UNIVERSITEIT VAN PRETORIA
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YUNIBESITHI YA PRETORIA

LEADERSHIP THROUGH THE LENS OF RESEARCH PRODUCTIVITY

By

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A thesis submitted in fulfilment of the requirements for the degree of

PHILOSOPHIAE DOCTOR (PhD)

In

EDUCATION POLICY STUDIES

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University of Pretoria
August 2011

ACKNOWLEDGEMENTS

At this stage I would like to view my doctoral journey through the lens of humanity and pay tribute to those who supported me along the way.

I would like to extend my thanks to Professor Mokubung Nkomo, who, despite a heavy supervision load, willingly stepped in to take over when Professor Jansen, my original supervisor, left the University of Pretoria. Your guidance was quiet and unassuming and yet its strength got me through terrain that seemed mountainous and sparse at times. Thank you for staying with me on this academic journey.

My colleague and friend, Dr Andrew Kaniki, served as an academic mentor and critical friend. Thank you for the many discussions during the conceptualisation of this research study and for your role in the piloting process. Thank you for providing much needed critical comment on a first draft of this thesis.

This research thesis owes much of its content to ten generous research leaders and their postgraduate students (past and current) who took time out of their very busy schedules to share the story of their research journeys with me. Thank you for entrusting your story with a research novice.

The National Research Foundation provided financial employee assistance for this doctoral study and a period of leave away from the office. Thank you for this gift of time. I acknowledge the support of my SAASTA colleagues who made allowances for my study commitments, even through our busiest work schedules.

I also extend sincere thanks to my supportive network of loyal family and friends who, each in their own unique way kept me real and believing in myself.

Lastly, I want to thank three special young women who give deep meaning to my life and who have been an integral part of every phase of my life journey. This goes to Dominique, Nicole and Judy, who told me that when you believe in somebody, there are no what ifs, only when's.

ABSTRACT

Academic leadership in higher education in the 21st century is very different and more multifaceted than it was just a decade ago. Thus, given the multilayered, dynamic nature of higher education leadership at individual, group and organisational levels, a more nuanced understanding of its role in driving excellent research performance remains paramount. Hence, this study explores the professional and personal nature of research leadership that enables and stimulates high quality research performance.

The research explores the research career pathways of ten researchers from various disciplinary fields who had been rated by the National Research Foundation (NRF) of South Africa and who were recommended by their education institutions as research leaders. The ten leaders were each interviewed about their research careers. Postgraduate students (47 in total) whom they had supervised were invited to answer an email questionnaire about their personal experiences of the leaders' mentorship and leadership. In addition, information about the leaders and mentees was obtained from various documents such as curriculums vitae, research training records, institutional annual reports and web sites. The data collected and analysed in the study showed that the research career pathways of the research leaders were highly diverse and were affected in various ways by the historical-political and social context of South Africa. However, across the career pathways, the research leaders had the following features in common: 1) the presence of strong research-centeredness throughout all career phases; 2) they lead by example of personal scholarship and intellectual leadership; 3) their research is locally relevant and globally competitive; and 4) their personal dynamics influence a confident and dynamic people-centred leadership approach. The most notable differences in research leadership across the sample could be traced to disciplinary contexts which ranged from distributed leadership across large teams and entrepreneurial networks to the more prevalent one-on-one mentor-mentee relationships. Leaders who were most influential in driving research performance were highly regarded

scholars with extensive academic experience, had served a variety of leadership roles, confidently embraced the complexity of academic leadership and created stimulating research environments.

The research also reveals a number of challenges that still remain for research leadership in addressing the human resource transformation requirements of the South African higher education research context. These include issues of 1) individualism and competition; 2) equity and excellence; 3) race and gender; and 4) research career exit and entry paths. The South African higher education system is characterised by pockets of scientific excellence in some disciplinary fields, as illustrated by the career trajectories of leaders in this study, but much work remains to be done in order to build a fully representative research-performing professoriate for South Africa.

