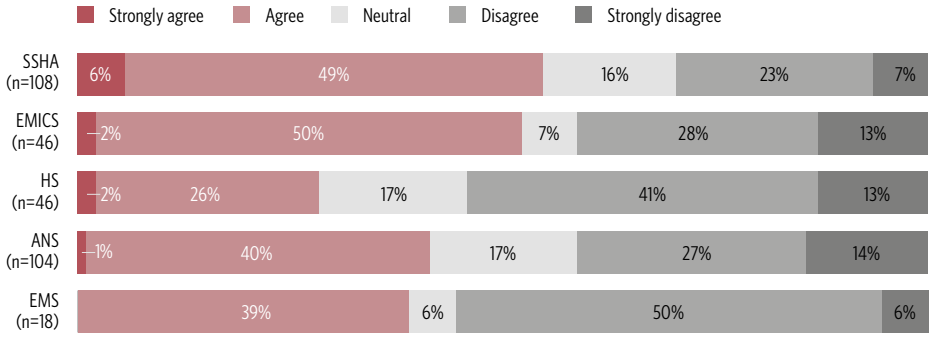
Source: Table 5.1: Academic staff with doctoral degrees and ratios of academic staff to doctoral students and graduates (1996–2012)

process unfolds. These issues are directly linked to the quality of the supervision given.

The study found, and this is cause for concern, that a sizeable percentage (45%) of all respondents indicated that they sometimes have to supervise students outside their main area of expertise. The breakdown by main scientific field (Figure 5.5) shows that this situation is slightly more common in the Social Sciences, Humanities and Arts, and in the Engineering and Mathematical Sciences.

The second question asked how the increasing burden of supervision impacts on the attention that supervisors are able to give students. The results, again, are interesting: significant numbers of supervisors (32%, nearly a third of the respondents) feel that they do not give sufficient attention to their students. The disaggregation by main scientific field (Figure 5.6) shows that this situation holds for all fields, with an even larger proportion (60%) of respondents from the Economic and Management Sciences discipline agreeing with the statement (although the actual numbers are small).

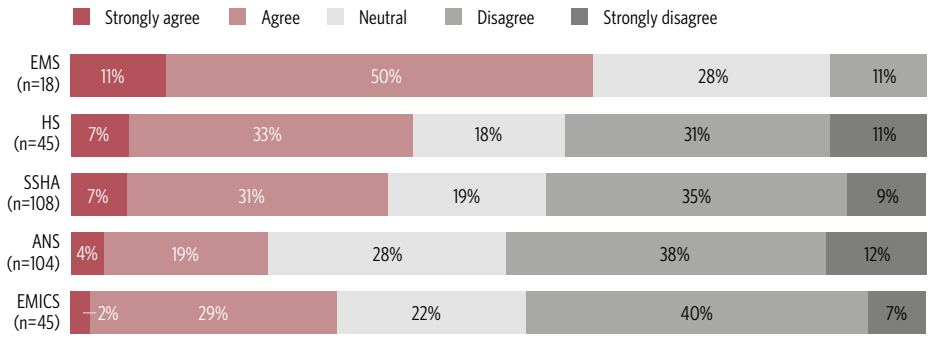
Figure 5.5: Extent of agreement with statement: 'I sometimes have to supervise PhD work that lies outside my area of expertise', by scientific field (2011)



EMICS = Engineering and Mathematical Sciences
ANS = Agricultural and Natural Sciences
HS = Health Sciences
EMS = Economic and Management Sciences
SSHA = Social Sciences, Humanities and Arts

Source: Mouton et al. 2012

Figure 5.6: Extent of agreement with statement: 'I lack sufficient time to give each PhD student the attention that he/she deserves', by scientific field (2011)

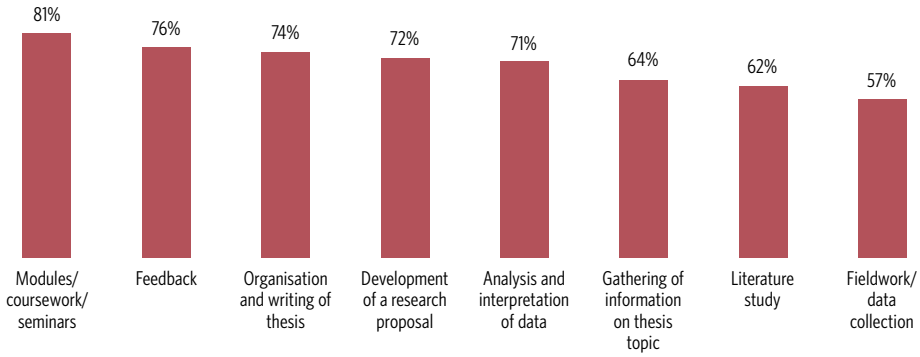


EMICS = Engineering and Mathematical Sciences
ANS = Agriculture and Natural Sciences
HS = Health Sciences
EMS = Economic and Management Sciences
SSHA = Social Sciences, Humanities and Arts

Source: Mouton et al. 2012

In a study conducted in 2000 at Stellenbosch University of postgraduate students who had graduated at the university during the previous decade (Mouton and Hunter 2001), we asked students to indicate how they rated the quality of the supervision they had received in a number of categories. As Figure 5.7 shows, the overwhelming responses were positive. Large

Figure 5.7: Assessment of the quality of supervision by doctoral students (% rated as 'excellent' or 'good') (2000)



Source: Mouton and Hunter 2001

majorities of respondents rated the coursework, feedback received, the assistance with the development of the research proposal and so on, as being somewhere between 'good' and 'excellent'.

Although this study is somewhat dated and confined to one university, it gives some indication of the quality of supervision as experienced by students.

Understanding how good-quality supervision occurs is not straightforward. A perspective from the supervisor highlights concerns about the amount of time and attention students require, their own time and expertise in the domain of the study and their own levels of experience. The perspective from the student is likely to be variable. Some students (who are better qualified, who are being supervised by the supervisor of their choice, who are well-supported by the university and department) are likely to report on good-quality practices. On the other hand, various studies have reported on student dissatisfaction with the quality of doctoral supervision.

An example of an excellent qualitative study on doctoral experience is Judy Backhouse's doctoral thesis of 2009. Although she interviewed a relatively small sample of doctoral students (n = 38), her findings are probably indicative of doctoral experiences of supervision. She summarises her findings as follows:

> *Many in this study appear happy with the supervision they get. They speak highly of their supervisors as 'very cool ... inspirational, supportive and all that' and 'the best supervisor in the world'. Some told tales of neglect and disagreements between co-supervisors that they had experienced during their masters degrees, and tales of*

> *supervision disasters which they had heard of second-hand. There were cynical remarks about the practice of supervisor names appearing on student publications and suggestions that supervisors sometimes act selfishly in suggesting research directions and one person complained that his supervisor took three months to reply to e-mails. But otherwise people did not raise significant problems with supervision.* (Backhouse 2009: 212)

In the absence of a comprehensive survey of doctoral experiences in South Africa (and not merely small-scale qualitative and often anecdotal studies), we would maintain that the quality of doctoral supervision is more likely to be good.

Quality of the doctoral graduate

The final 'product' of the doctoral education process is the doctoral graduate: someone who should, in theory, be more employable because he or she is more knowledgeable, skilled and competent in knowledge production. It has become common practice in doctoral destination and tracer studies (and also employer studies) to establish what the level of employability of doctoral graduates is (the quantitative question) as well as a more qualitative question about the 'fit' between the doctoral graduates and the demands of a specific employment. The evidence for this section is sourced from two studies conducted by CREST in 2010 and 2009 under commission from the Academy of Science of South Africa (ASSAf) (ASSAf 2010; 2011).

Degree of employability

ASSAf commissioned the Centre for Research on Science and Technology (CREST) at Stellenbosch University to conduct a tracer survey of humanities graduates from South African universities. Eighteen of the 23 universities in the country participated in the survey. A web-based survey was launched in February 2010 and closed by the third week of April 2010. A total realised sample of 12 064 graduates had completed the web-based questionnaire by the close of the survey, making this one of the biggest graduate tracer studies ever conducted in South Africa. A total of 3 617 graduates from the social sciences, humanities and arts (SSHA) completed the survey; 2 936 graduates from the economic and management sciences (EMS) and 5 488 graduates in the agricultural, natural, engineering and health sciences (NEHS). A small number (23) of students did not indicate their field of study.

A main finding of the study was that the *majority* of graduates from all fields of science obtained their first job in less than one month after

graduation. In all three broad domains within SSHA, the tendency is for graduates to find work within a period of six months after graduation, with the majority finding work in less than one month. Moreover, especially in the social sciences, there appears to be a shift from finding work in less than one month after graduation to between one and six months after graduation. This is evident in the fact that 79% and 18% of graduates from the most historical year-period (before 1980) reported that they had found work in less than one month and between one and six months, respectively, compared with 54% and 36% of respondents in the most recent graduate period (2000–2010).

These findings are consistent with one other major destination study conducted in the past ten years. In their study 'Pathways from University to work: A Graduate Destination Survey of the 2010 Cohort of Graduates from Western Cape Universities', Kraak and Du Toit found that 83% of graduates obtained employment during the two-year transitional period between graduation in 2010 and 1 September 2012. Excluding those who continued with studies in higher education, unemployment of 2010 graduates in 2012 amounted to about 10%.

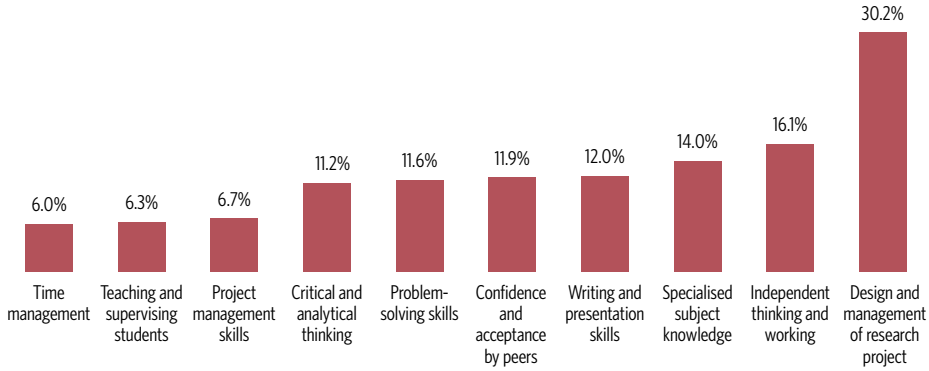
In a web-based survey conducted between March and June 2009 for ASSAf as part of the PhD in South Africa study (Mouton 2009), slightly more than 5 000 e-mails were sent to doctoral graduates at 15 South African universities requesting them to complete a web-based questionnaire. A total of 1 076 completed questionnaires were received. This translates into a return rate of about 22% for the entire survey (253 e-mails were invalid).

One of the questions that were put to respondents that is particularly relevant to our discussion is whether they felt that their doctoral degree had prepared them for employment. It was found that the majority of respondents across all fields felt that their doctoral qualification prepared them well or very well for employment.

PhD graduates who indicated that their doctoral degree did indeed prepare them for employment were also asked to explain in what way the qualification prepared them for employment. The top ten reasons mentioned are displayed in Figure 5.8. The ability to design and manage a research project was considered the most important preparation for employment. This is closely linked to the ability to think and work independently. Having specialised subject knowledge also opened and eased the entry into employment for a number of PhD graduates. It would also seem that a doctoral qualification provided confidence and acceptance into the scientific world for some of the respondents.

These results are consistent with the CREST Tracer study (Mouton et al. 2012). The findings of that study show that vast majorities of graduates in

Figure 5.8: How doctoral studies prepared students for the world of work (2009)



Source: Mouton 2009

all fields indicate that their current employment utilises their knowledge and skills either to some degree or to a significant extent (93.1% in SSHA, 96.6% in EMS and 95.8% in NEHS). This is a significantly positive finding as far as SSHA graduates are concerned as it shows convincingly that the 'fit between knowledge/skills and employment is equally good across all fields of study' [Mouton et al. 2012: 50]. The results do not support (a popularly held view) that the university preparation of SSHA graduates is less relevant to a future place of employment than is the case for graduates in other fields of science. Within the SSHA 54% of graduates from professional disciplines as against 40% from academic disciplines indicated that their current employment utilises their knowledge and skills to a significant extent. These findings are also consistent with a study (much smaller in scale) conducted by Griesel and Parker in 2008 amongst employers in the private sector.

Although South African higher education does not have an abundance of tracer or destination studies, the few studies (with reasonable sample sizes) consistently present the same results: vast majorities of South African graduates and especially doctoral graduates who do not have employment on completion of their studies find employment quite quickly. There is nearly no unemployment of doctoral graduates to speak of. Studies of doctoral graduates and employers also concur that there is acceptable alignment between the demands of the workplace and the skills and competencies of the graduates. Although these are indirect measures, the picture that emerges from all of these studies (Botha 2015) provides

positive evidence for the quality of the doctoral degree and candidate in the country.

In conclusion

Our discussion of quality in doctoral education and the challenges in measuring quality has been limited to those 'dimensions' for which there is readily available data. Although this is clearly a limiting factor that needs to be kept in mind when drawing conclusions about how good or bad doctoral education is in the country, we would also suggest that most of the measures that were used point to the same conclusion: that general doctoral education in South Africa is of an adequate quality. We have presented evidence that shows that:

- There are fairly stringent policies and rules in place to ensure proper accreditation of doctoral programmes.
- The HEQC has ensured – to a large extent – that universities conform to standard practices in quality assurance of doctoral education (including registration, supervision and examination processes).
- The fact that majorities of doctoral students work while they study impacts on their levels of preparedness for doctoral studies. Various studies confirm that doctoral candidates typically require a large degree of help and support in coping with the demands of doctoral education. This has also meant that universities – at least in most cases – are screening and selecting potential doctoral candidates more stringently and rigorously in order to ensure that the best pool of talent is accessed for doctoral studies. However, we would maintain that the part-time nature of doctoral studies for many students poses one of the major challenges to maintaining high standards of doctoral education in the country.
- We have presented evidence that suggests that the quality of doctoral supervisors and supervision is generally good. Again, however, the increasing burden of supervision (which is linked to the demands for growth and efficiency) is cause for concern (amongst many supervisors) and an additional factor that may compromise the quality of doctoral education. Increasingly, supervisors have to take on larger numbers of students as well as – in many cases – students in areas falling outside their own expertise.
- Doctoral tracer studies show that South African doctoral graduates do not find it difficult to find employment (keeping in mind that about 60% are already employed at the time of study). These studies, as well as employer studies, indicate that there is a reasonable fit between the

demands of the labour market and the knowledge and skills presented by the doctoral graduate.

Our overall assessment, then, is that the quality of doctoral education in South Africa is generally good. However, at the same time we need to caution against any complacency as there are already isolated indications of strains on the system, which may in the long run compromise quality. The imperative to improve quality is and should be an essential goal of any system of doctoral education.

Notes

1 The National Qualifications Framework is a comprehensive system approved by the minister for the classification, registration, publication and articulation of quality-assured national qualifications (SAQA 2008).

2 For a detailed, qualitative analysis of the different study trajectories of doctoral students, see Backhouse (2009).

Chapter 6

Multiple paths to success

Johann Louw and Gillian Godsell

- Method and selection criteria
- Quantity: Increasing the number of PhDs produced in South Africa
  - Capacity to supervise
  - Institutional pressure
  - More efficient models to produce PhDs?
  - Concerns about quality
  - Student preparedness
  - Postdoctoral positions
- Efficiency: Improving performance and completion rates
  - Selection or acceptance of doctoral candidates
  - Funding
  - Administration
  - Departmental and institutional support
  - Supervision
  - Research experience
  - PhD thesis examination as quality control
- Summary of findings
- In conclusion

The four imperatives of quality, efficiency, transformation and quantity, outlined in Chapter 1, typically play themselves out at a broad policy level, structuring national and international debates. What is often neglected, however, is how such general demands or pressures (e.g. to increase the number of PhDs) are experienced and responded to at the level of a university, a department, or even an individual supervisor. This chapter reflects on an attempt to discover how these four imperatives are experienced and addressed. The focus of the chapter is mostly on issues of quantity (producing more PhDs) and efficiency (low dropout and high completion

rates), but concerns about quality and transformation weave their way in and out of these discussions.

This chapter focuses on the humanities and social sciences in South Africa, and what we can learn about the successful cultivation of doctoral scholarship. Twenty-five disciplines that had consistently enrolled and graduated significant numbers of PhD students were selected from the national database, the Higher Education Management Information System (HEMIS), for further study through interviews with heads of department and productive supervisors.

Method and selection criteria

Thirteen universities were selected to take part in this study: the universities of Cape Town, Johannesburg, KwaZulu-Natal, Pretoria, South Africa, Free State, Western Cape, Witwatersrand, Zululand, Nelson Mandela Metropolitan, Rhodes, North-West and Stellenbosch. Collectively they produced 96% of the higher education system's doctoral graduates in social sciences and humanities over the ten-year period from 2000 to 2009.

The first criterion applied to select individual departments for study was that a university must have produced a total of at least 20 graduates in that field over the ten-year period between 2000 and 2009, based on HEMIS data. As 52 departments met this criterion, there were too many to interview with the project's resources, so additional criteria were applied to reduce the department selection. This included analysing graduation rates and doctoral enrolments over the ten-year period and checking on the progress of cohorts of new doctoral enrolments for the period 2001 to 2004.

Ten disciplines were identified for further exploration: Education, Psychology, Public Administration, Political Studies, Economics, Sociology, Religion, Law, English and Social Work. In all, these fields produced 80.9% of the doctorates in the social sciences and humanities across South Africa. No field contributed less than 2.5% (Political Studies being the smallest) to the total, and each field also had an average annual intake of at least 26 doctoral candidates between 2000 and 2004. Ultimately 25 departments were included for this part of the study.

The interviews were conducted by the authors, both senior academics with doctorates and many years of academic experience. All interviews were recorded in audio and transcribed, but interviewers also took notes and these were included in the analysis.

Table 6.1 shows the departments that were selected on the basis of the HEMIS data. However, these 25 departments should not be regarded as the most productive ones. The authors did not want the cases to be concentrated in only a few geographical areas and to include only a few universities and

disciplines, so these factors were considered as part of the final selection of cases to study.

Extracts from interviews are recorded in this chapter without any identifying details of the individual concerned, the department or the university. This is in line with the confidentiality arrangement discussed with respondents prior to the interviews. The purpose of the extracts used in this chapter is illustrative in that the extracts serve to demonstrate arguments advanced in the body of the chapter.

Studying the human and social sciences is not a simple task – simply deciding on which disciplines to include in the study was a challenge in itself. Furthermore, once the decision had been taken on which disciplines to study, these did not map directly onto the departments (the unit of analysis for the study). At some universities the disciplines are confined to departments but at others they constitute whole faculties, such as Theology, Law or Education. Some departments fall within the Commerce Faculties, such as Economics at UCT and Public Administration at SU. Others fall within the Health Sciences Faculty, such as the Social Work Department at

Table 6.1: Departments selected to explore the quantitative report on the HEMIS data

University	Department/Faculty	Number of participants
North-West University (NWU)	Education	2
North-West University	Social Work	2
Rhodes University (RU)	Education	4
Stellenbosch University (SU)	Public Administration	3
Stellenbosch University	Theology	1
Stellenbosch University	Sociology	6
University of Cape Town (UCT)	Faculty of Law	2
University of Cape Town	Economics	2
University of Cape Town	English	2
University of Cape Town	Political Studies	1
University of Johannesburg (UJ)	Education	2
University of Johannesburg	Psychology	1
University of KwaZulu-Natal (UKZN)	(School of) Accounting, Economics and Finance	1
University of KwaZulu-Natal	English	2
University of KwaZulu-Natal	Religion	4
University of Pretoria (UP)	Law	1
University of Pretoria	Public Management Administration	3
University of Pretoria	Social Work and Criminology	3
University of Pretoria	Theology	3
University of South Africa (UNISA)	Public Administration	2
University of the Free State (UFS)	Theology	3
University of the Western Cape (UWC)	Education	1
Witwatersrand University (Wits)	Psychology	2
Witwatersrand University	Political Studies	1
Witwatersrand University	Sociology	1

NWU. For simplicity's sake, departments are the unit being referred to throughout the chapter, unless a specific faculty or school is mentioned.

Universities also differed in how they handled these complex disciplinary boundaries. This resulted in a changing configuration over time. At SU, for example, the Sociology and Social Anthropology departments both fall under Sociology. As a result of the changing configuration over time, a question raised during the study was what constitutes a pure Sociology degree. Wits Psychology follows a similar approach, but their departments are still recognisable as such within the overall school. The UCT English Department underwent a major reorganisation during the study. The department lost Film and Media Studies to a newly created department and Linguistics to a new school. Similarly, the School of Accounting, Economics and Finance at UKZN has undergone many changes since it was the School of Economics and Management. Despite these differences in nomenclature, the selected departments mapped reliably onto disciplines in the social sciences and humanities.

Quantity: Increasing the number of PhDs produced in South Africa

All the departments involved in this study were aware of recent policy initiatives aimed at increasing the number of PhDs produced in South Africa, and are already responding to it in some way or another. A number of departments indicated that their university's policy is to increase the percentage of postgraduate students overall, with the figure of 30% often being mentioned. Typically those departments that are essentially postgraduate departments or faculties are already in line with policy: UWC Education, RU Education and UCT Law reported that the percentage of postgraduate students in their faculties were already in excess of 30%.

Capacity to supervise

With few exceptions, all the departments included in the study had sufficient capacity to supervise PhDs as they had a respectable number of experienced staff members with PhDs. This is unsurprising given that they are among the most PhD productive departments in social sciences and humanities in South Africa. The percentages of staff with PhDs in these departments are much higher than for the average South African university department. Finding ten of the Academy of Science for South Africa (ASSAf) study (ASSAf 2010) was that approximately a third of all permanent academic staff members at public higher education institutions in South Africa hold a doctoral qualification.

Public Administration at UNISA reported that 90% of their academics have PhDs. Other departments with high percentages of staff with PhDs

are Education at UWC (70%) and Wits Sociology, UCT English and UKZN English, with more than 80% each. In the middle range are departments like Wits Psychology and NWU Education at around 50%, and UFS Theology with 65%. NWU Education commented that their relatively low percentage of PhDs came about when the merger with Potchefstroom Teachers Training College took place. The merger also led to the taking on of a number of teaching modules, resulting in a heavy teaching load and leaving staff with little time to improve their qualifications. Departments falling within the lower end of the spectrum are UJ Psychology (45%) and UKZN School of Accounting, Economics and Finance (33%).

There is a concerted effort by almost all universities to increase their number of academics with PhDs. UKZN reported that there is a vice-chancellor's PhD project in place, according to which all academic staff must either have a PhD or be enrolled for one. NWU has a similar goal in mind, and the Wits respondents reported that their university envisions that 70% of their staff should have PhDs in the not too distant future.

A particular advantage of having a sufficient number of supervisors with PhDs is that they are able to assist other less-experienced colleagues to become productive supervisors by co-supervising or mentoring. However, numerous interviewees pointed out that academic staff without PhDs place some stress on the capacity of departments as they themselves require supervision for their own PhDs. To increase the percentage of academic staff with PhDs from 34% to 70% in line with the objective stated in the *National Plan for Higher Education (*Ministry of Education 2001) would create strain, even in these high-capacity departments.

The extent to which the 25 departments have spare capacity to supervise PhDs is not clear. The number of PhDs supervised ranges from 2 to 12 per supervisor in the sample interviewed. In a number of instances it was clear that the departments perceived themselves as running at full capacity and were thus introducing steps to manage new enrolments. Departments with relatively open admission procedures and criteria reported very high numbers of PhD enrolments.

Departments were aware of the age profile of their productive supervisors and the potential burden this will put on their capacity to produce PhDs in the future. Departments such as UCT Law, NWU Social Work, UFS Theology, NWU Education, UJ Education, Wits Political Studies and UP Law regarded their age profiles as less of a problem as their current staff complements are younger and many have PhDs. All departments recognised the need for succession planning to replace retiring supervisors. At the time of conducting the interviews, some departments used only a few supervisors to carry out almost all their PhD supervision. In the UCT English Department, three people were responsible for almost all supervision, and the UCT Political Studies Department had only two

supervisors. The three supervisors of most UWC Education PhDs had retired and 11 other supervisors at UWC Education had left the university over the period 2000 to 2012.

The strategies to address succession planning varied. In some cases, retiring supervisors were retained in some capacity. In other cases, appointments favoured people with PhDs who were able to supervise straight away. Others encouraged staff members to complete their own PhDs as soon as possible. A number of departments used part-time supervisors. The RU Education Faculty had six such supervisors to supervise eight students. UNISA Public Administration used eight emeritus professors to supervise six students. SU Sociology Department had two part-time supervisors for eight students and UP Theology Faculty used six to supervise eight students. UKZN Religion employed the most part-time staff, with at least 20 part-time supervisors and co-supervisors. At the time of the study Wits Sociology indicated that they would in the near future expect emeritus professors to co-supervise PhDs in order to pass on their supervision skills. All departments reported that their universities are cautious about over-reliance on part-time supervisors. Some departments, such as UP Public Administration, discourage it. Study participants mentioned that different mechanisms are employed to regulate this process. At many places, including UCT Law and UP Law, part-time supervisors are only afforded co-supervision status. At others they are appointed as honorary research associates (UCT English), extraordinary professors (UWC Education) or research fellows (UJ Psychology).

UJ Psychology and UKZN Accounting, Economics and Finance reported a somewhat different problem in succession planning. In these departments the problem is not so much a 'greying faculty' as of a 'missing middle'. There is a gap between younger staff members and those aged 49 and older. Our impression was that this could be the case with other departments as well.

Institutional pressure

The study asked participants if they experienced pressure from their universities to increase doctoral enrolment. Most participants indicated that pressure is perhaps too strong a term for what they currently experience. Wits Psychology, however, indicated that they have felt under pressure since 2005. Most other departments felt that they were merely responding to the policy directions given by the universities:

> *Pressure? Not so much pressure ... I would argue that maybe it's more in the way of incentives. The department gets more funding for graduates, even undergraduate student[s] and so ... we gain as a*

> *department if we increase our graduate numbers. I think there is increasing pressure in the way of ... gentle nudging from the Dean in particular to try and make sure our completion rates are ... within the time frame that one would like because there's a large number of people who register and don't complete. That's a global issue. But I don't think it's the case that there's any kind of undue or stipulated pressure in that sense. I think there's a general move, a general encouragement, a general sense of ... the direction we should go; and there are incentives in terms of finance and resources that support them.*

Thus, for many departments, an increase in the enrolment of doctoral students has become the norm and what is expected of them. In some, such as UWC Education, UP Social Work and UCT Law, the pressure is not on enrolment but on throughput. One department, UJ Education, did mention pressure from the university to increase numbers. The department is, however, resisting this and would rather try to bring numbers down and increase throughput.

In one instance a respondent believed that it was easier to expand at masters level than at doctoral level, a view that is likely to be shared by others as well:

> *It's certainly feasible at the masters level because there are more applicants and it's easier to deal with those than the doctoral students for a number of reasons. First of all, the doctoral students ... tend to be of a poorer calibre to those of the masters because, for example, they're maybe more mature [and] they've been out of academia for longer. So although they might have verbal and ... intellectual skills, there is a certain mindset they've lost because they've been involved with families and their careers and jobs. So simply because they're older, they tend to be more involved in their career development and therefore they're less able to devote time to their doctoral studies. The masters applicants ... tend to be a bit younger. The complexity of the requirements for a masters [are] far less than for a doctoral, so it's easy to handle. Also we have more staff that are able to oversee the masters supervision than at the doctoral level. So for all those reasons it's easier for us to expand the postgrad at the masters level, but there is pressure across the board.*

A sizeable number of interviewees held strong opinions about this pressure. Not all saw it as benign: although departments and individuals are encouraged or pressurised by their universities to increase postgraduate enrolment and PhD graduations in particular, many interviewees felt that

it came without an accompanying increase in resources. As one said, 'It is a monster that just demands more and more'. Concerns that increasing the number of PhDs would lead to a drop in quality were often raised during the interviews. Universities were frequently quite strongly criticised for a lack of support for such strategic drives, and for an absence of recognition of good individual or departmental performance in doctoral production. Generally we got the impression that only a few universities were perceived to give due credit to senior academics for the overall amount of work they put in: balancing research, teaching, administration, student development and particularly in developing and encouraging students from disadvantaged backgrounds.

> *I think the difficulty is the balance between different types of work. I think many academics are happy to supervise, but supervision is quite time-consuming and so there has to be a balance between that and coursework delivery: the actual teaching. And also the university requires quite a lot of administration. So in positions like mine, positions like this academic leader position, there are many demands on time and therefore the time available for supervision is contested time. And obviously people [also] have to do their own research. And although supervisions are related to your own research, they're ... a distinct thing. Directing and commenting on somebody else's work is not the same as just writing down what you do.*

This could be the underlying, more general explanation behind the perceived lack of incentives to supervise PhDs, discussed below.

Resources go beyond these matters, to a systemic level:

> *It's really a question of resources. The older model was individual initiative: research was a kind of hobby; research teaching certainly was a hobby as it was totally unaccredited. These things shouldn't really be personal initiatives. There needs to be a systemic base for supporting them within a department, within the faculty, within the university, within the national higher education system as a whole. There has to be an integrated set of supporting measures which work together to really allow this kind of rare initiative to ... be realised. It's just ridiculous that it's not. So there's something systematically wrong. The Research Chair Initiative is an excellent model. That is the model for creating a research culture. But the research chairs are not as well-resourced as they should be. But it does raise the question then of [whether] you want the system of higher education to be well-resourced, or only those selective and often politically selected areas of it [to be resourced]?*

> *Now my feeling is that if the faculty and university system really wants to promote PhD production – research production – it must put resources there. So the faculty needs to do something. But of course the faculty is reliant on the university. Now there we get to a version of the black box: the black box of what happens to the research funding, which comes in from the government in terms of PhD and scholarly production and ... goes out into the faculties and departments and the individuals concerned. How does that come to us in a way that enables the building of a research culture? So actually the old system is still in place because there isn't a proper articulation between national funding agencies and individuals, between universities and faculties, faculties and departments. It's just a mess, as I'm sure you've heard many, many times.*

And, from another university:

> *We feel a little bit [at] times we're struggling against a lack of cohesive response to the issue within the faculty ... I don't think it's faculty's response: I think faculty is doing quite a good job. It's really [a] lack of ... funding from the top. A lot of hot air comes from our administration about what we should be doing and it's not backed up by resources.*

More efficient models to produce PhDs?

The ASSAf study (2010: 16) found that 'the traditional apprenticeship model may not be an efficient approach for the purpose of rapidly increasing the production of doctoral graduates in South Africa'. There has been a proliferation in the types and styles of doctorates in the recent past, but this landscape is now well mapped out and broadly speaking five PhD models can be identified (Huisman & Naidoo 2006; Park 2007):

- The traditional research-based PhDs, often referred to as the British model;
- The PhD by publication via a series of peer-reviewed academic papers;
- The taught PhDs, often referred to as the American model;
- Professional or work-based PhDs, where the field of study is within a profession rather than an academic discipline; and
- Practice-based PhDs, typically awarded in the creative and performing arts.

We draw on Louw and Muller's (2014) literature review conducted for this project to describe the five models briefly.

The traditional PhD

This is the best-understood version of all pathways to the doctorate, with its roots in European mediaeval universities. It is based largely on a supervised research project and examined through a thesis, which often is defined in terms of an original contribution to knowledge. The mode of supervision focuses on the individual. The student typically works alone on the thesis, under the supervision of one or two senior researchers:

> *The objective is to deliver an original and significant contribution to the research literature in the field of study. A broad understanding of the field she/he is working in is often an additional criterion, as well as that the quality should be such that academic publication of the dissertation is likely.* (Huisman & Naidoo 2006: 6)

PhD by publication

The PhD by publication is based on a supervised research project but is examined 'on the basis of a series of peer-reviewed academic papers which have been published or accepted for publication, usually accompanied by an over-arching paper that presents the overall introduction and conclusions' (Park 2007: 33).

For Huisman and Naidoo (2006: 6), the PhD by publication is:

> *rather similar in terms of objectives and standards as the traditional PhD, but the process is different. The candidate presents a volume of academic publications. In the social sciences, the publications are often accompanied by an introduction and reflection.*

Introduced in the UK in the mid-1960s, this pathway to the PhD has been attractive for a number of reasons. Two major reasons are:

- The implementation of university funding models that reward publication and research student completions; and
- Pedagogical reasons for favouring publication by doctoral students. Kamler (2008) provided evidence suggesting that success in publication of PhD work is well correlated with subsequent scholarly productivity. This comes about as a result of closer institutional attention to the process, and skilled support from knowledgeable supervisors.

The taught doctorate

This is the North American doctoral model, containing substantial taught elements, often including research training. The taught elements are formally examined separately from the thesis. The thesis can be shorter

than is typically expected in the UK and Europe. According to Park (2007), this model entered the UK in 2001, where it is referred to as the New Route PhD.

Professional and work-based doctorates

This form of the doctorate also contains a substantial taught element, but:

> *the field of study is a professional discipline, rather than the academic discipline. Quite often, a variety of didactical tools are used in the educational process. Although research-based, the focus is normally more (or also) on application within the student's professional practice (reflexive practitioner)*. (Huisman & Naidoo 2006: 7)

The supervised research project is often smaller than the traditional PhD, is more applied, and is work-based or work-focused (Park 2007). The research problems investigated often emerge from professional practice and the students are typically experienced professionals. It also covers research in cooperation with enterprises.

Examples of such degrees include the Doctorate in Education (DEd or EdD) (one of the best developed of the applied or practitioner professional degrees in the USA and Australia), the Doctorate in Clinical Psychology (DClinPsy), and the Doctorate in Engineering (DEng).

The Doctorate in Business Administration (DBA) is a relative latecomer to the field, but Gill and Hoppe (2009) have shown that its presence at universities is on the increase. These authors identified 16 DBA programmes in the UK by 1999, and the initiation of 20 DBA programmes in Australia between 1993 and 2005.

It appears that the professional doctorate is the most prevalent alternative to the traditional PhD. It has proliferated, especially in the UK and Australia (Bourner et al. 2001). Although the USA offered its first professional doctorate in 1921, Nerad (2008: 279) emphasised that:

> *the primary purpose and goal of doctoral education (in the US) has been preparation of the next generation of university professors who will become productive researchers and innovators, and in turn become teachers of the following generation.*

Practice-based doctorates

For Park (2007: 33), the practice-based doctorate is:

> *based on a supervised research project, usually in the performing arts, where the output involves both a written piece (which is usually*

> *much shorter than the traditional PhD thesis, and includes both reflection and context), and one or more other forms, such as a novel (for Creative Writing), a portfolio of work (for art and design), or one or more performance pieces (for theatre studies or music). Both forms of output are examined.*

Huisman and Naidoo (2006) agree that this PhD is work-based or practice-based, and earned in the creative and performing arts. The exact form of this PhD is still much contested.

Practices in South Africa

Given the Higher Education Qualifications Framework prescribed by the Department of Higher Education and Training (DHET), it is not surprising that the traditional PhD model is used almost exclusively in these departments. Only one department, NWU Social Work, produces most of their PhDs by publication. They have done so since 2007 and now produce approximately 90% of their PhDs using this model. A maximum of five articles, and more usually four, are submitted. The SU Public Administration, Theology and Sociology Departments, as well as UWC Education, UP Social Work, NWU Education, UKZN Accounting, Economics and Finance and Wits Psychology, have produced a limited number of PhDs by publication. Internationally the jury is still out on this model. Badley (2009), for example, has found that papers discussing the use and value of the PhD by published work are still relatively rare.

The PhD by publication has been rejected in two instances: the faculty to which the UJ Psychology Department belongs has considered and rejected the degree by publication. The interviewee stated this was 'because it would undermine the integrity of the academic endeavour'. Wits Sociology Department is strongly of the view that only a PhD by dissertation provides the necessary academic challenge and rigour for students. It was thus not amenable to proposals to allow students to follow the PhD by publication model, even though it is followed by at least one other faculty at Wits.

The RU Education Faculty is in the process of discussing a professional or work-based Doctorate in Education (D Ed). UNISA Public Administration reported that they are phasing out their D Admin programme. Elsewhere, it appears that the professional doctorate is the most common alternative to the traditional PhD.

The UCT Economics Department has gone furthest in offering a taught doctorate by offering a degree by coursework plus a thesis. It offers a four-year, full-time programme, with two years devoted to prerequisite courses and two years for writing a thesis. The advanced courses are prerequisites to registering for the thesis but do not accrue credits. This programme is offered in collaboration with other universities in sub-Saharan Africa and

is supported by the African Economic Research Consortium (AERC) through donor funding. The UCT Economics Department thus offers a blend of the traditional model and the taught doctorate, since the coursework in their programme does not accrue credits. They indicated that since they introduced this degree, PhD enrolments have increased dramatically.

The current debate, at least as reflected by these 25 social science and humanities departments, is mostly about the traditional PhD and about strengthening or improving that process. Considerations on the design of the doctoral enterprise and on different routes to get to a doctorate are much less in evidence in South Africa than elsewhere in the world (see Park 2007). The exception is universities where PhD by publication is already allowed; most of the discussions at other universities are about this option.

Almost all the departments we interviewed are moving towards coursework of some kind, where coursework means formal courses that PhD students have to complete in order to continue with their studies. As indicated above, UCT Economics have gone the furthest in formalising a comprehensive coursework component.

Concerns about quality

A concern that increasing the number of PhDs will lead to a drop in quality was a recurring theme throughout the interviews. Universities were often criticised quite strongly for their lack of recognition of good individual or departmental performance in doctoral production. Generally, we got the impression that only a few universities were perceived to give due credit to senior academics for the overall amount of work they put in.

In a few interviews, especially in departments like law and accounting, the question was asked, 'Why do students who do not want to pursue an academic career want to obtain a PhD?' Part of the answer would seem to be that in some professions, such as psychology, social work and theology, there is a high demand for PhDs as they enhance professional status. In other professions, such as law and accounting, there is no incentive whatsoever. This may lead to a low number of PhDs in some faculties, such as in UKZN Management and Accounting.

Student preparedness

Universities everywhere fret about student preparedness for PhD studies. Respondents to this study provided answers that are largely in line with concerns raised in other South African studies. The ASSAf study (2010) identified the quality of incoming students as one of the primary barriers to

increasing the productivity of PhD programmes at South African higher education institutions. Studies from other parts of the world, such as Allan and Dory (2001, in Herman 2011) pointed to similar concerns about incoming candidates. One of the supervisors interviewed for this study explained what kind of skills and discipline students require:

> *[Students require the] ability to clearly conceptualise their projects as a whole, and the problem statement and purpose in particular, as well as to construct an appropriate focused ... theoretical ... framework in ... support of their respective investigations. [They need p]ractical skill with regard to gathering and analysis of valid and reliable data, and to ... synthesise their findings into coherent responses to the central problem statement and research question. Finally, students need to be able to come up with a realistic schedule of work, and need the self-discipline to stay with such a schedule, else they seem to struggle to keep up good momentum in terms of progress.*

Almost everyone interviewed talked about PhD students' writing or language skills. Many mentioned how students struggle with conceptualisation: they do not have the ability to convey concepts in writing. Indeed, the importance of writing as a factor affecting completion rates is widely acknowledged. Many respondents felt that this is where students struggled the most. It was often attributed to poor schooling or insufficient writing coaching at other universities. But there is more to it. Many interviewees mentioned the fact that students lack experience with academic projects and discourse. Some students have not really absorbed an academic ethos, one aspect of which is academic writing. Thus, learning academic writing becomes part of the PhD process.

But how do students acquire competence in academic writing? The finding of this study is that the current one-on-one model, where the supervisor provides the student with continuous feedback on submitted work, is the default position for bringing about writing competence. All supervisors expressed tremendous frustration with this aspect of their work. A second remedy, mentioned elsewhere in this chapter, is to enrol students in a writing centre or writing workshop. However, questions remain about how much of the academic project could be taught this way. Some supervisors try to overcome a lack of academic writing skills by giving preference to students who have already published at the time of applying for their PhD.