KEY WORDS

- Academic leadership
- Scholarship
- Research Leadership
- Research Performance
- Research Culture in higher education
- Research Capacity Development
- Research Career Development
- Mentoring and supervision
- Leadership attributes and behaviours
- Leadership development

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LIST OF ACRONYMS

ASSAF	Academy of Science of South Africa
CHE	Council for Higher Education
CSIR	Council for Scientific and Industrial Research
DOE	Department of Education
DHET	Department of Higher Education and Training
DST	Department of Science and Technology
DVC	Deputy Vice Chancellor
EOC	Education Opportunities Council
FTE	Full time Equivalent
GDP	Gross Domestic Product
GEAR	Growth Economic Acceleration and Redistribution
HEQF	Higher Education Qualification Framework
HESA	Higher Education South Africa
IIE	Institute of International Education
ISI	International Scientific Index
NACI	National Advisory Council on Innovation
NGO	Non-governmental organisation
NRDS	National Research and Development Strategy
NRF	National Research Foundation
OECD	Organisation for Economic Co-operation and Development
SAEP	South African Education Program
SARC	South African Research Chairs
SARCHI	South African Research Chairs Initiative
SPII	Support Programme for Industrial Innovation
THRIP	Technology and Human Resources for Industry Programme
TIA	Technology Innovation Agency
UNESCO	United Nations Educational, Scientific and Cultural Organisation

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CHAPTER ONE

Rationale and Background

1.1 Introduction

This study seeks to explore the professional and personal nature of leadership that enables and stimulates high-quality research performance within the context of the research enterprise. Research performance is one of the defining characteristics of academic excellence, and strong universities are characterised by strong research cultures. It is generally recognised that universities with strong research cultures have high research performance. Research universities are those that offer a full range of baccalaureate (undergraduate) programs, are committed to graduate education through the doctorate, and give high priority to research. Although usually part of differentiated academic systems, they are viewed as integral knowledge generating institutions of the 21st century with a role to "provide access to global science, produce basic and applied research and educate key leaders for academe and society" (Altbach, 2007:111).

Research universities are characterised by their top graduates, ground-breaking research and vigorous transfer of technology, with critical dimensions cited as a concentration of talent, abundant resources and favourable governance. It is felt that the combination of these factors generally assures excellence in graduate education and research output (Kearney, 2009). Successful academic researchers are generally those who publish in the leading journals, develop quality postgraduate students, garner large external grants, create intellectual property, create publicity for their institutions, and are selected for the nation's elite academies. "It is also usually the same academics who are able to attract large teams of research associates, post-doctoral researchers and graduate students, as well as professorships and chairs" (Pourciau, 2006:3).

Hence it can be seen that research performance refers not only to the presence of material resources, but also to individuals and research teams with the necessary knowledge, research skills and talents. David King (2004), in measuring the quality of research on national scales and locating this within an international context, made the key point that "sustainable economic development in highly competitive world markets requires a direct engagement in the generation of knowledge" (p.314). One measure of a nation's knowledge base is its output of doctoral students.

Available data show that South Africa produces only 23 to 27 doctorates per million of the population per annum. In addition it is projected that a five-fold increase of graduates is required in science, engineering and technology (SET) alone in order to make a significant difference to the country's development (ASSAF, 2010). Discussions at the United Nations Educational, Scientific and Cultural Organisation (UNESCO) forum on trends in higher education, research and knowledge reiterated the importance of this research investment. This is because the overall objective of postgraduate education is to "educate highly-skilled citizens and professionals who are able to address specific issues within their national contexts as part of the wider globalised society" (Kearney, 2008:4). Thus research institutions that are able to compete effectively in the global production of knowledge can be viewed as part of the national assets of a country. When countries lose their base for academic excellence – "through outdated policies, neglected institutions, the exodus of their best graduates and inadequate investment in university research – their competitiveness in a global knowledge society will dwindle and finally disappear" (Kearney, 2009:6).

Higher education is also seen as a powerful engine for transformation "particularly suited to powering wider social change" (Jonathan, 2001:37), and research excellence and its social manifestations and supporting policies, '[are] more often than not politically and culturally grounded' (Tijssen, 2003:94). The changing landscape of higher education in South African has been a much-contested space with regard to a differentiated landscape for further and higher education institutions. According to Kraak (2006),

commentators on higher education argue that there are only five South African universities that qualify as research universities, even though the Department of Science and Technology has identified seven South African institutions as part of its "national system of innovation" (Kraak, 2006:151). Kruss (2005, 2006) argues for a further set of emergent universities with evolving capacity to do cutting edge research using new technology platforms. Despite inherent limitations, flaws and biases of global university rankings, people the world over pay attention to rank positions, and South African universities that endeavour to be research–led have joined a globally competitive system. The Top 500 universities identified by the Academic Ranking of World Universities included only three South African universities in the elite global list for 2008, namely, the universities of Cape Town, Witwatersrand and KwaZulu-Natal (http://www.universityworldnews.com, 2007). Four South African universities (17% of the country's institutions) were ranked in the top 500 of the Shanghai Jiao Tong, and in 2007 Cape Town University made it into the Times Higher Education Supplement – QS top 200 at position 107. This was the first time an African university had made it into these rankings. Although acknowledging the subjective biases of the ranking systems, the vice chancellor of the University of Cape Town was of the opinion that "our good performance in the rankings sends the message that they (South Africans) can get a world-class education at home" (http://www.mg.co.za/article/2010-09-24). Hence, given the large diversity of external criteria and varying external environments, an important starting point for selecting dimensions of research performance is the research mission of the university itself and its key research areas. A perusal of some websites of South African universities shows that within the local context, research aspirations are made visible through vision and mission statements. The following examples illustrate this trend:

"The Premier University of African Scholarship" (University of KwaZulu Natal http://www.ukzn.ac.za)

"..a leading university in South Africa, in Africa, and in the world by sustaining globally competitive standards of excellence in learning, teaching and research" (University of Witwatersrand http://www.wits.ac.za)

"..to be an internationally recognised South African teaching and research university and a member of the international community of scholarly institutions…" (University of Pretoria http://www.up.ac.za)

Thus it seems that many South African higher education institutions have identified the need to strengthen their research capacity and capability as being critical to their institutional missions and to their survival as institutions. In all instances, academic leadership and productivity are regarded as critical indices by which to measure research success (Hazelkorn, 2005). According to an early work by Bland and Ruffin (1992:392) "leadership is the one variable that affects all of the other organisational characteristics that influence research productivity". There is evidence to suggest that the absence of strong leadership is one of the key barriers to research success, with a number of studies pointing to the crucial role of academic leadership in maintaining morale, enhancing productivity and helping university staff adapt during periods of organisational change (Hansson and Monstead, 2007; Goodall, 2007; Lee, Gambling and Hogg, 2004). An investigation of the management of research in six international research–intensive universities found that a key characteristic of these institutions was "powerful, visionary leadership with a firm, unwavering commitment to the research-led mission…". (Taylor, 2006:13). Ramsden (1998) captures this essence when he states that "the most substantial advantage a university in a competitive and resource-hungry higher education system can possess is capable academic leadership"(p.363). However, we have very little understanding of the extent to which academic leadership impacts on research performance. In addition, the changing nature of the global research enterprise continues to introduce new perspectives on research leadership. Studies have found that academic leadership poses problems that are distinctly different from leadership in business or government agencies, despite some recent shifts towards more executive styles of leadership and decision–making in higher

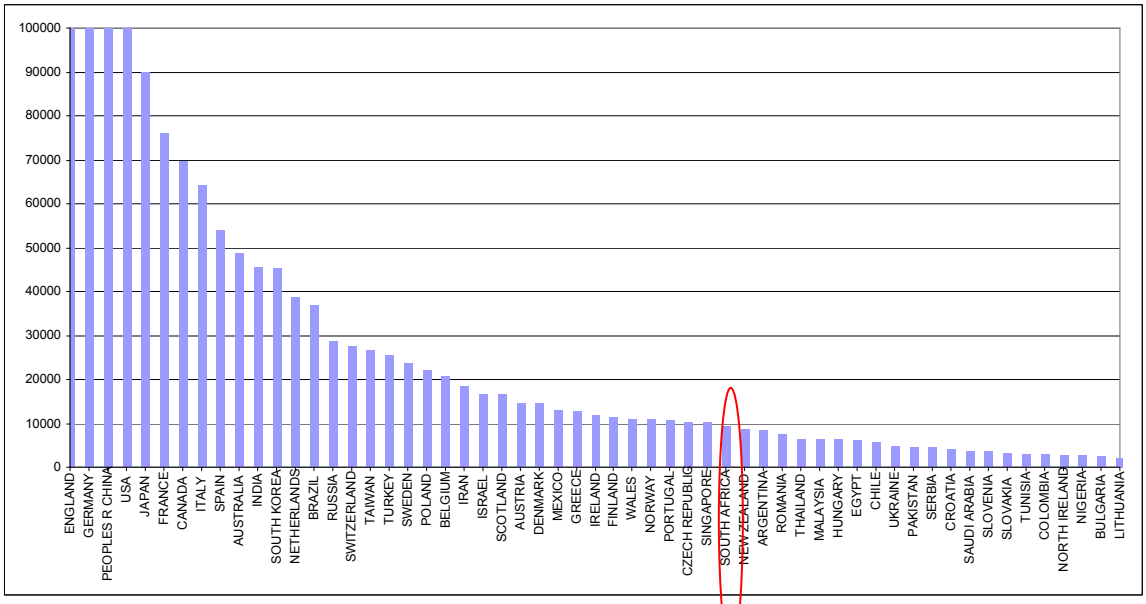
education (Sathye, 2004; Johnson and Cross, 2006; Smith and Adams, 2008). Thus, given the "multilayered, dynamic nature of higher education leadership at individual, group and organisation levels", a more nuanced understanding of its role in driving excellent research performance remains paramount (Bolden, Petrov and Gosling, 2008:358).

Research universities have emerged on the policy agenda of many developing countries, mostly as part of growing national efforts to compete in the global knowledge economy. Since the late 1990's the higher education context in South Africa has been subjected to a number of interventions to transform research at policy and implementation level. There have also been large amounts of funding provided by National Government and organisations like the National Research Foundation (NRF) for programmes to develop research capacity. These can be viewed as collective attempts to build the quality of researchers and scholars, improve research performance, and grow research leadership as required by the transformation agenda. However, by the early part of the 21st century South Africa was faced with declining research productivity (Pouris, 2003:425), institutional academic staff profiles that remained largely constant, challenges to local supervision capacity and a research population that consisted largely of white, ageing males. South Africa also continued to lose a significant number of highly skilled people to other countries: for example there was an outflow of 2100 people during 2000 (Mouton, 2003). In addition, 65% of all publications were produced by only 6 universities in South Africa (Council for Higher Education, 2004) and there was the overall feeling that despite the overt official changes, institutional cultures of higher education institutions had remained more or less the same. At the time, there was general agreement that "viewed from the inside of institutional life at the turn of the century, there is little evidence of a substantial shift in the ways South African universities and their counterparts produce knowledge" (Jansen, 2002b:519).

By 2010, there was still broad consensus in the science community in South Africa that not enough high quality doctorates are being produced in relation to the developmental needs of the country (ASSAF, 2010). According to the

PhD study carried out by the Academy of Science of South Africa (ASSAF), this problem is compounded by multiple factors at numerous levels within the national education system such as the school system, undergraduate programmes, high dropout and repetition rates, supervisory capacity as well as numerous exit levels along the qualification pipeline. In addition, the overall trends towards improved race and gender representation in this sector remain very small. The number of articles published in journals on the Institute for Science Information (ISI) index, places the scientific productivity of South Africa below the requirements of the ten-year plan of Government and makes a strong case for increased research output to address this situation. Figure 1 below illustrates ISI output per country and the standing of South African scientific publications in relation to other countries in 2010.

Figure 1: ISI Outputs per Country, 2010



Source: National Research Foundation (NRF). Annual Performance Plan, April 2011

These factors emphasise continuing challenges to research performance in higher education in South Africa. However, we have little understanding of the extent to which academic leadership impacts on research performance. Thus, the purpose of this study is to explore the professional and personal nature of leadership that enables and stimulates high quality research performance

within the context of the research enterprise. The emphasis of the study is on South Africa's academic research leadership as it attempts to explore and understand the influence of leaders on research performance within a transforming research context. This study comprises case studies of research leaders and their mentees within the university research enterprise.

1.2. Rationale

Universities face increasing pressures from various sources, including the "policies of government, employers seeking capable graduates, levels and bases of funding, increasing student intakes, efficiency drives, and the continued quest for improved effectiveness in teaching, business development and research" (Ball, 2007:449). While universities have to underpin the role of higher education as a key economic driver, governments are placing greater focus on science and technology disciplines, the balance between basic and applied research, activities that promote the transfer of knowledge and technology and the protection of intellectual property. Institutions able to match research priorities with national priorities, as determined by technology foresight studies, are well rewarded (Hazelkorn, 2005).

It seems that higher education in South Africa has taken on most of the features identified in the comparative international literature on new managerialism (Council for Higher Education, 2006:14). The expectation of increased efficiency in the production of research and research candidates means that the tasks of formulating production goals and of mobilising resources and support by means of incentive systems become crucial concerns (Bleiklie and Henkel, 2006).

Researchers argue that the "evidence shows that the conditions under which research and scholarly work are undertaken have been constrained by this shift" (Johnson, 2006:69). There is little evidence to indicate that the much-needed efficiency and effectiveness is reaching fruition. In many cases

"research output remains either stagnant, or is dwindling, and student throughput has become a major concern" (Johnson and Cross, 2006:54). These pressures and other changes within the global context have increasingly focused attention on the importance of leadership. The complexity of leadership in higher education is well articulated, and this complexity is challenged by the changing institutional, national and global character of the academic workplace. Since research is a key area of university performance, and research leadership is a critical variable in achieving research excellence, the rationale for this study can be viewed as being four-fold.