The first place where academic writing problems emerge is during the proposal-writing phase. Supervisors can see if students are struggling with the proposal. This raises an interesting conundrum as students have to

prepare and submit their PhD proposals at a point when their writing skills may be inadequate.

It is likely that two further shortcomings of PhD students mentioned in the interviews are related to language issues. These are the lack of prior reading in the field and the lack of theoretical rigour. Supervisors frequently see students who have not read sufficiently or in depth on the topic prior to presenting a research proposal. As a result, they are uncertain about theoretical frameworks that may be appropriate to their intended work.

Weakness in research methodology and a lack of understanding of how to do PhD research emerged as additional major deficiencies in student preparedness. As students are said to lack research skills, a frequent remedy is to arrange special workshops or courses in research methods (discussed elsewhere in this chapter). In the NWU Social Work Department, the issue is addressed via an entrance examination that focuses entirely on methodology. However, some staff interviewed said students did not understand the depth of engagement with data required for a PhD. Students also needed to be able to conceptualise their research question and their strategy for answering it. Supervisors clearly saw PhD research as a major transition and step-up for students. They explained that coursework often does not help with research methods.

The role of a coursework masters degree in preparing students for PhD research was seen as less than ideal in at least one instance:

> *And the MA by research has been ... fundamentally undermined by the taught masters because it's a much tougher degree. But the MA by research, if you do it, is a much better preparation for [a] PhD because of the style of work, and what you do when you're involved in it. And so I think that [is] the sense in which [the] MA by research has been devalued, and yet [it's] a much better indicator of, and more consistent with the style of work that you do for a PhD.*

> *And it's not just South Africa, I think there's a global trend. The MA has become quite seriously devalued, I think. So I don't think the research experience they get at MA level necessarily equips a lot of students, who are quite able, with the adequate background, to undertake what is a ... much more demanding [exercise].*

When advanced coursework is part of expectations, PhD students sometimes struggle:

> *I think the biggest challenge with the PhD students coming to do coursework is that they are often a little bit rusty. They haven't been doing masters for a while and they've been out of school for a while.*

> *And we then find that they come in for the coursework and they battle.*

Other factors mentioned include that prospective students don't have a good idea of the scale of their undertaking. They have a naive sense of what a PhD is, and of the commitment required to complete one. One supervisor said student commitment plays a role in his decision to accept a student or not. Lack of time and poor time-management skills also negatively affect student completion rates.

Student preparedness, or lack thereof, may be related to what Scott (2012) identified as the four major purposes of masters degrees. Only one of the four, the traditional, research-based degree with a strong disciplinary focus, is deliberately designed to act as a portal into doctoral education. The other three objectives are to complete undergraduate education, to provide conversion courses for students who want to switch fields, and to provide various vocational courses often leading to professional accreditation. These three objectives do not focus on the research skills required for PhD study; and it is likely that students completing masters degrees for these objectives may be identified as being underprepared for PhD studies. This was mentioned by a number of interviewees.

Difficulties experienced by specific groups

Social sciences and humanities at South African universities reflect an increasing diversity in their PhD student body. In 2009, for example, 22% of doctoral students at South African universities came from other African countries. As the interviewees indicated, the vast majority of these students study part-time as they already work full-time. Law and Public Administration were particularly good illustrations of this.

Two challenges, provided by different groups of students, stood out: funding and language.

Students from other African countries, in particular, struggled to obtain sufficient funding to support their studies in South Africa, especially if they are full-time students. UP Theology has asked for funding for a PhD house for African students as they believe that, with such a facility, they could add another ten students from Africa. Funding issues often intersected with personal difficulties as these students' families back home are also making personal sacrifices.

Language provides some interesting challenges for departments. The SU Theology faculty, for example, attracted quite a few students from South Korea and they often struggled with English. The PhD students in the UCT Law Faculty who come from Portuguese- and French-speaking African countries were in a similar position. Wits Political Studies had two French-speaking academic staff members and this helped with the language issue

in their department. South Africans who have not attended Model C or private schools are reported to be very weak in English language, particularly in grammar and sentence construction. Academic language, with its nuances and understated style, adds to this complexity, especially for students choosing qualitative research methods for their study.

The majority of PhD students at South African universities are studying part-time. A number of departments raised this as having its own challenges, mainly in terms of time commitments and funding. Students also often study at a distance from the university, which is not perceived as ideal. The NWU Social Work Department had a slightly different take on this: although most of their students were part-time, they were also older, in their 40s or 50s, and this made the process smoother as they were clear about what they wanted to achieve and had fewer home commitments.

Only one department, UKZN Religion, mentioned a residence requirement that they instituted recently. This was introduced as a remedy for the distance element in PhD studies and to ensure that students could spend time in the library and work closely with a supervisor. Other universities may also have such a requirement.

The UCT Economics Department, which has gone the furthest in formalising coursework, mentioned an unexpected drawback they have experienced. Many students have been out of academia for a period and so their knowledge of the discipline was rusty. These students sometimes found the high-level coursework difficult.

Postdoctoral positions

The study enquired about postdoctoral positions in these departments, as these are often considered to add significant value to the department concerned, as well as the PhD programme. Views varied quite dramatically: some respondents were disinterested, others knew little about it, and a third group both knew and were enthusiastic about postdocs. Those who were sceptical about postdoctoral positions saw them as part of a science model unsuited to the humanities. Perceived obstacles were that, until recently, it was not possible for supervisors to appoint their own students to postdoctoral positions; students often needed to earn money once they have graduated; finding office space for postdoctoral staff was a challenge; and where PhD students work full-time it was not feasible to offer many such positions.

Postdoctoral fellows are funded mostly by either the university concerned or the National Research Foundation (or both). With a total of ten, NWU Education had the largest number of postdoctoral fellows. Expectations differed: some departments, such as NWU Education and the UKZN Departments of Accounting, Economics and Finance, required staff

in postdoctoral positions to produce a paper for each year they spent there. UP Theology expected staff in postdoctoral positions to produce four journal articles per year and to assist with PhD supervision tasks such as reading first drafts of PhD chapters.

Efficiency: Improving performance and completion rates

A significant part of the interviews enquired about steps participating departments took to improve their performance in terms of reducing student dropout and increasing completion rates. These practices are presented below as a series of chronological steps in the PhD process, from the early phases in the process, such as the recruitment and selection of students into the programme, to submission of the thesis and graduation. Of course, the final logical step of doctoral education is the transition to a career, but that would require another study in itself, and is thus not included here.

Selection or acceptance of doctoral candidates

Ideally, departments aspire to admitting highly qualified students who will complete the doctoral programme within the expected time frame.

Up to now, departments have paid relatively little attention to the beginning of the PhD process of how students are recruited and selected into the programme. This is rapidly changing in a number of departments, as a refined selection process is expected to result in improved throughput. Wits Political Studies and the UFS Theology faculty stated that in the past they had accepted virtually everyone as PhD students but that this has changed in the past five years. Where departments had introduced changes to general practices in the past five years, this was particularly evident in changes to selection procedure. Those introducing changes had carefully considered their entrance criteria and selection procedures and would only admit students who met these requirements. UCT Law, for example, has introduced a strict selection process. They proposed advertising ten PhD positions in areas where the Faculty has capacity. Students are selected on the basis of their ability and the availability of a suitable supervisor. Selected students receive exemption from registration fees. This process addresses the selection of PhD candidates, their supervision and their student funding concurrently.

Some departments have included a minimum pass mark at masters level as a criterion for selection into their PhD programme. Wits Political Studies, Wits Psychology and UCT Political Studies require a 70% minimum pass in the masters degree. NWU Social Work requires a 68% minimum pass and UP Social Work a 65% minimum pass.

The NWU Social Work Department has formulated specific, explicit application and selection procedures. A key component of these is a formal entrance examination. Students contacting members of staff are referred to the head of department for a discussion. A document about the envisaged research, containing a preliminary title, the problem statement and the aim, is submitted to the department head. All prospective postgraduate students need to write an admission examination based on a prescribed methodology text and additional readings. Admission examinations are written four times in a year. Prospective students have only two opportunities to write the admission examination. Students who have passed their masters thesis with a minimum of 65% within the last three years are exempt from this rule. A research proposal must be submitted within six months of registration. A departmental committee considers and approves the proposal or refers it back to the student. If a student fails to submit a research proposal before the end of their first year of registration, their student registration is terminated. The maximum period of study for a PhD is four years, regardless of whether this is full-time or part-time.

Nearly all departments indicated that they are selective in taking in PhD students. One exception was UNISA Public Administration, which accepts most applicants and had 365 registered PhD students in 2012. Usually a small postgraduate or doctoral committee reviews these applications, as is the case for NWU Social Work discussed above. There is some variability in terms of how strictly applications are channelled through these committees. With UCT English, UP Public Administration and SU Sociology, the committee is the only route into the PhD programme. Wits Psychology screens candidates by requiring them to submit a portfolio of work to a minimum of two committee members as well as to the suggested supervisor, after which they will be screened by the head of the committee. At UWC Education, the advice of the prospective supervisor is taken into account alongside the more formal screening procedures. If a supervisor accepts a student, the committee accepts the supervisor's decision.

The RU Education faculty has adopted a novel approach to addressing both student preparedness and selection. They have introduced a pre-doctoral programme to allow students not yet ready for PhD studies in a particular area to start the process. Participants are given access to university facilities and are expected to undertake two long assignments during the programme. Support and feedback is given on these assignments, which then form the basis of a doctoral proposal. This pre-doctoral programme is, however, no guarantee of admission into the doctoral programme. The UFS Theology faculty and UNISA Public Administration have similar requirements. Their students are required to spend a year working on a proposal before they register. Proposals are then carefully scrutinised and must fall within an available supervisor's expertise. UCT English are

considering a similar strategy with the possibility of introducing a year of pre-doctoral studies. UCT Political Studies sometimes uses provisional registration whereby students are given six or 12 months to work on a proposal while attending other courses. UP Public Administration described this as the Ethiopian model. Students in the Ethiopian model are given a one- to two-year intensive pre-PhD training, and are then allowed as much time as they need to complete their PhD. Students at UJ Education who apply for a PhD are allowed to work with a supervisor for six months before submitting a preliminary proposal. If they cannot do so, they are not considered for a PhD. Once accepted into the PhD programme, they have nine months to write a proposal that must be approved by the faculty committee. UJ Psychology also uses a preliminary preparation process. Once the department accepts a candidate's application, the candidate must work closely with a supervisor before applying for registration.

One department that does not have a pre-doctoral process made the following observations about the potential for one:

> *[W]hat [would] be a very good idea [would] be to have a pre-registration year in which students do advanced graduate work across a range of specified courses. That would mean that those courses would have to be there as part of the research culture of the department. And that might include things like practical things like grant applications ... but also just raising the level of students' cultural capital to the level which it should be for them to become doctoral students. If we want to really have internationally competitive PhD production, [then] because of the historical particularities and specificities of our situation, there needs to be at least a year of carefully thought-out and conceptualised ... pre-doctoral work or pre-registration. I think that will have huge dividends in the ultimate completion of PhDs within a time frame and better chosen research topics. Because, as we found even in our little process of working through the research committee, it has helped students enormously to engage a little bit. But to do that systematically would be ... the key to really helping create a research culture.*

Wits Psychology has a recruitment strategy and a selection process for attracting PhD students. There are websites with clear and accessible information on the benefits of pursuing doctoral studies in the relevant department and step-by-step instructions for submitting doctoral applications. Other departments have also thought about recruitment. UP Public Administration, for example, recruits actively from its masters classes.

Wits applications require a full academic transcript, a copy of the masters research report or dissertation, examples of previous research and

publications (where possible), and a concept paper relating to the proposed research. The following criteria for evaluating the proposal were noted at Wits:

- The applicant should have obtained a minimum of 70% in a masters degree at a South African university;
- The applicant should demonstrate above-average capacity on the compulsory fields in the evaluation sheets; and
- There is supervisory capacity in the proposed topic of the research.

If accepted, the candidate is expected to present a proposal of acceptable quality to the committee within six months of registration with the faculty.

While many departments have some element of this approach, Wits' approach is the most systematic and detailed. Not surprisingly, the research proposal is central to the application process described by all departments. Many have a two-step process consisting of the student first submitting an initial concept paper (the Wits Psychology term for this) and then later submitting a full proposal to serve before a thesis committee. SU Sociology calls the initial concept paper a pre-proposal.

The UP Social Work Department screens proposals similarly to Wits Psychology. Proposals are read by two blind-reviewers from the department. These reviewers consider criteria, including the following:

- The knowledge gap justifying research in the field;
- The research focus area in relation to the department's priorities;
- The feasiblity of the study;
- The ability to write in a scholarly manner (also explicitly mentioned by SU Theology); and
- The available expertise and human resource capacity in the department to supervise a study (also mentioned by most interviewees).

Feedback from the reviewers is given anonymously to prospective students. After feedback, candidates can immediately begin work on a second draft of their research proposals. When prospective candidates do not meet the criteria, feedback is provided and the candidate is allowed to submit a second time. Should their second attempt still not meet the minimum requirements, the candidate is refused acceptance into doctoral study.

UP Public Administration and UCT Law conduct interviews with prospective PhD candidates together with the written application. Many departments ask for CVs and some, such as UCT Law, also ask for referee reports.

Three observations follow from the study findings. First, admission to doctoral education in the departments interviewed ranged from the strongly

regulated to informal and unregulated. Eligibility, selection criteria and admission procedures were frequently not transparent (with certain exceptions mentioned above), and they varied as much as the requirements for admission. In international literature this is often linked to the model of supervision. In the apprenticeship model, widely followed in South Africa, the model of supervision is informal and unregulated. In this model, students do not do coursework and choose their own thesis topics, but have to find a supervisor who accepts the task of supervision and helps with identifying the chosen topic. As departments moved more towards to a programme model, the procedures tend to become more regulated and contractual.

Second, the mere act of streaming the PhD into research clusters or niche areas had knock-on effects in many aspects of managing the PhD process. Here we can see how structuring a department in this way draws attention to supervisory capacity, the selection process itself and the criteria applied.

Third, as stated above, all departments were aware of the call to increase the number of PhDs in South Africa. Despite the fact their selection criteria and admission processes differed, they had all admitted more students than they would have liked due to the pressure to increase the number of PhDs. UFS Theology identified this as a tension they experience. Additionally, as supervising PhDs has an impact on incentives and holds consequences for promotion, it is very difficult for academics to be dismissive about this. The aim of increasing numbers of postgraduates to 30% of the overall student population was frequently mentioned. Interviewees were definitely aware of the tension between increasing PhD student-population percentages and the strategy of accepting only top students and producing PhDs faster and more easily, and with more publications. The NWU Education faculty is following this route: they are reducing the intake into their PhD programme to improve throughput, although they are aware of the potential drawbacks. The dilemma of quantity versus quality is well illustrated in the UKZN English Department. They experience almost no challenges with PhD students as they only admit students into a PhD if their English is excellent. However, the concomitant problem is that they have almost no students.

The alternative is to uphold a developmental obligation – referred to as transformation in some circles – by taking in students who are not ideal candidates for PhDs as they require much time and effort, but who will learn a great deal and make a lot of progress, certainly contributing to the country when they finish. This tension was present in every department interviewed. In some of the interviews, respondents expressed anger at the irreconcilability of the two goals of transformation and large numbers of PhDs set by the DHET. Transformation often requires a lot of effort from supervisors or departments and to provide this for increased numbers of

students appears impossible. This exasperation is further compounded by a perceived lack of recognition for achievements by both university and national authorities with the emphasis rather always falling on what is still to be done.

With regard to the perceived quality of doctoral applicants and candidates, two departments stated that their applicants were sub-standard and that this had resulted in them having to cut down on the number of PhD students admitted. A number of other departments implied that they had the same challenge. The Wits Political Studies Department explained that their high PhD throughput rate was, in large part, due to the rigour applied when admitting PhD students.

Funding

Students

Many studies have found that funding is an important issue for doctoral students everywhere. Ehrenberg et al. (2010) found that attrition rates and the time taken to complete degrees are most improved by extending multi-year financial support to students, including tuition fees, scholarships, state grants, part-time studies and paid teaching positions. The overall findings of this study were that the insecure financial situation of doctoral students contributes to high dropout rates and increases the time needed to complete the degree. As one interviewee said:

> *There are issues of economic stability: people needing to be employed and earning an income and having people to support whilst still trying to do a PhD. And in fact most of the people fail to complete, some to complete at all, some to complete on time, because they are holding jobs and then they delay, so they are not putting all they should be putting into work.*

Eggins (2008) reports on the frequent involvement of governments in funding doctoral study by making grants to institutions or students. In some countries, such as Australia, Canada and the Nordic states, doctoral education is free. In others, the fees are sponsored by a range of stakeholders – research councils, institutions, employees and individuals. Loans are available in Thailand and Japan. In the United Kingdom, doctoral students and particularly those studying on a part-time basis frequently fund themselves. One complaint raised in this study was that the public funding provided in South Africa was so low that candidates could not afford to undertake research.

In many departments, lack of funding emerged as a major obstacle to PhD enrolment and completion. Departments with funding sources

reported more enrolments. UKZN English stated that increasing the number of postgraduate bursaries was the most helpful contribution the university had made in support of PhD study. UCT Economics launched its four-year programme with external funding via the African Economic Research Consortium (AERC), which allowed them to increase their enrolments substantially. All PhD students at NWU Social Work either have university bursaries or National Research Foundation (NRF) bursaries, and they estimated that they would have an 80% graduation rate over four years. The NWU Education faculty awards three merit bursaries to PhD students per year, covering fees and a decent living allowance. UP Theology provides bursaries that fully cover the fees for PhD students after they found that giving partial bursaries (50%) proved futile as students could not afford the other half. UCT English is attempting to integrate the PhD application process with the funding application process. UCT Law is able to waive registration fees for successful applicants due to external funding. UKZN Religion ascribed their growth in student enrolment between 2001 and 2004 to increased funding. At UKZN, incentive schemes for attracting postgraduate students include waiving fees and non-taxable research awards. Wits Political Studies utilises a Mellon-funded 'Grow-your-own-timber' programme to provide finance for students and incentives to supervisors.

Wits and UKZN have introduced different financial incentives for PhD students. If students are able to graduate by the end of a specified year, they are given an additional grant of between ZAR 20 000 and ZAR 30 000 for additional time to review their writing and finish their dissertation. One of the interviewees thought this was a good initiative for improving completion rates and providing students with the resources to do so.

An interviewee suggested the following possible improvement:

> *I think the best thing that ... can be done [nationally] is to move towards a kind of financial packaged programme. People have been talking about this now for quite a while. It's not realistic for the university to grow its graduate numbers without there being financial packages, financial support for graduate students. At the moment it tends to be the universities making these initiatives on their own or trying to find some kind of international foundation to support the initiative, but a state-backed initiative would be crucial; and it would have spin-off effects for the whole of the country in terms of the impact of better qualified citizens. We could be creating a lot more doctorates to feed into South African higher education institutions and create general diversity. It's about the structure of opportunity that is put in place for people.*

An Australian study by Sinclair (2004) supported this argument. The study found that across university types and disciplines the likelihood of completion was enhanced by a scholarship. In addition, full-time candidates were more likely to complete than part-time candidates.

The PhD Completion Project (Council of Graduate Schools 2004) identified the following positive practices in financial support of PhD students:

- Guaranteeing multi-year support via the allocation of funding to departments;
- Providing competitive travel grants to support students invited to present at conferences;
- Promoting graduate student applications for external fellowships and providing staff assistance with proposal development and submission;
- Holding supervisors to strategic performance indicators of satisfactory degree progress; and
- Developing best practices to track student progress and financial aid amounts and types.

We found that many departments, and supervisors in particular, did not have information about bursaries and scholarships readily available. Most relied on their universities' postgraduate funding office instead to assist students with information on funding options. However, this strategy only works if the postgraduate funding office functions efficiently and communicates well with students.

Research

Departments trying new ways to create and support a research culture pointed out that most efforts are due to individual initiative, and that university-allocated resources to assist with PhD production and research production are too limited. Where support is provided, it is often done via external funding through education-focused charitable groups like the Mellon Foundation. Although this is good, the danger identified is that this support is not part of the university system and that it could disappear rather quickly.

Administration

Monitoring the progress of PhD students

At most universities, monitoring is done via an annual progress report prepared by supervisors, either online or in hard copy. Wits Psychology reported that the faculty keeps students to a tight deadline with the first

draft of a proposal expected within six months, and annual progress reports by both student and supervisor submitted to the faculty. The PhD convener follows up with students every six weeks. The NWU Social Work Department indicated that their faculty, the Health Sciences Faculty, follows a stringent progress-monitoring process, issuing first and second warnings before deregistering students who have not progressed. They also stipulate that proposals must be completed one semester after registering. The NWU Social Work Department estimated that 80% of PhD students graduate within four years. NWU Education provides a great deal of training in the first year of the PhD. However, if students have not completed their proposals within their first year, their enrolment is terminated. The UP seems to be the strictest in this regard: students have to complete their PhDs in three years or else they are deregistered (with special consideration given for exceptional cases). The UP Social Work Department uses a progress form with codes indicating progress levels, similar to that used by UP Faculty Administration, to indicate annual progress. The intention is that supervisors complete progress forms biannually and submit these to the head of the department.

RU Education includes progress sessions in their doctoral weeks. The administrative load that this involves is often not recognised:

> *I would like to see that the heads of the department taking charge of the supervisors within that department and have regular meetings with them ... just basically to remind them. Because you see what can happen with a doctoral student very easily is that you continue with your daily work and the doctoral student is not really on your mind. And then six months later, another student turns up again. The responsibility [is] to a large extent on the student and what I would like to do is just to instil the sense that we have to manage the process more closely. And I would use the HoDs to assist in doing that. The other thing that is a problem is funding, but I would like to have [someone] like a retired academic who can actually almost be like a guardian for the doctoral students and who can call seminars and get the supervisors together, and so on. So it's not going to cost the university that much, but I think, if you can get a person who doesn't have other administrative responsibilities, that would be the way to go.*

Graduate schools

A number of universities including UCT, Wits and UNISA have introduced graduate schools as an organisational model for administering PhD students. This was not explored in the interviews. Park (2007) identified graduate schools and doctoral/research schools (Crosier et al. 2007) as a

major development internationally. Graduate schools include doctoral and masters students. They provide administration, ensure developmental and skills support, are responsible for quality assurance, and organise admission, courses and seminars. There is great variability in the form graduate schools take: from the virtual to the physical, from the institutional to the faculty-based. Doctoral/research schools admit only doctoral students and may be organised around a particular discipline, research theme or a cross-disciplinary research area. They may involve anything from one institution to several institutions in a network.

Departmental and institutional support

The ASSAf study (2010) found that one of the major risks of non-completion or attrition of doctoral candidates in South Africa is due to inadequate socialisation experiences. Golde (2005) quoted research suggesting that lack of academic integration rather than social integration into a department is the key to doctoral attrition. Socialisation has become the common theoretical framework used to better understand the complexity of the doctoral student experience. In the natural sciences, this is encouraged through the nature of the research: often laboratory work is conducted in groups, with additional collective work on joint publication of papers. Doctoral students and research in the humanities and social sciences usually functions much more independently and individually, with less collaborative authorship.

Clear expectations when students start the process

Evidence from other studies has shown the importance of stating clearly, at the outset, what students can expect. This includes timetables for satisfactory progress and expected time to completion. Ehrenberg et al. (2010) found that clear expectations have the greatest impact on completion rates. This would usually include clear and unambiguous information about university and faculty regulations, guidelines, paperwork and the structure for completing the PhD. We found that most departments interviewed provided students with little of this information, ranging from students receiving only the university's general guide, to a memorandum of understanding (MoU) signed by both the student and supervisor and lodged at the faculty and/or university level. Departments felt they were improving in this aspect and that they were exploring new ways of providing students with positive first experiences:

> *We're getting slightly better. In the past I think we weren't so good at it ... We've made the application date earlier ... and that gives us more time to organise our lives: to give the letters of acceptance*

> *quicker, to get them funding more efficiently. They then have time to do their visas. The housing has been a crisis of major proportion in the past and we haven't had too much trouble for two years now, but up to three years ago, it was ... not very cool. When they come, we have lunch with them ... and we have a bit of a chat [and] a library tour. There is a sort of a social aspect to it as well that is [developing] organically. So we have one of our other masters students do this tour with the students ... We have introduced a mentorship programme where, once in a while, probably once a quarter, possibly twice a quarter, in principle an academic gets allocated to a student, have lunch together and ask him (sic) what's going on. I'm not sure if that's quite working out. I think we want to have that a little bit fleshed out. So there is thinking about how (we) can make it better for the students just to get involved in the department. We are fortunate in that all the PhD students sit in the same lab and we've got a lab of 36 seats ... There's place for growth, so we can go to 40, I think.*

In a few cases, supervisors developed their own, stricter and more detailed MoU with their PhD students. UKZN Religion requires students to sign a contract. UP Public Administration also requires students to sign a contract and deregisters students if they do not submit work as agreed. This raises a general question about what the consequences are when a student does not meet the requirements.

> *We have the MoU in place. Does it always work exactly as it should? What happens if there's poor performance? Often there's an explanation for it, personal or otherwise. I have not seen very many people thrown out of the programme because they didn't meet the requirements of the MoU. The promises that get made at the beginning of the year are often quite substantial. So sometimes students meet them but often they don't, and then there could be a variety of different reasons: family, personal, whatever.*

Lack of student orientation at the start of the PhD contributes to a lack of clarity in expectations. The traditional model for PhD study, as followed by everyone in our sample, is so highly individualised that almost no effort is made to orientate students at the beginning of their studies. The exception is RU Education, which offers an orientation in the form of a doctoral week in March each year. Many departments use their university's online learning platforms for students to introduce themselves. We expect that the growing number of enrolments at many departments will make student orientation more important in future.

Support provided to PhD students

Park (2007) identified an increasing emphasis on skills development and training in PhD studies in many countries; it is now standard to include both research and skills development and training in the overall student experience. Departments involved in this study tended to have little formal support to PhD students. One department, NWU Education, stated that both they and the university itself provide PhD students and supervisors with much support. One feature of their additional support is that attendance is compulsory. This statement summarises the general view across all interview sites:

> *Doctoral studies, however, remain a lonely route. Students are easier linked on masters level in group discussion because of group cohesion, especially in coursework programmes.The faculty [and] university should do much more to strengthen departments' hand in supporting doctoral students.*

One area in which departments provided some support is in writing. This is unsurprising given the shortcomings identified with writing. In some cases, departments organise annual writing workshops. More commonly, departments make use of writing centres at their universities.

Respondents frequently mentioned courses in research methods. The exception was NWU Social Work because students are selected via a methodology examination, so they have to have a strong methodology knowledge base already, and thus no further methodology courses are offered.

Most departments organise formal doctoral seminars, of which the three doctoral weeks arranged at RU Education are the most systematic example. These weeks at RU comprise seminars, workshops, debates and presentations on a range of issues, among them methodology. SU Public Administration and UKZN English have an annual doctoral workshop or seminar, or annual research day, where PhD students present their proposals and findings. NWU Education runs compulsory development and training workshops two or three times per year that include academics from other local and overseas universities. UJ Education PhD students must attend two compulsory doctoral colloquia. The faculty also runs an annual voluntary Research Indaba for PhD students, with a prize for the best presentation. Where departments have formed research clusters, such as at UCT Law and RU Education, they hold regular meetings or sessions for cluster members. UWC Education also has regular sessions on Saturdays for their students in Science Education. UKZN Religion runs a parallel process of one lecture a week of teaching alongside doctoral work. Foreign students at UKZN Religion, such as those from Francophone

Africa, are required to complete an English course before registering. Most departments include doctoral students in events organised for postgraduates in general. These events include training in research and library skills, how to apply for funding and other topics, and lunchtime seminars.

PhD students are encouraged to submit papers to conferences. This enhances students' professional development and encourages collaborative work. UWC Education provides assistance to students in presenting their work as papers at conferences. Students at NWU Social Work are encouraged to attend and read papers at conferences, and funding is made available for this purpose. UCT English provides specific assistance on how to convert conference papers into publications. UP Public Administration reported that PhD students are all encouraged to co-author papers and attend conferences. In 2012, all staff and PhD students at the UP Public Administration School attended the conference of Schools of Public Administration in Bangkok, which was made possible through external donor funding.

UP Social Work follows a slightly different route. They organise a doctoral student presentation before students submit their doctoral theses. During this seminar, held in the final stages of study, doctoral students present their study findings and conclusions. Experts in the research field and academics are invited to the seminar to provide final expert input before the study is concluded.

Wits Psychology has made presentation of work prior to evaluation one of their key interventions to increase the quality and quantity of PhDs. They recommend mandatory monthly seminars, annual symposia, annual writing retreats and supervisor workshops to support this process.

One of the ways in which support can be improved is when students encourage each other through formal departmental or informal student working groups, but this strategy was not found much in this study. Respondents felt that the nature of PhD work in the humanities and social sciences, the high numbers of part-time students, and the number of students working at a distance from the university contributed to students' isolation. At UWC Education, PhD students in Educational Psychology are formally organised into groups that meet regularly. RU Education reported that in one of the niche areas, Higher Education Studies, students have formed regional support groups in Cape Town, Johannesburg and Durban. RU students also use the online learning platform to engage in debate, share readings and provide support to each other. At UJ Education, some networking ensues from support provided by one of the departments to science teachers, and some from weekly Saturday morning methodology and writing courses for the first six months after registration. UKZN Religion organises a weekly lunchtime Theology Café with research presented by staff and visiting academics, often from overseas. In the Wits

Political Studies Department, PhD students organise their own forum where they present their research and listen to invited speakers.

In a few interviews, people mentioned how useful it would be to have communal workspaces for students in their departments. Others who already have such spaces confirmed their value. The NWU Social Work Department makes two rooms available for the exclusive use of PhD students. Students who come from far afield are encouraged to come in to the Social Work Department to work for a week at a time.

In a number of interviews, the poor level of functioning of the postgraduate office at the universities was mentioned. Although only a few departments explicitly complained about this, it was implied by a number of others. It should be noted, however, that it was frequently expressed in terms that suggested that supervisors (rather than heads of departments) had a tenuous understanding of how these offices work and what they offer to students.

Supervision

The work of doctoral supervisors has emerged as an issue of concern in higher education internationally. In the USA, for instance, the Carnegie Initiative on the Doctorate, led by the Carnegie Foundation for the Advancement of Teaching, identified supervisors as pivotal to any effort to improve doctoral education (Golde and Walker 2006). As part of the Bologna Process, the crucial role of supervision was recognised in a ministerial agreement on the Ten Salzburg Principles on the Doctorate (Golde and Walker 2006). At the inaugural meeting of the European University Association Council for Doctoral Education (EUA 2007), one of the five themes identified for doctoral training in Europe was improving the supervision of PhD candidates, particularly through better training and monitoring of supervisors. The recent Mellon-sponsored report (Ehrenberg et al. 2010) has sustained this critical attention. As the Mellon report also shows, the mounting anxiety around supervision seems to be tilted towards the humanities and social sciences; concern about supervision of the natural and applied sciences is far more muted (Ehrenberg et al. 2010). As we show later in the study, all modifications to doctoral supervision are in effect modifications to supervision in the social sciences and the humanities specifically, whereas supervision in the natural sciences continues in much the same vein as before.

Various policy changes have intensified the demands on supervisors' time: here, in Europe and elsewhere (EUA 2007, QAAHE 2004). These policy changes included a shift to a new form of managerial regulation known as the New Public Management. This management system features regular performance reviews of supervisors, multiple supervision

arrangements, requirements for continual professional skilling, and output-based funding. These factors have in turn increased the requirements for supervisors to monitor PhD students and report on their progress to curb attrition and shorten the time for completion of a PhD (Neumann 2007). Increased demands for satisfactory performance via improved productivity are coupled with an effective reduction in staff numbers due to the economic downturn. This has made the traditional model increasingly unsustainable in the humanities and the social sciences because, if the years to completion are seen in financial terms, it is plain that the model is grossly inefficient. Student-funding regimes across the world have pegged funding at three to four years. While this has further increased the pressure to complete PhDs within this time frame, there is the simultaneous recognition that very few students finish within this time frame (EUA 2007).

Neumann (2007) argued that this pattern has had two principal effects in the Australian system. The first is a perverse effect. The traditional pattern has been for students progressively to define their research topic, refining it through an iterative process that was traditionally leisurely, depending on the candidate's progress and confidence. With the new funding regime, Neumann (2007: 465) revealed a distinct downsizing in both scope and ambition of doctoral projects: 'the effect in the humanities and the social science-based professions is to encourage less ambitious projects in terms of scale'. The new funding regime has thus brought a distinct curb on innovation in Australia. This may conceivably account for at least some of the concerns expressed about quality in the South African system.

The second effect is to look for ways to build in multiplier mechanisms or to maximise supervisory expertise and the productive inputs to students. This can be done in one or more of the following ways:

- Seminar programmes;
- Taught courses, often in a summer or winter school format; and
- Cluster supervision in varied cohort formats, trying to adapt the laboratory-based model to different disciplinary requirements.

All of these are attempts to ease the time pressure on academics.

The result in Australia has been that for students, the supervisory relationship has become more formalised and the demands more diverse and intense, and for supervisors, the requirements are likewise more formalised, but the workload has not noticeably decreased. Of most concern is that students reported less productive supervisory contact compared with their experience in their honours and masters years (Neumann 2007).

It is not surprising that there are signs of the pendulum swinging back from these augmentations in the supervisory job which, as the above findings suggest, are not sustainable. At the 4th Annual Meeting of the EUA Council for Doctoral Education held in June 2011 in Madrid, the focus shifted back from the supervisors to the students and their responsibility. Reminding readers that the aim of the doctorate is to 'nurture the innovative research mindset', the communiqué for the meeting added, 'Achieving this mindset requires the development of a high level of autonomy and critical thinking as well as the ability to think independently and creatively about highly complex issues' (EUA 2011). The argument is that regulation of doctoral education might be reaching a ceiling and that the discourse is moving towards putting the onus for the doctorate back on the student and at least partially away from the supervisor. The issues of attrition and lengthy time before conclusion then become the fault of the tardy student rather than the supervisor or institution.

These themes are all recognisable in the concerns raised by heads of departments and supervisors in the interviews.

Support provided to supervisors

The preparation of supervisors and supervision arrangements themselves have become increasingly formalised. The interviews made reference to efforts to improve the quality of supervision via workshops and seminars, with many universities organising postgraduate supervision workshops. A couple of departments conceded that they did not really provide such assistance to supervisors.

Inexperienced supervisors initially receive additional support via co-supervision with a more experienced supervisor. However, given the amount of supervising experienced staff members are required to do, they are often not enthusiastic about taking on extra co-supervision. Another mechanism is mentoring, but this seems to be rather unsystematic and vague.

The Netherlands University Foundation for International Cooperation (NUFFIC) is funding a project to develop postgraduate supervision involving RU, UCT, SU and the University of Fort Hare (UFH), with Rhodes as the lead partner. The South African group is partnered with a consortium involving the Free University of Amsterdam. The group is trying to develop an accredited open-source course for supervisors. The course, organised in four modules, will carry 30 South African Qualifications Authority (SAQA) credits. Universities would be able to accredit it using their short-course policies. The development of the course is the first phase of the project. The second phase, involving rollout to 19 universities to make the course available in South Africa, was scheduled to run until the end of 2014.

Experienced supervisors usually receive minimal attention, apart from invitations to attend the general workshops mentioned above. One respondent commented on the likely experience of supervisors:

> *I [have] had quite a number of doctorate students going through my hands up to now, but nobody trained me. What I know is what I learned the hard way by doing it myself.*

Students and supervisors coming together

We asked supervisors to describe how PhD students were allocated to them. Unsurprisingly, reputation was mentioned as the most recognisable factor. Some universities, notably UCT, mentioned the role of the university's reputation in attracting students. The ASSAf study (2010) found that half of doctoral students selected particular PhD programmes or institutions based on the research focus of departments or programmes. Other contributing factors are the reputation of particular supervisors at the institution, the perceived quality of the programmes or departments, financial support offered, and whether the masters degree was completed at the same institution.

In terms of the reputation of the supervisor, promising applicants are usually familiar with the supervisor's work. One reputational aspect is the throughput rate supervisors achieve for their students. UKZN interviewees said students pick good, reliable supervisors who meet with their students regularly, give quick feedback, and provide information about available grants and bursaries. The RU Education faculty specifically mentioned the Mathematics Education Programme. This programme facilitates an easy transition from masters to doctorate, and has developed a national and international reputation as a good career trajectory. UCT Economics mentioned its recognised strength in the research focus areas, including the good reputation of its supervisors.

Research focus areas are clearly important to students. Departments with research focus areas are popular study areas at PhD level. A characteristic of such focus areas is that they involve longer-term projects as in the science model. This in turn generates recognition which helps to attract students. Focus areas also make it easier for students to identify where their interests overlap with potential supervisors' research fields or fields of expertise.

The Wits Psychology Department referred to the following reasons for its acceptance of PhD students, as well as reasons why students wish to study under a particular supervisor:

- The area of expertise of the supervisor: content and methodology;

- Students discuss it among themselves and rate certain supervisors as more reliable than others;
- Supervisors have worked with particular students from honours to PhD;
- Supervisors may approach students with particular interest areas or expertise to work on chosen research projects (also mentioned at UP Social Work); and
- Supervisors' work is shared through reading groups (of which there are many in Gauteng) for continuous professional development (CPD) points in the psychology profession.

Departments that have structured their programmes using strong research niches reported that students responded positively to this. RU Education confirmed that students apply because they like the structured programme with its support and sense of community.

Some departments offer funding packages to students incentivising them to do well. UCT Economics and UCT Law follow this route. Answers to the question on how many applications were turned down varied considerably, from 'none', 'not so many' to 'at least 20' over the last two years. Supervisors and departments had a tendency to turn down more applications than they accepted, with some cases of only a third of applications of enquiries resulting in accepted PhDs. In most cases, students from outside South Africa were turned away.

Criteria for accepting students

Supervisors were generally in agreement about the factors they take into account before accepting a PhD applicant. Reasons included knowledge of their field, evidenced by whether students have read widely, are able to identify the central issues in the field and can talk critically about them. Ideally, some supervisors would also like to see that a student is an active member of that particular knowledge community:

> *Quality of the student, not in the sense of only taking excellent students but in the sense of thinking that the student has a real shot at the degree.*
>
> *Their area of interest.*
>
> *Whether they are interested in working full-time on their research.*
>
> *Many of my bursaries are available only to South Africans, and black South Africans in particular. So this is important. The*

> *department has worked hard to broaden our funding for African students and so this makes a difference too.*

> *When you refer ... a student to articles, to read papers, basically you will see if the student has enough. If somebody wants to work, say, on banking: that person has a knowledge and understanding of banking from a non-academic perspective. Now I want to find out whether that person is able to read [the] leading paper ... in the academic field ... Now that is technical and it is intuitive. Now if the person is not able to read the paper, then it becomes problematic.*

The specific mechanism used to ascertain students' knowledge of their field is their PhD proposal. The proposal should hold a clear, focused research objective and should demonstrate the student's familiarity with the literature. Supervisors also look for evidence of the student's research and writing abilities, and use the student's masters' track record to help determine this. One department asks for references as part of the application to explore further the extent to which the applicant meets the criteria.

Despite these academic criteria and the relatively high rate of requests for supervision being declined, many interviewees also mentioned the developmental role that higher education institutions have to play. Although certain applicants may not fully meet the academic criteria, they are given a place if they appear to have the potential to later develop this or make an important contribution to society or the discipline.

Managing students

All the supervisors interviewed carried above-average supervisory workloads at PhD level, and often at masters level as well. The interviews showed that supervisors do not pay this above-average supervisory workload much attention. Responses to a question of what strategy they use to manage their supervisory workloads elicited answers like 'not much', 'none really' and 'just via regular meetings'. Two departments, Wits Psychology and SU Public Administration, noted the importance of managing the intake of PhDs. Wits Psychology said that the enrolment screening has improved quality and increased throughput. This again draws attention to the perception that selectivity in PhD intake is a significant factor in the whole process.

Other strategies adopted to manage students included:

- Using electronic communications to motivate students regularly;
- Remaining in contact with students and enquiring regularly about their progress;
- Linking students with one another and with relevant resources; and
- Ensuring good academic support, such as from the library.

In departments where students collaborate on defined research questions that feed into a larger research agenda, it is easier to set up, manage and structure these aspects.

UJ Education is one department that mentioned supervision by committee. Each doctoral student works with a doctoral committee consisting of a supervisor, two to three other academics from within the department, and one academic from another department. The committee provides input into the proposal, attends the two compulsory doctoral colloquia that each PhD student must present, and provides feedback to the student.

A distinction is often made in the literature between hands-on and hands-off supervisory styles. Our impression is that both styles were present in the sample of supervisors interviewed, and often the same person will follow different styles with different students.

Hands-on supervisors:

- Create their own expectations, which may differ from those of the faculty;
- Track progress more closely than the faculty's reporting requirements;
- Tend to involve students in collaborative teamwork; and
- Involve sources of advice other than the supervisor.

Hands-off supervisors are likely to direct students to available sources of information such as university handbooks and administrative staff, with the expectation that students will determine their own course.

Very few supervisors mentioned changes in their supervisory practice over the last decade. Where they did, it was by way of more group meetings with students being supervised, more accountability to the faculty, and by arranging seminars for students to talk about their work.

> *As my PhD cohort increased, I had to streamline my supervision practices more and more. The establishment of a central research agenda has facilitated this very effectively.*

and

> *Instead of trying to get things perfect from the start, I get students to proceed from one chapter to the next ... That way, the student acknowledges the shortcomings in the chapters submitted but moves along and is more able to fix the chapter at a later stage.*

Supervisors were of the opinion that, as numbers increase, their supervisory practice will change. They are considering streamlining the process by, for

example, adhering more closely to a centralised research agenda. They also felt that following existing procedures more strictly, such as structuring the process via goal-setting and deadlines, may also assist with dealing with large numbers.

Students needing help

Some interviewees did not consider it a good sign when students needed help:

> *First of all, if a PhD student needs help, it's a bad thing. It means that that person is not up to scratch or that person is not able to appreciate the literature ... so it becomes problematic. So hopefully you won't have students like this; but if you have them, then it very much depends on what type of help the students need.*

Where the supervisory style is characterised by regular contact sessions and interactions, long silences in communication may indicate that the student needs assistance. Hands-on supervisors respond when students miss or cancel scheduled meetings. Another warning sign is when a student shows lack of progress by not submitting analysed data or written work, or handing in written work that lacks conceptual clarity.

> *If they have not made contact [or] submitted for a while, it does not mean that they neccessarily need help with their studies, but with planning, finding balance between work and studies [or] being motivated again. The quality of submitted work will also be a clear guideline of a need for more specific guidelines.*

Supervisors generally help students with the following:

- Conceptualising the research project, especially in the initial phases when the research question has to be formulated;
- Analysing, managing and interpreting data;
- Maintaining theoretical and philosophical alignment in the student's work;
- Directing students to key readings; and
- Structuring the thesis, but not writing it.

The importance of keeping students motivated is sometimes overlooked:

> *Two things I give help on: ... first and foremost, inspiration and motivation ... I think it's the most important thing to inspire them*

> *and to take their ideas seriously. And then I would give help ... in that moment of exciting animated discussion: [I'd] say, look, read this, read that. Or I'll give them contacts that I know. So it's more helping to ... re-motivate them and to give them linkages. That's what I'm prepared to do and that's what I believe I need to do.*

The interviewees suggested that language and writing issues provide supervisors with the most difficulty. Practices for dealing with these vary a great deal, with some supervisors willing to assist with language and others not. One supervisor stated, 'I am not willing to help with grammar, punctuation and referencing'. The practice of using language editors also drew widely varied reactions:

> *I forbid them using language editors. We as a school have got a policy: you cannot do that until the very final product; in other words, [only] once your supervisor has said this can be submitted for examination, [can] you ... go to a language editor. For me, the focus is first, on coherent argument, second, on issues of language and third, on issues of presentation. So what I try to get them to understand is that ... the word thesis means an argument.*

Language editing is also considered at an institutional level:

> *there seems to be an acceptance in this faculty that language editing is permissible. And in fact very often when they'll submit work, they'll actually have a statement, even on a proposal, 'This has been language edited by so-and-so'. And the language editor will say, 'I haven't changed any words'. Most of us, I think, in this department have a concern about that for other reasons. On the one hand ... maybe if English isn't their first language, they should be assisted. Certainly any psycholinguist will tell you this and certainly a lot of psychologists and philosophers: the way in which we conceptualise complexity is embedded in one's ability to express that linguistically ... If a person, for example, expresses it [other than] in home language ... they would write in very poor English. And then there's a language editor. The only way in which that language editor can [do their job is] by improving the grammar; clearly they improve the flow, the texture, the depth of the discussion, the complexity. It's an issue: whose work is it? It is a candidate's, but now there's been a language editor ... The faculty has a policy to support that. I mean, maybe I'm old school: I do not.*

Others feel that, given the students' lack of preparedness in writing and technical skills, they must assist with language usage issues even if they are uncomfortable in doing so:

> *everything that they give to me, I do a kind of preliminary language edit on it. So I jot down certain things ... just to give them an indication. I don't do it exhaustively but I try to show them the kind of things that need to be worked on, whether it's referencing, whether it's grammatical stuff, whether it's argument.*

Areas where supervisors indicated they are not prepared to help are with technical skills students should already have mastered – proofreading and rewriting theses.

> *I expect work of the highest quality ... submissions must be proofread, referencing practices must be 100% ... I am not willing to assist students with technical skills that they should have mastered before entering a PhD programme. My role is an intellectual and academic one. I invest a lot of time with the student in ensuring that the conceptual groundwork is thoroughly done. Once the proposal stage is over, I assist in providing support in the data analysis and data management stages. This is very time-consuming. Students need a lot of assistance in maintaining theoretical and philosophical alignment in their work. I do not proofread work. We have other expertise that the student can draw from [for that].*

They were also not prepared to intervene in students' personal lives or with financial assistance. Despite this, in almost all cases, we detected an awareness that these factors play a significant role in a student's progress. Supervisors frequently mentioned that funding, family commitments or access to basic facilities might affect a student's studies.

Student throughput

Experienced supervisors (defined as those with the heaviest supervisory workloads over the last decade), reported that all or most of their students graduate within five years of registration. Across the board, however, answers to this question ranged from all to none graduating within five years.

Most experienced supervisors had very few students withdraw from their doctoral studies over the last decade. Where students did withdraw, it was often for financial reasons. UP Public Administration identified the tough three-year time limit for PhD completion as the cause of most of

their dropouts. Other reasons for pulling out were students' difficulty with studying part-time and personal, often family-related, circumstances. In a small number of cases, students withdrew because they enrolled for the wrong purposes, due to lack of discipline, or sometimes because they chose inappropriate research projects.

Almost none of these experienced supervisors do cohort supervision (where students collaborate on projects), but UKZN Religion reported that they use it extensively. Wits Psychology has instituted a cohort system for a specific area of psychology: psychoanalysis. There is a cohort of supervisors and a cohort of PhD students involved. They hold a monthly seminar where the students are very competitive, pushing one another to make progress. The quality of the work is perceived to be high and the progress is fast, but it is time-consuming for the cohort convener. At RU Education, one of the research niche areas uses this system of supervision, and at UCT Law a number of other sections are doing the same, including labour law, property law and criminology. At least one supervisor in the UP Theology Faculty makes use of student groups, since all students do similar types of research. This is what one supervisor using cohort supervision said:

> *Students mainly work within the scope of my research focus: as such, their projects are related and complementary. Of those who completed during 2000–2009, five out of seven worked in this way, albeit in two separate cohorts. Currently, two out of four doctoral students working with me are working in such a way on related investigations.*

Incentives to supervise

Most departments revealed that there were no direct benefits to staff (such as finance and teaching relief) who supervise PhD students. However, sometimes PhD supervision contributes to the calculation of individual workloads, as we mentioned earlier in the chapter. One or two departments indicated that this should change and that there should be direct incentives, while most signalled that it should be seen as part of the job, with no additional benefits. Overall it appeared to be a negative incentive for promotion and in performance appraisals if one does *not* supervise PhDs. Although there were differences of opinion as to whether the practice was good or not, most respondents believed that in some locations, academics were being paid cash into their bank account for successful supervision of PhDs. UKZN respondents were the most forthcoming about receiving financial incentives in the form of payments into their research funds for each PhD student who graduates.

Research experience

Improving the students' research experience in a department by creating a particular research culture is one strategy for developing a successful PhD programme. A few departments in the sample addressed this explicitly, often framing it in terms of how they cover their disciplines. Available resources are limited, and so it is unlikely that every programme can be good at every aspect of doctoral education. Many of the departments interviewed had already decided which aspects of the discipline they intended to cover.

Three departments – Wits Psychology, UP Public Administration and RU Education – completed structured assessments of their departments' strengths and then tailored their PhD offerings in accordance with these strengths. UCT Law confirmed that it had been tailoring its PhD offering for a number of years by identifying research clusters and giving these more formal recognition. UCT Law considered three factors when identifying research clusters: what the department is known for, existing departmental specialists, and how the department perceives and responds to developments in its discipline.

The RU Education Faculty was structured by niche area into the Environmental Education Sustainability Unit, the Centre for Higher Education Research, Teaching and Learning, and the Mathematics Education Programme. UP Public Administration have organised themselves into five areas of specialisation, with PhDs fitting into these. Wits Psychology has identified 12 potential research clusters and PhDs must fall under one of these. The Wits PhD in the psychoanalytic psychotherapy cluster was highly organised and combined a number of features discussed in this chapter. Students are allocated a primary supervisor but also receive panel supervision from all members of that cluster. In addition, this PhD requires a minimum number of publications in peer-reviewed journals that are later bound by a common argument to make up a coherent thesis.

Departments following the strategy outlined above frequently spoke of promoting a research culture in the department. PhD production then forms part of this strategy rather than being a goal to be pursued in its own right. The term *research culture* includes the following aspects:

- Professionalising graduate studies;
- Appointing or developing well-qualified academics who are active in research;
- Having institutional support for research;
- Making research visible via discussion groups and conferences;

- Initiating active research cohorts; and
- Creating academic exchanges and postdoctoral opportunities.

A few departments have received NRF research chairs. This has resulted in increased doctoral interest and an improvement in the research culture of the department. All departments that have followed this strategy reported that they were very satisfied with the resulting changes.

This more focused and specialised approach has many advantages. The Wits Psychology Department estimates that candidates would be able to complete the degree in half the time normally required. An added advantage is the publications accruing to the individual, the department and the university. Departments where this practice has been in place for a while, such as RU Education and UCT Law, reported increased interest in their departments and in PhD enrolment. Similarly, NWU Education stated that students are attracted to PhD study there because there is a focus on particular specialisations, such as Mathematics Education. When students become aware of specialisation areas, they are often prepared to travel and are sometimes referred by other campuses. Experience from other countries has also shown that students in a mass higher-education system find open-ended, unstructured study less attractive than structured study pathways (Scott 2012).

This is a significant finding. It recognises that departments cannot do everything in their discipline and that some specialisation is required. No department is resourced to perform both a great deal of teaching and research across the whole discipline. Thus departments can aspire to cover different aspects of their discipline, depending on their frame of reference, context and staff expertise. Identifying and building strong niche areas may lead to an increased diversity of offerings across departments in specific disciplines in the country.

Reconfiguring departments in this way can have a number of interesting consequences:

- It encourages cohort supervision;
- It guides the future direction of departments;
- It guides staff appointments; and
- It provides guidance on how to strengthen and maintain growth areas in respective disciplines.

In the English Department at UCT, reconfiguring is also nudging the department in the direction of small supervisory panels for the supervision of PhD canditates.

PhD thesis examination as quality control

South African universities require, on average, three written reports for research theses. In exceptional cases (see below), candidates are required to undergo an additional oral examination during the final stage. Many interviewees regarded the thesis examination as the major existing quality-control mechanism.

Two departments, UP Public Administration and UP Law, said they use two examiners – one from South Africa and the other from another country. In Public Administration, the internal examiner is the supervisor. All the other departments use three examiners.

RU and UCT do not use examiners from their own university. The rest of the universities indicated that one internal examiner is allowed and that, in some cases, such as at NWU Social Work, the examiner is from their own department. UCT Economics, UCT English and UKZN English use a minimum of one examiner from outside South Africa and UCT Law uses a minimum of two. All universities require thesis examiners to be experts in that field. Examiners are usually nominated by the supervisor, via the head of department.

SU and UP have introduced a form of oral examination as part of the procedure. NWU Education introduced an oral examination in 2013. UFS Theology does not conduct an oral but does hold a discussion that is attended by all staff members of the merits of the thesis. This also gives the faculty an opportunity to reflect on the questions addressed by research in the faculty, and on how the research contributes to its envisaged direction.

Two departments indicated that publication forms part of the examination. UJ Education requires each student to submit a journal article before graduating. In 2012, NWU introduced a rule across the university, making it a compulsory part of the PhD examination for students to have at least one article either accepted for publication or already published in a recognised journal. The rule is stated on their 2012 website as follows: 'When a thesis is submitted for examination, a research article that in the opinion of the promoter is ready for publication, may be required'. The Education Faculty at NWU mentioned that the small number of journals in some specialist fields – and also the length of time it takes for articles to be accepted by some journals – can make it difficult for students to get articles published before graduation.

A final word on efficiency

With smaller numbers of PhD candidates, performance is not an issue. However, as numbers increase, departments have come to realise that they need to pay more attention to managing students and to formal procedures.

Thus most departments increasingly pay attention to the formal, administrative aspects of the PhD process. Departments commented that the relatively laissez-faire approach to managing and supervising students needs to be replaced by a more systematic approach, and that good supervisory skills must be formally taught. It is likely that the increase in PhD enrolments has influenced these changes, alongside university and DHET pressure to monitor progress.

The trend towards more structure has also been seen elsewhere: Park (2007) drew attention to the increased formalisation of PhD studies, manifested in new institutional regulations and formalisation of supervision. In most cases, the trend goes hand in hand with an increase in student numbers: larger numbers require better, more explicit management procedures. Students in mass higher-education systems also seem to need more guidance and support. The findings from these interviews corroborate a trend that Mouton (2011) identified at South African universities over the past decade: the move towards increased structuration – or 'thick' models – in doctoral education. The key features of these are identical to those described in this study: structured and rigorous forms of screening; coursework, particularly in theory and research methods; doctoral research-proposal development completed as a structured process; more directive supervision; and encouragement to publish papers.

Summary of findings

This chapter summarised the efforts of productive departments to increase the number of PhDs awarded in the humanities and social sciences in South Africa, without compromising quality and efficiency, while keeping transformation as an important goal in mind. Much of what has been described in this chapter can be read as different responses to the contradictory demands of increasing the number of PhDs in South Africa without substantially better resources, and maintaining or improving quality while transforming the face of the doctoral cohort.

The interviewers were struck by how positive the responses to these conflicting policy discourses generally were. There is little doubt that heads of departments and supervisors experienced these external demands as onerous, but they nevertheless responded to them thoughtfully and positively. Ehrenberg et al. (2010) explained that the support of academic staff and departments is central to making decisions about doctoral programmes, because they shape the innovations at the outset and are responsible for carrying them through. They made the fairly obvious observation that innovations coming from departments are more likely to be successful than those that come from the 'top down'. Thus the heads of departments and supervisors we interviewed were less than impressed with

the way external demands were made from the top down, but they made the decisions regarding the changes they wanted to see.

The interviews left us with the distinct impression that doctoral education in South Africa is, at least as reflected in the most productive departments in the social sciences and humanities, a changing practice. Aspects of this practice include the following:

- All departments are aiming to increase the number of doctoral graduates.
- Despite the relative homogeneity forced on the sample by the selection process, there is still great variability in the practices followed by departments. These practices or strategies echo those tried elsewhere in the world.
- Departments included in the study have a good number of experienced academics with PhDs. However, supervisors increasingly experience the supervision of doctoral candidates as a heavy burden, which is specifically linked to the perceived quality of incoming students.
- The ageing profile of potential PhD supervisors is not characteristic of all departments interviewed, but there is an expected shrinking of the workforce through retirement. Succession strategies and efforts to expand the pool of supervisors, by making use of emeritus or extraordinary professors, are either in place or are being considered.
- The traditional research-based model of producing PhDs is still dominant. A few departments have awarded a small number of PhDs on the basis of publications. No department offers what is known as the American model, a PhD by coursework and thesis.
- Increasing numbers and more diverse PhD students have led to changes in pedagogy. Every department recognised a need for some coursework for their PhD students and many have made arrangements for this by way of more structured programmes, summer school programmes, and intensive weekend training programmes.
- Departments in the past decade shifted towards greater management of doctoral education. The quality of management systems and procedures (such as continuous monitoring of doctoral performance), supervisory practices, examination processes, and formal and informal support to PhD candidates have all come under scrutiny. As we noted above, admission to doctoral education ranges from the strongly regulated to the informal. Nevertheless, there is a strong tendency for more structured and rigorous selection and screening procedures. Despite this, many departments still struggle to make eligibility and selection criteria, as well as admission procedures, transparent to prospective applicants. Supervisory practices are changing slowly, from the informal and unregulated features of the widely followed apprenticeship model

to practices that give more direction to students. One notable consequence of these changes is that the doctoral research proposal is becoming a much more managed and structured process to enable departments and supervisors to judge the quality of the applicants.

- A number of departments have identified their research strengths or niche areas and are streaming PhD studies into that structure, which affects many aspects of managing the PhD process. Structuring a department in this way draws attention to supervisory capacity, the selection processes, and the criteria applied.
- The greatest challenge that students face is in securing funding for their studies. A number of universities have introduced incentives for this, such as waiving fees.
- A number of departments have started to work with students before they formally register for a PhD, partly because their language and writing skills and research-methodology skills are perceived to fall short of those required at PhD level. Two departments have introduced a formal pre-doctoral year to prepare students for doctoral studies.
- The preparation of supervisors is increasingly formalised. Many departments offer training for supervisors, particularly for the inexperienced. Incentives for supervising PhDs are under consideration, and vary greatly between universities.
- Supervisors are selective in accepting PhD students. They examine the PhD proposal for the student's knowledge of the field, as reflected in their familiarity with the literature, their ability to write, and their ability to conceptualise a research problem.
- Only one department mentioned supervision by committee, although a number are considering variations on this theme. The default position still is the apprenticeship model, where the supervisor works individually with the student.

In conclusion

Perhaps the outstanding finding that emerged from the interviews is the variety of strategies employed by departments in response to the demand to produce more PhDs. The interviews showed that departments introduced strategies to improve their performance at each step in the PhD process: in selection, orientation, administration and funding. This is not surprising as there is little evidence of there being a single solution to enhance either productivity or quality in earlier large-scale studies of PhD education (Ehrenberg et al. 2010, Golde and Walker 2006). The present investigation is therefore no exception. Departments have tried a number of strategies that could make a difference without evidence that these would work. Strategies identified here as efforts to improve performance are similar to

what the PhD Completion Project (Council of Graduate Schools 2004) has called 'promising practices'. Since there is no silver bullet or single pathway to success, none of these strategies can be eliminated. It thus makes sense for departments to focus on one or more of them. From the interview data, it appears that most of these strategies worked at least partially, and that no department reported interventions that had really failed.

When assessing whether promising practices will deliver on their promises, the time lag in seeing results must be taken into account. With almost no exception, the strategies described were only introduced at some stage in the past five years, and together with some major restructuring in some cases. Numbers included in the present study were drawn from the period 2000 to 2009 and so do not yet reflect the full effect of these strategies. There is thus potentially a tenuous link between how departments have performed in the past and how they are going to perform in future. The effects of recent efforts to improve PhD production will only emerge in the future, and it is unlikely that these effects will turn out to be only positive (see Neumann 2007). For example, do we lose something in streamlining procedures and the drive to be more efficient, such as no longer taking risks on students, with 'wild cards' dealt out of the new improved system? Or that our attention will shift to compliance (increasing numbers, for example), away from content (a PhD graduate who can engage with the discipline in a specific way)?

Comparing the findings of the present study to literature on PhD education, it becomes clear that there is an enormous amount of re-tilling of well-tilled ground here. It is apparent, in most innovations discussed and in the large-scale studies mentioned, that there is an inexorable trend in response to increases in doctoral enrolments and the pressure to increase enrolments and graduations (Louw and Muller 2014). This trend is characterised, firstly, by a greatly increased regulation of the doctoral study process and, secondly, by an increased proceduralisation of the stages of the doctoral cycle. Together, these aspects push the procedures and routines into an ever-greater generic direction, as noted in the Dublin descriptors for doctoral study (JQIA 2004) and in a critique of these by Gewirtz (2008). The trend towards genericism runs counter to the individualising trajectory of PhD work. The latter approach calls for the singular authoritative voice of the doctoral student to stand out against that of his/her peers to fulfil the criterion of genuine innovation that is the hallmark of the doctoral thesis. A related aspect is that the drive to increase the structure of doctoral programmes is counter to the development of independence and autonomy that doctoral education seeks to foster. These seem to be essential tensions in doctoral education.

Chapter 7

Incremental change and a paradigm shift

- Imperatives as social constructs
- Imperatives as normative statements
- Imperatives and discourses
  - The knowledge economy discourse
  - The developmental discourse
  - The redress discourse
- Intersecting imperatives: In tension or contradictory?
- The evidence
  - The evidence for growth
  - The evidence for efficiency
  - The evidence for transformation
  - The evidence for quality
- Discourses, imperatives and practices
- The dominant model and practice of doctoral education in South Africa
- In conclusion
  - Incremental change
  - Radical change

Imperatives as social constructs

We began this book with a statement of our central thesis, namely that four imperatives intersect in current debates on the production of PhDs in South Africa. We argued in the first and subsequent chapters that these imperatives are embedded in various policy and strategy documents produced by the South African government over the past two decades. We do not assume that these 'imperatives' are necessarily independent or objective forces that generated specific actions in any direct and linear fashion. The 'system' in which they operate – the doctoral education system – is a complex system in which unilineal causality is the exception rather than the rule. Imperatives are social constructs in at least three senses:

1. As authors we have selected and interpreted these four imperatives as influential discourses that have shaped and influenced doctoral production in the recent past (and continue to do so). Although we would argue that these four discourses are the most dominant as far as the doctorate is concerned, there are conceivably other ways to interpret these imperatives. Also, it is not inconceivable that one could identify other imperatives that have also shaped doctoral production in the country. Indeed, we argue that the demand for transformation has been confounded in recent years with another imperative – the demand for internationalisation – and that this could be seen as an additional imperative that is embedded in the discourse of globalisation and internationalisation.
2. These imperatives are also not static and unchanging. We have shown ample evidence of how, for example, the demand for transformation has shifted (and understood to be so) from an initial focus on addressing inequity to an increasing focus on transformation as development.
3. The four notions of 'growth', 'efficiency', 'transformation' and 'quality' are also obviously constructs in the generally accepted epistemological sense of the word. They are 'theoretical notions' that are complex in nature. For the purpose of measurement and analysis, they need to be further unpacked (or 'operationally defined') for one to achieve some degree of consensus of what they mean in reality. We have argued in each of the preceding chapters for a range of operational measures for each construct in order to make analysis possible. But we have also emphasised that there is no general consensus about the ways of measuring each of the notions.

Imperatives as normative statements

An imperative is defined as a rule or principle that requires or compels certain actions. It has both a normative and compelling force, and is usually embedded in a higher-order goal. Arguably the most famous 'imperative' in philosophy, was the categorical imperative defined by Immanuel Kant. According to Kant, human beings occupy a special place in creation, and morality can be summed up in an imperative, or ultimate commandment of reason, from which all duties and obligations derive. He defined an imperative as any proposition declaring a certain action (or inaction) to be necessary. He contrasted his categorical imperative with hypothetical imperatives (which is simply when an individual wishes to attain certain ends). A categorical imperative, on the other hand, denotes an absolute, unconditional requirement that must be obeyed in all circumstances and is justified as an end in itself. It is best known in its first formulation: *Act only according to that maxim whereby you can; at the same time, will that it should*

become a universal law. The important point here is that categorical imperatives are seen as morally binding principles that require or demand certain actions.

We used the term 'imperative' in this book in this stronger Kantian sense denoting principles that require or demand certain actions. So, although we have argued above that they are constructs, this does not mean that enactment of these imperatives does not have material consequences.

At this point it is important to introduce a further distinction. The four imperatives identified and discussed in this book differ in an important respect – the degree to which they presuppose some notion of normativity. Stated differently: to what extent do these imperatives already imply some notion of what is intrinsically desirable?

At the one extreme it seems obvious that the notions of 'quality' and 'efficiency' already, in themselves, contain some notion of what is normatively desirable. They are – stated differently – most often seen as ends in themselves (and not a means to and end). For example, we defend the quality of the doctorate as an intrinsically worthwhile pursuit. We equally commit ourselves to efficiency in doctoral production (as in most fields) because 'efficiency' is regarded by most people as being a virtue.

At the other extreme, the notion of 'growth' evidently does not in itself contain a specific normative goal. It is indifferent, even neutral, unless the anticipated outcome is specified. Is it growth to become more competitive? Or, is it growth to meet the growing or changing demands of the (knowledge) economy?

The imperative of transformation is interestingly poised between these two extremes. In the most basic sense of referring to any form of change, the imperative to transform by itself is ethically neutral, and hence needs to be further explicated: change to what purpose? A higher-order discourse (equity, redress, innovation, competitiveness, etc.) is required to clarify the normative intent behind transformation. However, it is fair to say – as we argued in Chapter 4 – that within the South African political discourse, transformation has acquired a de facto normative meaning. Transformation is assumed to be good and hence an end in itself. It is justified on the ground of achieving greater equity by redressing inequalities of the past. Against this background we would contend that the imperatives of quality and efficiency do not require further (moral or otherwise) justification, whereas the imperatives of growth and transformation do need to be shown to be embedded in or derived from higher-order discourses. Within the context of the doctorate, these discourses typically speak to the question of the purpose, function and even value of the doctorate in a country.

After this short context we return to the relationship between imperatives and discourses as they pertain to the doctorate in South Africa.

Imperatives and discourses

The knowledge economy discourse

We showed in Chapter 1 that the international discourse on the doctorate is largely about the contribution to and place of the PhD graduate in the knowledge economy. There are two strands to this debate. One is about strengthening the university as a knowledge producer. In this approach, increasing the number of doctorates is part of the link between high-level research training, disseminating new knowledge through international networks (such as conferences, journals and books) and linking in different ways to research and development through an innovation cycle. In this sense it is both about strengthening the university (and specifically the quality it produces) and contributing to the knowledge economy.

The second aspect is the doctorate as a contributor to 'talentism', meaning the global search for talent. In this sense, doctoral education is concerned with the provision of high-level skills, both research and analytical, for careers outside the university, be it within industry or the public sector. The debates, rather ironically, are also about whether there are too many doctoral graduates (at least in the USA) and the impact on the higher-education system.

Important questions for countries are: What kind of knowledge economy? And, which high-value skills would be required? Such questions in turn pose a more strategic set of questions about how many PhD graduates a country needs and in which fields. This would also confront South Africa with the dilemma that it cannot reach its doctoral targets without the substantial recruitment of students and academics from the rest of Africa.

The developmental discourse

In developing countries, particularly East Asia, Latin America and even in South Africa (the *National Development Plan 2030*), the PhD is regarded as being integral to the development project – even if it is not clear whether PhDs are a driver of growth, or if this necessarily follows from the knowledge economy viewpoint. Most of the commentators (see Appendix 2) express some unease about how the PhD actually contributes to economic development, why in certain countries there are unemployed PhDs, and whether the PhD 'factories' will lead to poor quality, thus undermining the essence of the skills embedded in the traditional PhD, namely independent thinking and writing. Unease is also expressed as to whether too direct a link to development will privilege the sciences, engineering, and business at the expense of the humanities and social sciences and whether a

predominantly economic-development orientation will not undermine the ideal of contributing to a better society. However, all seemed to agree, in different ways, that the driving force for doctoral education has gone well beyond 'just' training the next generation of academics.

More relevant for Africa, the continent on which the AU Commissioner Dr Nkosazana Dlamini-Zuma is calling for thousands more PhDs, is that many countries, like South Africa, proclaim to be pursuing a knowledge-economy model, but are in fact practising a more industrial-age, extractive economy, with a very thin layer of research and development and large numbers of lower-skilled workers. But even the modern extractive-economy model is not without high-knowledge skills. Calderon and Castells (2014) show that Chile has become globally competitive in high-tech farming (wine and salmon) and mining by massifying higher education and adopting advanced information (knowledge) farming and mining technologies. An important question for countries is 'What kind of knowledge economy and what high-value skills are required'?

In South Africa, where the National Planning Commission (NPC) and the Department of Science and Technology (DST) are firmly located within a knowledge-economy discourse, part of the argument for tripling the number of doctoral graduates annually is driven by an intention to increase the capacity in the system – by increasing the percentage of academics with PhDs from 35% to 75%. Thus it does seem that even if there is not agreement on the role or contribution of the PhD to the knowledge economy, or on what kind of knowledge economy Africa is striving for, or whether Africa needs more PhDs to improve academic quality, there is tacit consensus that there is a need to increase and improve doctoral training and output.

The redress discourse

Within the South African context, the dominant discourse (especially in the 1990s) around the doctorate was embedded in the notions of equity, race and gender and how to address the imbalances of the past. In post-apartheid South Africa, a common South African practice is to use transformation as a euphemism for racial issues, despite its many interpretations and meanings. Govinder et al. (2014: 1) illustrate this well in the following quote:

> *In the South African context, transformation refers more specifically to change that addresses the imbalances of the past (apartheid) era. It has many facets, including demographic and systemic change. However, regardless of the different components and qualitative measures for transformation, the ultimate (and most important) indicator is that of demographics.*

In summary then, the question remains: Is the doctorate seen as a 'means' to address the higher-order goals of:

- A knowledge economy (with the concomitant focus on knowledge production, international competitiveness and innovation);
- A developing economy (with the demand for more highly skilled labour to drive economic growth and wealth creation); or
- A redress agenda with the demand for more black (and recently more African) and female graduates?

We have argued that none of these discourses on their own is unproblematic. Within the South African context a case could be made for adopting any one of these discourses as the dominant one. Taken together, the picture becomes even more complex. It is not obvious that these discourses are easily reconciled or integrated as the underlying premises are very different, and perhaps even contradictory.

Intersecting imperatives: In tension or contradictory?

In 1977 Thomas Kuhn published a book with the intriguing title *The Essential Tension*. This text, which followed his seminal work on the role of paradigms in science (*The Structure of Scientific Revolutions*), argues that in science, tradition and innovation are in tension, but that this tension is essential for science to progress. The notion (or even ideal) of tradition is captured in the notion of a paradigm that provides guidance and direction, and hence stability, to research within 'normal' periods of scientific inquiry. However, 'innovation' is equally important and necessary to ensure that science grows, and that space is created for new theories and ideas. Although there is a tension between tradition and innovation (change), the history of science has shown that this tension is an essential and productive one.

Can one make the same claim for the four imperatives of growth, efficiency, transformation and quality? Do they co-exist (in harmony) and hence co-produce the kind of doctoral-educational system that the country needs? Some arguments have been made that transformation (especially when understood as leading to more diversity) at least contributes to (or may even be an essential condition for) improved quality. In the same vein, one could argue that greater efficiency in the processes of doctoral supervision could be instrumental in achieving higher-quality doctoral graduates. However, it is equally obvious that the demand for growth can be interpreted to be in direct tension with the demands of efficiency and, especially, quality. If current trends in doctoral enrolments continue to increase, it will put even more strain on the current supervisory capacity in the system, which in turn is likely to affect the quality of the doctorate. In

fact, an argument could be made that the imperatives for growth and quality are not only in tension but that they are contradictory. Achieving the one (continuous growth) undermines the achievement of the other (maintaining standards of quality), especially in a system where there are serious constraints on resources.

In an insightful overview of the origins of the doctorate in South Africa, André du Toit (Du Toit 2012: 3) cautioned against the effects of the demands of growth on quality:

> *Current higher-education policy imperatives calling for a drastic increase in the overall production of the number of PhDs in South Africa will be dangerously misconceived unless serious prior consideration is given to the nature and function of the PhD degree. A substantial increase in the number of current South African PhDs by research dissertation only will most certainly not satisfy either the urgent needs for upgrading the 'academic' sector itself or the demands of the economy and society for an increased number of advanced graduates with a 'general' knowledge base and transferable intellectual skills. Instead, the most likely consequence of a substantive increase of the number of PhDs based on the current higher degrees structure is both a significant slump in academic standards as well as a probable backlash against the universities from different sectors of the economy and society: a substantial number of the new PhDs will be unable to find appropriate employment while outside institutions will remain frustrated when looking to these PhDs to satisfy their specific and general needs.*

In this regard Manuel Castells, in his paper 'Universities as dynamic systems of contradictory functions' (Castells 2001), made two important observations. Firstly, he argued that because universities are social systems and historically produced institutions, they undertake different functions simultaneously within the same structure, although with different emphases at different historical moments. One critical element of the structure and dynamics of university systems is combining and making compatible seemingly contradictory functions. In this, the challenge for university systems is to develop institutions that are strong and dynamic enough to withstand the tensions inherent in these contradictory functions. The second observation is that a single university cannot manage the contradictory/competing functions; rather, this has to happen within a higher-education system because all the contradictory functions of a system cannot be resolved within a single university (Castells 2001).

One obvious way in which the 'tension' between some of these imperatives has manifested itself in the South African university system, is

reflected in the differential responses to these imperatives by the different universities. We have given ample evidence of the fact that the 'response' to these demands has been very different for different universities and university groupings. The most positive changes in growth rates, efficiency and transformation are confined to a small group of eight to ten universities: the same universities that perform better on knowledge production indicators. The less productive universities in the system simply do not have the resources to respond to these imperatives.

Our qualitative study (Chapter 6) of the very productive departments found that academics are quite aware of the different policy imperatives, and, on the whole, experience or view them as contradictory demands. However, the interviewers were struck by how positive the responses to these conflicting policy discourses generally were.

During workshops on supervision facilitated by the second author over the past ten years, an issue of concern often raised is that it has become the norm for universities and departments to set targets and benchmarks for quicker throughput rates. In a system where universities compete for doctoral candidates as an additional source of revenue, this is not surprising. However, it adds to the burden of supervision, and supervisors are under huge pressure to complete the doctoral study process as quickly as possible. This translates into a high degree of monitoring and surveillance of students and, in some cases, intervening to help students to write parts of their theses. When the major lament of academics regarding the under-preparedness of many of the candidates is added to the pressure to improve completion rates, plus demands for constant monitoring and accountability, then the 'burden' of supervision translates into the 'stress' of supervision'.

It could be argued that the sharp increase in research output (5 585 research publication units in 2000 to 14 000 units in 2013) is a product of more direct incentives than those for producing doctoral graduates. A number of respondents mentioned that while the national government subsidy for a doctoral student is substantial, the academics did not know what happened to this money within the university budget; in other words, unlike research subsidies, this seldom trickles down to the faculty or the department. What is also clear is that there are widely different policies and practices between different universities, including a range of incentive structures, as well as 'perverse' incentives. It has, for example, become common practice for some university departments to insource doctoral supervisors who are not necessarily expert or experienced in the specific subject area of the department simply to be able to supervise the growing numbers of doctoral candidates.

We would argue that these four imperatives do not necessarily co-exist comfortably. There are inherent tensions and even contradictions between

them. This, we believe, is one of the main reasons why any initiative to effect further change in the current system of the doctorate in the country will only result in small and incremental changes. Within a complex system whether there are counteracting (and even mutually undermining) forces at work, it is difficult to achieve anything more than small gains in efficiency or quality. We will argue in the final section that the structure of the system in itself would have to change if far-reaching and substantial changes are to be expected.

The evidence

The main body of this book has been devoted to present the best available evidence on patterns and trends on growth, efficiency, transformation and quality of the doctorate in South Africa. Even if one disputes the 'appropriateness' of these headings as imperatives, we have found it useful to organise and present the results of different studies that we have conducted over the past ten years under these headings. So what have we found?

The evidence for growth

The public higher-education system in South Africa has witnessed significant growth in the production of doctorates. Doctoral enrolments and graduations increased by an average annual rate of 6.4% between 1996 and 2012/13 – a rate higher than any other degree level. Universities as a group have also been more successful in achieving the aim of increasing the number of doctoral graduates in specific fields. The proportions of doctoral graduates in science, engineering and technology, and in the business, economic and management sciences have increased considerably over the period from 1996 to 2012. For example, the percentage of graduates in natural sciences, engineering and technology (SET) increased from 45% in 1996 to 53% in 2012. We have also highlighted the fact that the introduction of the new funding framework in 2005 started to impact on the system by 2008, when the growth in doctoral enrolments and graduations accelerated even more.

But when comparing South Africa's yield of PhDs to that of other countries worldwide, the data reiterates the finding of the ASSAf (2010) PhD study that the country's production of PhD graduates is too low, and that South Africa is near the bottom of the list of PhD-producing countries worldwide. In summary, when compared to OECD countries, South Africa not only fares poorly against countries with a similar population size and GDP ranking, but even does so when compared to much smaller countries with lower GDP rankings, and fares considerably worse when compared to top-ranked GDP countries.

The evidence for efficiency

Our analysis of efficiency in doctoral production employed four measures:

1. The ratio of graduations to enrolments;
2. Cohort analyses of graduating students;
3. Progression and completion rates of doctoral students; and
4. The ratio of PhD students to academic staff with doctorates.

As to the first measure (*ratio of graduations to enrolments*), South African universities displayed a marginal improvement in efficiency, with an average annual increase in graduates of 6.5% compared to 6.4% in enrolments between 1996 and 2012.

The results of the *cohort analyses* for the 2003, 2004 and 2005 cohorts showed that the average graduation rate of 35% after five years increased to 42% after seven years. The 2006 cohort had a 43% completion rate after six years, while the 2007 cohort showed a 45% completion rate after the same period of time. The percentage of new entrants who graduated after five years grew from 36% for the 2003 cohort to 38% in 2007. The percentage of new entrants who graduated after six years increased slightly more from 41% for the 2003 cohort to 45% for the 2007 cohort. Although the percentage of doctoral cohorts who graduate is still low, these increases show improvements in doctoral graduation rates.

The main finding from our analysis of the *progression and completion rates* relates to the effect of part-time studying on progression and completion rates. The fact that more than 60% of South African students – across all scientific disciplines – study while they work has far-reaching effects on all aspects of doctoral production. This is especially clear when we compare students in the natural sciences (where larger proportions study full-time) with students in other fields. For the former, progression and completion rates are significantly higher: students in these fields (where higher proportions of students are able to study full-time) progress faster from honours to masters to doctoral studies *and* complete their studies at each level in shorter times. We also found clear evidence of the effect of socio-economic realities on these rates. Black students (and especially African students) have much fewer resources to support their postgraduate studies. This also translates into longer progression and completion times for this subgroup.

Our final measure (*ratio of PhDs supervised per academic staff with doctorates*) shows that there has been an increase in the overall efficiency in the system in the recent past. We again found evidence of huge institutional differences, with the best-performing institutions demonstrating significantly higher

ratios of PhDs supervised per academic staff with doctorates. These ratios have also increased steadily in the recent past.

Our analyses of the efficiency of doctoral education have produced a mixed picture. The analysis of the doctoral pipeline in Chapter 3 revealed low progression rates. For example, only 24% of bachelors students enrolled for a honours degree, just over 20% of honours graduates enrolled for a masters and only 16% of masters graduates enrolled for doctoral study within five years. The end result is that the pipeline is not only a leaky one, but also very long. From a systems perspective this is indicative of a very inefficient system. We lose too many students between the bachelors and doctoral level and those who do manage to afford to stay in the system, take too long to progress from bachelors to doctoral studies. We have argued that the major cause of this state of affairs is the lack of sufficient funding (especially for black students) to study full-time and hence to complete their studies within much shorter periods of time.

But there is also another side to the efficiency argument. Despite the lack of sufficient funding for doctoral studies, regular interruptions of studies for work- and employment-related reasons and hence an older-than-average doctoral cohort (compared to the age of students completing in Europe and North America), completion rates compare favourably with international benchmarks. Despite high teaching loads and the increasing 'burden of supervision', academic staff at the top South African universities have increased their PhD output in recent years. All of this evidence suggests that South African universities and supervisors are quite efficient in the production of graduates who are in the system. Thus, university support to and supervision of doctoral students is not the major problem in the system. These structures and mechanisms are in themselves quite effective and efficient. This is particularly evident when we focus on the throughput and completion rates of the top research universities.