1.2.1. Policy context

"An investigation of academic productivity reveals the mood of the policy makers, usually with some visible evidence of national concern over productivity and accountability in higher education" (Pourciau, 2006:68). The decade of transformation of higher education in South Africa has provided a very fluid and dynamic context that includes a number of policy imperatives concerning research. These include:

- the national policy imperative (as contained in the National Plan on Higher Education) to increase research outputs while maintaining standards of excellence;
- the increasing shift within public sector research towards more strategic applied research (National Research and Development Strategy), to the possible detriment of fundamental research;
- the high level goals for transforming the science system in the country, that includes human resource profiles and the relationship between its outputs and the needs of a democratic society (this imperative cuts across the higher education and science and technology policy) (CHE, 2005:17).

Higher education leadership *per se* and leadership of the research enterprise more specifically has not been the focus of policy attention in the reconstruction of South African higher education. The debate on leadership

was subsumed under broader governance struggles and there was very little, if any, engagement with the role of leaders in the transformation agenda (Kulati and Moja, 2002). This is a grave vacuum, since achieving significant change of the kind required by the transformation agenda requires leadership at many levels. Middlehurst (1997) points out that serious engagement in the process of 'tearing down walls' in higher education will not occur without leadership and the kind of leadership that engages people in a large-scale change agenda. This research study explores research leadership as it is considered one of the key requirements for addressing these change imperatives for research in higher education.

1.2.2 Scholar- Leader debate

International studies (Bassey, 1995; Ramsden, 1998) point to the crucial role of academic leadership in maintaining morale, enhancing productivity and increasing research output. An empirical study of leaders and how they affect university performance (Goodall, 2007) documents a positive correlation between the lifetime citations of a university's president and the position of that university in a world ranking. "This study appears to be the first longitudinal evidence that the appointment of university presidents who have been successful researchers improves the performance of their universities" (Goodall, 2007:18). Thus it appears that, internationally, active researchers lead the world's top research universities. Although the Goodall study does not show performance of universities to be causally linked to the actions of their leaders, it does offer some basis for studies to investigate research and/or scholarship and leadership in the university context.

The institutional landscape of higher education in post-apartheid South African has had to confront the scholarship/leadership debate in the public (media) domain. In the appointment of the Vice Chancellors of Northwest University and the University of Johannesburg, a labour matter arose out of contentions between criteria of strong research backgrounds and strong management. When the post Vice Chancellor and Principal was advertised at the University of Johannesburg, there was an emphasis on an excellent

academic and research record and proven academic leadership. However, the final appointment carried much public controversy especially on the issue of an alleged lack of academic credentials on the part of the newly appointed vice chancellor. In the case of North-West University, the Council emphasised that it was looking for a strong manager. The final appointment was also contested openly through the legal systems on the issue of research background and scholarly leadership. The Council argued that it was looking for a strong manager and the candidate supported this view by the statement that he 'was not an academic' (Jansen, 2004). Researchers such as Harman (2002) suggest that it is likely that an increasing number of senior staff with less impressive academic records will be heading academic units and will be called on to make academic as well as management decisions. Amongst major scientific facilities and laboratories there is a view that "today facility heads are often selected less for their intellectual brilliance than for being good committee men or women who can cope with the bureaucracy now inherent to the task" (Macilwain, 2010:919).

These changes have been in contrast to the restructuring (2007/08) of leadership positions at Rhodes University. The creation of two Deputy Vice Chancellor positions reflects Rhodes' determination to put academics at the head of management of the institution, to enable two highly capable academic minds to focus their attention on keeping the university competitive and desirable as a place for study and research. According to the university, the appointments are part of the Vice Chancellor's plans to create a leadership team for the university composed of academics rather than professional managers (Rhodes University, 2008). The challenge for such efforts, though, is to train talented scientists in the more mundane aspects of management without scaring them off or ironing out the personality traits that make great leaders (Macilwain, 2010).

Hence, in the South African context, it is opportune to look more closely at research leadership and research performance in light of the constant and continuing tension that is played out in the national higher education system.