The efficiency challenge is quite obvious: we need to ensure that larger proportions of postgraduate students are able to study full-time (with sufficient funding) and not interrupt their studies.

The evidence for transformation

When transformation is understood solely within a discourse on equity and redress, and the focus is on changing the demographics of race and gender, the evidence shows significant transformation. Whether one looks at absolute increases in the number of black and female students or annual growth rates, the results are the same. As far as enrolments are concerned, African doctoral students increased their share from 13% in 1996 to 32% in 2004, and to 48% in 2012. Similarly, the share of coloured doctoral

enrolments increased from 4% to 6%, and the share of Indian doctoral students from 5% to 8%. By contrast, the proportion of white doctoral enrolments dropped from 78% in 1996 to 38% in 2012. The same trends apply to doctoral graduations where the proportion of African doctoral graduates increased from 8% to 44%, while the proportion of whites declined from 86% to 43% between 1996 and 2012. Similar shifts were recorded as far as gender is concerned. By 2012, 42% of all doctoral graduates were female, compared to 35% in 1996.

However, the discussion about transformation in terms of a racial definition becomes more problematic when we introduce 'nationality' into the equation. As discussed in Chapter 2, the increases in African male and female students (enrolments and graduates) in particular were the result of the influx of students from the rest of Africa. We have offered some explanations of why this happened and continues to happen – a combination of supply and demand factors. But the reality is that the South African doctorate would not have changed (transformed) to the extent that it has, without the injection of large numbers of students from the rest of the continent. And, of course, it raises the question whether this constitutes 'transformation' as it was (originally) intended by policy-makers and government. Or are we simply confusing two very different notions of 'African': a 'racial' definition with a 'geographical' one?

One way to clarify the issues is to focus on South African students only and the shifts in their *participation* rates as opposed to *growth* rates. And then the transformation question needs to be reformulated: Are larger proportions of South African African students participating in doctoral studies today than 13 years ago? The evidence presented shows that the rate for South African African students (male and female) increased from 0.84 to 3.61 students per 100 000 of the age-relevant population group. This constitutes a fourfold increase in participation rates. But this substantial increase must be seen in relation to the same statistics for white students: whereas the share of white enrolments declined over the same period, their participation rates increased from 45 to 63 per 100 000 of the age-relevant population. In fact, the participation rate for white students compares well with populations of developed countries.

The rate of participation must be assessed in terms of the size of the overall system and in relation to population changes. South Africa's overall higher-education participation rate is low – around 20%. With regard to population growth, the white population for enrolments in the 20-to-24-year age cohort declined from 349 102 in 1996 to 316 000 in 2012 – an overall decline of 9%. In contrast, the African population for enrolments in this age cohort increased by 974 918 (31%), from 3 153 082 to 4 128 000. All of this means that for (South African) African students to equal the

participation rates of their white counterparts, a total of 5 688 African doctoral graduates would have been required in 2012, which is 17.5 times more than the 325 African doctorate graduates for that year!

The evidence for quality

Our discussion of quality in doctoral education and the challenges in measuring quality has been limited to those 'dimensions' for which there are available data. We have presented evidence that shows that:

- There are fairly stringent policies and rules in place to ensure proper accreditation of doctoral programmes.
- The HEQC has ensured – to a large extent – that universities conform to standard practices in quality assurance of doctoral education (including registration, supervision and examination processes). However, what the HEQC has not done is produce any indicators, or even proxy indicators, for quality.
- The fact that the majority of doctoral students work while they study impacts on their levels of preparedness for doctoral studies. Various studies confirm that doctoral candidates typically require a large degree of support in coping with the demands of doctoral education. This has also meant that universities – at least in most cases – are screening and selecting potential doctoral candidates more stringently and rigorously in order to ensure that the best pool of talent is accessed for doctoral studies. However, we would maintain that the part-time nature of doctoral studies for many students poses one of the major challenges to maintaining high standards of doctoral education in the country.
- We have some evidence in Chapter 5 that suggests that the quality of doctoral supervisors and supervision is generally good. Again, however, the increasing burden of supervision (which is linked to the demands for growth and efficiency) is cause for concern (for many supervisors), and an additional factor that may compromise the quality of doctoral education. Increasingly supervisors have to take in larger numbers of students, as well as, in many cases, students in areas that fall outside their own expertise.
- Doctoral tracer studies show that South African doctoral graduates do not find it difficult to find employment (keeping in mind that about 60% are already employed at the time they commence their PhD). These studies as well as employer studies also indicate that there is a reasonable fit between the demands of the labour market and the knowledge and skills presented by the doctoral graduate.

Discourse, imperatives and practices

The evidence produced here shows that there have been exceptional rates of growth in doctoral enrolments and graduates, substantial shifts in transformation (understood primarily in demographic terms), and indications of an adequately efficient system of doctoral education, but with a very inefficient postgraduate progression rate. We have discussed the data in terms of four imperatives that have shaped the doctorate in South Africa over the past ten years. However, our thesis is not that the changes that have been recorded are simply to be understood in terms of institutional (or even individual) responses to these imperatives (and their underlying discourses).

Although there is general awareness and knowledge of these imperatives in the system (perhaps best illustrated in the general knowledge of the incentives to increase doctoral output since 2005), the changes in growth and transformation especially are clearly the result of complex interplay of demand-side factors (new demands from the labour market; the demand created by the increase in students from other African countries who choose South Africa as a destination for postgraduate students), as well as supply-side factors (new masters and PhD programme offerings, increased supervisory capacity at most universities, increased funding for doctoral studies, as well as the effect of the new incentive and reward strategies of universities).

In fact, one should be cautious not to attribute too much agency to the university sector in the face of the four imperatives. Although it is appropriate to speak of a response of the universities to some of these imperatives, this would be more applicable where the imperatives have been translated into specific funding instruments and incentives (or their counter side of penalties and sanctions). These incentives (and sanctions) operate both at the system level and the institutional level. But some of the changes that we have analysed and discussed – such as the three-fold increase in doctoral students from the rest of Africa – were probably unforeseen 15 years ago.

At the system level the introduction of the new funding framework by the DHET in 2005, which recognised the production of research masters and PhD students for additional research subsidy, has indeed elicited a clear and unequivocal 'response' from the universities. One of the reasons for this has been the fact that most universities have internalised the same incentive principles in their internal process of reward and promotion. Similarly, the NRF and other funding agencies have set very clear targets for doctoral production – especially in the case of transformation targets – that influence the research awards and grants made by the organisation. Again these principles have been appropriated by the universities (down to

faculty and departmental levels) and hence have shaped individual supervisory behaviour.

But these imperatives also led to institutions adopting their own standard practices. However, these were not necessarily all in response to national imperatives. For example, most universities have established structures and initiatives to strengthen doctoral supervision (in some cases supervision training has been made compulsory) and the level of preparedness of doctoral candidates (multiple mechanisms to improve screening and selection as well as institutional support). Many universities have embarked on innovative ways to expand their supervisory capacity (changed retirement ages of staff, re-appointed productive academics, insourced external experts to act as supervisors, and so on). In general, quality assurance of the doctoral process (including examination processes) has been strengthened (in some cases this was a response to the HEQC audits of the mid-2000s), but in other cases these initiatives have gone beyond the explicit requirements of the HEQC.

The general point being made is that national discourses and imperatives do not by themselves necessarily produce change. The changes in a wide variety of practices for which we have presented evidence are also the end result of the complex interplay between regional and geopolitical forces on the African continent and beyond, demand-side changes in the South African economy, as well as institutional actions – some of which are clearly responding to these imperatives, while others are self-initiated.

Our story of the doctorate in South Africa would not, of course, be complete without addressing the challenges that flow from the dominant mode of doctoral supervision (education in more general terms) in the country. We have alluded to the fact that the predominant model of doctoral education remains that of one-on-one supervision. We have also already commented in some detail on the fact that the typical doctoral candidate in South Africa currently studies while working; all evidence points to the fact that about 60% of all doctoral students study part-time. We return to these issues in the next section.

The dominant model and practice of doctoral education in South Africa

The traditional research-based model of producing PhDs is still the dominant route in South African universities. A small – but increasing – number of departments also award PhDs on the basis of publications. Very few departments currently offer what is known as the 'American model', a PhD by coursework and thesis.

The increase in numbers and diversity of PhD students has already lead to changes in pedagogy. Many departments have recognised the need for some coursework for their PhD students, and many have made arrangements

for this by way of more structured programmes, summer-school programmes and intensive weekend training programmes.

Departments in the past decade have shifted towards more active management of doctoral education. The quality of management systems and procedures (such as continuous monitoring of doctoral performance), supervisory practices, examination processes, and formal and informal support to PhD candidates, have all come under scrutiny. As we noted above, admission to doctoral education ranges from the strongly regulated to the informal. Nevertheless, there is a strong tendency for more structured and rigorous selection and screening procedures. Despite this, many departments still struggle to make their eligibility and selection criteria and admission procedures transparent to prospective applicants. Supervisory practices are changing slowly, from the informal and unregulated features of the widely followed apprenticeship model to practices that give more direction to students. One notable consequence of these changes is that the doctoral research proposal is becoming a much more managed and structured process to enable departments and supervisors to judge the quality of the applicants.

As far as the doctoral candidate is concerned, the greatest challenge that students face is in securing funding to do their studies full-time. A number of universities have introduced incentives for this, such as waiving fees, but these are mostly aimed at short-term efficiency gains rather than a wholesale shift towards more full-time students.

It is perhaps good to remind ourselves of the basic facts: the typical doctoral candidate in South Africa today studies while he or she is working, is about 35 years old when enrolling for the doctoral degree and 41 years old when he or she graduates. As we have pointed out, this means that the typical student would have interrupted his or her studies a number of times since being awarded a bachelors degree. These interruptions between the bachelors and honours, and between the honours and masters and ultimately between the masters and doctorate, have significant consequences for the degree of academic preparedness of the typical student. This usually means being reintroduced to an academic culture (that has changed significantly in many respects), learning new technologies that are essential for doctoral studies (such as searching electronic databases) and very often re-learning basic methodology and statistical skills and competencies.

All of this is true of the average student, but even truer of black students. Because of deep-seated socio-economic realities, the average black postgraduate student in this country has access to fewer financial resources and less social capital (such as family wealth), and hence is more reliant on his or her own resources. This translates – on average – into longer progression and completion rates on the road to getting a doctorate. One can even speak of the 'double dilemma' that the typical black postgraduate

student candidate faces. Upon graduating from their first degree, there are often family expectations to earn money and contribute, not to mention the need to repay previous support. In addition, with affirmative action policies in government and the private sector, there is a strong search for 'black talent'. This means that there are huge pull factors for black students to pursue employment rather than to consider full-time masters or doctoral studies. Can one expect the most talented to remain in higher education?

It is important to understand the interdependence between the dominant model of doctoral education (one-on-one supervision, additional coursework and preparation and an increasing investment in student support) and the biography/demography of the average doctoral candidate (studying part-time, without adequate financial resources, an interrupted study trajectory and hence a low level of academic preparedness).

There are, of course, still significant numbers of doctoral students (about 40%) who are able to study full-time, who have shorter postgraduate trajectories and are able to complete in shorter periods of time and also graduate at a much younger age. These students tend to be white, come from more affluent backgrounds, are more likely to enrol for the natural sciences and have had good schooling. The stark contrast between these different groupings points to the real challenges that face doctoral education in this country. What are our options? Is it possible for the system to attain the target of producing 5 000 doctorates by 2030 and sustain current levels of quality and efficiency? Our discussion in the next chapter presents a detailed analysis of the 2030 target and the most likely scenarios in which it can be achieved.

In conclusion

Based on the evidence presented in this book about recent growth paths, efficiency and quality levels, and transformation shifts, what would be the best strategies to pursue over the next 15 to 20 years for reaching the NDP target without compromising the quality of the doctoral graduate? Strategies operate at different levels – from the national to the institutional and individual (supervisor–student) levels.

A first response to the question above is that strategies that have been shown to be successful in the past for improving efficiency and quality should of course continue to be pursued. Many of these have led to incremental changes and improvements in the organisation and management of the doctorate, and have done so mostly by addressing the traditional research-based (supervisor–candidate) model for mainly part-time students. However, we will also propose that consideration is given to a more radical strategy that addresses the deep structure of doctoral education in the country.

Incremental change

The core and determining feature of doctoral education in South Africa is the fact that 60% of all students enrol for their studies while they work. For the humanities this proportion is 75%; for the natural sciences it is 55%. We have argued that this is the most important reason why the majority of students take five years on average to complete, why progression rates from bachelors to doctoral studies are so protracted, and why our cohort of doctoral students is so much older than its counterparts in Europe. Because of this, supervisors are forced to resort to innovative ways of 'managing' their students: one-on-one supervision remains the rule rather than the exception, a huge amount of supervision is virtual (rather than face to face) and the low levels of academic readiness require additional measures of screening, selection and support.

We believe that this situation is not likely to change fundamentally over the next 15 years. Even if we manage to effect a significant shift (see below) towards much larger numbers of students studying full-time, we will still have large cohorts of students studying part-time. This implies that most of the current strategies that are in place to optimise efficiency and quality in doctoral production will remain relevant. More innovative strategies – some of which could involve better use of learning technologies – are likely to be designed and implemented. But on the whole, all of these strategies will at best only effect incremental improvements in the current system.

National strategies

At the national level we assume that the current funding incentives for the production of PhD students will remain in place. We also assume that the NRF and other funding agencies will expand their scholarship support for doctoral students. Current scholarships for full-time doctoral studies are insufficient alone to enable large numbers of students to study. Access to additional (financial) support is vital. In some cases, universities augment the scholarship, but under certain strict conditions. We would hope that the NRF would consider bringing back a scholarship scheme that combines a masters and doctoral scholarship for students who meet certain performance requirements and that the lack of financial support at the honours level will be addressed. We also assume that grants to university academics who are nearing completion of their doctoral studies will be extended (sabbatical or time-off grants). A current investigation into creating more equitable access to electronic research databases at South African universities holds the promise that all post-graduate students in the country will in future be able to search and find the literature they need for their studies. Students at some universities still do not have the kind of access to electronic knowledge

resources that are currently required to do a PhD of quality. We assume that this will become a reality soon and provide further support to doctoral students.

Institutional strategies

At the institutional level, many universities have invested in training their staff in good supervisory practices. It is conceivable that universities will increasingly make such training compulsory for novice supervisors. Existing support infrastructures (writing centres and graduate schools that provide support in the development of doctoral proposals and research methodology as well as editorial services) will continue to play a crucial role in doctoral education. With expected increases in enrolments, these services will undoubtedly have to be expanded.

Departmental and supervisory strategies

Perhaps the outstanding finding that emerged from our study of productive departments is the variety of strategies they employ to respond to the demand for producing more PhDs. The interviews showed that these departments introduced strategies to improve performance at each step in the PhD process: in selection, orientation, administration and funding. This is not surprising as there is little evidence of there being a single solution to enhance either productivity or quality in earlier large-scale studies of PhD education. Departments tried a number of strategies without evidence that these would work. Strategies identified here as efforts to improve performance are similar to what the PhD Completion Project (Council of Graduate Schools 2004) called *promising practices*. Since there is no silver bullet or single pathway to success, none of these strategies can be eliminated. It thus makes sense for departments to focus on one or more of them. From the interview data, it appears that most of these strategies worked at least partially, and that no department reported interventions that had really failed.

What is clear from our scenario exercise is that demands on universities and doctoral supervisors will only continue to grow. If one assumes current levels of growth in student enrolments and academic capacity, the average supervisor will have to supervise four to six doctoral students per year by 2030 in order to produce a graduate every third year (in addition to huge numbers of masters students to supervise).

For these reasons we believe that the strategies that are currently being employed – even if they become more structured and internalised in the productive universities – will at best ensure that current efficiency rates and quality levels are maintained. In fact, one could argue that with the growth in numbers across the whole pipeline (from bachelors to masters to doctoral students) and subsequent higher ratios of students to supervisor, it is more

likely that the efficiency ratio of 0.4 (which is required to produce more than 5 000 graduates) will not be achieved. It is also possible that the quality of doctoral education may begin to deteriorate under such conditions. There is already anecdotal evidence that many supervisors find it difficult to maintain the required quality standards of supervision and examination with the current burden of supervision. In addition to the current strategies, we therefore propose that consideration be given to a more radical strategy that will change the dominant model of doctoral education in the country.

Radical change

The second proposal could be called a paradigm shift in which we argue for establishing cohorts of full-time doctoral students who would be 'employed' as junior staff members at South African universities. The proposal is that we aim to reverse the current full-time to part-time ratio of 40:60 to 60% full-time and 40% part-time. In real numbers this would mean that about 9 600 of the current cohort of doctoral students would be able to study full-time (compared to about 6 400) – an increase of about 3 000.

A model of doctoral education in which the majority of students study full-time would enable experimentation with different models of doctorate management, such as graduate schools, and with possibly more coursework, more integration and group/laboratory approaches.

In terms of management and structures, it is clear that the traditional research-based, one-supervisor-with-one-candidate model is still dominant, particularly in the social sciences and humanities, but that a range of other models are emerging and spreading. These models range from taught PhDs (or at least a significant taught component of the degree), integrated programmes (coursework, additional training workshops or seminars, and a dissertation), professional and or practice-based PhDs, PhD by publication and a research group/laboratory approach. In addition to different models, there are initiatives such as graduate schools, for which there are also numerous models of organisation – some are discipline-based but more prevalent are interdisciplinary 'schools'. Common to most, are the aims of creating a critical mass of students, providing a wider and better coordinated offering of courses, and student and supervisor support, and providing a more coordinated organisational structure for doctorate education.

There is overwhelming international evidence that students who study full-time complete their degrees in shorter periods. A South African example in the humanities is the Graduate School in the Faculty of Arts and Social Sciences at Stellenbosch University. Since 2010, the Graduate School has given scholarships for social science doctoral candidates to study full-

time with the intention of completing within three years. In 2013 the average time to degree of Graduate School graduates was 3.35 years (compared to the university average of 5.06 years). In 2014 this improved further to 2.84 years (compared to the university average of 5.73 years). Although this is a small sample (about 80 students) it suggests that the doctoral students in the social sciences and humanities can achieve the same time to completion of their degrees than their counterparts in the natural sciences if they are able to study full-time.

What underpins many of the new arrangements and models, both in the US and Europe, is the changed funding model. In many European countries, particularly those in Scandinavia, students are employed as full-time junior staff for periods of three to four years. The full-time study model allows for much more dedicated and regular supervisory engagement, more intensive coursework, supplementary training in methodology and writing skills, and pursuing team or group supervision. Examples of how appointing students on a full-time basis also allows for different models of doctoral education, are provided by the commentators in Appendix 2.

Although it is difficult to provide empirical evidence that students who study full-time also produce higher-quality theses, it is not difficult to see how such a model would generate better 'outputs'. The proposed model would lead to shorter progression trajectories from honours to masters to doctoral studies, which also implies more accumulative learning and retention of knowledge. Fewer interruptions of study should translate into better prepared students. Instead of supervisors focusing on 'remedial' teaching to address an interrupted study career, they can focus on deepening knowledge acquisition and especially training in more advanced methodologies. The full-time model provides for more peer-group learning and feedback as well. And it is assumed that 'junior staff' status and a salary, rather than a scholarship, would attract more black and women candidates.

If South Africa follows the example of countries where doctoral candidates are appointed at universities who study for four years and then teach for one year, it also means that they would contribute to expanding the pool of academics.

The counter arguments, we suspect, may concern the cost of implementing such a model. At a first glance the costs may seem prohibitive. If one were to start modestly and appoint approximately 2 000 doctoral candidates at an average of a junior lecturer's salary in 2015 (ZAR 400 000 [USD 30 800]) this would require an additional injection of about ZAR 800 million (USD 61.5 million) per year into the sector. However, if one keeps in mind that this would enable these candidates to complete within three to four years (which is an improvement of 20% to 30% on current completion rates) and will result in cohorts that are generally younger when they

graduate (early 30s rather than early 40s), the gains begin to offset the costs. And in addition, we are likely to produce more high-quality graduates and research.

Our discussion in this chapter focused on four national imperatives (growth, efficiency, transformation and quality) and the way in which they have influenced doctoral education in South Africa over the past two decades. We have summarised the evidence presented in the preceding chapters with regard to each of these. We argued that the interplay between these four imperatives (and their associated discourses) is a complex one and sometimes even appears contradictory. We have also argued that these imperatives – although social constructs – have been very influential in 'guiding' practices in doctoral education within the universities (the way in which they have responded to these imperatives) as well as the nature of supervision.

And finally, we argued that the major challenge that we face in this country is to generate sufficient funding to support more postgraduate students to study full-time, which will also stimulate the introduction of different models of doctoral education, and that this may encourage or incentivise more black students to engage in doctoral education. This is a plea for a radical change to the current approach to doctoral education that will enable the system to respond more innovatively to all four imperatives.

In the final chapter we address three related policy options that are based on our analysis in this book.

Chapter 8

Policy choices and implications

- Policy choice 1: Growing doctoral enrolments and graduates
  - Growth in doctoral enrolments
  - Increases in academic capacity
  - Increases in proportion of academic staff with PhDs
  - Improvement in efficiency levels
  - Scenarios based on growth variables
- Policy choice 2: Making South Africa a PhD hub for Africa
- Policy choice 3: Implementing a differentiated university system
  - Differentiated doctoral production
  - Government responses
- Tough questions
- In conclusion

The discussion in Chapter 7 focused on the ways in which the four national imperatives of growth, efficiency, transformation and quality influenced doctoral education and doctoral supervision in South Africa's universities. Chapter 7 concluded that the South African university system should be able to respond in innovative ways to all four imperatives if sufficient public and private funds were made available to enable at least 60% of doctoral students to engage in full-time doctoral studies. The chapter concluded further that growth in full-time studies would stimulate the introduction of differing models of doctoral education, and may encourage more black students to engage in doctoral work.

In this final chapter, we discuss, within the framework of the conclusions of Chapter 7, three key areas within which options should be considered and choices made. The three areas are summarised below:

- The first is the *National Development Plan* (NDP) and Department of Science and Technology (DST) target of 5 000 doctoral graduates per

annum by 2030, which will require decisions at national and institutional levels about doctoral enrolment growth, academic capacity, efficiency gains, transformation and quality.

- Interwoven with attempts to reach this ambitious graduate total target is a set of policy issues regarding internationalisation of doctoral studies, and in particular what South Africa's relationship should be with the rest of the African continent. We argue that there is a strong case to be made – given recent trends – to further strengthen South Africa as the hub for doctoral production in Africa. Such a policy choice will have major effects in terms of high-level knowledge production and innovation. However, in order to pursue this course of action, current immigration policies and policies related to human development would need to be revisited.
- Chapters 2 to 5 showed that high levels of differentiation already exist in the South African university system. Formalising these differences for the purposes of the delivery of doctoral education will require tough decisions to be made by the Department for Higher Education and Training (DHET), in coordination with other government agencies and institutional leadership.

It is important to stress that the aim of this chapter is not that of policy prescription, which is the domain of government, institutional leadership and interest groups. The overall aim of Chapter 8 is to illustrate and highlight challenges and options in the areas in which choices will have to be made.

Policy choice 1: *Growing doctoral enrolments and graduates*

The NDP (NPC 2012), strongly supported by Minister Pandor's 2014 DST budget speech (Pandor 2014), set a national output target of 5 000 doctoral graduates per year by 2030. It has also set a target of 75% for the proportion of academics to be holding a doctorate by the same year.

We have argued in this book that the doctoral education system is a complex one. A large number of factors at various levels of the system affect its overall performance. These factors range from geo-political forces (influx of doctoral students from the rest of Africa to South Africa), to policy and strategy considerations (funding framework for HE, incentive strategies, available scholarship support for postgraduate students), institutional factors (differentiation in the capacity of the university sector, institutional policies and strategies, institutional support structures and initiatives, supervisory capacity) and, of course, the individual student level (resources for study, support structures, nature of employment, academic readiness, personal motivation and so on).

If we suspend for the moment some of the more qualitative considerations listed above, as well as issues related to regional and national policy, the discussion of the feasibility of the 2030 targets can focus on four growth variables:

- Doctoral enrolments;
- The academic capacity of South African universities;
- Permanent academics with doctorates; and
- The efficiency of the doctoral system.

Growth in doctoral enrolments

South Africa has benefited from sustained and relatively high levels of growth in doctoral enrolments (6.4% between 1996 and 2012), mostly due to an annual rate of growth of 18% in students from the rest of Africa. The evidence presented in this book suggests that a 6% rate of growth in doctoral enrolments could be sustained if (a) the influx of students from the rest of Africa continues; (b) the participation rates of South African black students (especially African students) increase substantially; and (c) the academic capacity of universities, in terms of their academic staffing resources, increases at reasonable rates.

The assumption listed as (a) above seems to be a reasonable one as there is persuasive evidence from forthcoming CHET/HERANA studies that the number of doctoral enrolments from the African continent will continue to grow. Account would, however, have to be taken of negative international perceptions about South Africa (related, for example, to crime and xenophobia), as well as of the current bureaucracy around attaining student visas that may constrain the growth from the rest of Africa.

The second condition involving increases to the participation rates of South African black students will be more difficult to attain. We have provided ample evidence that South African black students struggle to secure the requisite funds to study (and, in particular, to study full-time). Deep-seated socio-economic realities affect this group adversely, and with these unlikely to change in the short to medium term, it is difficult to see how one could expect a substantial increase in their doctoral participation rates.

The third condition that academic capacity must increase cannot be taken as given. It is not inconceivable that some South African universities may start to cap the growth of their doctoral intakes if there is not a commensurate increase in their academic capacity.

Despite these considerations, we believe that the reasonable choices could be based on current enrolment growth rates. We do not believe that reasonable choice could be made within a high-growth scenario (which

might, for example, assume an average annual enrolment growth rate of 9%). A high growth rate could only be achieved if the current, very high annual growth rates (>18%) of students from other African countries are maintained or even increased.

Increases in academic capacity

If one assumes that doctoral enrolments will continue to increase, it is obvious that the system would need a corresponding increase in the number of academics able to provide the required supervision for these growing numbers. Even if the proportion of academics with PhDs increases (see below), it is unlikely that this would be adequate to meet the growing demand. It should be noted that the average annual increase in doctoral enrolments for the period 1996 to 2012 was 6.4%, which is more than double the average annual growth rate in academic staff numbers (2.9%) over the same period.

Would it be reasonable to base policy choices on an assumption that the average annual rate of increase in the number of full-time academics will in future exceed 2.9%? We believe that the assumption that there will be a high growth rate in academic staff numbers (e.g. 4% per annum) is not a reasonable one, and that it should probably not be included as a policy choice option.

An annual growth rate of 4% would be attainable only if the government invests substantial new amounts in expanding the current academic staff in the system, and specifically at the eight to ten universities that produce the bulk of doctoral graduates. We are aware that the DHET is planning to expand the investment in academic staff, but we think it is likely that these investments will be evenly distributed across all universities, regardless of their share of doctoral production.

So, although the 4% annual growth rate cannot be ruled out, we believe that any future policy choices should be based on the continuation of the current growth rate of 2.9% in permanent academic staff.

Increase in proportion of academic staff with PhDs

Achievement of this goal is more clearly within the control of universities. This target is the most likely to be achieved, especially if the NRF and universities expand the many initiatives to support staff with time-off and sabbatical grants to complete their doctoral degrees. However, the gap between the current proportion (41%) and the target (75%) is enormous, and there are a number of limiting factors that will affect the attainment of this target. First, the retirement and post-retirement policies of universities – especially the more productive universities – are major factors in

determining the size of the supervisory pool. There are still a few universities where academics must retire at age 60, which results in a considerable loss of capacity in the system. Second, the required increase in the proportion of staff with PhDs will have to happen *at the same time* as the pool of academics who retire or resign (or leave the system for other reasons) is being replenished. Third, a general increase in the proportion of staff with doctorates will not necessarily address the growing demand for doctoral supervision: the increase has to happen in the fields and disciplines where we anticipate the greatest growth to occur. The increases in enrolments are likely to continue to occur in certain fields (and these are not likely to be in the humanities and the social sciences). Hence, there needs to be a strategic alignment between the 'supply' of academic supervisory capacity and the 'demand' of new doctoral students.

Improvement in efficiency levels

One of our main arguments has been that once students are in the doctoral education system and are able to persist in their studies, universities and supervisors are quite efficient in managing doctoral outcomes. On average every academic with a PhD delivers a doctoral student about every four years (0.28 per year). Given the already strained burden of supervision (quantitatively and qualitatively), our view is that this constitutes an acceptable level of doctoral supervisory efficiency. In fact, if one keeps in mind that staff at the best performing universities (Stellenbosch, Pretoria and UWC) each produced 0.37 doctoral graduates in 2013, the picture is even more positive.

We do, however, believe that it is realistic (but not without more dedicated support and new incentives) to expect that all of the PhD-producing universities could achieve a ratio of close to 0.35 doctoral graduates per supervisor per year.

If, however, efficiency levels are expected to be increased beyond this (say to 0.4), then we would contend that this could only happen if the proportion of students studying full-time also increases substantially. We have shown that full-time students have shorter progression and completion rates. They complete their doctoral studies on average six to seven years earlier than part-time students and are, therefore, also able to contribute to knowledge production at an earlier stage of their academic and scientific careers.

Scenarios based on growth variables

The discussion in earlier subsections has focused on what could be regarded, for the purposes of achieving the 2030 target of 5 000 doctoral graduates per annum (NPC 2012), as a reasonable range of values for four

growth variables. The variables and ranges included in the discussion were these:

1. *Growth in doctoral enrolments*: 6% (current) and 9% (high) rate of average annual growth;
2. *An increase in academic capacity*: 2.9% (current) and 4% (high) rate of average annual growth;
3. *Proportion of academic staff with PhDs*: 41% (current) and an increased (high[1]) proportion of 58%; and
4. *Efficiency rates*: Number of doctoral graduates produced by each doctorate-holding academic staff member: 0.28 (current) and 0.40 (high).

These options in combination generate 16 theoretical scenarios (see Appendix 6 for the complete table).

The possible scenarios that will be discussed in the remainder of this subsection are based on an assumption that the current 6.4% average annual growth in doctoral enrolments will be sustained up to 2030. Figures 8.1 and 8.2 present the possible outcomes for these scenarios, depending on whether the number of full-time permanent academic staff continues to increase at its *current* rate (Figure 8.1) or increases at a *higher* rate of 4% per annum (Figure 8.2).

Figure 8.1 shows the output effects within a framework of current growth rates in doctoral enrolments and permanent academic staff. The options available in this framework would be interventions designed to improve the proportions of academics with doctorates and/or graduate efficiency rates. If the choice made is to retain current doctoral proportions and efficiency rates, then the annual total of doctoral graduates produced by 2030 would be below 3 000. To achieve the target of 5 000 doctoral graduates by 2030, the choices and interventions would have to be ones designed to increase the numbers of academics with doctorates, and hence potential doctoral supervisors, by more than 40% by 2030 compared to the current total rate. The doctoral output efficiency rate would, at the same time, have to increase by about 50%. These are very stringent conditions, and hence even their achievement would pose major challenges to the doctoral education system.

Figure 8.2 retains the assumption that doctoral enrolments will increase at the current average annual rate of 6.4%. It assumes that, in contrast to the assumption embedded in Figure 8.1, the academic staff total will grow at the higher average annual rate of 4%.

The data flow in Figure 8.2 shows that a choice to increase the number of academics at a rate above the current 2.9% could have a major impact on doctoral outputs. The annual total of doctoral graduates could easily reach 5 000 by 2030 if a 4% academic staff increase is linked to improvements in the proportion of academics with doctoral degree qualifications. The earlier

analyses in this section have, however, shown that an increase of 4% in the overall total of academics is probably not a choice that will be available to those wishing to increase doctoral graduate outputs in South Africa.

Our discussions above attempted to show under what conditions the attainment of the annual target of 5 000 doctoral graduates would be possible. The conclusion reached is that to meet the target, the DHET, DST, NRF and other institutions (including the universities) would have to give serious consideration to strategies and models that would affect radical change (see previous chapter) to the doctoral education system in

Figure 8.1: 2030 scenarios – current (2%) average annual growth rate in (AAG) student enrolments

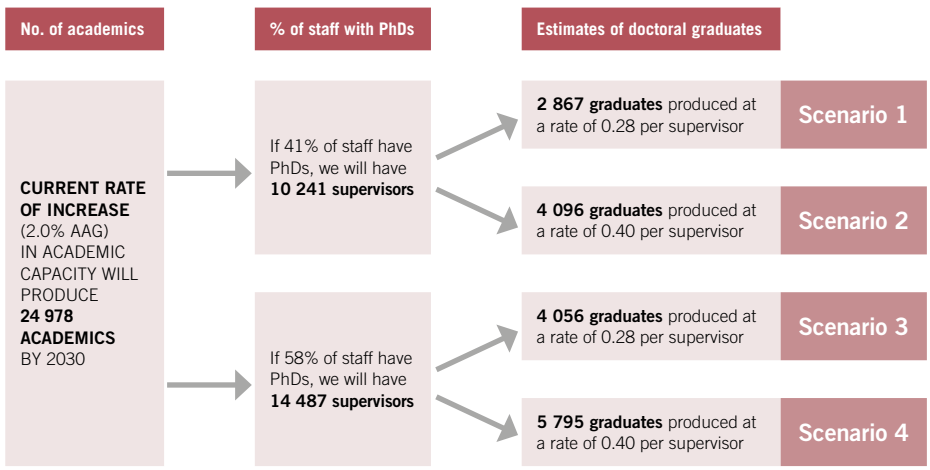
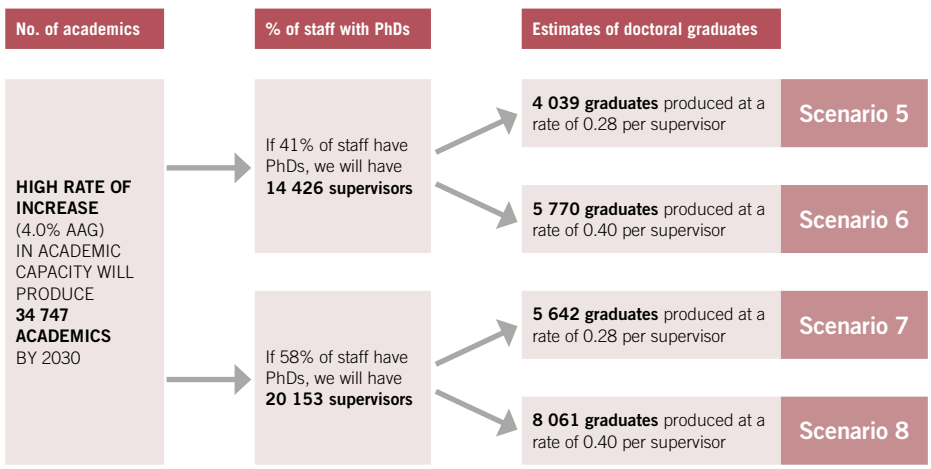


Figure 8.2: 2030 scenarios – high (4%) average annual growth rate in academic capacity



the country. Our analyses have shown that the choices which need to be made if the target of 5 000 is to have a chance of being achieved must include ones related to funding for higher proportions of full-time doctoral students.

One set of choices discussed in this subsection concerns the growing of the intake of doctoral students from the African continent. The argument in the subsection was that to retain the overall current rate of growth in doctoral enrolments (6.4%), a clear focus should be placed on continuing, and even expanding, the recruitment of doctoral students from other African countries. The next subsection spells out the choices to be made in terms of South Africa being made a 'PhD hub' for Africa.

Policy choice 2: *Making South Africa a PhD hub for Africa*

Emerging from the academic boycott in 1995, the NCHE never discussed the internationalisation of the doctorate, and the Department of Education had not introduced a formal HEMIS data category for foreign postgraduate students. Foreign doctoral students have continued to attract South African government subsidies on the same basis as students who are South African citizens or permanent residents. A consequence of this 'policy gap' has been that in 2000 16%, and in 2012 43%, of total doctoral graduates in South African universities were international students. This is by international comparisons a very successful internationalisation 'policy', albeit one that was not specifically intended.

More surprising is that in 2000, 10% (70 of 700) of doctoral graduates were from the rest of Africa, and in 2012 the proportion had reached 41.7%. Even more unusual, regarding internationalisation globally, is that the average annual growth rate of doctoral graduates from the rest of Africa, is at 21%, more than twice as high as the 9.8% for South Africans. The 'controversial' statistic which emerges is that by 2012 South African universities had more doctoral graduates who had entered from the rest of Africa than African doctoral graduates who resided in South Africa (498 compared to 323).

In terms of students, there are four key factors that contribute to the possibility of South Africa becoming a PhD hub for the continent. The first is the considerable investments the South African government is making, and intends to make, towards increasing PhD production; improving supervisory capacity among academics; providing incentives for students to remain in the system up to doctoral level; and supporting jobless graduates in work experience in science, engineering and technology institutions.

A second factor is that, relatively speaking, South Africa is inexpensive for PhD candidates from other African countries. In Chapter 4 (Transformation) we showed that pursuing a PhD degree in South Africa is

a bargain at around USD 13 000 per annum, in contrast to USD 46 000 in the UK and almost USD 70 000 at private US institutions such as New York University.

The third factor, as is shown in research from the Higher Education Research and Advocacy Network in Africa (HERANA), is that other African countries have low doctoral enrolments and low doctoral graduation throughput rates. For example, in 2013, Cape Town produced 50% (205 out of a total of 408) of the doctoral graduates in the sample of seven flagship universities (the other flagship universities being in Botswana, Ghana (Legon), Eduardo Mondlane, Nairobi, Makerere and Mauritius). There may also be a growing demand for doctoral study building up in these universities: the seven universities in the HERANA group enrolled 28 600 masters students in 2013, but only 3 200 doctoral students.

A fourth factor is that postgraduate students from elsewhere in Africa are seen as attractive to many South African universities – they contribute to racial transformation, efficiency (completing studies more quickly than local students) and quality (reputedly good writing skills).

In Chapter 7 we discussed a paradigm-changing approach that would aim to recruit and graduate more PhDs, particularly among black South Africans. But the paradigm shift is not only about students, we also pointed to the need to increase supervisory capacity, with a major potential source being suitably qualified academics from other African countries.

At a number of universities, such as Fort Hare and North-West (Mafikeng campus), where substantial numbers of academics from the rest of Africa have been employed, an unanticipated outcome has been a significant increase in research publication output. At Fort Hare, the publication output trebled between 2008 and 2012. At Mafikeng (the previously historically-disadvantaged university in the merger), the publication output grew from 6% of North-West University's output to 22% by 2012, and the ratio of publications per academic exceeded that of the historically-advantaged (white) Potchefstroom (DHET 2013a). This 'transformation' has finally punctured the myth that conditions at the historically black universities in South Africa are so detrimental that academics cannot do research and publish. A second unanticipated outcome is that the academics from the rest of Africa also attract doctoral students from the rest of Africa. At Fort Hare, for example, the output of PhDs quadrupled, from 11 in 2008 to 43 in 2012 (DHET 2013a).

But, the South African immigration policy relating to foreign academics and foreign skills has become ambiguous and uncoordinated (Cloete et al. 2015). In June 2014, new guidelines for work permits were promulgated. The central change in the new guidelines is that while previously a candidate could be accepted with what was described as 'exceptional skills', this has been replaced with a more focused and defined category of 'critical skills'

– that is, skills that are deemed critical to the needs of the country's economy (Republic of South Africa 2014).

For academic positions, academics and researchers are listed under critical skills. However, at a workshop in May 2014 between the universities and the Department of Home Affairs, officials who had drafted the regulations disagreed with each other about whether this category should read (a) academics and researchers, or (b) academics or researchers, the implication being that if it is the former, then academics would be required to fulfil the critical skills list. The published list contains 40 areas, of which more than 30 are in South Africa's new global research niche area of astronomy. The list starts with areas such as galaxy formation and deep observations of earlier galaxies, and ends with earth observation and natural and applied sciences (Republic of South Africa 2014). One immediate implication would be an end to international appointments within the humanities, law or social sciences. At the time of writing this chapter, this issue remained unresolved.

A senior university official dealing with international students and staff observed that the list of bodies/authorities from which confirmation and/or evidence of one's critical skills are required is lengthy, and that officials are reluctant to help and are seemingly uncertain about what is expected of them. The consequence is that critical skills visas are often issued effortlessly outside of South Africa, whereas within South Africa there is uncertainty: 'The risk here is clear: the processes, (mis)interpretation and insufficient coordination between government departments is/will prevent us from retaining these critical skills' (Cloete et al. 2015).

However, a counter trend is that there is also pressure on academics to focus on training more South African Africans, and many universities (as well as the Department of Labour) do not count Africans from the rest of Africa as contributing to transformation. There are indications that the new African middle class, with access to policy influence, is trying to reduce competition for lucrative professional positions and lifestyles.

Another key policy issue relates to South Africa's knowledge economy ambitions and in this regard it is instructive to take note of the work of Saxenian (2002) on Silicon Valley and its interaction with East Asia, and later with Latin America. Saxenian's path-breaking article 'Brain circulation: How high-skill immigration makes everyone better off' illustrates a need to transform the traditional relationships between immigration, trade, education and economic development in the 21st century. The new high-skill immigrant entrepreneurs foster economic development directly by creating jobs and wealth, both in their new country and back home, and indirectly by coordinating information flows and providing linguistic and cultural know-how that promote trade and investment both ways (Saxenian 2002).

While Silicon Valley might be the innovation centre of brain circulation and has brought immense wealth to California, issues have been raised about immigration policy in the US and its impact on retaining high-skill immigrants in the country. As recently as 2010, New York Mayor, Michael Bloomberg, joining influential chief executive officers from the Partnership for a New American Economy, said: 'I can't think of any ways to destroy this country quite as direct and impactful as our immigration policy ... [W]e educate the best and the brightest, and then we don't give them a green card' (Packer 2010).

Even if South Africa does not have overt Silicon Valley ambitions, it could also be argued that we should at least look at the idea of 'EdHubs' proposed by John Douglass et al. (2011; 2014) of the University of California, Berkeley. The greater San Francisco area EdHubs model enables the enrolment of more high-paying 'out-of-state' students, and creates a space where universities can imagine themselves as knowledge hubs that respond to both regional and national economic needs, as well as to the thirst of a growing world (African) population for high-quality tertiary education.

This would sit comfortably with the 2013 *White Paper for Post-School Education and Training*, which states that hosting large numbers of international students could represent a major contribution by South Africa to the development of SADC, and that strengthening southern African economies will also boost South Africa's economy. The NDP actually suggests that South Africa establish itself as a hub for higher education.

If South Africa is to focus its internationalisation efforts on postgraduate – and specifically doctoral – education, postgraduate education should become more closely linked to an innovation, brain circulation, economy-migration model. However, experience and studies have shown that brain circulation could only be achieved if conditions in the rest of Africa's flagship institutions provide environments – and particularly research environments – that stimulate continental collaboration. However, currently, with the exception of a few nods to the rest of Africa, official policies are narrow in their horizon in that they focus on how to improve South African higher education and how to make South Africa (not the region or Africa) a knowledge economy. Obvious policy choices will involve either retaining the current focus on creating a South African knowledge economy, or moving towards the development of a regional knowledge economy.

Some other important policy decisions would have to deal with what kind of financial support students from the rest of Africa would qualify for and whether students from the rest of Africa would be eligible for the proposed full-time appointments. And then there are the related questions of whether the students from the rest of Africa qualify for work permits once they complete their studies and of a better coordinated work permit

system for academics from the rest of Africa that will stimulate collaboration and brain circulation, not mainly brain drain.

It will be crucial that the range of government departments affected adopts a more coordinated approach to these issues, rather than a continuation of the pursuance of policies that are at times contradictory. In addition to coordinated political will, more monitoring will be needed to include the tracking of student mobility – who goes back where, who stays, and by whom are they employed? All in all this points to a more rational, research-informed and consultative approach among all collaborators if South Africa is to be a PhD hub with brain circulation, and not another version of internal continental brain drain accompanied by accusatory transformation discourses.

Finally, at the continental level it is not enough for the African Union (AU) simply to say that there must be thousands more PhDs. As a continental structure the AU will have to do more to encourage brain circulation and perhaps look at European-type Erasmus Mundus Africa-wide collaboration and exchange programmes. At the launch of the new Millennium Goals (October 2015) there was a call for the AU Commission to put in place mechanisms to improve the movement of staff and students to institutions across the continent: 'Mobility can be enhanced by providing an enabling environment, as well as reducing challenges to inter-country mobility.'[2]

Policy choice 3: *Implementing a differentiated university system*

South Africa has over the past 17 years produced six major policy documents that have considered the issue of differentiation in the higher education system. The consensus, starting with the first *White Paper* in 1997, has been that South Africa must have a differentiated higher education system. The problem has been how this should be done, within a context in which there were, and still are, competing demands for priority to be given either to overcoming the institutional inequities of South Africa's apartheid past or to meeting the development needs of a changing society and economy.

Attempts to meet the equity demand led to a process of institutional mergers, between 2004 and 2006. Their aim was that of radically altering the apartheid landscape by merging and closing higher education institutions, and by reducing by 2013 the overall number of university-level institutions from 36 to 23. Attempts to meet the development demand led to three categories of university-level institutions being introduced after 2007. Institutions in all three categories would have strong undergraduate programmes, with (a) the six universities of technology having a major focus on vocational training; (b) the 11 traditional universities having a focus on professional rather than vocational training and on strong masters and

doctoral programmes; and (c) the six comprehensive universities offering a mix of university of technology and traditional university programmes at undergraduate level, and some masters and doctoral programmes.

After setting up this first, high level of differentiation, no government decisions have, however, been taken on the contentious decision of how differentiation could be extended into the three broad categories. The policy choices seem to have been set up as either (a) that of allowing (say) the 11 traditional universities to 'self-differentiate' by formulating their own vision and mission statements, or (b) that of differentiating through national contracts that are based on the empirical performance of traditional universities relative to goals and targets set for South Africa's traditional universities.

If the final choice of government is to allow self-differentiation, then no clear, formally recognised group of research universities will emerge in South Africa. This would run contrary to the growing consensus among national policy-makers and other central socio-economic actors that the university is a driver for economic growth and development. This has to do with the role of the university in producing a highly-skilled and competent labour force, and in producing new knowledge. Both contributions are essential to the creation of innovation and the development of a national economy that is globally competitive. This is well summed up by Olsson and Cooke (2013: 18) in an OECD/IHERD report as follows:

> *Top research universities in industrialised countries (often referred to as the Super RUs) usually dominate the global ranking tables. In contrast, their counterparts in middle and low-income countries have, if anything, more important missions because they are the engines of local and regional knowledge development and natural leaders of their own evolving academic systems. As these systems become increasingly complex and the need to nurture knowledge networks for research grows ever more essential, the success of these institutions becomes even more crucial for national development policy.*

A clearly differentiated academic system is needed for research universities to flourish. But, according to Altbach (2013: 328):

> *The fact is that few if any developing countries have a differentiated academic system in place; and this central organisational requirement remains a key task … These institutions must be clearly identified and supported. There must be arrangements so that the number of research universities will be sufficiently limited so that funding is available for them and that other resources, such as well-qualified academics, are not spread too thinly.*

But as Altbach points out, research universities with strong doctoral programmes constitute a relatively small percentage of the higher education sector. In the US, the ratio is about 5% (220 research universities in a system of more than 4 000 post-secondary institutions); in the UK 25% (25 research universities among 100 universities); and in China 3% (100 research universities out of more than 3 000 institutions countrywide). In many smaller developing countries there is often only one research university and many countries have none (Altbach 2013).

As was stressed in the opening paragraphs to this subsection, the question about differentiation in South Africa is not whether the higher education system should be a differentiated one. Policy commitments to differentiation have been in place from 1997 through to 2014. The only level approved so far by government has, however, been the three-tier category discussed earlier. What has not been decided is how differentiation within the categories should be implemented, and whether cross-cutting of categories will be permitted. For example, a subcategory of research universities would naturally fall within the broader category of traditional university. But what of a subcategory for doctorate producing universities? Should this be limited to the category of traditional university, or should it cut across all three of the broad categories? To illustrate what would be involved in an implementation choice of this kind, we have selected two indicators for growth, efficiency, transformation and one for quality. The indicators are in Table 8.1 and are compiled from data presented in Chapters 2 to 5.

Differentiated doctoral production

Table 8.1 shows that in 2012 the top seven universities produced 68% of the doctoral graduates and the bottom six only 1%. In terms of growth rate, five universities grew at more than 20% annually during the period 2008 to 2012, while three had 0% growth.

Regarding efficiency (the 2006 cohort), four universities had a completion rate above 55% after seven years, and seven universities had a completion rate lower than 35%. Another indicator of efficiency is the ratio of PhD graduates as a percentage of academic staff with doctorates. In 2012, five institutions had a ratio higher than 0.30 and four universities lower than 0.10.

Regarding transformation, in 2012, five universities produced more than 90 black doctoral graduates each and six universities only 15 in total, while five universities produced more than 75 female graduates each, and six universities just 13 in total.

Using percentage of academic staff with a PhD as an indicator of quality, in 2012, six universities had more than 50% of staff with PhDs and five fewer than 20%.

Table 8.1: Indicators for performance in doctoral production

	GROWTH		EFFICIENCY		TRANSFORMATION		QUALITY
University	**Graduates 2012**	**Average annual growth rate: 2008–2012**	**% of 2006 cohort graduating after seven years**	**Ratio of PhD graduates to academic staff with doctorates 2012**	**Number of black PhDs produced**	**Number of female PhDs produced**	**Percentage of academic staff with PhDs**
Cape Peninsula	24	16.6%	34.0%	0.19	19	5	16%
Cape Town	199	7.1%	55.8%	0.28	98	78	**65%**
Central	5	0.0%	30.8%	0.07	3	1	26%
Durban	6	18.9%	46.2%	0.07	4	5	15%
Fort Hare	43	**40.6%**	34.1%	0.36	41	9	38%
Free State	94	14.3%	50.7%	0.25	42	44	40%
Johannesburg	109	10.5%	55.0%	0.37	52	53	29%
KwaZulu-Natal	177	6.8%	50.3%	0.27	**138**	91	47%
Limpopo	17	5.0%	32.0%	0.13	16	7	16%
Mangosuthu	0	0.0%	0.0%	0.00	0	0	9%
Nelson Mandela	86	16.3%	51.4%	0.36	51	26	41%
North-West	154	11.4%	52.1%	0.25	42	82	50%
Pretoria	**200**	2.7%	51.5%	0.32	83	**99**	49%
Rhodes	67	25.5%	50.6%	**0.39**	34	32	51%
South Africa	152	22.7%	24.5%	0.25	94	60	39%
Stellenbosch	**240**	18.9%	**65.1%**	**0.46**	**107**	**96**	53%
Tshwane	44	**35.6%**	51.1%	0.25	33	14	21%
Vaal	2	0.0%	0.0%	0.05	2	0	13%
Venda	4	18.9%	29.4%	0.04	4	1	31%
Walter Sisulu	3	10.7%	25.0%	0.04	2	1	12%
Western Cape	75	15.6%	**59.8%**	0.26	62	23	52%
Witwatersrand	150	9.1%	44.5%	0.25	92	56	**55%**
Zululand	28	21.1%	51.6%	0.35	26	11	27%

Note: Figures in bold indicate the top two universities in each category
Source: DHET 2013a

It is of course not the same institutions that perform the best for each of the indicators. In 2012, Stellenbosch and Pretoria both produced 200 or more graduates, while for the period 2008 to 2012, Fort Hare University and Tshwane University of Technology grew at more than 35% annually. Stellenbosch had a completion rate of 55.1% and Western Cape had a completion rate of close to 60% for the 2006 cohort. Stellenbosch and Rhodes had an above 0.39 ratio of PhD graduates to academic staff with doctorates. Regarding transformation, KwaZulu-Natal and Stellenbosch produced more than 100 black PhDs each, and each of these institutions graduated more than 90 women. Finally, at Cape Town and Witwatersrand more than 55% of the staff had a doctorate.

Looking at doctoral performance across the seven indicators, there is a grouping of at least seven traditional universities that consistently perform well across the indicators: Cape Town, KwaZulu-Natal, Pretoria, Rhodes, Stellenbosch, Western Cape and Witwatersrand. There is a second grouping of nine that are consistently in the top 10 in terms of at least five of the indicators: (a) four traditional universities: Fort Hare, Free State, Limpopo, North-West; (b) four comprehensive universities: Johannesburg, Nelson Mandela Metropolitan, South Africa and Zululand; and (c) one university of technology: Tshwane. The third grouping of seven universities performs poorly across most of the indicators. This group consists of (c) five universities of technology: Cape Peninsula, Durban, Central, Mangosuthu and Vaal; and (d) two comprehensive universities: Walter Sisulu and Venda.

It is worth noting that in terms of the official government classification of the system into traditional universities, comprehensive universities and universities of technology, four of the comprehensives (Johannesburg, Nelson Mandela Metropolitan, South Africa and Zululand) perform quite comparably with the second grouping of traditional universities as far as doctorate production is concerned. Regarding the universities of technology, it is only Tshwane that could be classified as being in the doctorate-producing grouping.

High performance relative to indicators and goals has often been attributed to historical advantage (some universities are more than 100 years old) and particularly to the apartheid practice of discriminatory allocation of resources and human capital (DHET 2013c). However, the data in Table 8.1 show that in post-apartheid South Africa, some of these differentiations in performance – particularly in terms of knowledge production (PhD and research output) – continued, but that there is a differentiation occurring amongst the historically disadvantaged institutions. For instance, Western Cape, Fort Hare and the Mafikeng campus of North-West University (see 'South Africa as a PhD Hub' above) have become much more productive, and the Tshwane University of Technology is comparable to the second grouping.

Government responses

Underpinning the paradigm shift proposal are some important policy imperatives that have been discussed in Chapter 1 and Chapter 7. Chapter 1 shows that globally there are two major discourses. Within the developed countries, with already high doctoral production and part of the knowledge economy, there is a debate about whether an increase in doctoral graduates is required and what kind of contribution (research skills, innovation and talentism) a PhD makes to their knowledge economies. In sharp contrast, there is a range of developing countries, from Brazil and Mexico in Latin America to numerous East Asian countries such as China, Malaysia, Singapore, where higher education, and specifically the doctorate, is seen as a development driver towards becoming a knowledge economy – and these countries have invested massively in the expansion of doctoral programmes (see Chapter 1).

Central to this group of countries is that the call for increasing doctoral output is part of a larger policy framework, which includes a pact (broad agreement) about a range of policies often across different ministries – it is not just a case of growth in doctorates.

But in Chapter 1 we showed that in Africa the discourse is very different. The HERANA study reported that amongst the eight participating countries only Mauritius had a broadly supported knowledge economy development model with policies across different ministries, and that for the other seven countries there was no pact about a development model, nor about the role of the university in development. We concluded that in Africa the call from both Dr Dlamini-Zuma of the AU for thousands more PhDs is without an economic context, and the IAU-ACUP (2012) conference report stated that while the status of the PhD is recognised, African societies do not know how to evaluate the competencies, which raises the question whether the demand for more doctorates is mainly a response to the brain drain.

But in South Africa the government (through the DHET, DST and National Research Foundation [NRF]) has responded within a knowledge economy discourse, even though, as we pointed out earlier, the real economy is still very much a low-skill, mineral-extraction, export-dominated model.

Both the DHET and the NPC have, in policy documents, supported the notion of strengthening high-performing research-led universities. For example, the DHET *White Paper* (2013c: 29) declared that in 'the university sector this continuum will range from largely undergraduate institutions to specialised, research-intensive universities which offer teaching programmes from undergraduate to doctoral level.' It goes on to state that:

> *As part of the strategic objective envisioned by the National Plan for Higher Education, this policy aims to sustain current research strengths and to promote the kinds of research and other knowledge outputs required to meet national development needs.*

In its rhetoric, the DHET is quite in line with the sentiments captured in the NDP, which in 2012 stated the aim to:

> *strengthen universities that have an embedded culture of research and development. They should be assisted to access private sector research grants (third stream funding) in addition to state subsidies and student fees, attract researchers, form partnerships with industry and be equipped with the latest technologies.* (NPC 2012: 319)

In terms of financial policy, DHET has rewarded performance in terms of subsidies for research output and doctoral enrolments and graduation. (See Appendix 5 for details of the substantial subsidies for doctoral education, differentiated across fields of study.) The DST and NRF have awarded scholarships, special professorships (South African Research Chairs Initiative)[3] and Centres of Excellence[4] based on merit and equity, but the strong doctoral education group of institutions has benefitted commensurately, as could be expected if merit is an important, even if not the only, criterion.

Tough questions

The findings presented in this book pose anew at least six tough policy questions that the country has struggled with since 1994, and continues to struggle with, if it wishes to gear up the system to meet the target of 5 000 new doctorates a year by 2030.

First, should the seven institutions that make up 30% of the system and produce 70% of the doctorates be regarded and recognised as having an 'embedded research culture', as research-intensive universities with strong doctoral programmes? If so, what are the policy levers for further strengthening such universities? Second, should the nine institutions in the next cluster be encouraged and incentivised to develop and expand their research and doctoral education capacities? While this would broaden the base of the system, it would run counter to the international trend of singling out a smaller group of institutions worthy of high-level support. Third, should the six institutions that produce 1% of the doctoral graduates be allowed to continue to offer doctoral programmes? In the USA and Norway, for example, PhD-awarding status is attained only after meeting

fairly stringent conditions. Fourth, if a decision is taken to increase funding support for full-time doctoral studies, with the attendant considerable costs involved, should these programmes be distributed across all institutions or concentrated in the most efficient universities with demonstrated supervisory capacity? Fifth, it is highly unlikely that South Africa will meet the target without welcoming candidates and supervisors from the rest of Africa more actively. Can this be encouraged in the face of the prevailing national mood? Last, but certainly not least, can the country afford not to incentivise (highly productive) universities to produce more black women with doctorates?

In conclusion

The central issue that emerged from the discussion in this chapter is that if the proposal on a shift in doctoral education paradigm is accepted, it will involve much more than simply giving more funding to the DHET to continue the current performance system. It will require more policy coordination from the different role-players. To achieve that there will have to be a pact (broad agreement) amongst national departments, and between universities and the national and relevant continental stakeholders. To inform these different role-players, and provide evidence for decision-makers at different levels, there will have to be more and ongoing research – the current fragmented institution-driven expansion could be disadvantageous to everybody concerned.

What this study has attempted to show is that discourses framed around the single imperatives of growth, efficiency, transformation or quality do not on their own generate productive policy discourses. What is required is a change in approach that accommodates multiple imperatives and allows for these to be addressed simultaneously. In South Africa, we will have to learn to become better at identifying and managing the policy trade-offs arising from competing imperatives than at stridently promoting single causes.

Notes

1 This proportion is based on an average annual increase of 4%.

2 http://www.universityworldnews.com/article.php?story=20151002124741617&mode=print

3 http://hicd.nrf.ac.za/?q=node/16

4 http://www.nrf.ac.za/division/rcce/instruments/centre-of-excellence

Appendix 1

Data sources and methodology

The evidence presented in this book was sourced from various studies and projects conducted previously by CREST as well as analyses done specifically for this text. There are four main studies that were used in this regard.[1] We list each study and the core methodology pursued in the table below, and indicate where the study is cited in the relevant chapters. This is followed by a more extensive discussion of the methodology of the study concerned.

No.	Study	Methodology	Chapters
1	Trends in PhD production and efficiency (2014)	Secondary analysis of HEMIS student data conducted specifically for the book	Results of these analyses are found in Chapters 2–5
2	Study of productive departments in SSH (2013)	Qualitative study (face-to-face group interviews) with 25 selected departments at 13 South African universities	Chapter 6
3	DST retention and progression study (2014)	Secondary analysis of HEMIS student data for pipeline analysis	Chapter 3
		Web-based survey of post-graduate enrolments	Chapter 2
4	Study of doctoral supervision in South Africa (2011)	Web-based survey of SA doctoral supervisors	Chapter 5

Study 1: Trends in PhD production and efficiency

Data tables and analyses

The main sources for the data tables were data extracts prepared by the Department of Higher Education and Training (DHET) from the South African Post-Secondary Education (SAPSE) Information System for the period 1986 to 1999 and the Higher Education Management Information System (HEMIS) for the period 2000 to 2012. In order to establish trends over time, all data from pre-merger institutions were mapped to the post-merger universities.

The only source of data before 1960 that could be obtained was an unpublished doctoral thesis from the University of Pretoria by JG Garbers completed in 1960, titled '*Gradueringstendense in Suid-Afrika 1918–1957*'. Another useful source of data before 1986 was a 1982 publication by the former Pretoria-based *Departement van Nasionale Opvoeding* titled '*Statistiek van Kwalifikasies Toegeken deur die Outonome Universiteite in die Jare 1971–1979*'.

The data elements needed for the national versus international doctoral student comparisons were extracted by the DHET from the national HEMIS database according to the specifications needed for the analyses. International data are only available from the year 2000 in the HEMIS data.

HEMIS replaced the SAPSE Information System in 1999. HEMIS is an electronic database maintained by the DHET. It contains unit record data of qualifications offered by public universities as well as students enrolled by universities and staff employed by universities. Space data as well as financial data are also collected from public universities according to specifications. HEMIS data are audited and are provided to the DHET according to technical specifications.

Efficiency: Cohort analyses

Individual student records for all doctoral students for all the years from 2003 to 2012 were obtained from the audited data sets of HEMIS maintained by the DHET. The data for the analysis were extracted from the student as well as qualification files.

The following variables were used for the analysis of the qualification records: 001 – Qualification code; 003 – Qualification name; 005 – Qualification type; 063 – Institution code; 082 – Qualifier; 089 – Mode of delivery; 588 – Submission; 529 – Collection year

The following variables were used from the individual student records: 001 – Qualification code; 005 – Qualification type; 007 – Student number; RegisterID – Unique random number created for students to replace ID number to mask student identity; 009 – Qualification commencement date; 010 – Entrance category; 011 – Date of birth; 012 – Gender; 013 – Race; 014 – Nationality; 024 – Attendance mode; 025 – Qualification requirements status; 026 – CESM category for first area of specialisation; 027 – CESM category for second area of specialisation; 063 – Institution code; 529 – Collection year; 571 – Age in years; 588 – Submission; 589 – Headcount indicator.

Although an attempt was made to determine trends for full-time and part-time doctoral students, the full- or part-time indicator (Element 079 – Full-time/Part-time student) could not be used for analytical purposes since it was not captured for the majority of PhD student records by the universities.

This was a drawback because the difference in the performance of full-time and part-time students could not be compared. It is recommended that the DHET ensures that universities collect and capture this information accurately in future.

Students from pre-merger institutions were mapped to post-merger institutions. Vista students were mapped to their post-2005 institutions by testing the destination institutions in which they ended up after 2005 by tabulating their post-2005 institutions using their Unique_ID. Patterns in student numbers were used to map VISTA students who completed before 2005 to their 'post-merger' institutions. Doctoral student data for the period 1996 to 2004 were thus reconfigured into the post-merger institutions to enable appropriate trend analyses.

For the purposes of this study, throughput rates/completion rates are defined as the percentage of students who graduate within the period of analysis. Dropout rates are the percentage of students who do not graduate within the period of analysis, including students who discontinue their studies. Since each cohort was analysed until 2012, dropouts were defined as students who had not graduated by 2012. Those who were still registered in 2012, but who did not graduate in 2012, were counted as dropouts, since the 2013 data were not available at the time of the analysis to determine how many of them reregistered in 2013.

To calculate throughput/completion rates one needs to look at data from several years to select a cohort of new entrants of students of a reasonable size and follow their graduation trends over a number of years. In essence, throughput/completion rates give an indication of how successful the universities were in graduating new entrants into the qualification in a particular year (cohort) over the period of analysis. It also provides information on dropouts, who are students who do not reregister after dropping out for the period of analysis and who thus do not obtain the qualification. The data contain a record for each year of registration for each student. A student's enrolment and graduation history thus had to be constructed from several enrolment records for each student. Each student record contains at least one – or, at the most, four – Classification of Education Subject Material (CESM) code/s. HEMIS data element 81 – *Institution Programme Name* – is a valuable data field which, with the CESM categories, assists with the classification of students into a field of study.

The CESM code was used to classify the student enrolment into the major fields of study. The CESM category for first area of specialisation was used to classify the student record into the major field of study. The major field of study was classified for each qualification type in which the student was enrolled separately because the student does not necessarily continue further studies in the same field of study. Due to the fact that students change their fields of study often for the same qualification type, the field

of study of the last enrolment of the student for the particular qualification type was used for the classification of the major field of study. Where the CESM category for first area of specialisation was not completed, the CESM category for the second area of specialisation was used for the classification of the major field of study. The second- and third-order CESMs were trimmed to first-order CESM categories. The CESM categories changed in 2010.

The following recoding was done for the years 2001 to 2009:

CESM	Field of study
1 – agriculture, 6 – computer science and data processing, 10 – home economics, 15 – life sciences and physical sciences, 16 – mathematical sciences	Natural sciences
2 – architecture and environmental design, 8 – engineering and engineering technology	Engineering and technology
9 – healthcare and health sciences	Health sciences
4 – business, commerce and management sciences	Business, economic and management sciences
7 – education	Education
3 – arts, visual and performing, 5 – communication, 12 – languages, linguistics and literature, 13 – law, 14 – libraries and museums, 17 – military sciences, 18 – philosophy, religion and theology, 19 – physical education, health education and leisure, 20 – psychology, 21 – public administration and social services, 22 – social sciences and social studies	Humanities and social sciences

The following recoding was done for the years 2010 to 2013:

CESM	Field of study
1 – agriculture, agricultural operations and related services, 6 – computer and information sciences, 10 – family ecology and consumer sciences, 13 – life sciences, 14 – physical sciences, 15 – mathematics and statistics	Natural sciences
2 – architecture and the built environment, 8 – engineering, 11 – languages, linguistics and literature	Engineering and technology
9 – health professions and related clinical sciences	Health sciences
4 – business, economics and management sciences	Business, economic and management sciences
7 – education	Education
3 – visual and performing arts, 5 – communication, journalism and related studies, 12 – law, 16 – military sciences, 17 – philosophy, religion and theology, 18 – psychology, 19 – public management and services, 20 – social sciences	Humanities and social sciences

The study required that the new entrants in each academic year had to be clearly distinguished from doctoral students who have previously been registered. In the HEMIS data the entrance category variable gives an indication of whether the student was a new entrant or a student who had previously been registered for the qualification. New entrants in doctoral programmes are not always consistently classified by universities. For this reason students who registered in year n who were not registered in year n-1 for doctoral studies were considered new entrants.

Study 2: Study of productive departments in the social sciences and humanities

The second study listed here consisted of case study analyses of highly productive departments in the social sciences and humanities. Thirteen universities were selected to take part in this study: the universities of Cape Town, Johannesburg, KwaZulu-Natal, Pretoria, South Africa, Free State, Western Cape, Witwatersrand, Zululand, Nelson Mandela Metropolitan, Rhodes, North-West and Stellenbosch. Collectively they produced 96% of the higher education system's doctoral graduates in social sciences and humanities over the 10-year period from 2000 to 2009.

The first criterion applied to select individual departments for study was that a university must have produced a total of at least 20 graduates in that field over the 10-year period from 2000 to 2009. This process resulted in a list of 52 departments meeting this criterion. Additional criteria were hence applied to reduce the department selection. This included analysing graduation rates and doctoral enrolments over the 10-year period and checking on the progress of cohorts of new doctoral enrolments over the period 2001 to 2004.

Ten disciplines were subsequently identified for further exploration: Education, Psychology, Public Administration, Political Studies, Economics, Sociology, Religion, Law, English and Social Work. In all, these fields produced 80.9% of the doctorates in social sciences and humanities across South Africa. No field contributed less than 2.5% (Political Studies) to the total, and each field also had an average annual intake of at least 26 (Political Studies) doctoral candidates between 2000 and 2004. Ultimately 25 departments were included for this part of the study.

On-site interviews were subsequently conducted by Gillian Godsell and Johann Louw. All interviews were recorded in audio and transcribed, but interviewers also took notes and these were included in the analysis. Table 1 shows the final list of departments selected for this study.

Study 3: DST retention and progression study

Part 1: Analysis of HEMIS data for pipeline analyses

The quantitative component of this study consisted of a secondary analysis of HEMIS student data. The methodology consisted of measuring the actual numbers of bachelors students who proceed to register for honours studies and so on. However, conversion – interpreted as the change from one degree (lower) to another (higher) – can occur either directly upon completion of the first degree or only some time thereafter.

Table 1.1.1: Departments selected

University	Department/Faculty	Number of participants
North-West University (NWU)	Education	2
North-West University	Social Work	2
Rhodes University (RU)	Education	4
Stellenbosch University (SU)	Public Administration	3
Stellenbosch University	Theology	1
Stellenbosch University	Sociology	6
University of Cape Town (UCT)	Faculty of Law	2
University of Cape Town	Economics	2
University of Cape Town	English	2
University of Cape Town	Political Studies	1
University of Johannesburg (UJ)	Education	2
University of Johannesburg	Psychology	1
University of KwaZulu-Natal (UKZN)	(School of) Accounting, Economics and Finance	1
University of KwaZulu-Natal	English	2
University of KwaZulu-Natal	Religion	4
University of Pretoria (UP)	Law	1
University of Pretoria	Public Management Administration	3
University of Pretoria	Social Work and Criminology	3
University of Pretoria	Theology	3
University of South Africa (UNISA)	Public Administration	2
University of the Free State (UFS)	Theology	3
University of the Western Cape (UWC)	Education	1
Witwatersrand University (Wits)	Psychology	2
Witwatersrand University	Political Studies	1
Witwatersrand University	Sociology	1

The analysis started with a consolidated database of 1 933 681 records that included all students enrolled for any degree at a South African university for the period 2001–2013. The comprehensive database included biographical information that allowed for an in-depth analysis of student retention, progression and completion rates in terms of scientific domain (categorised into six broad domains), gender, race, nationality (categorised into three broad geographical locations) and age group (categorised into three broad groups).

Calculation of retention and completion rates

In calculating retention, we used a definition according to which all students who remained registered (enrolled) for a particular qualification level (e.g. masters) within the system over a given period, irrespective of completion status, could be considered 'retained' for that qualification level. Put differently, retention is the percentage of new entrants in a given base reference year (BRY) who have completed a degree by the end of a reporting year or are still enrolled for the degree in that reporting year.

As a first step, we created 12 data sets for each of three qualification levels (bachelors, honours and doctoral), thereby producing 36 data sets in total. In each data set the BRY corresponds to the particular cohort of new entrants in that year.

Each initial year or BRY focused on new enrolments only, with subsequent years focusing on returning entrants. This ensured that we could uniquely identify and track a selected cohort (group). In calculating the completion rate, the same cohort that was selected for retention was tracked over the same period. However, in calculating the completion rate the focus was on the percentages of the BRY cohort who had completed their programme at the end of each reporting year (up to 2013).

Calculation of progression rates

Progression was defined as the percentage of students who would move from one level of qualification to a higher level of qualification over a given period. In this instance, our focus was solely on the 'traditional' paths a student might make i.e. moving from bachelors to honours, honours to masters, and masters to doctoral. In taking this approach we discarded possible deviations/alternatives (e.g. a masters graduate who might enrol for an honours programme).

In order to calculate progression rates we also created 12 data sets for each of three progression paths (bachelors to honours, honours to masters, and masters to doctoral). Thus, a total of 36 data sets was produced. The reason for creating 12 data sets per progression path was that there are 12 possible BRYs, where a BRY corresponds to the particular cohort of graduates. Similar datasets were also produced for the progression from honours to masters (12 data sets) and masters to doctoral (12 data sets). In each case the BRY focused on all graduates in a lower qualification degree, so that they could be tracked in terms of their enrolment for a next-level qualification in subsequent years.

Part 2: Web-based survey

A web-based (electronic) survey that targeted a large sample of postgraduate students at the main universities in South Africa was conducted as the second phase of the DST retention and progression study. The 10 most productive universities (in terms of masters and doctoral output) produce more than 97% of all postgraduate students in the system. We obtained the co-operation of these universities to conduct a web-based survey that was emailed to all their current (as of 2014) honours, masters and doctoral students.

The methodology is based on the assumption that it is best to conduct the qualitative component by asking students who have already made their

decisions about proceeding with further studies to reflect on the reasons for their decisions. This means, in practice, we asked honours students to reflect on their reasons for deciding to proceed with postgraduate studies while they were still undergraduate students. We asked masters and doctoral students to do the same. In addition we developed a set of questions about future plans and decision-making for all three groupings. We therefore ruled out the need to ask undergraduate students to participate in the survey. This decision was based both on methodological grounds (we did not think we would get reliable responses to any questions about future decisions) as well as logistical grounds. The methodology employed in the web-based survey entailed the following:

- Getting approval from the universities to conduct a web-based survey (the questionnaire was sent to all universities prior to the submission of the survey for ethical approval).
- CREST designed and managed the survey from a central point, but sent a web link to a contact office at each university for distributing to their postgraduate students. The e-mail links to the web-based questionnaire were distributed in batches by each university to their own students, thereby obviating the need for making student e-mail addresses available to CREST (which is one of the concerns in studies of this nature).
- Students then responded (anonymously) to the e-mail request to participate in the survey and the completed questionnaires were captured by CREST.
- All data analyses were done in aggregate form.

Three separate electronic questionnaires were drafted: one each for honours, masters and doctoral students. The questionnaires were almost identical with differences in phrasing here and there. The qualitative survey aimed to ascertain the primary reasons for students' attitudes (if applicable) towards interrupting their studies or considering discontinuing their studies. A few questions were also aimed at identifying which factors affected students' choices towards selecting institutions and programmes.

Study 4: A study of doctoral supervision in South Africa

With the huge growth in doctoral enrolments (a doubling of enrolments between 2000 and 2009), it was inevitable that individual academics (those with doctoral degrees) would increasingly face larger and ultimately unmanageable numbers of students to supervise. But the challenge of supervision is not only a matter of additional volumes of students to supervise. Evidence from various workshops on doctoral supervision clearly shows that supervisors are not only finding the increased numbers

challenging, but – even more importantly – also the reality that a large number of prospective doctoral candidates are woefully underprepared for doctoral studies. Supervisors complain about the fact that many of their doctoral students cannot write scientifically, do not know how to search the literature, lack the required quantitative and qualitative skills to do proper data analysis and so on. In cases where doctoral students are underprepared for the specific demands of doctoral studies, the doctoral supervisor has to devote more time to guiding the student through the doctoral research process. The 'burden of supervision' is therefore both a result of the substantial growth in the numbers of students to be supervised as well as the large proportion of doctoral candidates who are ill-prepared for their doctoral studies.

In order to gather more systematic evidence about these and related issues, CREST designed and administered a web-based survey of doctoral supervisors at South African universities in 2011.

Methodology

A database of PhD supervisors was compiled from information obtained from South African universities during 2010. We identified the most 'research productive' supervisors on the basis of their publication output over the preceding 10 years. This process produced a list of slightly more than 3 000 names of possible respondents. All of these academics were subsequently invited in an e-mail letter to participate in the web survey. The first batch of e-mails was distributed through the online survey system of Stellenbosch University on 31 October 2011. The initial closing date of the survey was 14 November 2011, effectively giving the participants two weeks to complete the questionnaire. Although e-mails were sent to 3 042 supervisors, delivery failed to approximately 924 recipients, indicating that the addresses were no longer in use or invalid or that some mailboxes were full. At the time of the deadline of the survey (23 November 2011) a total of 336 questionnaires had been received of which 5 were incomplete. Out of approximately 2 118 sent invitations (3 042 initial invitations minus 924 failed deliveries), a total of 331 valid responses were received, resulting in an overall response rate of 15%.

Apart from collecting demographic information, included various questions about PhD supervisory approaches and styles as well as monitoring and feedback mechanisms in the supervisor–student relationship.

Sample profile

An analysis of the realised sample shows that 72% of the 324 respondents who specified their gender were male. The mean age of respondents at the time of completing the survey was 55, but it is also interesting to note that

significant numbers of respondents (36% of the sample) were over 60 and even over 65 (16%). In general, it is fair to say that the sample represents a slightly older profile than population characteristics. This is mainly because of the manner in which we had defined our target population, i.e. as the most research-productive academics in the country. The representation of PhD supervisors by scientific field is comparable to the production of doctoral graduates across scientific fields, based on figures for 2010.

In addition, we were specifically interested to establish for how long the respondents had been supervising PhD students. Altogether 69% of respondents said they had been doing so for at least 10 years, of which 29% reported 20 or more years.

This short description of the demographics of our respondents revealed that our typical respondent is a male, in their mid-50s and with significant experience in doctoral supervision.

Notes

1 In Chapter 5 on quality reference is made to two other surveys conducted by CREST. The first, was a survey of postgraduate students at Stellenbosch University in 2003; the second was a tracer study of doctoral graduates in 2010 under commission for ASSAf. Since we have cited only a few results from each study, we decided not to discuss the methodologies of these two studies in detail in this appendix.

Appendix 2

Responses to the presentation of preliminary findings from the Study on the Doctorate in South Africa (May 2014)

The aim of the seminar *The Doctorate in South Africa: Policies, Discourses and Statistics* was to discuss the framework of the four different pressures or discourses on doctoral education: growth, efficiency, quality and transformation. The researchers also presented a slice of the data and short reports on the qualitative study of departments in the social sciences and humanities that produce above-average numbers of PhDs, and a national survey of supervision practices.

The research group invited a number of responses from experts who are familiar with the South African higher education context and have themselves been involved in PhD supervision. Professors De la Rey and Badat are both former chief executive officers of the South African Council on Higher Education. Dr Butler-Adam, a former deputy vice-chancellor was the Ford Foundation Programme Officer who funded this research project. Professors Moja, Langa, Stensaker and Maassen are involved in doctoral education in their own countries and internationally. While the first three commentators are mainly focused on the research project itself, the latter four are more concerned with different approaches to doctoral education.

Cheryl de la Rey
Former CEO of the Council on Higher Education and Rector at the University of Pretoria

Over the past year, there have been several workshops or seminars in South Africa focusing on the doctorate. This is a reflection of a worldwide trend putting the spotlight on PhDs and their production. This increasing

awareness and focus on the production of the doctorate arises to a large degree through the perceived link between PhDs and social and economic development on both a national and regional basis.

With respect to policy in South Africa, we have had – and will continue to have – opportunities to discuss the *National Development Plan 2030* (NDP) and its prioritisation of growth of PhD production (NPC 2012). This same emphasis is also reflected in the recently finalised *White Paper for Post-School Education and Training* (DHET 2013b), and in programmes run by the National Research Foundation (NRF) and the Department of Science and Technology (DST).

Major debates around the PhD

When we look at the PhD as an issue, we find that there are two main debates:

The developed world and the overproduction of PhDs

Many countries are producing more PhDs than can be absorbed by the higher education sector or by the broader economy. This is particularly evident when one looks at the demographics of European countries and North America. Cyranoski et al. (2011) also pointed to the example of Japan.

The developing world and a focus on ramping up the number of PhDs (as is the case in South Africa)

The question of absorption into the economy is getting much less attention here than in the developed world. If we look at China and India as examples of developing economies that have dealt with the consequences of successfully ramping up PhD numbers, the issue of absorption is somewhat different. In these situations, the debate is more about whether there is accompanying expansion in employment of academics in line with increased student enrolment. It also relates to the absorptive capacity with respect to the expansion of the economy. In China and India, there is evidence that there has been increased demand for PhDs to match the increase in infrastructural development.

But the issue is also about quality, not just quantity. So we need to look at what quality is as well, and what this means in relationship to the doctorate and its purpose, both currently and in the future.

If we look at the NDP, there is a clear assumption that the doctorate is linked to economic growth. This is different to what we have been socialised to expect, which is that PhDs feed into academic-sector employment. Increasingly, the public and private sectors in South Africa are stating that the doctorate is a requirement for certain positions.