1.2.3 Personal interest

At the beginning of the 21ST century (2001-2006) the Focus Areas Programmes were created through a decision by the NRF to change course from support of unrestricted disciplinary oriented, self-initiated research to funding of steered, relevant and multi-disciplinary oriented research. This represented a significant change of course for academic research in South Africa, although the change was in line with international practices. At the time the international trends indicated that national research funding agencies were increasingly steering their national research systems towards collaboration and socio-economically relevant research (Marias, 2007). It was also the first time that the NRF supported natural and social sciences as well as the humanities. The macro-economic context in South Africa at the time was influenced by the Reconstruction and Development Programme (RDP) that aimed to provide a socio-economic framework by which to steer economic growth and redistribution. The Focus Area Programme consisted of nine focus areas that were used to align research to societal needs and national imperatives more closely. As the researcher of this study was the manager for the NRF Focus Area, *Education and the Challenges for Change* from 2001-2003, there is a a personal interest in the present study. During this period responsibilities included awarding education research grants as well as developing and supporting initiatives to build research capacity. Some challenges faced at the time included:

- the poor quality of many research proposals;
- annual grants that were awarded to only a few ‘established’ researchers;
- the inability to increase the base of new, young researchers who were able to qualify for support;
- not being able to lobby for a ‘bigger slice of the limited funding pie’ without an increase in the quantity and quality of proposals.

At the time the situation painted a gloomy picture of support for education research. As a result the question of the type of leadership needed to drive change in research performance was formulated. During 2008 the Centre for

Education Policy Development, commissioned by the NRF, undertook an audit and analysis of education research in South Africa from 1995-2006 inclusive, with the aim of determining the gaps, strengths and general research trends over that twelve-year period (Deacon, Osman and Buchler, 2009). The findings suggested that although a vibrant education research community had been built over the years, much of the scholarship was "diffuse small scale and individualised, with a dearth of large scale research projects that could consolidate knowledge about issues of national and global importance" (p.1073).

The present study can contribute to the rather limited knowledge base of effective research leadership in developing countries. This information will be useful to research support agencies whose individual and institutional investments are meant to contribute towards improving research performance and establishing sustainable research cultures.

1.2.4. Gaps in the literature

Much of the current literature reviewed on leadership focuses on school leadership and leadership and management within the corporate sector, with emphasis on North American and Australian research. Researchers such as Hopkins (2001) and Harris (2004) reinforce the importance of leadership in schools. The results of effective schools research has been a strong driving force behind political efforts to improve public education, emphasising the strategic role of strong principal leadership in improving student outcomes (Heck, 1992;21). Grant (2006) is of the opinion that leadership is a critical issue in the transformation of South African schools. However she also argues that there is a perception that leadership is equal to headship. Traditionally, leadership has been most commonly understood in terms of position, status and authority. She is of the opinion that a different view of leadership is needed: a shift from leadership as headship to a distributed form of leadership (p.512).

Studies that focus exclusively on leadership in higher education are somewhat sparse. To date, no attempt has been made to assess the management of research in research-intensive universities (Taylor, 2006). Literature on the leadership of department chairs is growing but most higher education leadership research has focused on the role of the college or university president (Goodall, 2007; Ramsden, 1998). According to a recent literature review of effective leadership in higher education in the United Kingdom (UK), the United States of America (USA) and Australia (Bryman, 2007), there are numerous studies that examine what leaders in higher education do, but these studies did not always explore links with performance, as the present research attempts to do. There is also a need for more and better research on the characteristics of leadership effectiveness and the contribution of leadership to academic and organisational goals (Middlehurst, 2008).

A common criticism of studies on leadership is that they are often based on anecdotes and personal experiences, or that, because they are only loosely connected to empirical investigation, they might be too simple to provide much value in the higher education context. Some clarification of the relationship between leadership theory in general and leadership as it relates to higher education in particular would be valuable and could help place research findings in a relevant theoretical framework. According to Bryman (2007), “what is needed is the generation of new categories of the behaviour which relate directly to higher education, instead of those that have provided the language of leadership theory for many years” (p.15).

There is also concern about the lack of rigorous research on leadership, especially in the Third World context. Tirimizi (2002) notes that “ while several theories and models and their respective measurement instruments have been developed and used to measure leadership behaviours, the controversy about validity and availability of leadership theories and instruments across cultures makes a strong case for developing new models of leadership outside the western context” (p.270).

Metcalfe and Metcalfe (2005) raise some concerns about the volume of the charismatic–transformational models of leadership that began to dominate leadership literature. In brief, their concerns were that these studies were:

- dominated by studies of leadership conducted in organisations in the USA;
- often based on data collected in military and commercial organisations;
- largely influenced by observations of top managers or 'distant leaders';
- based pre-dominantly, if not solely, on studies about men;
- based on studying only, or pre-dominantly, white managers;
- developed by focusing only on leaders themselves (p30).

In the South African context these findings resonate with Jansen's description (2005) of his experiences as a black dean in a dominantly white institution. They highlight the following key concerns regarding research on leadership:

- the ethnocentric character of Western research on leadership;
- the paucity of critical literature on deanship; and
- the lack of studies on educational leadership in post-conflict societies.