The literature often mentions the case of Germany, which is sometimes referred to as using the approach of the 'progressive PhD'. Germany does produce the highest number of PhDs in Europe, but they also look at the problem of oversupply and make changes to match PhDs to economic needs. As an example, a number of German universities have made structural changes in order to embed transferrable skills within their PhD courses. Looking at examples like this can shift our traditional perceptions about what the PhD's purpose is.

The key issues to consider are that the debate is not just about numbers. We also need to look fundamentally at the nature of doctoral education and the tradition we subscribe to. We are at a point where we must ask whether we have a tradition that will serve the assumptions of policy-makers and funders: that increasing the number of PhDs will have a positive effect on social and economic development.

The big question on the table is about the nature and purpose of the doctorate and specifically the PhD. At the very least, we should be critical about the taken-for-granted assumptions in the growing literature about the PhD. Nico Cloete, director of CHET, has pointed out that we still need to interrogate the evidence to show a direct link between PhDs and a certain kind of economic growth. At the same time, it's this 'certain kind of economic growth' that I think we need to problematise. This relates to our core question: What do we mean by development and how does the PhD connect with development?

The McKinsey report (on Africa and its future horizons) that was published a few years ago presented scenarios for economic growth. This growth was based on very specific indicators. Looking at development today, one of the key issues we are struggling with is not only the positive consequences of economic growth as measured by those indicators, but also the growing joblessness within our societies. This brings with it the need for us to look at alternative models. One way of looking at development in Africa is to look at the degree to which it provides access to opportunities, resources, human rights and social justice, rather than measuring purely development in economic terms.

In one of the lectures that I heard recently as part of a series looking at 20 years of democracy in South Africa, Professor Maxi Schoeman, head of the Department of Political Sciences at the University of Pretoria, argued that the crisis we face currently is not a crisis of leadership as vested in certain individuals, but a crisis of imagination about the future, and a crisis about imagination about the future of Africa. I think this speaks to our concerns here about what we assume the role of the doctorate in Africa to be, and its link to disciplines and different knowledge domains.

In looking at the role of the PhD, many of us share the perspective that the PhD provides an opportunity to produce new knowledge and innovation.

This is essentially about producing individuals who think imaginatively about the future of something. But that process of thinking imaginatively doesn't happen in the same way across all knowledge fields.

What are the implications of this project?

How do we make sense of this project and its implications? One of the ways to look at the project and its implications is with reference to three different levels of analysis: the national, regional and systemic level; the institutional (university) perspective; and the individual level of supervisors and students. These levels are obviously interrelated and I will discuss each level and the interconnections.

At the national, systemic level, what is our assumption about the PhD when we talk about ramping up numbers to 5 000 and beyond in South Africa, and ways in which we are considering doing this? One could argue that if PhDs in social sciences, humanities and the arts are about imagination and the thinking individual, you could never have too many PhDs. Oversupply only becomes an issue when we think about the role of PhDs in very particular terms. Of course we don't have an absolute answer to this issue of numbers. However, the link between the number of PhDs and conceptualisations of what development means in the African region is critical.

This also brings us to considering the historical evolution of universities in Africa. One of the learnings I remember from doing my own PhD is going into the archives to understand something about the history of universities in South Africa, and realising that early debates about the introduction of social sciences were all about how the authorities could best manage the 'natives'. So that is the tradition we have to think about. This reveals something about where we come from as universities, what the role currently is and what may require rethinking.

By and large, we have worked from the assumption on this project that **universities** are the sites for doctoral education. For the most part, this is an assumption that holds; but we need to remember that, structurally, it doesn't have to be that way. We could also consider national contexts where specific institutes have been created to produce PhDs. It unlocks a few things if you start thinking about a different institution established with a different purpose as opposed to our universities, which for the past 100 years have been mostly concerned with undergraduate teaching and are now expected to meet a different purpose. There is a link here to looking at the historical evolution of universities because most of the universities that we recognise today in South Africa can be clearly linked to colonial authorities and what happened in the postcolonial era. This point applies not only to the national level as a unit of analysis but also to the institutional

level of universities and other HE institutions. For instance, in South Africa we have had many discussions where we have talked about our research institutions (such as the Council for Scientific and Industrial Research [CSIR] and the Human Sciences Research Council [HSRC]) and which role they may play in doctoral studies.

When it comes to the individual level, the self-evident way to connect this is by thinking through the public and private benefits of higher education. We have the evidence that PhDs bring a number of private benefits. But we are still grappling with the public benefits.

Nico Cloete has raised the issue of more funding being required. This is a topic that could constitute a whole new research project. Funding is a very significant lever in all of this. This is because what we see across the data in South Africa is a clear positive link between a change in the funding framework and a change in research output and in PhD enrolments and graduates. In looking at the three steering mechanisms most commonly used by government as policy levers (planning, quality assurance and funding), funding is clearly very powerful in influencing behaviour. Funding shifts behaviour at the institutional level as well: we've heard how institutions are paying supervisors or how incentives are used. At a completely different level of analysis we can see how funding influences behaviour. It also influences the behaviour of students. We haven't detailed this as part of our study, but how fees are levied or waived, and how scholarships and bursaries are awarded, are significant factors that shift enrolment and doctoral patterns. If we were to look at how Stellenbosch University's performance at doctoral level has been able to jump up so significantly in so short a time, I would speculate that there's a clear link to funding.

The other issue that was raised about the purpose of the PhD and its role was: do we use it at an institutional and systemic level, but particularly within the sector as a proxy for something else, such as quality, or for achieving something else out of the system such as differentiation? We must come back to this important question.

Looking at the policy context and the role of universities in particular, our discussion of the role of the university in a knowledge economy reminded me of the debate about the role of the university that unfolded four decades ago. Over time this evolved: we looked at the 'engaged university', the 'entrepreneurial university', innovation as a concept, and science parks. Today we find ourselves looking at the concept of the 'university for development'. This shows that there are larger contexts in which we must think about doctoral training and the contribution it may or may not make in Africa.

It was interesting during the course of this project how often the notion of the 'PhD factory' came up. It is a concept worth thinking about. If we

start critiquing and disaggregating it, it foregrounds a number of issues that manifest the tension between quality and quantity, and raises questions about the nature of the PhD: is it to develop the thinking individual, new knowledge, and so on?

At a national level, we can see the notion of a PhD factory at work. Our funding regime sets up the PhD factory when we have to fill in our HEMIS data. We have a situation that might be quite contradictory, in that at the same time as we talk about the quality of PhDs, others amongst us (who lead institutions and are heads of planning departments) have to count numbers. There's a trade-off to some extent. For example, when we talk about models, we may argue for replacing the traditional, old-fashioned model of the PhD student working in the library for six months with the natural science model; but, to a large degree, the natural science model in large institutions is not concerned with generating thinking: it's very much like the PhD factory. You work within a project; you get your specific question; a triangle is set up with the principal investigator, five postdocs, 20 PhD students, 40 masters and hundreds below that. This triangle leads to the production line. At an institutional level, we have to ask what the proportionality is that we are looking at and where the space for a different model is. The liberal arts model – the thinking individual and the PhD that cultivates imagination – asks how we establish a national system that has space for all of this, not just one or the other.

We haven't said very much about the changing nature of the knowledge landscape itself and how the discussion about trans-disciplinary work relates to models of PhD and PhD supervision. We have talked today about models in relation to the number of PhD graduates rather than what kind of knowledge we need for the current context. If you train PhDs who can only work on expensive laboratory-based equipment, the only option for them after graduation is to go to Europe and North America. Are there ways in which we can think about our context differently and still embed quality?

I will now look at the question of quality and why we didn't tackle it directly in this project. Early on, we debated how we would assess quality of PhDs. One way we thought of doing so was to read completed PhDs because we wanted to distinguish between scholarship and technical completion of PhDs. But we couldn't agree on which methodology to use. The best proxy we had was looking at examination regimes. But is that a good proxy? This question remains unresolved.

I want to conclude by saying that the fundamental issue is how we see development: the role of the university and higher education as a whole in relation to a system of African development, linked to the PhD and what we expect of it. I had the privilege of listening to Ben Okri recently when the University of Pretoria awarded him an honorary PhD. He talked about the

importance of people who can imagine. And I found myself asking the question, 'Are these graduates in the hall people who can imagine for the future of Africa?' For me, that is the fundamental question.

Saleem Badat
Former CEO of the Council on Higher Education, former Vice-Chancellor of Rhodes University and current Programme Officer of The Andrew W Mellon Foundation

I will offer my observation on the project under three headings, which draw on the three keywords in the title of the book – discourse, policy and data.

Discourse

The study's engagement and critique of the major debates on the doctorate will add to the contemporary discourses on the PhD. Whether it remains at the level of critique or advances a coherent alternative discourse, will, according to the authors, be discussed in the concluding chapter. If an alternative discourse is advanced it will hopefully address three issues.

First, it will not simply take the demand for more doctorates in South Africa as a self-evident good, but critically interrogate this clamour. Here one is reminded about the 1980s skills shortages discourse – which, it was argued, was actually a metaphor for bringing about certain kinds of ideological changes and restructuring in the economy. So too with the doctorate discourse – or not?

Second, notwithstanding my first point, it will hopefully make, not an impassioned but a cogent and compelling *case* for the doctorate and for greater policy and financial support.

Third, like many others, the authors, surprisingly, given who they are, elide an important issue, which they will hopefully address. This is that the case for the doctorate is entirely linked to the idea of 'high-level skills' linked to the 'knowledge economy', economic growth and expanding or reproducing the academic workforce and ensuring that it is of much higher quality.

It is evident that the competition for and concentration on economic advantage means that today certain kinds of knowledge and research, especially that generated by the natural, medical and business sciences and engineering, are privileged. The arts, humanities and social sciences are the objects of either benign tolerance or neglect. However, as has been argued in relation to Africa, 'attempts to improve Africa's prospects by focusing on scientific advances and the benefits accruing from them have all too often overlooked the important perspectives which the humanities and social sciences afford'. It 'is vital that the social sciences and humanities

are granted their rightful place ... if Africa's development challenges are to be fully and properly addressed' (Mkandawire 2009: vii).

At the same time, elsewhere, Mkandawire cautions against a 'developmentalism' in which research becomes the narrow instrument of 'the developmental state', and ignores various other 'aspects of our people's lives' (Mkandawire 2009).

In the African context, there is a more fundamental questioning of the arts, humanities and social sciences. Mahmood Mamdani (2011) argues that 'the central question facing higher education in Africa today is what it means to teach the humanities and social sciences in the current historical context and, in particular, in the post-colonial African context'. Moreover, what does it mean to teach 'in a location where the dominant intellectual paradigms are products not of Africa's own experience but of a particular Western experience' (Mamdani 2011)?

My raising of this issue is not about the Peter Vale/Academy of Science of South Africa (ASSAf 2011) crisis of the arts and humanities narrative being either reduced to numbers or a yearning for some non-existent past, but about the much-needed epistemological transformations that are required in South Africa – which are not unconnected to the development of South Africa, broadly conceived, and higher education itself.

At the level of discourse, there is a rather un-nuanced and also not persuasive notion that the NDP or more recent policy thinking is about a move from equity to development. I think you can read this in a more nuanced way, rather than equity and development somehow being entirely in competition. Certainly, it is important that the issue of growth/development is becoming a greater preoccupation, but equity is then linked to development, which is also a good thing, rather than entirely in terms of redress.

This has long been a strand in higher education thinking. So perhaps the authors are making more of the shift than is warranted. Nonetheless, this is a welcome return to thinking again carefully about the development/equity issue, if we also need to think more about efficiency issues.

Policy

It is not clear whether the book will limit itself to an analysis of policy, or also extend into analysis *for policy* and into actual policy proposals. I am hoping that there will be some clear policy propositions if not concrete proposals. Similarly, I hope that there will be a highlighting, with appropriate interrogation, of promising *practices* that could help to advance doctoral education and equity, quality and efficiency.

Cheryl de la Rey suggested that it is not about numbers, but about the nature of doctoral education and training and whether traditional models

are adequate or other models are needed. Indeed, we may certainly need new models but there may be a prior question. Here, I am reminded of the conclusion of the Yale Report of 1828. As Arthur Levine (2000) had quoted, 'In the early years of the Industrial Revolution, the Yale Report of 1828 asked whether the needs of a changing society required either major or minor changes in higher education. The report concluded that it had asked the wrong question. The right question was, "What is the purpose of higher education?"'

So, to paraphrase, instead of asking whether the needs of a changing society require either major or minor changes in doctorate education, perhaps the right question is: What is the purpose of the doctorate?

I hope that the book engages seriously at the policy level with the conundrum that Karen MacGregor (2013b) expresses: 'In order to produce more doctoral graduates, more PhD supervisors are needed: but in order to have more supervisors, more PhDs are needed'. So if this is the vicious cycle, what is the *virtuous* cycle?

Finally, what percentage of academics with a PhD have never published a peer-reviewed article or supervised a student since completing their PhD? It would be good to have this knowledge in order to temper great expectations about the necessary but not sufficient situation of larger numbers of academics having PhDs.

John Butler-Adam
Former Programme Officer, Ford Foundation and Editor of the South African Journal of Science

I have a short story to tell. It focuses on the context out of which this study has grown.

I have retired from the Ford Foundation (FF) and with us is Nazeema Mohamed who is the Foundation's new Programme Officer for Post School and Higher Education in southern Africa. But as someone who was part of the beginning of this process at the Ford Foundation, I find it wonderful to see how this process has reached this stage of fruition.

When this project started in 2009, the FF in southern Africa had two main focuses in higher education: the development and strengthening of the broad post-school education system and, within this, supporting the emergence of the next generation of academics on an equity basis.

This particular project's grant created the only administrative challenge I had at the FF. Having initiated the grant process, the grant leader (Cheryl de la Rey) changed jobs so the grant had to be moved to another organisation. Ford is not fond of doing that kind of thing, but it was eventually resolved

I'm not focusing today on the document presented and on which others are commenting, but on the kind of thinking that led to this project coming

in existence at all. Why did the FF make this a grant to focus primarily on the PhD in the human and social sciences and the arts? The simple answer is that the focus of the project has always been the FF's major concern. There's always been a strong funding focus on science and health by other funders like Kaiser, Wellcome, Rockefeller and Gates. So the FF chose to focus in the areas that it believed was very important but that received relatively little funding (arts, humanities, social sciences and social justice). The grant wasn't designed to exclude science, engineering and technology (SET) disciplines, but rather to ensure that the humanities, social sciences and arts also received the attention they deserved.

From about seven years ago, the FF was also interested in a particular approach to managing the supervisory problem, and the development of a 'next generation' of postgraduate students on an equity basis. We were interested not in trying to replicate what had happened in the sciences (the lab-based approach), but rather in getting together groups of students from different disciplines into groups who could work together, in an interdisciplinary manner, on a problem area to which they could all make a contribution. The FF made a specific call for proposals in this area, to which a relatively large number of universities submitted proposals. We allocated grants with the following conditions:

- The project should include a mix of masters and doctoral students;
- There should be a core supervisor who was a real leader in his/her own field;
- The students should not lose contact with their own disciplinary background;
- There should be a good mix of participants in terms of gender and ethnicity; and
- The host university should provide a space for the project.

The grants attempted to provide support for students who were studying full-time.

We subsequently asked the Cape Higher Education Consortium (CHEC) (Nasima Badsha and Sharman Wickham) to review and assess the approach described above. They discovered that there were diverse outcomes to the grants made. For me, the most critical discovery was that this approach worked best, not surprisingly, in the universities that already had a strong research background.

Another finding that came out of that work and engagement with grantees was that, although it wasn't articulated upfront, people were very aware that they were playing a development role and made sure that their groups were diverse in terms of both ethnicity and gender.

We also realised that the process of defining what a student will do is a complex one. We have to keep looking at this to work out what gels and works well to create greater efficiency. It's also important to remember that, unless one can nurture third- and fourth-year students and encourage them all the way through the process to the PhD level, the pipeline dries up.

A final observation is that it's important not to set generic standards by which students and supervisors are assessed. Not all students enter into PhDs under the same circumstances: resources and support may differ, as does the time available to each student. Assessment must then be sophisticated enough to take account of the conditions under which students work.

Teboho Moja
Professor of Higher Education, New York University

South Africa has a history of participative knowledge generation that engages scholars in debates, as we did in the 1990s. I am glad to be part of these discussions. I find it encouraging to see us re-stimulated and engaging in debate informed by the knowledge that's been generated for the publication of a book on the doctorate in South Africa.

The knowledge that is produced and presented today is ploughing the ground for new thinking to come to the fore as we come to understand our situation, analyse the problems and search for solutions. It gives us the advantage of being informed before policies are adopted; it gives us models that might work: models that have been successful – or otherwise – elsewhere and which we may want to adapt to our needs. We have a history that includes our involvement in the production of *A Framework for Transformation* by the National Commission on Higher Education in 1996. That report remains a good example of research that informed policy and continued to frame the changes in higher education, as well as represented a platform for debate to challenge knowledge generated by looking at what was missing or what needed to be added.

Promoting doctoral programmes has become an important topic all over the world, but more so in countries that have been underproducing students with doctoral degrees. The United States produces over 50 000 doctoral degrees per year and we know that those graduates play a major role in advancing the economy of that country. The inclination from us in the developing countries is to be tempted to do what advanced economies are doing; and that is to call for an increase in the production of doctoral degrees as well. In doing so, there are a number of factors we need to take into consideration, such as the fields in which those doctoral degrees are promoted, and employment paths and patterns for graduates with doctoral

degrees so that we do not overproduce in some areas while under-producing in areas that are critical for development.

Developing countries and doctoral production: What are the issues?

Right from the beginning, it is important for us to look at two issues: the fields in which those degrees are awarded and the design of the programmes. The former issue is important so that we can be cautious that we don't overproduce them in the same way as happened with BA degrees in humanities. Where I teach at New York University (NYU) our students seem to get jobs very quickly upon graduation but there are doctoral students who remain unemployed or underemployed upon graduation. They end up taking jobs as adjunct teaching staff at several institutions and are therefore underutilised. We need tracer studies that look at how long it takes some doctoral students to get a job in line with their qualifications. The frustration of not getting suitable jobs leads to students opting for jobs that are not in line with their qualifications – and that is a waste of resources.

The second issue has to do with the way our doctoral programmes are designed and offered. On the processes and models for producing doctorates (with reference to Johann Louw's Chapter 6), the question to raise is whether we are interrogating the models we are using at all. Or is our starting point acceptance of the models currently in use for producing PhDs? I'm not trying to take us back to the 1970s where we looked at the African university and its relevance in Africa. But I would like us to look at the literature on different models and types of doctorates that are emerging as well. One example to point out that is used in the UK is that of accepting three scholarly and peer-reviewed publications for assessment in the place of a PhD thesis in order for a degree to be granted. What I'm hearing today is that we are still looking at models that were transplanted to South Africa many years ago. Within inherited models, we need to interrogate even the process embedded in those models. I find the process involved in admitting students to doctoral studies so discouraging that it makes us lose many potential candidates who are intimidated by the process of writing a proposal. A cooling-off period for additional assessment prior to entry into the programme – in the form of a pre-admission year – is a good idea that we should explore more. This would allow for students to opt either to exit or go forward and generate a proposal needed for admission to a doctoral programme.

International models to consider

The dominant individualistic model – where producing a PhD is one-on-one work – has been mentioned. Where I work (at NYU), as supervisors we

work collaboratively from the point of entry into the programme, being the admissions stage. The process involves team screening and reading of all applications before we agree on the selection of students to be admitted. We also agree on who will provide the initial supervision to the student. The student decides afterwards who will supervise his or her work or the supervising professor decides based on work done by the student. Each student works closely with all three professors and, at the end, the work is assessed by an additional two reviewers before the student is passed for graduation.

In most programmes at NYU, there are other strategies that help students to progress. For example, we have set up four milestones to producing a PhD:

- Coursework to embed the students in the literature in their field;
- Producing a literature-based paper (candidacy paper), followed by review and final selection for PhD. This allows them to really ground themselves in literature and to see how the subject matter has been addressed by other scholars, what has already been covered and what is missing (this takes 1.5–2 years);
- Producing a proposal (2.5–3 years from start); and
- Producing the doctorate.

We also have other methods that encourage students to keep tabs on their progress. Students complete an annual self-assessment form. This includes a projection of when they expect to graduate. This encourages them to participate in all aspects of doctoral production: research, progress in writing a paper for publication, and so on.

Who funds doctoral studies and how students are funded is a major issue as well. Funding models in my programme have also been reviewed. We have moved from partial funding for PhDs to full funding for full-time students. Money is available due to major fundraising that the university embarks on (since we are not government-funded), as well as money raised through grants to support doctoral education.

Doctoral education and economic development

Additional key issues have been pointed out, such as the premise that there is a link between doctoral education and economic development, even though it's not as evidence-based as it could be. I'm not advocating against doctoral education but we need to show that the link really is there. The research that proposes the link between doctoral education and economic development excludes research on the contribution of doctoral education to social development. The heavy emphasis on economic development needs

to be reviewed; and the research on the link to social development needs to be included as well. Research done by the National Science Foundation in the United States actually maps out the different types of doctoral degrees by disciplines and does a comparison in numbers, rather than discussing doctorates in a generic manner and applying the results in a generic mode as well.

This book signals a step in the right direction as there is great work in the making that needs to be taken further.

Patricio Langa
Professor of Higher Education, University of Western Cape and Eduardo Mondlane University

The topic of training PhDs is an important but challenging one. I cannot speak the words I really feel like saying without undermining the position from which I am speaking. I just got a job offer as a professor at the University of the Western Cape (UWC) and I had to have a PhD to secure it. So I cannot say that we don't need more PhDs.

I will play the devil's advocate by questioning some of the views we usually take for granted. I was relieved to hear Cheryl de la Rey this morning raising both sides of the equation, showing that popular understandings on the need for training PhDs for a better society and for a knowledge economy are not taken for granted and that there are different views.

What is the purpose of the PhD in Africa?

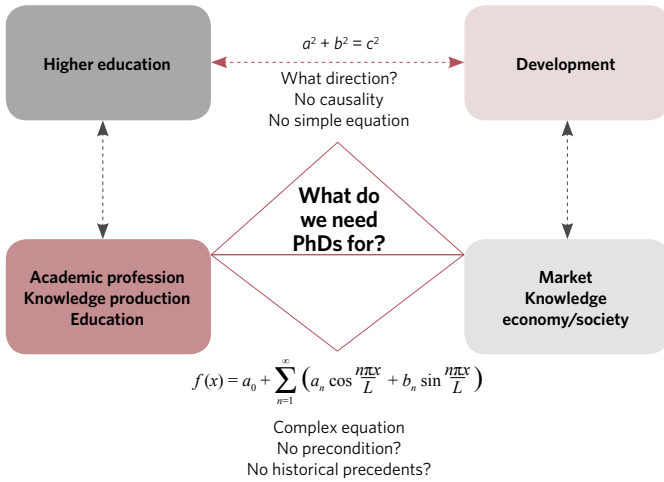
I found the first chapter of this book interesting and informative, including its critical review of trends on the training for the PhD internationally. It raised the issue of countries like China, Brazil, Singapore and India that have in the last couple of years increased their PhD output. But the questions for me are: What are these PhDs for? Before looking at increasing the numbers, what is the purpose of the PhD and training for it in Africa? And do we need more PhDs?

There are two assumptions that come into this debate. One is that the basic economic resource in the knowledge economy – the means of production – is no longer capital, labour or natural resources: it is knowledge. But does this apply to most African countries? And if we describe and prescribe the pattern of the future of human society in such terms, are we not running the risk of being teleological by eliminating all other possibilities and alternatives? For many years, Africa has been subject to perverse external intervention, with dire consequences legitimised by teleological thinking that there is only one 'correct' path to development or because they did the 'right thing'. Is moving towards becoming a knowledge

economy the new 'right thing'? We must pay attention to this kind of discourse and ask whether training PhDs is the only way to a knowledge economy.

I've captured most of that debate in this figure:

Basic assumptions scheme



The rationale is that we need PhDs for two reasons: to feed both the academic profession and knowledge production. If we are in an ideal society, this will happen. Historically, the driving force has been the academic ethos: academics would publish and train their successors. One could say that *scientific libido* – a lá Bourdieu (1997) – drove academic production. This centres around the idea that academic work of acquisition is work on oneself (self-improvement), involving an effort that presupposes a personal cost: an investment, above all of time, but also of that socially constituted form of libido, *libido sciendi*, with all the privation, renunciation and sacrifice that it may entail.

The *homo economicus* hegemonic discourse brings its own logic: training PhDs is regarded as a precondition to getting to a specific place known as development. This kind of thinking is based on an assumption: you need to move Africa from where it is to a different, ideal place.

I have just given a lecture recently about another possibility: how training PhDs can lead to poverty. For example, in my country (Mozambique), we are witnessing the virtualisation of cultural capital. This describes an increase in PhDs whose skills don't match either academic needs or the market. So there is a mismatch between skills that PhDs acquire and the fit required by the market. This provides not so much a linear equation but a more complex picture.

The knowledge economy and doctorate production

I would like to make three points on the knowledge economy. First, China is not just producing over 50 000 doctorates because it wants to become a knowledge economy: it is becoming a knowledge economy, and so now it needs to produce more graduates. We need to look at the direction of the relationship: it could be the other way around as well. Most African countries are far from being knowledge economies, they are factor-driven economies. So why do they need PhDs? Look at Mozambique. We think we are blessed by all the natural resources but when government announces a new offshore mine and says that there will be many jobs created, the kinds of jobs that are created are not the jobs that fulfil the needs of a knowledge economy.

Another point is about the aging professoriate and the need to produce PhDs to replace them. This is a particularly South African issue that exists for historical reasons. In most countries, you don't have an aging professoriate: you have new people moving into these positions for the first time. You also have to look at the mismatch between positions created (by massification or expansion of higher education) and the number of PhDs who have been trained. The system also produces lots of postdocs but where are they headed? What is the role for these postdocs? Because of this, some people joke that the job of the postdoc is to look for another job.

Even if you consider that, in many African countries, there are still many positions to be created and that those few who are in academia tend to be co-opted to top government positions or to take up managerial positions, thereby becoming unproductive academic capital. But this does not mean we need to train tens of thousands to replace them. This again speaks to the issue of virtualisation of cultural capital. The fact that you have PhDs with virtual scientific capital does not mean that their power is not real. You have people with degrees that do not match with the academic positions they hold in the institutions, but they are holding real power. These are the people who at times hold the change.

I would like to discuss an example from Brazil. I visited the universities of São Paulo and Campinas. About 98% of their academic staff have PhDs. But this was not done under this reasoning of the knowledge economy. When the decision was taken to raise the entry level for academic profession in the 1980s, the idea was not the knowledge economy. It was to have a better-quality society and better-quality education. That is what is happening with São Paulo and Campinas where you see very tough competition between PhDs and postdocs, not just for positions created in these universities but also to move to lower-ranking

universities in the countryside. That is driven by a coordination body, the Coordination for the Improvement of HE (CAPES). It has a set of steering mechanisms to ensure the trickle-down of quality, often through collaboration with lower-ranking institutions. A key factor here is performance-based funding from CAPES to do these things. It's critical for higher-ranking institutions to apply for such funding to support lower-ranking institutions. Of course the final aim is to export quality.

My final point is that, in thinking about why we need PhDs in Africa, we need to go beyond meeting the needs of the market economy as the goal, and also think about a better society as the goal of higher education.

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The European PhD education in transition

As part of the ambition to create a European area for higher education and to foster the transition of Europe into becoming a knowledge society (Maassen and Stensaker 2011), there is an increasing attention on how and in what way European PhD education could play a role (EUA 2005, OECD 2010, LERU 2010, Byrne et al. 2013). In general it is possible to identify a changing political focus away from the traditional role of PhD education as a mechanism for replacing the older generation of professors in universities, to a role of the PhD as a mechanism for stimulating innovation, entrepreneurship and new knowledge networks in society at large (Neumann 2007). Typical questions asked are about how the modern PhD creates and transmits knowledge of relevance to the private sector, and how the PhD can stimulate more interdisciplinary and multidisciplinary problem-solving for the grand challenges facing society (Thune 2009, Thune et al. 2012).

However, the increasing interest in European PhD education can also be linked to other dynamics in European higher education. First, the PhD education was not really in focus with respect to the implementation of the Bologna process in many European countries, and was in many countries not on the agenda when the degree structures at bachelors and masters level, and the new quality assurance schemes, were developed (Kehm et al. 2009). Second, as part of the ongoing process of 'modernising' higher education in Europe there is a renewed interest in how universities and colleges can organise and manage their educational offerings (Huisman 2009), including the PhD education (Hyllseth et al. 2012). These drivers have created a momentum for change on the functions of PhD education, and how it should be organised and structured in the future.

Towards a stronger standardisation of the PhD in Europe?

While the Bologna process can be said to have changed European higher education along many dimensions, it should be underlined that PhD education is an area where considerable diversity remains, not only between countries, but also – in some countries – between higher education institutions (Kehm 2009). In general, it can also be argued that one common feature of PhD education is that it is an educational level that has struggled with time to degree, unclear admission and structures surrounding the training activities, and challenges concerning how the education should be funded (EUA 2005).

Kehm (2009: 225–229) have identified a range of different models in European higher education:

- The traditional research-based PhD is still a dominant model in a number of European countries. Typical features of this model are the content and quality of the PhD thesis, and a close relationship between the PhD student and his/her supervisor. In this model, there are not always mandatory courses and training activities.
- The taught PhD can be seen as a more modernised version of the traditional research-based PhD in that it emphasises considerable coursework and mandatory training for the candidate. Here, the thesis is of slightly less importance.
- The PhD by published work is another model in which training is often combined with publication of research articles throughout the whole PhD period. The PhD in this model is obtained when a number of research articles have been published.
- Professional PhD education is found in a number of countries throughout Europe and is again a model characterised by a high extent of coursework, often in combination with more practice-related work. This model also sometimes enables part-time study.
- The practice-based PhD is another variant of the professional PhD and is often found within art education and related fields of knowledge. In this model, a PhD may be obtained by demonstrating certain skills or competences.
- The integrated PhD is a particular model found in the UK. Admission takes place after a completed bachelors degree and there is a combination of extensive training and coursework.
- In addition, there are new models in which candidates obtain joint degrees or that stimulate collaboration between universities.

The diversity found in PhD education has led to concerns about the transparency and the possible transferring of skills at PhD levels within

Europe. Thus, some have argued for overarching standards and regulations that could ensure the quality and standards of PhD education across the continent. A major step in this respect was the establishment of the so-called Salzburg principles in 2005, and later initiatives taken by the European University Association (EUA) in relation to creating an overarching framework for quality assurance of the PhD across nation states (Byrne et al. 2013). The latter project also identified a growing interest in attempt to evaluate and assess PhD education by various stakeholders, and the introduction of more formal routines, regulations and standards at this level (Byrne et al. 2013: 42).

New expectations regarding the competence and skills of the PhD candidate

Historically, PhD education has had various functions in society. In many countries, it was a final accomplishment topping a long academic career (Neumann 2007). Today, there are a number of new expectations and demands directed at the PhD (Nerad 2004, LaPidus 1997, LERU 2010), not least in relation to policy agendas advocating innovation and entrepreneurship (Nerad and Heggelund 2011). Part of this changing agenda can be empirically documented in the form of an increased number of PhD candidates being admitted into this level. In some countries, the expansion of PhD education has been considerable. Countries with a high increase in the number of PhD students admitted include Ireland and the Netherlands, but also countries such as Portugal and Norway (OECD 2010). Other countries have traditionally had high admission rates and have managed to maintain that during the last decade (the UK, Sweden and Germany) (OECD 2010). This growth in the number of PhD candidates has also triggered some tensions and challenges in terms of supervision and employability. Since the growth in the number of PhD candidates is not matched by a growth in the number of supervisors, the latter have had to take on more students. While there are various practices between countries with regards to how such supervision is economically rewarded, both individually and towards the department/school to which the PhD candidate is affiliated, the main problem in many countries is to find supervision capacity. The dilemma for academic staff is that supervising a PhD implies benefits in terms of being kept up to date in your research field, and to maintain research activities in the form of joint publications and joint research projects, while formal requirements regarding how supervision should be undertaken and what it should involve are increasing.

When looking at where doctorate graduates get employed, there is much diversity in different countries, although there is a tendency that more PhD candidates find work outside higher education and research. For

example, in the Netherlands and Denmark, more than two thirds work outside the higher education sector (OECD 2010).

This change has triggered a debate about which competences PhD candidates need for future employment and leading European universities have argued that PhD education in Europe needs to be broadened (LERU 2010). The general criticism is that PhD candidates are often (LaPidus 1997; Nerad 2004: 85):

- Too narrowly trained and without generic skills;
- Short of professional competence, not used to working in teams, and with little experience of functioning in inter- or multidisciplinary settings; and
- Not experienced and trained in teaching and presentation techniques, with poor communication skills.

'Graduate schools' as a generic problem-solver?

One of the trends observed in Europe during the latter decade is that graduate schools are being developed as a response to the challenges noted above. However, graduate schools are found in very different forms and formats. They are far from being an institutional overarching umbrella intended as a governing layer of existing PhD offerings within a university with substantial organisational set-ups, its own board and considerable autonomy in terms of its offerings and activities. Some graduate schools are interdisciplinary while others are more discipline-based. Still, typically they all include a setting in which both PhD students and their supervisors can establish a joint learning environment, and where some sort of quality assurance activities are established. In some countries, one can also find national graduate schools often with the ambition of securing high academic standards in certain disciplines and professional fields (Thune et al. 2012).

Hence, although there is limited agreement on what a graduate school is, and how it should be organised, the arguments related to such establishments are often to create interdisciplinary settings, establish a critical mass of students, enable a better offering in courses and training activities, and secure an improved organisational structure for PhD education (Thune et al. 2012, Byrne et al. 2013). In a recent survey by the EUA, it was found that the number of graduate schools doubled in the period 2007 to 2010 (Byrne et al. 2013: 15). Even though some of this growth may be caused by the mere increase of PhD candidates in Europe (recent numbers suggest that there are currently around 600 000 PhD students in Europe), or more symbolic establishments and name changes, it points to

a willingness or at least an interest by universities to take a stronger responsibility for PhD education.

Whether the new graduate schools witnessed in Europe will be the answer to all the new challenges directed at PhD education is still an open question. However, there are indications that graduate schools may provide PhD candidates with a more structured research network and resources they otherwise may have forgone, although the effect on the quality of course offerings and training as such is more unclear (Thune and Olsen 2009, McAlpine and Amundsen 2011).

However, what can be seen is that PhD education in Europe is gradually being transformed from a more individual to an organisational responsibility where the universities take on a more significant role. The fact that EUA in 2008 established a separate Council for Doctoral Education in Europe (EUA-CDE) is only one sign of this development.

The increased demands and expectations directed towards PhD education may also create some interesting dilemmas for the future. While many countries still have problems concerning time to degree and dropout of their PhD candidates, one might wonder whether an increased course load or more intensified training will actually be a critical element in solving some of these problems. An increased offering of courses and training options may also create more confusion and insecurity among the candidates about what sort of activity is 'smart' to engage in given their time limitations.

New expectations may also create challenges for the universities because increased interdisciplinary or multidisciplinary training may cause tensions among departments. More traditional disciplinary-oriented departments may experience it as a challenge if additional interdisciplinarity implies a reduction of the coursework and training that is more disciplinary-specific. As such, one could argue that the establishment of graduate schools might imply a managerial governing over PhD education at the expense of the disciplines. Is the new graduate school the arena in which contestations between politics, administration and disciplinary knowledge may perhaps play out?

Appendix 3

Current trends in PhD studies: A review of articles published on the *University World News* website (2013)

This review prepared by Gill Sloan provides a summary analysis of key themes and trends reflected in 31 articles on the doctorate appearing on the *University World News* (UWN) website for the period January to December 2013. A full list of all references is also provided.

Global themes

Balancing excellence and access (Jørgensen)

- The bulk of doctoral education is provided by relatively few institutions globally and research capacity is still highly concentrated in a few regions: the EU, Japan and US.
- There is a need for a decentralised research infrastructure featuring a culturally diverse set of researchers. Local talent should access and receive training in the community without being absorbed in the few hubs where capacity is concentrated.

Too many doctorates? (Maslen 2013c)

- Governments are beginning to ask if it is time to slow the PhD production line. This stems from a recognition that many PhD graduates are unable to find academic positions and that a high proportion of those who do may find themselves working in casual or part-time appointments.
- Questions have been raised about the quality of PhDs produced and the relevance of the training students receive, given the employment opportunities on offer. There is debate about the kinds and the breadth of non-research skills that PhD graduates need or can reasonably

acquire to make them more competitive in the job market against those with bachelor degrees and with work experience.

Future mobility trends (Choudaha)

- Mobility of international students at doctoral level over the next 20 years will be shaped by both an increasing number of undergraduate-level students in developing countries who qualify for and aspire to a doctoral education, fuelling mobility; and by the improving quality of the higher-education system in source countries, stemming mobility.
- In terms of stay rates: students who go abroad to earn doctoral degrees may return home to work because of improving opportunities in their home countries; in addition, the proactive immigration policies of host countries will strongly encourage international students to remain away from their home countries.

Themes across regions and countries

Increasing doctoral graduate numbers and quality

Africa: Survey reveals strategies to increase PhD production (Lee 2013b)

- A survey of eight institutions in Africa – the Universities of Cape Town, Pretoria, Rhodes and the Western Cape in South Africa, the University of Nairobi in Kenya, Makerere University in Uganda, and the Universities of Ibadan and Obafemi Awolowo in Nigeria – indicated efforts to increase PhD production.
- Doctoral fees are being waived at levels of 75–100%, or funded with postgraduate development funds, scholarships, research and conference grant schemes, and by three-year funding packages.
- Lecturers are, in some instances, required to hold PhDs, with some universities promoting staff completing PhDs and providing small financial rewards to staff completing masters and PhD qualifications. Five universities reported an increase in the number of staff with PhDs, and another an increase in staff enrolling for PhDs.
- Supervisors have a set cap on the number of students they can work with at any time, minimum requirements for supervisors have been set, and complementary models of supervision allowing more flexibility and coherence, as well as improved supervisory capacity, have been introduced.
- There has been focus on increasing publications from doctoral theses, with some universities encouraging or requiring students to produce at least two publications in internationally acclaimed peer-reviewed journals before graduation.

- Doctoral offerings have been increased or restructured to include coursework, examinations and thesis programmes. Universities have appointed directors or doctoral committees and restructured or established postgraduate schools and offices.
- Transdisciplinary courses have been introduced, covering advanced research methodologies, philosophy of methods, advanced gender-research studies, statistical methods in research, qualitative data management, scholarly writing and communication skills. Non-academic support for postgraduate students has been expanded to develop academic-skills development, professional-skills development and doctoral careers. Clear rules for doctoral enrolment and training have been provided.
- Most universities have strengthened their networks and established strong partnerships to encourage doctoral studies. Some have set up exchange agreements with other African and overseas countries.
- Challenges were lack of supervisory capacity, inadequate trainer capacity, inadequate incentives for supervisors and difficulty in finding lecturing replacements for staff taking sabbaticals.

Africa: Where to from here for the African PhD? (MacGregor 2013b)

- In November 2013, higher-education leaders, experts, funders and journalists gathered for a two-day workshop on 'Expanding and sustaining excellence in doctoral programmes in sub-Saharan Africa: What needs to be done?' The workshop was convened by South Africa's National Research Foundation (NRF) and the Carnegie Corporation of New York.
- There was agreement that Africa needs tens of thousands more PhDs in order to renew an ageing professoriate and staff, rapidly expand higher education, boost research and generate high-level skills for growing economies in Africa.
- It was also agreed that the way that PhD education in Africa is conceptualised and delivered needs to be realigned to African-led priorities.
- Many African universities cannot carry out their research mandates effectively and under-development has placed limits on the flourishing of postgraduate education, affecting PhDs especially.
- Sub-Saharan Africa currently contributes only 0.7% of the world's scientific output.
- Capacity needs to be strengthened for the whole pipeline of early-career researchers, postdoctoral fellows and doctoral candidates, so that they can take part in a changing knowledge economy.
- In South Africa, national policies assume quality but do not reward it; policies also overlook both the roles of supervision in PhD production and of part-time students (often the case for PhDs).

- An integrated approach to PhDs, coordinated networks and additional support to focus on capacity development are needed.
- On the African continent, there is a strong need to support PhD training. The gathering identified the African Union, the Association of African Universities, leading African philanthropists and donors as potential partners in this regard.
- Nationally and regionally, governments, regional higher-education and research networks and institutions need to acknowledge and promote PhDs.
- At institution level, recommendations included incentives, resources, effective management, joint accreditation and supervision, and tapping into the knowledge of African professors in diaspora. There was also support for the sharing of PhD programmes and creating vibrant environments for postdoctoral fellows, while still striving to be world class.

Brazil: Brazil's doctoral production lessons for Africa (MacGregor 2013c)

- The remarkable achievements of Brazil in PhD training – from 800 to 12 000 doctorates a year in three decades – could provide a model for African countries trying to expand doctoral production.
- In 2010, Brazil produced 12 000 doctorates and 41 000 masters graduates, a ratio of 3.4 masters per doctorate.
- Prof. Ribeiro of the University of São Paulo outlined two key factors facilitating such growth: strict evaluation by peers and funding from the government.
- Three main evaluation agencies in Brazil deal with science and research evaluation. Evaluation of masters and PhD programmes is done every three years in 46 fields of knowledge.
- The main criterion in evaluation is research quality as transmitted to the student. Other criteria are the impact factor of publications in journals, degrees awarded and their quality, and publication of theses and dissertations. Emphasis is also placed on the quality and distribution of supervisors.
- Programmes are awarded grades from one to seven. Those with very low grades – one or two – are shut down. To offer PhDs, courses must achieve a grade of at least four.
- Programmes with the highest grades of six and seven must help other courses that are less successful. No programme can get a high grade if it has not cooperated with a lower-graded course.
- Funding via the federal agencies is allocated using three main criteria linked to the evaluation grade:
    - Programmes that perform better get more money.
    - Courses in less-developed states receive more funding.

    - Based on priorities, some fields of knowledge are funded more than others.
- Most full-time doctoral students receive full scholarships from the government.
- The state makes pedagogical visits to programmes that are performing badly to ascertain the reasons for poor performance and provide advice on how to improve. The same practice is applied to proposed new graduate courses.
- Since 2005, it has become obligatory to publish all theses and dissertations either in a periodcal or book or on the Internet.

The brain drain

Arab world: Effort needed to attract postgraduates back home (Sawahel)

- Some 80% of 900 000 postgraduates in the Arab world study abroad, and only 55% of them return home.
- Factors contributing to this trend include the slow rate of development in Arab countries, a failure to make adequate use of new technologies in the productive sector, low salaries and the relative lack of opportunities for scientific research. Broader factors include political and social instability in many countries in the region.
- To stem this brain drain:
    - Universities in developed nations should look at transferring resources, technology and knowledge to African nations via exchanges of staff and students, research collaborations and 'twinning' with institutions, along with developing partnerships and networks between scientists and research institutions, with a focus on training for young professionals.
    - Incentives to encourage students to return home after their studies could be established by creating national and regional centres of excellence in Africa and supporting existing centres.

Asia: High stay rates continue (Veugelers)

- The increase in Asia's own scientific capability does not seem to have led to a greater propensity of Asian PhDs to return from the US, certainly not immediately upon graduation.
- Asian stay rates remain very high. Chinese and Indian PhD students record the highest rates, which have only marginally decreased over time.

Greece: Economic recovery stifled by serious brain drain (Marseilles)

- Emigrants from Greece are highly skilled professionals, with postgraduate qualifications, who are unable to function in the country's

depressed economic environment. But their leaving is also delaying – even preventing – Greece's recovery. Of those leaving Greece now, 73% have a postgraduate degree and 51% a PhD, and most have studied abroad in some of the world's best universities.

- Economic orthodoxy claims that the road to economic recovery cannot take place without young people with fresh ideas, without well-educated executives and managers, without postgraduates who could help rescue the country from stagnation.

Italy: Why highly educated Italians leave home (Constant)

- 30 000 home-grown researchers leave Italy each year, while only 3 000 qualified scientists go to Italy. The main destination is the US, attracting about 34% of Italian brains, followed by the UK (26%) and France (11%).
- The top three reasons cited for international migration are lack of research funding, better conditions abroad from an economic standpoint, and better career opportunities abroad.

Mexico: Emigration of highly qualified Mexicans contributes to US economy (Albo and Díaz)

- Mexican migration to the US is often thought to be a movement of people with low education and income levels, but emigration of highly qualified Mexicans is also significant. In 2010, the number of Mexican immigrants with doctorates in the US represented 15% of all those with doctorates in Mexico.
- Overall, Mexican immigrants in the US provide 4% of its GDP, while the contribution of those with PhDs is larger than other migrant groups because of their higher productivity.

Turkey: PhD students drawn to US for more than a decade (Bilecen)

- Although Britain sent more than 9 000 students to the United States in 2012, and Germany sent about 9 300, both lagged behind Turkey, which has been sending more than 10 000 students a year to the US since 2000.
- The biggest flow of Turkish students to the US is at the PhD level, followed by their settlement there after graduation.

A rise in foreign PhD enrolments

Australia: 37% of PhD students are from other countries (Maslen 2013a)

- The proportion of international students starting a PhD jumped from 21% in 2002 to 37% in 2011, when more than 4 000 international students joined 7 000 locals to start a PhD programme.

- In many disciplines it is now unusual for students to move directly from an undergraduate degree to postgraduate training or to be doing their PhD full-time. In 2011, the average age at commencement of a PhD was 33, while a 2010 survey found more than 10% of research students were aged from 50–59.
- The global mobility typical of those seeking or being awarded a doctorate tends to cease when foreign students obtain their degrees in Australia, and a significant proportion stay on as permanent residents. Government amendments to the immigration rules in recent years mean that a student who earns a PhD will now almost certainly qualify for a residency visa.

India: Brain gain counters brain drain in attracting PhDs (Mishra)

- Only 5% of Indians who go to the US to earn a doctorate degree return home, as shown in a study on the mobility patterns of PhD graduates in science, engineering and health.
- India also has the largest diaspora, with 40% of its home-born researchers working overseas and 75% of its scientists going to the US. A major reason behind the brain drain is the divide between universities and specialised research institutions, with most universities not engaged in cutting-edge research and unable to attract the best minds.
- Now the government and industry, along with India's elite universities and technical institutions, have united to implement a series of measures to stem the tide while also encouraging large numbers of researchers to return home.
- India's new science policy aims to position the nation among the top five global scientific powers by 2020. This cannot be achieved without qualified academics, researchers and scientists. As the nation's elite institutions try to morph from world-class teaching institutions into world-class research centres, they have put in place flexible recruitment policies, generous research grants and industry–academe collaborations to attract their researchers back from foreign institutions.

Scandinavia: Increasing foreign enrolments (Myklebust)

- Across Scandinavia, the overall number of doctoral degrees conferred increased by 32% between 2002 and 2011, whereas the number of foreigners awarded a PhD jumped by an astonishing 121% in the same period. There was also a 46% stay rate amongst those who were awarded doctorates in 2011.
- Foreign students accounted for 37% of newly enrolled doctoral candidates in Sweden in 2011 and 24% in Denmark, both representing steep rises over the previous decade.

- The proportion of foreigners awarded a doctorate in 2011 was 33% in Norway, 29% in Denmark, 22% in Sweden and 14% in Finland. In the same year, Iceland awarded 51 doctoral degrees, being 38% of the total.

United Kingdom: Almost 40% of UK postgrads are from other countries (Osborn)

- Over 2011–12, there were nearly 2.5 million university students in the UK, with more than 550 000 undertaking postgraduate studies; 38% of these postgraduates were from outside Britain.
- Only 54 000 international postgraduate students were from other European Union (EU) countries, a figure dwarfed by the 96 240 postgraduates from Asia, with the major shares represented by China (37 876) and India (21 765). Another 20 585 postgraduates were from Africa and 14 640 from the Middle East.
- To date, the UK has not used its regulatory system to encourage postraduates to stay on after qualifying.

Incentives to encourage staying

Europe: Blue Card aims to lure the highly qualified (Maslen 2013b)

- The European parliament has backed the adoption of a 'Blue Card' as an EU-wide work permit that would attract high-skilled non-EU citizens to work and live within the European Union.
- Those applying for a card must have a recognised diploma, evidence of at least three years of professional experience and the offer of an EU job contract with a salary three times the minimum wage.

France: Tackling administrative difficulties to attract more foreign PhD students (Marshall)

- About 70 000 PhD students are studying in France, of whom 41% are from abroad; 24% of the 6.4 million PhD (or equivalent) graduates living in France are foreign.
- While academe and industry appreciate the value of having large numbers of highly qualified foreigners working in France, the bureaucracy and lack of information that foreigners experience when dealing with embassies abroad and the prefectures in France that control their residence rights makes life difficult. Particularly problematic is obtaining a long-term visa, which is essential for opening a bank account, travelling and qualifying for a housing allowance and for social security.
- The government is now introducing a series of reforms to attract the brightest foreign students to study in France.
- These measures include construction programmes for student housing; two- to three-year student visas, depending on the kind of

degree concerned, to avoid the hassle of renewals; one-stop shops for simplified administrative and academic processes; and relaxed labour laws to allow highly educated foreign graduates easier access to employment in France.
- Furthermore, unlike in many other host countries, fees in France are low: for a doctorate, fees are only €380 (USD 500) a year.

Netherlands: Foreign PhDs urged to stay (Myklebust and Beerkens)
- The number of doctoral candidates in the 13 Dutch universities jumped by almost 60% in the decade to 2010, and is now close to 4 000 students each year. The first five years after 2000 saw the third highest growth rate of international students in the world in the Netherlands, after South Africa and New Zealand.
- The Dutch authorities have tried repeatedly to address the imbalance between more doctorate holders leaving the Netherlands than those who graduated from local universities or migrated to the Netherlands with a degree taken elsewhere.
- In 2008, the proportion of foreign students at doctorate level was 20%. In 2010, 50% of PhD candidates at the three technical universities were foreign, with 60% from Europe, 25% from Asia and Oceania and 10% from North America. The percentage of international employed PhD candidates for all universities was 45% in 2010, up from 35% in 2006.
- Factors contributing to this increase include:
  - The output-based financing in the Dutch system, through a so-called PhD premium where universities receive around €90 000 (USD 116 000) for each graduate; and
  - Foreign PhD candidates increasingly coming to the Netherlands to pursue the degree while being funded by their own governments.

Portugal: Reversing decades of brain drain (Heitor, Horta and Mendonça)
- Analysis of the flux of doctorates in Portugal over the period 1970–2010 shows a positive flow of doctorates in Portugal in 2010, after four decades of consecutive lagging behind in terms of scientific capacity.
- Portugal faced the challenge of overcoming a decades- or centuries-long gap in scientific and technological development, to surpass by 2010 the average OECD level in terms of researchers per thousand people in the workforce.
- This was accomplished by public investment in science associated with policies facilitating the co-evolution of human capital formation and institutional capacity building.

- As a result, the number of doctorates grew by more than 74% between 2000 and 2010.
- Out of a total of 19 876 PhD holders who completed their PhD at a Portuguese university, only 669 (3.4%) were found to be working abroad, while 1 836 foreign PhDs were working in Portugal, of whom 83% were engaged in research and development activities.
- The key factor in this achievement was a major, long-term, publicly funded and centralised programme of research grants for doctoral and postdoctoral projects, based on national evaluations of individual proposals that were independent of any university or research institution.

Russia: Government plans to attract foreign postgraduates (Vorotnikov)

- Foreign students in Russia's universities currently number some 250 000, of whom about 20 000 are postgraduates, which is significantly lower than during the Soviet period.
- 40% of all foreign students, including postgraduates, find a job in Russia after graduation, while more than 50% – mainly from Africa and other developing countries – return to their homeland. The remaining 10% find work in Europe or the US after confirmation of their Russian diplomas and passing of additional exams to prove their qualifications.
- The Russian government is considering creating conditions to persuade foreign students, including postgraduates, to continue their education in the country. The measures include abolishing the existing system of quotas for admitting foreign students to Russian universities, providing employment assistance, eliminating administrative barriers associated with employing foreigners, and increasing the number of scholarships, whose amounts are currently below the living wage.

Spain: Efforts to retain doctoral graduates (Rigg)

- Spain saw a sixfold increase in the number of doctorates awarded over 1978 to 2004; and in 2010, it was placed fifth in terms of European PhD production. Data for 2012–2013 showed that nearly 24% of the 8 000 doctorates awarded were earned by foreign students, of whom 62% were from Latin America and 27% from Europe, with only 4% from Asia-Oceania and 4% from Africa. It is not clear whether these students stayed in Spain once they received their doctorates but some evidence suggests the students may be in transit and on their way to continue their research back home.
- Spanish and Portuguese universities are at the bottom of the European pile in terms of offering fixed-term contracts.

- The two major hurdles that foreigners outside the European Union face are legal problems related to visa acquisition and language barriers, especially regarding administrative procedures. The Spanish government sought to address this by introducing special scientific visas under the Immigration Act to ease researchers' inward mobility.
- Another major obstacle for postdoctorates in Spain has been the low level of staff mobility in universities, which is directly related to the way recruitment occurs. National policies have long sought to tackle the perceived common problem of inbreeding, including imposing mobility requirements in some postdoctoral programmes.

Incentives hampered by limitations in the environment

Canada: International PhD candidates not finding jobs to stay (Millar)

- An ambitious programme intended to attract the world's brightest talent to Canada, the Vanier Canada Graduate Scholarship scheme, was launched in 2009 and offered USD 50 000, three-year scholarships to up to 500 new PhD candidates a year. So far, 660 scholarships have been awarded: 164 to students from Africa, Asia, Europe and the United States.
- The government also changed the immigration rules to attract doctoral students to Canada so that from November 2011 PhD students could apply for permanent residency through the Federal Skilled Worker Programme, with the government pledging to accept up to 1 000 applicants annually.
- Although Canada has more than doubled the number of international PhD candidates studying there in the past five years, highly educated immigrants face worse job prospects than their Canadian-born counterparts. Discrimination appears to be at the root of this. This is likely to cause many to leave the country in the long term.

China: Return scheme not showing long-term results (Sharma)

- The Chinese government is regarded as being among the most assertive in the world in introducing policies to reverse the brain drain of scientific and entrepreneurial talent as part of its aim of becoming a global economic and science powerhouse.
- China's high profile 'Thousand Talents' scheme to lure back academic high-fliers may, on paper, look like a major success, but there is concern that it is not bringing researchers back to stay full-time, commit to the long-term development of China's science and technology sector and nurture future local PhD talent. Returnees prefer part-time or visiting research posts in China rather than full-time positions, and they are often unwilling to leave tenured positions at major universities in the West.

- 92% of Chinese who received a science or technology PhD in the US in 2002 were still in the US in 2007. For India, the figure was 81% and for Canada 55%.

Prohibitive fees chase away foreign postgraduate students

Sweden: Losing talent through high tuition fees (Adamson and Flodström)

- In June 2010, the Swedish parliament decided that non-European students should pay tuition fees from the autumn of the following year while studying in Sweden. The consequences were dramatic.
- High tuition fees, matching those at Stanford in the United States and prominent universities in the United Kingdom, combined with the extremely limited possibility of scholarships, have made Sweden a far less attractive destination than was previously the case.
- In the autumn of 2010, the number of non-European students applying for a place in Swedish masters programmes plummeted to 25 000 – down from 125 000 the year before – while the number admitted fell from 16 600 to 1 200.

PhD programme offerings and the supervision relationship

Africa: Supporting doctoral education in Africa – A sketch of what is available (Harle)

- An Association of Commonwealth Universities study on funding available to doctoral students in Africa has illustrated how difficult it is for prospective African students to identify and access funding. Doctoral education is still heavily dependent on external assistance.
- While it emphasises that more full-funding is needed, it also suggests that the growth of network, collaborative and regional approaches is important.
- The report highlights the following:
    - While there is a range of funding activity, the need for support still outstrips what is available.
    - Many bilateral agencies and donors support postgraduate study, but predominantly at masters level.
    - Funding is generally earmarked for specific types of research.
    - Many schemes make partial awards for PhD study, meaning that doctoral students must have other support or risk not being able to focus fully on their research.
    - Some doctoral funding is restricted to staff or students within a particular network.
    - Only 11 active schemes supporting PhD study tenable at African institutions were identified.

- Eleven European countries offer awards to African students for study in their respective countries. African students can also apply to European Commission schemes. The UK had 4 130 research students from Africa in 2011/2012.
- Overall, European funding is still relatively modest.
- A popular approach to the challenges of limited supervisors, insufficient resources or a lack of good research-methods expertise is to build capacity at a regional level. Examples are the African Economic Research Consortium's collaborative PhD in economics and the programme in public health run by the Consortium for Advanced Research Training in Africa.
- Grants to attend conferences or summer schools to present papers are very limited.

Africa: Emerging ideas for building PhD training capacity (MacGregor 2013a)

- The Southern African Regional Universities Association (SARUA) is exploring ways to build supervision capacity through collaboration and drawing on strengths of universities across the region.
- An emerging hub-and-spokes model proposes connecting research-intensive institutions with others that are more teaching-orientated to share resources and facilities for PhD training.
- A survey of SARUA member universities showed that southern African universities were interested in collaborating around doctoral training and supervision capacity-building. About 70% of the respondents preferred an initiative in which there is collaboration in training, sharing of staff and equipment, and sandwich courses.
- The proposed hub-and-spokes model is a means of building PhD production and supervision capacity within Southern Africa.
- At the hub would be research-intensive universities, while the spokes would be middle- and lower-research-strength institutions.
- Hubs would be based on areas of strength in the research universities, and virtual regional centres of excellence would be developed.

Africa: Enhancing research through international collaboration (Rüland)

- Rüland, the German Academic Exchange Service (DAAD) secretary general, stated that quality higher education will occur only when the research dimension in universities is improved.
- Graduate education in Africa can be improved by embedding higher education and research within international knowledge networks.
- Universities should also be enabled to become engines of development in national development, well integrated into the global scientific community.

- Higher education in Africa is increasing, relatively rapidly in certain places. But underfunding has left many African universities with inadequate infrastructure, their best talent working overseas and, in many places, an ageing academic staff.
- African countries receive international support from Great Britain, Canada, France and Germany; and more recently from China and India.
- Bottom-up initiatives, such as the African Institute for Mathematical Sciences (AIMS), have emerged, combining national and international public and private funding. AIMS, founded in 2003, has rapidly expanded from one centre in Cape Town to further centres in Senegal, Ghana and Cameroon.
- DAAD provides assistance in strengthening academic institutions in Africa. DAAD research scholarships have trained many African PhD candidates and DAAD has co-funded PhD scholarships with Ghana, Kenya, South Africa and Tanzania. In 2008, DAAD started a programme to establish centres of African excellence at African universities. DAAD also supports the development of quality-assurance structures.
- More graduate schools need to be established and firmly embedded in worldwide academic networks.
- Universities in collaboration with their governments should outline career paths for recent PhD graduates. Allowing returning researchers to continue the research they have started abroad would be a step in the right direction.
- Infrastructure and trained personnel and management are needed; higher education and research must be prioritised at national and regional levels; and collaboration must take place with committed governments and like-minded organisations worldwide, and regionally with linkages between universities and industry.

Europe: Greater transparency needed on European PhD programme offerings (Paun)

- In Europe, doctoral education, which has been mostly based on a traditional model of personal relations between supervisor and student, has since 2007 moved towards professional management that includes quality assurance.
- As a result, there is now a need for more transparency by universities about what they offer through their PhD programmes to better allow students to compare doctoral studies across Europe. This will allow doctoral candidates to consider career-development resources, their research environment, funding and mobility options.

South Africa: Piloting a doctoral supervision course (Tongai)

- An innovative course that aims to produce a new generation of doctoral supervisors kicked off in 2013 at three South African universities.

- It is structured around four themes – power relations in supervision, the importance of scholarship, supervisor practices and supervisor processes.
- South Africa hopes radically to increase its number of PhD graduates and produce more than 100 doctoral graduates per million of the population by 2030. Across Africa, the current academic workforce is ageing and there is a need to produce future supervisors to replace those who will soon retire.

South Africa: Quality, ranking and the changing face of PhD training (Lee 2013a)

- Professor Cheryl de la Ray, vice-chancellor and principal of the University of Pretoria and former chief executive of South Africa's Council on Higher Education, has argued that African universities need to rethink how they understand success factors.
- In Africa, quality is most often associated with the name or brand of the institution, even though universities may have varying quality in their different PhD degrees.
- The South African system offers general and professional doctorates. Professional doctorates comprise 60% research and 40% coursework or work-based training.
- Demand for high-level skills in industry has increased PhD output, especially in the social sciences and humanities.
- Doctoral education is no longer traditional, following a one-student-per-supervisor model.
- Co-authorship and international collaboration is growing; however, this is more of a North–North pattern in Africa.
- Technological advances have transformed a number of disciplines, with research now being linked directly to industry in certain cases.
- Across Africa, there are research institutions with varying levels of capacity and opportunities for collaboration to increase doctoral graduate output.
- South Africa must develop local research agencies and foundations to support connectivity with local and global networks to reach targets across both Africa and within South Africa.
- South Africa needs access to big data and computational power; however, buying data is still expensive.
- Professional accreditation and absorptive capacity in universities and research institutions is important. Filling vacancies at South African universities can be challenging as universities need to make viable propositions to academics to come to South Africa.

Appendix 4

Government steering of doctoral production

Government steers the higher education system mainly through three instruments:

a. The **funding framework** provides financial incentives to achieve the goals set for higher education. Accordingly, the current funding framework, which was introduced in 2003 and became effective in the financial year 2004/05, was designed to give the minister the ability to reprioritise funding allocations in line with new priority areas and policy incentives.
b. The **programme approval process** gives the minister the leverage to phase out inefficient and expensive duplications, improve the quality of programme offerings, align programme offerings with institutional capacity, and ensure that programme offerings are aligned to economic needs. The minister has to approve the PQM (programme qualification mix) of each university for subsidy purposes, while the CHE has to accredit programmes to ensure that both the programme content and the university resources ensure a quality programme offering. **Quality assurance** is the function of the HEQC, a permanent committee of the CHE.
c. The **enrolment planning process (linked to the funding framework)** needs to ensure that student-enrolment growth in the system is aligned with broader social and economic needs, the capacity of the system in terms of human and capital resources, and the available fiscal resources. It is thus acknowledged that the enrolment process cannot be determined by institutional and student choice alone, but has to be *steered* in order to achieve the desired outcomes. Funding is thus used to support the achievement of the enrolment plans of universities.

The Higher Education Act (1997) gave the minister the power to determine the 'shape and size' of institutions. Size refers to the number of enrolments, while shape refers to the enrolments in various fields of study and ratios of undergraduate and postgraduate enrolments, and the like. As a consequence of this increased steering power assigned to the minister, the *National Plan for Higher Education* (MoE 2001) proposed ensuring institutional diversity by basing this on the type and range of qualifications offered.

As a first step in implementing the planning model and related goals outlined in the *National Plan for Higher Education*, the PQM profile of each higher-education institution was reviewed through a consultative process between the Ministry and the institutions, with advice from the Council on Higher Education (CHE). Some of the programmes were removed from the PQM mix of institutions based on past enrolment and graduation trends. Approval to offer postgraduate programmes where there were no enrolments recorded by institutions in 2000 (the first full year for which HEMIS data were available) was withdrawn except in instances where the withdrawal would have disadvantaged students from pursuing their studies in the field, and on condition that adequate supervisory capacity was available. Approval to offer programmes was also withdrawn if the programmes were not appropriate to the mission of the institution (for example, the offering of programmes in literary studies by [former] technikons or programmes in home economics by universities). Since the PQM review process (completed by 2008), the guidelines for approving new programmes have been much more rigorous, with a focus on institutional capacity and regional collaboration rather than competition.

Funding of doctoral students and graduates

The current funding framework, which provides substantial subsidy incentives for research doctoral degrees, was introduced in the 2004/05 financial year, with a migration strategy for the first three years and full implementation in the 2007/08 financial year. Two subsidy components are of relevance to research doctoral students, namely teaching-input grants and research-output grants. Teaching-input grants provide a subsidy for enrolments depending of the level (undergraduate and equivalent weight = 1, honours and equivalent weight = 2, masters and equivalent weight = 3, and doctoral and equivalent weight = 4). Teaching-input grants also apply a weight for the subject matter of the programmes. For funding purposes, the courses are grouped into four funding groups, each with a different weight:

- Funding group 1: education, law, psychology, and public administration and services receive a funding weight of **1**.

- Funding group 2: business, economics and management studies, communication and journalism, computer and information sciences, languages, linguistics and literature, philosophy, religion and theology, and social sciences receive a funding weight of **1.5**.
- Funding group 3: architecture and the built environment, engineering, family ecology and consumer sciences, and mathematics and statistics receive a funding weight of **2.5**.
- Funding group 4: agriculture and agricultural operations, visual and performing arts, health professions and related clinical sciences, life sciences, and physical sciences receive a funding weight of **3.5**.

This in effect means that for each full-time equivalent doctoral enrolment in the four funding groups the following subsidy amounts were paid in the 2013/14 financial year:

- Funding group 1: R 43 424 (USD 4 342)
- Funding group 2: R 65 136 (USD 6 514)
- Funding group 3: R108 560 (USD 10 856)
- Funding group 4: R151 984 (USD 15 198).

Each doctoral enrolment gets a credit value of 2. This means that a doctoral student earns approximately double these amounts in teaching-input subsidy for a university over the period of registration. The two subsidy credits allocated to a doctoral student enrolment are spread over a number of years based on the average time that students in the degree take to graduate. For each research doctoral graduate, universities received R357 081 (USD 35 708) research output subsidy in 2013. The amount allocated per doctoral graduate declined slightly over the last three years from R364 562 (USD 36 456) in 2011/12 to R357 993 (USD 35 799) in 2012/13 and R357 081 (USD 35 708) in 2013/14. This was as a result of steep increases in research output units from universities, especially research publications, which are funded from the same research output grant. Depending on the average number of years that doctoral students take to graduate, and changes in the rand values of the subsidy components from year to year, a university thus currently receives (in total for the duration of registration) approximately R447 000 (USD 44 700), of which 19% of the amount is teaching input and 81% is research output subsidy for a doctoral student in *funding group 1* who graduates. A doctoral student in *funding group 2* earns the university approximately R490 000 (USD 49 000), of which 27% is teaching-input and 73% is research-output subsidy, and a *funding group 3* doctoral student who graduates earns the university approximately R577 000 (USD 57 700), of which 38% is teaching-input subsidy and 62% is research output. The subsidy earned by a *funding group*

4 doctoral graduate is approximately R664 000 (USD 66 400), of which 46% is teaching-input and 54% is research-output subsidy. In addition, universities receive the annual fee income from the students for each year of registration.

Appendix 5

Additional data on the doctorate in South Africa

Table A1: PhD enrolments per institution type and broad field of study (1996 and 2012)

	Natural sciences		Engineering and technology		Health sciences		Business, economic and management sciences		Education		Humanities and social sciences		Total	
	1996	2012	1996	2012	1996	2012	1996	2012	1996	2012	1996	2012	1996	2012
Universities														
Cape Town	218	507	91	176	104	188	7	111	4	32	147	314	571	1 328
Fort Hare	1	104						8		40		132	1	284
Free State	120	221	5	17	28	36	3	12	20	56	163	189	339	531
KwaZulu-Natal	197	577	42	107	62	174	6	95	16	197	194	476	517	1 626
Limpopo	4	78			23	49		9	3	23	6	30	36	189
North-West	61	205	12	81	25	81	14	160	24	89	111	432	247	1 048
Pretoria	196	637	55	192	51	168	33	202	103	142	410	519	848	1 860
Rhodes	65	181			2	31	1	12	10	75	52	121	130	420
Stellenbosch	140	479	63	180	35	88	13	78	47	83	231	400	529	1 308
Western Cape	15	231			6	110	1	10	58	69	52	183	132	603
Witwatersrand	188	343	112	189	129	317	12	171	20	101	113	303	574	1 424
Subtotal: Universities	*1 205*	*3 563*	*380*	*942*	*465*	*1 242*	*90*	*868*	*305*	*907*	*1 479*	*3 099*	*3 924*	*10 621*
Comprehensive universities														
Johannesburg	61	182	33	92	21	42	28	80	106	102	183	162	432	660
Nelson Mandela Metropolitan	59	140	3	43	4	25	5	106	18	41	49	97	138	452
South Africa	21	134		5	48	90	33	103	123	240	368	601	593	1 173
Venda		55		4		11		40	1	3	2	27	3	140
Walter Sisulu	1					4				30	1		2	34
Zululand	3	47			1	2		3	7	22	11	105	22	179
Subtotal: Comprehensive	*145*	*558*	*36*	*144*	*74*	*174*	*66*	*332*	*255*	*438*	*614*	*992*	*1 190*	*2 638*
Universities of technology														
Cape Peninsula	2	36	20	51	1	25	1	35	3	22		28	27	197
Central		4	1	11	1	10		15		35		10	2	85
Durban		39	2	13		10		18		4		15	2	99
Mangosuthu														
Tshwane		82	6	76		24		35		49		42	6	308
Vaal		2		3			1	8				4	1	17
Subtotal: Universities of technology	*2*	*163*	*29*	*154*	*2*	*69*	*2*	*111*	*3*	*110*		*99*	*38*	*706*
Total	**1 352**	**4 284**	**445**	**1 240**	**541**	**1 485**	**158**	**1 311**	**563**	**1 455**	**2 093**	**4 190**	**5 152**	**13 965**

Compiled by Charles Sheppard
Sources: DoE (1999), SAPSE, DHET (2013a), HEMIS data (2000–2012)

Table A2: PhD graduates per institution type and broad field of study (1996 and 2012)

	Natural sciences		Engineering and technology		Health sciences		Business, economic and management sciences		Education		Humanities and social sciences		Total		Average annual growth rate
	1996	2012	1996	2012	1996	2012	1996	2012	1996	2012	1996	2012	1996	2012	
Universities															
Cape Town	25	81	15	23	13	35	0	19	1	4	19	37	73	199	6.5%
Fort Hare	0	20	0	0	0	0	0	0	0	8	0	15	0	43	
Free State	16	38	0	4	5	8	0	0	5	14	20	30	46	94	4.6%
KwaZulu-Natal	36	76	5	13	7	15	1	10	1	21	18	42	68	177	6.2%
Limpopo	2	9	0	0	1	2	0	0	1	1	0	5	4	17	9.5%
North-West	8	28	2	8	5	23	2	18	6	19	19	58	42	154	8.5%
Pretoria	21	71	13	16	13	28	5	15	12	17	43	53	107	200	4.0%
Rhodes	16	38	0	0	1	4	0	2	4	9	6	14	27	67	5.8%
Stellenbosch	14	101	7	16	6	11	3	10	6	13	32	89	68	240	8.2%
Western Cape	0	33	0	0	0	7	0	1	1	10	5	24	6	75	17.1%
Witwatersrand	22	57	14	25	14	25	1	5	2	9	14	29	67	150	5.2%
Subtotal: Universities	*160*	*552*	*56*	*105*	*65*	*158*	*12*	*80*	*39*	*125*	*176*	*396*	*508*	*1 416*	*6.6%*
Comprehensive universities															
Johannesburg	11	34	1	8	2	4	5	19	22	21	24	23	65	109	3.3%
Nelson Mandela Metropolitan	6	27	0	10	1	3	0	25	3	10	8	11	18	86	10.3%
South Africa	0	10	0	1	3	10	5	17	29	32	52	82	89	152	3.4%
Venda	0	1	0	0	0	1	0	0	0	0	0	2	0	4	
Walter Sisulu	0	0	0	0	0	1	0	0	0	2	0	0	0	3	
Zululand	0	8	0	0	0	0	0	0	0	4	1	16	1	28	23.2%
Subtotal: Comprehensive	*17*	*80*	*1*	*19*	*6*	*19*	*10*	*61*	*54*	*69*	*85*	*134*	*173*	*382*	*5.1%*
Universities of technology															
Cape Peninsula	1	2	0	7	0	5	0	8	0	2	0	0	1	24	22.0%
Central	2	0	0	4	0	0	0	1	0	0	0	0	2	5	5.9%
Durban	0	2	0	0	0	1	0	2	0	1	0	0	0	6	
Mangosuthu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tshwane	0	13	0	13	1	4	0	9	0	3	0	2	1	44	26.7%
Vaal	0	0	0	0	0	0	0	1	0	0	0	1	0	2	
Subtotal: Universities of technology	*3*	*17*	*0*	*24*	*1*	*10*	*0*	*21*	*0*	*6*	*0*	*3*	4	81	20.7%
Total	**180**	**649**	**57**	**148**	**72**	**187**	**22**	**162**	**93**	**200**	**261**	**533**	*685*	*1 879*	*6.5%*

Compiled by Charles Sheppard
Sources: DoE (1999), SAPSE, DHET (2013a), HEMIS data (2000–2012)

Table A3: PhDs by race and gender (1996 to 2012)

Year	African women	Coloured women	Indian women	Black women	White women	African men	Coloured men	Indian men	Black men	White men	Total
1996	10	4	9	**23**	219	48	13	14	**75**	368	**685**
1997	17	2	11	**30**	202	58	14	20	**92**	359	**683**
1998	20	11	9	**40**	241	57	22	24	**103**	377	**761**
1999	34	11	11	**56**	236	71	24	21	**116**	315	**723**
2000	40	8	21	**69**	262	114	28	32	**174**	329	**834**
2001	54	10	23	**87**	249	147	21	32	**200**	364	**900**
2002	55	19	28	**102**	278	175	31	44	**250**	355	**985**
2003	59	25	44	**128**	281	184	26	55	**265**	378	**1 052**
2004	80	14	42	**136**	284	218	36	60	**314**	370	**1 104**
2005	104	26	39	**169**	355	239	42	44	**325**	340	**1 189**
2006	108	24	45	**177**	298	226	33	46	**305**	320	**1 100**
2007	134	26	35	**195**	335	274	45	69	**388**	356	**1 274**
2008	121	31	45	**197**	324	263	25	52	**340**	321	**1 182**
2009	139	30	38	**207**	366	385	45	46	**476**	331	**1 380**
2010	169	34	52	**255**	340	384	47	52	**483**	341	**1 419**
2011	199	37	60	**296**	363	444	43	67	**554**	363	**1 576**
2012	240	36	70	**346**	449	581	64	72	**717**	367	**1 879**
Year	**African women**	**Coloured women**	**Indian women**	**Black women**	**White women**	**African men**	**Coloured men**	**Indian men**	**Black men**	**White men**	**Total**
Total % increase for the period 1996 to 2012	2 300.0%	800.0%	677.8%	1 404.3%	105.0%	1 110.4%	392.3%	414.3%	856.0%	-0.3%	174.3%
Total for period 1996 to 2012	1 5 3	348	582	2 513	5 082	3 868	559	750	5 177	5 954	18 726
% of total PhD graduates for period 1996 to 2012	8.5%	1.9%	3.1%	13.4%	27.1%	20.7%	3.0%	4.0%	27.6%	31.8%	100.0%
Average annual growth rate	22.0%	14.7%	13.7%	18.5%	4.6%	16.9%	10.5%	10.8%	15.2%	0.0%	6.5%

Compiled by Charles Sheppard
Source: DHET (2013a)

Table A4: Countries of origin of the 2012 international graduates

Country	2012	Accumulative %
Zimbabwe	142	22.5%
Nigeria	76	34.6%
Kenya	43	41.4%
Uganda	29	46.0%
Ethiopia	23	49.7%
United States of America	23	53.3%
Cameroon	19	56.3%
Ghana	19	59.4%
Tanzania	18	62.2%
Zambia	17	64.9%
Democratic Republic of Congo	15	67.3%
Lesotho	15	69.7%
Malawi	15	72.1%
Sudan	15	74.4%
India	13	76.5%
Mozambique	13	78.6%
Namibia	13	80.6%
Germany	11	82.4%
Botswana	10	84.0%
Rwanda	10	85.6%
United Kingdom	9	87.0%
Swaziland	7	88.1%
China	6	89.0%
Iran	6	90.0%
Canada	5	90.8%
Eritrea	5	91.6%
Mauritius	5	92.4%
Gabon	4	93.0%
France	3	93.5%
Netherlands	3	94.0%
Russian Federation	3	94.4%
Switzerland	3	94.9%
Belgium	2	95.2%
Italy	2	95.6%
Libyan Arab Jamahiriya	2	95.9%
Madagascar	2	96.2%
Sierra Leone	2	96.5%
Angola	1	96.7%
Benin	1	96.8%
Bosnia and Herzegovina	1	97.0%
Brazil	1	97.0%
Burundi	1	97.3%
Chile	1	97.5%
Egypt	1	97.6%
Greece	1	97.8%
Ireland	1	97.9%
Israel	1	97.9%
Liberia	1	98.3%
Malaysia	1	98.4%
Morocco	1	98.6%
New Zealand	1	98.7%
Norway	1	98.9%
Palestine	1	99.0%
Republic of Korea	1	99.2%
Senegal	1	99.4%
Singapore	1	99.5%
Spain	1	99.7%
Sweden	1	99.8%
Taiwan	1	100.0%
Total international	**630**	

Compiled by Charles Sheppard
Source: DHET (2013a)

Appendix 6

Scenarios that will produce doctoral graduates by 2030

The scenarios presented in the table below are based on the following four assumptions (each with two different options):

- Growth in doctoral enrolments: 6.0% (current) and 9.0% (high) rate of average annual growth.
- Increase in academic capacity: 2.9% (current) and 5.0% (high) rate of average annual growth.
- Proportion of academic staff with PhDs: 41.0% (current) and 58.0% (high) proportion (This proportion is based on an average annual increase of 4.0% in the proportion).
- Efficiency rate: Number of doctoral graduates produced by each doctorate staff member: 0.28 (current) and 0.40 (high).

These options in combination generate 16 logical scenarios as presented on the opposite page.

The range between the lowest graduate estimate (S1 and S9) of 2 867 and the highest (S8 and S16) of 8 061 is a clear indication of how the achievement of the target of 5 000 is dependent on a complex set of factors – some of which are outside of the control of the universities.

The relationship between the last column (estimate of number of graduates) and column 5 (ratio of enrolments to doctorate staff) is an important one and requires further elaboration. All eight *high student growth* scenarios will produce high ratios of number of enrolled students to staff: ranging from 3.44 to 6.78 students to one supervisor. These ratios will undoubtedly increase the already high burden of supervision and – more than likely- both the efficiency and quality of supervision. To illustrate this point: Scenarios 9 and 10 are based on the assumption of high student growth (not that unlikely) and low academic capacity growth (more likely

scenario). This means that the ratio of enrolled students to a single supervisor is close to 7 to 1. We believe this is too high. We also believe that with such a high ratio, it is unlikely that the efficiency will improve from 0.28 to 0.4 graduates per supervisor (and not taking into concerns about loss of quality). In this event the number of graduates will be below the target of 5000 at 2 867. Of course, if one assumes that the proportion of staff with PhDs will increase to 58% (Scenarios 11 and 12), the picture improves considerably. The ratio of enrolled students to staff reduces to 4.8 to 1 supervisor (still high) and under both efficiency conditions the number of graduates come closer to the target (between 4 056 and 5 795).