These concerns echo the main limitations of research in the wider field and point to the critical gaps in the field of leadership. This study can contribute toward an understanding of the current notions and practices of leadership as enacted through research leadership within higher education in the context of a developing country. Little is known about South African leadership values in higher education, leadership profiles or leadership philosophies and guiding theories and practices that may have emerged/are emerging in response to the changing educational landscape.

Thus, in a context where South Africa's scientific research publication output has not increased nor excelled at many levels internationally, where there is a dearth of literature and rigorous study of the practice of academic leadership and where a trend towards the ethos of 'new managerialism' has arisen, a deeper exploration of the professional and personal nature of leadership that

enables and stimulates high quality research performance within the context of the research enterprise is felt to be opportune.

1.3. Research Questions

The South African research context is characterised by limited research capacity and is infrequently punctuated by pockets of research excellence. Resources are scarce for a large section of the academe; individual researchers and institutions compete with each other, while some institutions are elevated to centres of excellence. Research of good quality is lacking across many faculties; the research 'gap' between the natural and social sciences and humanities persists. With all this in mind, what is the relationship between leadership and research productivity? In investigating this question, we need to acknowledge that leadership plays itself out in complex, dynamic and changing social systems.

This study then, focuses on the leadership of the academic work of the research enterprise, in particular research leadership, with special attention to how this influences research performance in a transforming context. It explores the dynamics of leadership and influence in the South African research enterprise. In particular, it aims to understand the nature of quality research leadership and to identify a range of leadership factors that contribute towards research productivity and, in doing so, highlight likely areas of tension or challenge as well as opportunities for improvement. This study will thus be guided by the following research questions:

1. How have research leaders emerged i.e. what are the career experiences and academic pathways that they have traversed?
2. What are the characteristics (attributes) and leadership experiences of effective research leaders in the context of the research enterprise?
3. Why are some research leaders more effective than others in influencing and stimulating research performance?

1.4. Brief overview of chapters

The next chapter (Chapter 2) sets the scene for the research study by providing an overview of salient features of the South African research context. It provides a short contextualisation of the early research arena under the apartheid government and then shifts to the changing research context (transition period) of the post 1994 period. The post 1994 period is described through the identification and discussion of a number of key research indicators related to the unique requirements for higher education in South Africa. The research system that was designed to address the inherited, deeply systemic inequalities of the past are also discussed. The chapter shows that, in spite of some growth, it has been much more difficult to significantly address the legacies of the past with regard to the research context of higher education than initially imagined.

Because the leadership field is expansive, Chapter 3 provides a short review of leadership theories before focusing on issues of academic leadership in general and on research leadership in particular. This genre of leadership is discussed with regard to research productivity, and highlights the main tenets of research productivity within higher education.

Chapter 4 draws together the main indices of research leadership and research productivity and provides a theoretical framework for the exploration of research leadership in relation to research performance. The chapter considers the development of conceptual models that include the role of leadership as a key contributing factor in increased research performance.

Chapter 5 sets out the research design and methodology used for the research study. The research findings emerged from the analysis of interviews with the research leaders and questionnaires completed by graduate students (mentees) of the research leaders in the sample. The findings are then presented in three separate chapters viz. Chapter 6, 7 and 8. This choice of individual chapters allows the findings to be presented in a

systematic way that starts with researchers on their way to becoming leaders and ends with the preparation of the next generation of leaders.

Chapter 6 presents an overview of the research leaders in the sample and draws attention to their research development over time. This will highlight findings that include both personal and contextual influences on their growth as researchers. In this chapter the influence of the social and political environment on the development of individual researchers or groups of researchers is revealed.

Chapter 7 presents discussions on the research leader from the perspective of intellectual leadership. This presents a description of the personal scholarship of researchers by reviewing their research contributions to the development of their particular field of interest and the recognition received from their peers.

Chapter 8 focuses on what is considered to be one of the main roles of research leaders, namely the preparation of the next generation of researchers. In this context, mentoring is seen as a leadership development tool; the chapter outlines various mentoring models used by leaders, efforts to encourage the research performance of early career researches, and the pathways available for the emergence of independent researchers. The research development pathways for mentees and research leaders are located within the transformation requirements of the higher education system of South Africa.

Chapter 9 provides an overall analysis of the main findings of the three previous chapters. It also links these findings to the research productivity models discussed in Chapter 4 in efforts to understand more succinctly the role of research leadership in enhancing research productivity within transforming research contexts.