Scenario	No. of enrolments (2030)	Academic staff (2030)	% of staff with PhDs (2030)	Ratio: Enrolments to doctorate staff	Doctorates per staff (2030)
CURRENT STUDENT GROWTH (6% AAG) SCENARIOS					
1	43 189	2.0% AAG = 24 978	41% = 10 241	4.22	0.28 = 2 867
2	43 189	2.0% AAG = 24 978	41% = 10 241	4.22	0.40 = 4 096
3	43 189	2.0% AAG = 24 978	58% = 14 487	2.98	0.28 = 4 056
4	43 189	2.0% AAG = 24 978	58% = 14 487	2.98	0.40 = 5 795
5	43 189	4% AAG = 34747	41% = 14 246	3.03	0.28 = 3 989
6	43 189	4% AAG = 34747	41% = 14 246	3.03	0.40 = 5 699
7	43 189	4% AAG = 34747	58% = 20 153	2.14	0.28 = 5 643
8	43 189	4% AAG = 34747	58% = 20 153	2.14	0.40 = 8 061
HIGH STUDENT GROWTH (9% AAG) SCENARIOS					
9	69 411	2.0% AAG = 24 978	41% = 10 241	6.78	0.28 = 2 867
10	69 411	2.0% AAG = 24 978	41% = 10 241	6.78	0.40 = 4 096
11	69 411	2.0% AAG = 24 978	58% = 14 487	4.79	0.28 = 4 056
12	69 411	2.0% AAG = 24 978	58% = 14 487	4.79	0.40 = 5 795
13	69 411	4% AAG = 34747	41% = 14 246	4.87	0.28 = 3 989
14	69 411	4% AAG = 34747	41% = 14 246	4.87	0.40 = 5 699
15	69 411	4% AAG = 34747	58% = 20 153	3.44	0.28 = 5 643
16	69 411	4% AAG = 34747	58% = 20 153	3.44	0.40 = 8 061

References

Academy of Science for South Africa (ASSAf) (2010) *The PhD Study: An evidence-based study on how to meet the demands for high-level skills in an emerging economy.* Pretoria: ASSAf

Academy of Science for South Africa (ASSAf) (2011) *Consensus Study on the State of the Humanities in South Africa: Status, prospects and strategies.* Pretoria: ASSAf

Adamson L & Flodström A (2013) Sweden: Losing talent to a freedom-loving America. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517144859736 [accessed 19 August 2013]

African National Congress (ANC) (1994) *The Reconstruction and Development Programme; A policy framework*. Available at: www.nelsonmandela.org/omalley/index.php/site/q/03lv02039/04lv02103/05lv02120/06lv02126.htm [accessed 18 August 2014]

Albo A & Díaz J (2013) Mexico: Both benefit when Mexicans migrate to the US. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516214854906 [accessed 19 August 2013]

Altbach P (2013) Advancing the national and global knowledge economy: The role of research universities in developing countries. *Studies in Higher Education* 38(3): 316–330

Backhouse J (2009) Doctoral education in South Africa: Models, pedagogies and student experiences. Doctoral thesis, University of the Witwatersrand

Badat S (2004) Transforming South African higher education 1990–2003: Goals, policy initiatives and critical challenges. In: N Cloete, P Pillay, S Badat and T Moja, *National Policy and a Regional Response in South African Higher Education*. Cape Town: David Philips

Badley G (2009) Publish and be doctor-rated: The PhD by published work. *Quality Assurance in Education* 17(4): 331–342

Badsha N & Cloete N (2011) *Higher Education: Contribution for the NPC's National Development Plan*. Available at CHET at http://www.chet.org.za/papers/higher-education-contribution-npc%E2%80%99s-national-development-plan [accessed 3 September 2013]

Becker HS (1963) *Outsiders: Studies in the Sociology of Deviance*. New York: The Free Press

Bennett P & Turner G (2013) PRES 2013: Results from the Postgraduate Research Experience Survey. Heslington, UK: The higher Education Academy. Available at https://www.heacademy.ac.uk/sites/default/files/resources/pres_2013_uk_report.pdf [accessed 8 October 2015]

Bilecen B (2013) Turkey: Turkish PhD students drawn to US and Germany. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517145904763 [accessed 19 August 2013]

Bitzer E (2012) Best practices for the research doctorate? A case for quality and success in knowledge production. *South African Journal of Higher Education* 26(6): 1182–1199

Blackburn RT & Lingenfelter PE (1973) *Assessing Quality in Doctoral Programs: Criteria and correlates of excellence*. Ann Arbor: Center for the Study of Higher Education, The University of Michigan

Botha J (2015) A desktop study of higher education tracer studies in South Africa. Sellenbosch: CREST, Stellenbosch University

Bound J, Turner S & Walsh P (2009) Internationalisation of US doctorate education. Available at National Bureau of Economic Research (NBER) at http://www.nber.org/papers/w14792.pdf [accessed 15 August 2013]

Bourdieu P (1997) *Pascalian Meditations*. Stanford: Stanford University Press

Bourner T, Bowden R & Laing S (2001) Professional doctorates in England. *Studies in Higher Education* 26: 65–83.

Bunting I & Cloete N (2004) *Developing Performance Indicators for Higher Education: A South African case study*. Cape Town: Centre for Higher Education Transformation (CHET)

Bunting I, Cloete N & Van Schalkwyk F (2014) *An Empirical Overview of Eight Flagship Universities in Africa: 2001–2011*. A report of the Higher Education Research and Advocacy Network in Africa (HERANA). Cape Town: Centre for Higher Education Transformation (CHET)

Bunting I, Sheppard C, Cloete N & Belding L (2010) *Performance Indicators in South African Higher Education 2000–2008: Summary report*. Cape Town: Centre for Higher Education Transformation (CHET)

Byrne J, Jørgensen T & Loukkola T (2013) *Quality Assurance in Doctoral Education: Results of the ARDE project*. Brussels: EUA

Castells M (1991) The university system: Engine of development in the new world economy. Paper for the World Bank seminar on higher education and development

Castells M (2001) Universities as dynamic systems of contradictory functions. In: J Muller, N Cloete & S Badat (eds) *Challenges of Globalisation: South African debates with Manuel Castells*. Cape Town: Maskew Miller Longman, pp.206–224

Castells M & Calderón (2013) Development, democracy and social change in Chile. In: M Castells & P Himanen (eds), *Reconceptualizing development in the global information age* Oxford: Oxford University Press. pp.175–204

Castells M & Cloete N (2011) Informational development and human development: South Africa in a global context. Paper for Stellenbosch Institute for Advanced Study seminar

Castells M & Himanen P (eds) (2014)*Reconceptualizing Development in the Global Information Age*. Oxford: Oxford University Press

Centre for Higher Education Transformation (CHET) (2012) Higher education performance indicators data: Performance indicators 2000 to 2011. Available at http://www.chet.org.za/data/sahe-open-data#hepid [accessed 23 March 2013]

Choudaha R (2013) Global: The future of international doctoral mobility. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516041702774 [accessed 19 August 2013]

Cloete N (1998) Quality of Higher Education: Conceptions, contestations and comments. *Higher Education in Africa: Achievements, challenges and prospects*. Dakar, Senegal: UNESCO Regional Office

Cloete N (2011a) Differentiation: Reasons and purposes, systems and methodologies. Pretoria: HESA. Available at http://chet.org.za/files/uploads/reports/HesaFinalAugust11_for%20website.pdf [accessed 1 September 2013]

Cloete N (2011b) South Africa: Radical new plan for higher education. *University World News*, 4 December 2011. Available at: www.universityworldnews.com/article.php?story=20111202222252975 [accessed 19 November 2013]

Cloete N (2012) Comments on the Tertiary Education Green Paper. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20120309094718922 [accessed 21 March 2014]

Cloete N (2014a) A new look at demographic transformation: Comments on Govinder et al. *South African Journal of Science* 110(1/2). Available at http://www.sajs.co.za/new-look-demographic-transformation-comments-govinder-et-al-2013/nico-cloete [accessed 24 March 2014]

Cloete N (2014b) The South African higher education system: Performance and policy. *Studies in Higher Education* 39(8): 1355–1368

Cloete N & Gillwald A (2014) South Africa: Informational development and human development – Rights vs capabilities. In: M Castells & P Himanen (eds), *Reconceptualizing development in the global information age* Oxford: Oxford University Press. pp.140–174

Cloete N & Moja T (2005) Transformation tensions in Higher Education: Equity, efficiency and development. *Social Research* 72(3): 693–722

Cloete N & Muller J (1998) South African higher education reform: What comes after post-colonialism. *European Review* 6(4): 525–542

Cloete N, Bailey T, Pillay P, Bunting I & Maassen P (2011) *Universities and Economic Development in Africa*. Cape Town: African Minds

Cloete N, Maassen P & Bailey T (2015) *Knowledge Production and Contradictory Functions in African Higher Education*. Cape Town: African Minds

Coetsee R (2014) CHET Report on South African Fulbright Scholars (1953–1996). Cape Town: CHET. Available at http://www.chet.org.za/papers/report-south-african-fulbright-scholars-1953%E2%80%931996 [accessed 5 October 2015]

Comad CF & Pratt AM (1985) Designing for quality. *Journal of Higher Education* 56: 601–622

Constant A (2013) Italy: Where do the brainy Italians go, and why? *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130522161858254 [accessed 19 August 2013]

Cooper D & Subotzky G (2001) *The Skewed Revolution: Trends in South African higher education: 1988–1998*. Cape Town: Education Policy Unit, University of the Western Cape

Council of Graduate Schools (2004) *PhD Completion and Attrition: Numbers, Leadership, and Next Steps*. Washington DC: Council of Graduate Schools

Council of Graduate Schools (2008) *PhD Completion and Attrition: Analysis of Baseline Demographic Data from the PhD Completion Project*. Available at www.phdcompletion.org/quantitative/book1_quant.asp [accessed 11 September 2013]

Council on Higher Education (CHE) (2000) *Towards a New Higher Education Landscape: Meeting the equity, quality and social development imperatives of South Africa in the 21st century*. Pretoria: Council on Higher Education

Council on Higher Education (CHE) (2002) *A New Academic Policy for Programmes and Qualifications in Higher Education*. Pretoria: Council on Higher Education

Council on Higher Education (CHE) (2004) *HEQC Criteria for Programme Accreditation*. Pretoria: Council on Higher Education

Council on Higher Education (CHE) (2008) *HEQC Framework for Delegated Functions*. Available at www.che.ac.za/media_and_publications/frameworks-criteria/heqc-framework-delegated-functions

Council on Higher Education (CHE) (2013a) *The Higher Education Qualifications Sub-Framework*. Pretoria: Council on Higher Education

Council on Higher Education (CHE) (2013b) A proposal for undergraduate curriculum reform in South Africa: The case for a flexible curriculum structure. Report of the Task Team on Undergraduate Curriculum Structure. Pretoria: Council on Higher Education

Crosier D, Purser L & Smidt H (2007) Universities shaping the European higher education area. European University Association. *Trends* V: online. Available at www.eua.be/fileadmin/user_upload/files/Publications/Final_Trends_Report_May_10.pdf [accessed 5 June 2013]

Cyranoski D, Gilbert N, Ledford H, Nayar A & Yahia M (2011) Education: The PhD factory. The world is producing more PhDs that ever before. Is it time to stop? *Nature* 472: 276–279

Departement van Nasionale Opvoeding (DNO) (1982). *Statistiek van Kwalifikasies Toegeken deur die Outonome Universiteite in die Jare 1971–1979*. Pretoria: *Departement van Nasionale Opvoeding*

Department of Education (DoE) (1997) *Education White Paper 3: A Programme for the transformation of higher education*. General Notice 1196 of 1997. Pretoria: Department of Education

Department of Education (DoE) (1999) *South African Post-Secondary Education (SAPSE) Information System*. Pretoria: Department of Education

Department of Education (DoE) (2001) *National Plan for Higher Education*. Pretoria: Ministry of Education. Available at http://chet.org.za/manual/media/files/chet_hernana_docs/South%20Africa/National/National%20Plan%20for%20HE%20SA.pdf [accessed 8 October 2015]

Department of Education (DoE) (2005a) Minimum admission requirements for Higher Certificate, Diploma and Bachelor's Degree Programmes requiring a National Senior Certificate. Available at www.education.gov.za/Documents/policies/AdmissionRequirements.pdf [accessed 25 June 2009]

Department of Education (DoE) (2005b) The National Senior Certificate: A qualification at level 4 on the National Qualifications Framework (NQF). Available at www.education.gov.za/Documents/policies/NSCNQF4.pdf [accessed 25 June 2009]

Department of Education (DoE) (2005c) *Student Enrolment Planning in Public Higher Education*. Pretoria: Department of Education

Department of Finance (1996) *Growth, Employment, and Redistribution (GEAR) Macroeconomic Policy in 1996*. Pretoria: Department of Finance

Department of Higher Education and Training (2012) *Green Paper for Post-School Education and Training*. Pretoria: Department of Higher Education and Training

Department of Higher Education and Training (2013a) *Higher Education Management Information System (HEMIS), 2000–2012*. Pretoria: Department of Higher Education and Training

Department of Higher Education and Training (2013b) *PhD cohort analyses. Higher Education Management Information System (HEMIS), 2000–2013*. Pretoria: Department of Higher Education and Training

Department of Higher Education and Training (2014c) *White Paper for Post-school Education and Training: Building an expanded effective and integrated post school system*. Government Notice 37229 of 2014. Pretoria: Department of Higher Education and Training

Department of Higher Education and Training (2014) *Policy Framework on Differentiation in the South African Post-School System*. Pretoria: Department of Higher Education and Training

Department of Higher Education and Training (2015) Research Policy 2015. *Government notice No. 188*. 11 March 2015. Pretoria: Government printer

Department of Higher Education and Training (DHET) and the Council on Higher Education (CHE) (2014) *HEMIS. PhD cohort analysis*. Pretoria: Department of Higher Education and Training

Department of Science and Technology (2008) *Innovation Towards a Knowledge-Based Economy. Ten-Year Innovation Plan 2008–2018*. Pretoria: Department of Science and Technology

Douglass JA, Edelstein R & Hoareau C (2011) A global talent magnet: How a San Francisco/Bay Area global higher education hub could advance California's comparative advantage in attracting international talent and further build US economic competitiveness. *Research & Occasional Paper Series*, CSHE.9.11

Douglass JA, Edelstein R & Hoareau C (2014) Bring the world to California: A global hub for higher education. *BOOM: A Journal of California* 4(1): 54– 61

Dube O, Hausman R & Rodrik D (2007) South Africa: Identifying the binding constraint on growth. Harvard AGISA Review. Unpublished working paper

Dunne T (2014) Mathematical errors, smoke and mirrors in pursuit of an illusion: Comments on Govinder et al. (2013). *South African Journal of Science* 110(1/2)

Du Toit A (2012) The PhD and the degree structure of South African higher education: A brief and rough guide. Paper presented at the CHET seminar 'Knowledge Production in South African Higher Education', 23 February 2012. Available at http://www.chet.org.za/papers/phd-and-degree-structure-south-african-higher-education [accessed 8 October 2015]

Eggins H (2008) The UNESCO Forum on Higher Education, Research and Knowledge Trends and Issues in Post Graduate Education: A global review. Paper presented at the DCU/UNESCO Forum Workshop, Dublin City University, 5–7 March 2008

Ehrenberg R, Zuckerman H, Groen J & Brucker S (2010) *Educating Scholars: Doctoral education in the humanities*. Princeton: Princeton University Press

European University Association (EUA) (2005) *Doctoral Programmes for the Knowledge Society*. Brussels: EUA

European University Association (EUA) (2007) *Doctoral Programmes in Europe's Universities: Achievements and Challenges*. Brussels: EUA

European University Association (EUA) (2011) *Promoting Creativity – Cultivating the Research Mindset*. Home page for the Fourth EUA-CDE Annual Meeting: online. Available at www.eua.be/fourth-eua-cde-madrid.aspx [accessed 4 May 2013]

Fisher G & Scott I (2011) The role of higher education in closing the skills gap in South Africa. Background Paper 3 for the project 'Closing the skills and technology gap in South Africa'. Washington DC: The World Bank

Fox B & Daniel T (2011) Many anxious as exiled Haitian leader plots return. The Asscociated Press. Available via Reading Eagle at www2.readingeagle.com/article.aspx?id=294769

Francis D (2005) Changing demographics of US science-engineering PhDs. Available at National Bureau of Economic Research (NBER) at www.nber.org/digest/jan05/w10554.html [accessed 15 August 2013]

Garbers JG (1960) *Gradueringstendense in Suid-Afrika 1918–1957*. Unpublished doctoral thesis, University of Pretoria

Gardner, M (2013) Germany: Attracting foreign skills a circular process. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516042552939 [accessed 19 August 2013]

Gewirtz S (2008) Give us a break! A sceptical view of contemporary discourses of lifelong learning. *European Educational Research Journal* 7: 414–424

Gill TG & Hoppe U (2009) The Business Professional Doctorate as an Informing Channel: A Survey and Analysis. *International Journal of Doctoral Studies* 4: 27–57

Golde C & Walker GE (2006) (eds) *Envisioning the Future of Doctoral Education: Preparing stewards of the discipline*. San Francisco: Jossey-Bass

Golde CM (2005) The role of the department and discipline in doctoral student attrition: Lessons from four departments. *Journal of Higher Education* 76(6): 669–700

Govinder KS, Zondo NP & Makgoba MW (2013) A new look at demographic transformation for universities in South Africa. *South African Journal of Science* 109(11/12)

Govinder KS, Zondo NP & Makgoba MW (2014) Taking the transformation discourse forward: A response to Cloete, Dunne and Moultrie and Dorrington. *South African Journal of Science* 110(3/4)

Graf T (2014) *Global DBA Survey 2014: Program characteristics, student characteristics, and career outcomes of professional doctorates in Management*. Bournemouth: Bournemouth University

Griesel H & Parker B (2008) *Graduate Attributes: A baseline study on South African graduates from the perspective of employers*. Pretoria: Higher Education South Africa

Hacker A & Dreifus C (2011) The debt crisis at American colleges. Available at http://www.theatlantic.com/business/archive/2011/08/the-debt-crisis-at-american-colleges/243777/ [accessed 15 August 2013]

Harle J (2013) Africa: Supporting doctoral education in Africa – A sketch of what is available. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131213114859707 [accessed 24 January 2014]

Hasselback JR & Reinstein A (1995) Assessing accounting doctoral programs by their graduates' research productivity. *Advances in Accounting* 13:61–86

Heitor M, Horta H & Mendonça J (2013) Portugal: Reversing decades of brain drain. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516041044252 [accessed 19 August 2013]

Hennigan T (2011) Brazil: Science students offered study-abroad grants. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20111027125409568 [accessed 15 August 2013]

HEQC (Higher Education Quality Committee) (2004) *Framework for Programme Accreditation*. Available at http://www.che.ac.za/sites/default/files/publications/Programme_Accreditation_Framework_Nov2004.pdf [accessed 24 March 2014]

Herman C (2011) Obstacles to success – Doctoral student attrition in South Africa. *Perspectives in Education* 29(3): 40–52

Higher Education Funding Council for England (HEFCE) (2005) PhD research degrees: Entry and completion. Available at www.hefce.ac.uk/pubs/hefce/2005/05_02

Higher Education Qualifications Framework (2007) Higher Education Act, 1997 (Act No. 101 of 1997). *Government Gazette* Vol. 928. Pretoria, 5 October 2007 No. 30353

Higher Education Qualifications Sub-Framework (2013) Publication of the General and Further Education and Training Qualifications Sub-Framework and Higher Education Qualifications Sub-Framework of the National Qualifications Framework. *Government Gazette* Vol. 578. Pretoria, 2 August 2013 No. 36721

Holbrook A, Bourke S, Lovat T & Dally K (2004) Qualities and characteristics in the written reports of doctoral thesis examiners. *Australian Journal of Educational & Developmental Psychology* 4(2004): 126–145

Holdaway E (1997) Quality issues in postgraduate education. In: RG Burgess (ed) *Beyond the First Degree*. Buckingham: Society for Research into Higher Education and Open University Press

Huisman J (ed) (2009) *International Perspectives on the Governance of Higher Education*. New York: Routledge

Huisman J & Naidoo R (2006) The professional doctorate: From Anglo-Saxon to European challenges. *Higher Education Management and Policy* 18(2): 1–13

Hunter M (2002) Postgraduate studies at the University of Stellenbosch: An exploration of students' perceptions. MPhil thesis. Department of Sociology and Social Anthropology, Stellenbosch University.

Hyllseth B, Kristoffersen E, Prydz K, Vøllestad N, Sundquist G, Stensaker B, Kalland E, Martinez J-R, Breivik J & Skjelsbæk I (2012) *Akademisk, attraktiv, allsidig. En helhetlig plattform for PhD utdanning ved Universitetet i Oslo* (Academic, attractive and flexible: A coherent platform for PhD education at the University of Oslo). Oslo: Universitetet i Oslo

IAU (International Association of Universities) (2012) Changing nature of doctoral studies in sub-Saharan Africa: Challenges and policy development opportunities at six universities in Sub-Saharan Africa. Available at http://www.iau-aiu.net/sites/all/files/IAUFinal%20Report_Doctoral%20Programmes.pdf [accessed 15 August 2013]

IAU-ACUP (International Association of Universities and the Catalan Association of Public Universities) (2012) International seminar on innovative approaches to doctoral education and research training in sub-Saharan Africa: Report. Available at http://www.iau-aiu.net/sites/all/files/Final_Report_IAU_ACUP_Seminar_on_innovative_approaches_to_doctoral_education.pdf [accessed 15 August 2013]

Jansen JD (2001) Rethinking Education Policy Making in South Africa: Symbols of Change, Signals of Conflict. In A Kraak & M Young (eds) *Education in Retrospect: Policy and Implementation Since 1990*. Pretoria: Human Sciences Research Council

Jessop B (2007) Knowledge as a fictitious commodity: Insights and limits of a Polanyian analysis. In: A Buğra & K Ağartan (eds) *Reading Karl Polanyi for the 21st Century: Market economy as a political project*. Available at http://bobjessop.org/2014/01/14/knowledge-as-a-fictitious-commodity-insights-and-limits-of-a-polanyian-perspective/ [accessed 21 March 2014]

Joint Declaration of the European Ministers of Education (1999) *The Bologna Declaration of 19 June 1999*. Available at http://www.bologna-berlin2003.de/pdf/bologna_declaration.pdf [accessed 15 August 2013]

Jørgensen T (2013) Global: Balancing excellence and access in doctoral education. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517142426580 [accessed 19 August 2013]

JQIA (2004) Shared 'Dublin' descriptors for short cycle, first cycle, second cycle and third cycle awards. European University Association Joint Quality Initiative Report. Available at www.eua.be/ [accessed 5 June 2013]

Kamler B (2008) Re-thinking doctoral publication practices: Writing from and beyond the thesis. *Studies in Higher Education* 33(3): 283–294

Kehm B (2009) New forms of doctoral education and training in the European higher education area. In: B Kehm, J Huisman & B Stensaker (eds) *The European Higher Education Area: Perspectives on a moving target*. Rotterdam: Sense

Kehm B, Huisman J & Stensaker B (eds) (2009) *The European Higher Education Area: Perspectives on a moving target*. Rotterdam: Sense

Kiley M & Mullings G (2004) Examining the examiners: How inexperienced examiners approach the assessment of research theses. *International Journal of Educational Research* 41: 121–135

Knight R (2001) South Africa: Economic policy and development. Available at http://richardknight.homestead.com/files/sisaeconomy.htm [accessed 1 September 2013]

Kraak A & Du Toit J (2013) Pathways from university to work. A Graduate Destination Survey of the 2010 cohort of graduates from Western Cape universities. Cape Town: Cape Higher Education Consortium

Kuhn TS (1977) *The Essential Tension: Selected Studies in Scientific Tradition and Change*. Chicago: Chicago University Press

Kuhn TS (1962) *The Structure of Scientific Revolutions*. Chicago: Chicago University Press

Kyvik S & Olsen TB (2013) Studies in Higher Education: Increasing completion rates in Norwegian doctoral training: Multiple causes for efficiency improvements. *Studies in Higher Education* 39(4): 1668–1682

Landau L & Rosenberg N (eds) (1986) *The Positive Sum Strategy: Harnessing technology for economic growth*. Washington DC: National Academy Press

Langa P (2010) Disciplines and engagement in African universities: A study of the distribution of scientific capital and academic networking in the social sciences. Unpublished PhD Thesis, University of Cape Town

LaPidus JB (1997) *Doctoral Education: Preparing for the future*. Washington: ERIC Clearinghouse

Lee P (2013a) Africa: Quality, ranking and the changing face of PhD training. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131114183744120 [accessed 27 November 2013]

Lee P (2013b) Africa: Survey reveals strategies to increase PhD production. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131114183411505 [accessed November 2013]

LERU (2010) *Doctoral Degrees Beyond 2010: Training talented Researchers for Society*. Brussels: LERU

Levine AE (2000) The Future of Colleges: 9 Inevitable Changes. *The Chronicle of Higher Education*, 27 October

Lisbon European Council (2000) *Presidency conclusions: Lisbon European Council, 23 and 24 March 2000*. Available at http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/00100-r1.en0.htm [accessed 15 July 2013]

Louw J & Muller J (2014) A literature review on models of the PhD. Cape Town: CHET. Available at www.chet.org.za/papers/literature-review-models-phd [accessed 12 September 2014]

Maassen P & Stensaker B (2011) The knowledge triangle, European higher education policy logics and policy implications. *Higher Education* 61: 757–769

Maassen P & Cloete N (2006) Global reform trends in higher education. In: N Cloete, P Maassen, R Fehnel, T Moja, T Gibbon & H Perold (eds) *Transformation in Higher Education: Global pressures and local realities*. Dordrecht: Springer

MacGregor K (2010) Higher education summit endorses stakeholder forum. *University World News,* Issue no. 121, 25 April 2010. Available at: www.universityworldnews.com/article.php?story=20100424200028621 [accessed 1 October 2014]

MacGregor K (2013a) Africa: Emerging ideas for building PhD training capacity. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131215083542491 [accessed 24 January 2014]

MacGregor K (2013b) Africa: Where to from here for the African PhD? *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131102155412705 [accessed 14 February 2014]

MacGregor K (2013c) Brazil: Brazil's doctoral production lessons for Africa. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131213152900757 [accessed 24 January 2014]

Mkandawire T (2009) Preface. *The British Academy and the Association of Commonwealth Universities: The Nairobi report: Frameworks for Africa-UK research collaboration in the social sciences and humanities*. London: The British Academy and the Association of Commonwealth Universities

Magome M (2011) Row over top TUT post. *IoL News*. Available at www.iol.co.za/news/south-africa/gauteng/row-over-top-tut-post-1.109272#.VgjzfPmqpBc

Mamdani M (2011) Africa's post-colonial scourge. *Mail & Guardian*, 27 May

Mangcu X (2014) Ripping the veil off UCT's whiter shades of pale. *Sunday Times*, 6 July

Marseilles M (2013) Greece: Economic recovery stifled by serious brain drain. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517143450480 [accessed 19 August 2013]

Marshall J (2013) France: Reforms aim to attract more foreign PhD students. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517105000290 [accessed 19 August 2013]

Maslen G (2013a) Australia: Half the nation's PhD holders are from overseas. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517142757453 [accessed 19 August 2013]

Maslen G (2013b) Europe: Blue Card aims to lure the highly qualified. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516040612 94&query=blue+card [accessed 19 August 2013]

Maslen G (2013c) Global: The changing PhD – Turning out millions of doctorates. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130403121244660 [accessed 19 August 2013]

McAlpine L & Amundsen C (eds) (2011) *Doctoral education: research-based strategies for doctoral students, supervisors and administrators*. Dordrecht: Springer

Mentz M (2013) The state of doctoral education and training in Africa. A report commissioned by CREST, Stellenbosch University. Stellenbosch: Centre for Research on Science and Technology (CREST)

Mercer (2013) Talent rising: High impact accelerators to global growth – Executive summary. Available at http://www.mercer.com/talent-rising-summary [accessed 1 July 2013]

Millar E (2013) Canada: International doctoral students face a tough job market. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516041429560 [accessed 19 August 2013]

Ministry of Education (MoE) (2003) *Funding of Public Higher Education*. Government notice no. 25824, 9 December 2003. Pretoria: [Former] Department of Education

Mishra A (2013) India: Brain gain counters brain drain in attracting PhDs. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516150447127 [accessed 19 August 2013]

Monk P (1989) *Technological Change in the Informational Economy*. London: Printer

Morgan J (2011) The rise and rise of PhDs as standard. Available at http://www.timeshighereducation.co.uk/415203.article [accessed 15 August 2013]

Morgan J (2012) The PhD rises in Britain: English universities, new realities. Available at: ooverseas.wordpress.com/2012/04/20/the-ph-d-rises-in-britain/

Mouton J (2009) Systemic blockages in postgraduate education and training: A report commissioned by the ASSAf Panel on the PhD. Stellenbosch: Centre for Research on Science and Technology (CREST), Stellenbosch University

Mouton J (2011) Doctoral production in South Africa: Statistics, challenges and responses. *Perspectives in Education* 29(3): 13–29

Mouton J, Boshoff N, De Waal L, Esau S, Imbayarwo B, Ritter M & Van Niekerk D (2008) The state of public science in the SADC region. In: P Kotecha (ed.) *Towards a Common Future: Higher education in the SADC region. Research findings from four SARUA studies*. SARUA 2008 Study Series. Available at http://www.sarua.org/?q=content/chapter-4-state-public-science-sadc-region [accessed 26 March 2014]

Mouton J, Boshoff N, James M & Treptow R (2009) Survey of doctoral graduates: A destination study of PhD students across a sample of fields and institutions. Centre for Research on Evaluation, Science and Technology (CREST), Stellenbosch University

Mouton J, Boshoff N, James M & Treptow RF (2012) ASSAf tracer study of university graduates in the social sciences, humanities and arts. Centre for Research on Evaluation, Science and Technology (CREST), Stellenbosch University.

Mouton J & Hunter M (2001) *'n Ondersoek na die stand van nagraadse studie aan die Universiteit van Stellenbosch*. Unpublished report. Centre for Interdisciplinary Studies, Stellenbosch University.

Muller J (2006) Dialogue on differentiation in higher education. CHET Seminar, 3–5 November. University of Cape Town

Muller J (2013) Discussion paper on the higher education and the NDP. Unpublished. Pretoria: Higher Education South Africa (HESA)

Myklebust JP (2013) Global: Sharp rise in foreign PhD enrolments in Scandinavia. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130516151544633 [accessed 19 August 2013]

Myklebust JP & Beerkens E (2013) Netherlands: Foreign PhDs urged to stay during strong expansion. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130522162351727 [accessed 19 August 2013]

Namuddu K (2014) Expanding and sustaining excellence in doctoral programs in sub-Saharan Africa: What needs to be done? Report of a workshop convened by the National Research Foundation, South Africa and Carnegie Corporation of New York, 27–29 October 2013. Available at https://www.dropbox.com/sh/r2bmbrsw4tcc47g/lLWg-piQI4 [accessed 26 March 2014]

National Commission on Higher Education (NCHE) (1996) *A Framework for Transformation*. Pretoria: National Commission on Higher Education

National Planning Commission (2011) *Diagnostic Report*. Available at www.pmg.org.za/files/docs/110913npcdiagnostic2011_0.pdf [accessed 23 August 2013]

National Planning Commission (NPC) (2011) *National Development Plan: Vision for 2030*. Available at http://www.gov.za/sites/www.gov.za/files/devplan_2.pdf [accessed 8 October 2015]

National Planning Commission (2012) *National Development Plan 2030: Our future, make it work*. Available at: http://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf [accessed 8 October 2015]

National Research Foundation (2013) *Annual Performance Plan 2013/14–2015/16*. Pretoria: National Research Foundation

National Science Foundation (2012) Chapter 2: Higher education in science and engineering. Available at http://www.nsf.gov/statistics/seind12/c2/c2h.htm [accessed 15 August 2013]

Nerad M (2004) The PhD in the US: Criticism, facts and remedies. *Higher Education Policy* 17: 183–199

Nerad M (2008) United States of America. In: M Nerad & M Heggelund (eds) *Toward a Global PhD? Forces and Forms in Doctoral Education Worldwide*. Seattle: University of Washington Press. pp.278–297

Nerad M & Heggelund M (2011) *Toward a global PhD? Forces and forms in doctoral education worldwide*. Center for Innovation and Research in Graduate Education, Washington: University of Washington

Neumann R (2007) Policy and practice in doctoral education. *Studies in Higher Education* 32: 459–473

Nkosi B (2015) Multimillion rand grant scheme for black universities. *Mail & Guardian*, 22 January

OECD (2010) *OECD Science, Technology and Industry Outlook 2010*. Washington: OECD Publishing

OECD (2013) Graduates by field of study. Available at: http://stats.oecd.org/Index.aspx?DatasetCode=RGRADSTY [accessed 6 July 2013]

Packer T (2010) CEOs and New York Mayor make economic case for immigration reform. *Daily Kos*, Immigration Policy Center. Available at http://www.dailykos.com/story/2010/06/24/879065/-CEOs-and-New-York-Mayor-Make-Economic-Case-for-Immigration-Reform [accessed 8 October 2015]

Olsson Å & Cooke N (2013) The Evolving Path for Strengthening Research and Innovation Policy for Development. Organisation for Economic Cooperation and Development (OECD). Available at http://www.oecd.org/sti/Session%204_The%20evolving%20path.pdf [accessed 8 October 2015]

Osborn A (2013) United Kingdom: Postgraduate students flood in from more nations. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517143806959 [accessed 19 August 2013]

Pandor N (2011) Science and technology budget vote speech by Minister Naledi Pandor: Enhancing excellence in science and technology for development economic growth and a better life for all citizens. Available at http://www.gov.za/science-and-technology-budget-vote-speech-minister-naledi-pandor [accessed 3 October 2015]

Pandor N (2014) Minister of Science and Technology Budget Speech, 22 July. Available at https://pmg.org.za/briefing/19087/ [accessed 3 October 2015]

Park C (2007) *Redefining the Doctorate*. York: The Higher Education Academy

Paun C (2013) Europe: EUA project calls for transparency in PhD programmes. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130315143352727 [accessed 19 August 2013]

Pearson M (1999) The changing environment for doctoral education in Australia: Implications for quality management, improvement and innovation. *Higher Education Research and Development* 18(3): 269–288

Pearson M (2005) Framing research on doctoral education in Australia in a global context. *Higher Education Research and Development* 24(2): 119–134

Phillips E (1993) The concept of quality in the PhD. In: DJ Cullen (ed.) *Quality in PhD Education*. Canberra: Australian National University, Centre for Educational Development

Powell S & McCauley C (2002) The process of examining research degrees: some issues of quality. *Quality Assurance in Education* 11(2): 73–83

Price M (2014) *Today's News: Staff transformation at UCT*. 14 July. Available at www.uct.ac.za/dailynews/?id=8752 [accessed 25 October 2014]

Qonde G (2013) Higher education must be transformed. *Mail & Guardian Online*. Available at http://mg.co.za/article/2013–02-01-higher-education-must-be-transformed [accessed 1 September 2013]

Quality Assurance Agency for Higher Education (QAAHE) (2004) *Code of Practice for the Assurance of Academic Quality and Standards in Education. Section 1: Postgraduate Programmes*. UK: QAAHE

Republic of South Africa (1997) Higher Education Act No. 101 of 1997. Pretoria: Government Printer

Republic of South Africa (2014) *Government Gazette* Vol. 588 No. 37716 of 3 June 2014. Pretoria: Government Printer

Rigg P (2013) Spain: Foreign doctoral students may be in transit. *University World News*. Available at http://www.universityworldnews.com/article.php?story=201305160422352 2 [accessed 19 August 2013]

Rüland D (2013) Africa: Enhancing research through international collaboration. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20131114184121685 [accessed 26 November 2013]

Sawahel W (2013) Global: Half of mobile Arab doctoral students remain abroad. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130524161517746 [accessed 19 August 2013]

Saxenian A (2002) Brain circulation: How high-skill immigration makes everyone better off. Washington, DC: Brookings Institution. Available at http://www.brookings.edu/research/articles/2002/12/winter-immigration-saxenian [accessed 3 October 2015]

Saxenian A (2014) Silicon Valley: Economic dynamism, social exclusion. In: M Castells & P Himanen (eds) *Reconceptualizing Development in the Global Information Age*. Oxford: Oxford University Press. pp.29–51

Schwab K (2012) The end of capitalism – So what's next? Available at http://www.huffingtonpost.com/klaus-schwab/end-of-capitalism_b_1423311.html [accessed 1 September 2013]

Schwartzman S (2013) Brazil: PhD mobility ebbs and flows, but most graduates return. *University World News* Available at http://www.universityworldnews.com/article.php?story=20130530155449642 [15 August 2013]

Scott P (2012) The global context of doctoral education. European University Association. Available at www.eua.be/fileadmin/user_upload/files/EUA1_documents/C_4_4_1%20(The%20Global%20Context%20of%20Doctoral%20Education).1166020495595.pdf [accessed 4 June 2013]

Serageldin I (2000) University governance and the stakeholder society. Keynote address presented to International Association of Universities, Durban, South Africa

Seshoka L (2014) No more transformation excuses. *Mail & Guardian*, Friday 24 October

Sharma Y (2013) China: 'Thousand Talents' academic return scheme under review. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130524153852829 [accessed 19 August 2013]

Shen G (2013) Building world class universities in China from the view of national strategies. Available at Global University Network for Innovation: http://www.guninetwork.org/resources/he-articles/building-world-class-universities-in-china-from-the-view-of-national-strategie/ [accessed 3 July 2013]

Sinclair M (2004) *The Pedagogy of 'Good' PhD Supervision: A National Cross-disciplinary Investigation of PhD Supervision*. Canberra: Commonwealth of Australia

South African Qualifications Authority (SAQA) (2008) What is a National Qualifications Framework? Available at www.saqa.org.za/docs/webcontent/2014/about.htm

Southern African Regional Universities Association (SARUA) (2012) *Doctoral Education: Renewing the academy*. SARUA Leadership Dialogue Series. Available at http://www.sarua.org/files/publications/SARUA%20leadership%20Dialogue%20Series/Leadership%20Dialogue%20Series_Vol%204%20No%201%20.pdf [accessed 15 August 2013]

Steiner B & Schwartz J (2007) Assessing the quality of doctoral programs in criminology in the United States. *Journal of Criminal Justice Education* 18: 1

Szanton D & Manyika S (2002) PhD programs in African universities: Current status and future prospects. Berkeley, California: The Institute of International Studies and Center for African Studies, University of California

Tamburri R (2013) The PhD is in need of revision. Available at: www.universityaffairs.ca/the-phd-is-in-need-of-revision.aspx#latest_data

The Economist (2010) Doctoral degrees: The disposable academic. Why doing a PhD is often a waste of time. Available at http://www.economist.com/node/17723223/print [accessed 3 September 2013]

Thune T (2009) Doctoral students on the university–industry interface: A review of the literature. *Higher Education* 58: 637–651

Thune T & Olsen TB (2009) *Stipendiaters arbeidsvilkår og karriereforventninger*. Oslo: NIFU

Thune T, Kyvik S, Sörlin S, Bruen Olsen T, Vabø A & Tømte C (2012) *PhD Education in a Knowledge Society: An evaluation of PhD education in Norway*. Oslo: NIFU

Times Literary Supplement (2013) Talent and human capital: Why it determines today's business success. Available at http://www.tlnt.com/2013/03/27/talent-and-human-capital-why-it-determines-todays-business-success/ [accessed 1 July 2013]

Tongai I (2013) South Africa: Three universities pilot doctoral supervision course. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130503124958332 [accessed 19 August 2013]

Van den Bergh SJE (2013) Towards explaining doctoral success at Stellenbosch University. Unpublished MPhil dissertation, Faculty of Education, Stellenbosch University

Van Vught F (2008) Higher education homogeneity on the rise worldwide. *University World News*, Issue no. 1, 29 January 2008. Available at www.chet.org.za/files/resources/UWN_Special_Edn_1_Jan_08.pdf

Van Wyk A (2014) How many professors are there in SA? *Africa Check*, 18 August. Available at: http://africacheck.org/reports/how-many-professors-are-there-in-sa/ [accessed 25 October 2014]

Veugelers R (2013) Global: Rise of scientific powerhouses not stemming PhD outflow. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130517105257 61 [accessed 19 August 2013]

Vorotnikov E (2013) Russia: Government plans to attract foreign postgraduates. *University World News*. Available at http://www.universityworldnews.com/article.php?story=20130522160514196 [accessed 19 August 2013]

WEF (World Economic Forum) (2012) *Global Competitiveness Report 2012/2013*. Available at http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012–13.pdf [accessed 1 September 2013]

Woodrow Wilson National Fellowship Foundation (2005) The responsive PhD: Innovations in US doctoral education. Available at http://woodrow.org/news/publications/responsive-phd/ [accessed 3 August 2013]

World Bank (2012) List of countries by GDP (nominal). Available at http://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)#Lists (World Bank, 2012) [accessed 23 August 2013]