CHAPTER TWO: SETTING THE SCENE

The South African Research Context

2.1. Introduction

The purpose of this chapter is to locate the research leaders and the post-graduate students/mentees who participated in my study in the context of their research experiences. As places of learning, knowledge production and innovation, universities play key roles in providing critical intellectual leadership to guide the transformation both of themselves and broader society. Leaders of the future are educated in the universities of today, and the relevant national policies and institutional practices provide the overall context for knowledge production and research in the country, hence *context* matters in leadership research. This is illustrated throughout the literature on both school and university research. Grace (1995:5), in researching school education leadership, emphasises the following: "it is essential to place the study and analysis of educational leadership in its socio-historical context and the context of the political and moral economy of education. We need to have studies of (school) leadership which are historically located and which are brought into a relationship with wider political, cultural, economic and ideological movements in society". Jansen's research (2007) with high school leaders in South Africa focuses on educational leadership in the context of social transition and highlights the importance of context in any theory of transition leadership that may emerge. He contends that "the context shapes the kind of leadership possible or even desirable in educational systems: generic or normative statements about leaders must be contextualised" (p.102). Middlehurst (2008) is adamant that "the first and most important point about leadership research is that it is clearly associated with its context" (p.324). He outlines how cognitive theories have shifted leadership from being construed as an objective phenomenon to a concept seen as being socially constructed. However, he points out that much of the literature, particularly on higher education, does not specifically address or problematise the different aspects of "context". Badat (2009), in theorising institutional change in

education in post-apartheid South Africa draws attention to the context of change since "… context is a matter of seeing that the past is not just the womb of the present, but the only raw material out of which the present can be constructed" (p.457). Findings from the studies cited demonstrate the need to take the issue of context seriously in the domains of leadership theory and practice.

The context of higher education research in South Africa has its roots in the nation's colonial and apartheid past that shaped a deeply fragmented legacy on which the (re)building blocks of the post-1994 system would need to draw. The remaining parts of this chapter will thus seek to provide the broad context that has affected the dynamics and nature of change in higher education, with the main emphasis on the context of research.

In South Africa the history of structured support for research in universities goes back to the Second World War that stimulated high-level research in applied areas of the military. This period also saw the establishment of the Council for Scientific and Industrial Research (CSIR) in 1945, the biggest science laboratory in the country outside university centres. In addition, research in secondary industries increased and this led to the development of an indigenous nuclear research industry and the building of a small number of atomic bombs. It is estimated that spending on military and defence research and development (R&D) during the mid-1980s was higher than all civil R&D expenditure combined at the time (Mouton and Gevers, 2009). Thus scientific research, in the name of strategic and relevant priorities of the government of the time, was harnessed to bolster the apartheid regime. "The development of science councils and the rapid development of a world-class energy and military/defence research industry together with an increasing focus on research at most established universities led to a major increase in national knowledge production in the 1960s and 1970s" (Mouton and Gevers, 2009:40). South Africa's share of world science (in terms of publications) peaked in the period between 1985 and 1990 at around 0.77%.

The major legacy of this era was the huge inequality spawned by the polarisation between the historically white institutions (separate English and Afrikaans medium institutions) and the introduction of universities that the apartheid government established for separate ethnic groups. By the beginning of 1985, a total of 19 higher education institutions had been designated for the exclusive use of whites, two as being for the exclusive use of coloureds, two for the exclusive use of Indians and six as being for the exclusive use of Africans (Bunting, 2002). Different institutions were allocated different ideological, economic and social functions. There was clear differentiation between institutions with high-level research functions and the associated funding and support of mainly white students and the white professoriate, and the historically black universities conceived of "primarily as producers of civil servants, professionals to serve the local (own) populations and certainly not as institutions to drive the production of knowledge" (Bawa, 2005). In 1918, the establishment of the University of Cape Town mainly for English-speakers and the University of Stellenbosch for mainly Afrikaans-speakers marked the beginning of university teaching and research in South Africa. The four historically white English medium universities were referred to as the 'liberal universities' and according to Ohav (2009) these institutions were well endowed due to their urban location, their historical networks, their links to business, their alumni and their research capacity. They sought to distance themselves from the apartheid agenda and "very little of the research undertaken by these institutions had direct links to government"(Bunting, 2002;43) These institutions developed strong international disciplinary teaching and research links. They enrolled limited numbers of black students in protest against government policy of the time. However, there is a school of thought, as expressed by commentators such as Mamdeni (1998), who believe that the "historically white English medium universities were never major agents for social and political change in South Africa, despite the anti-apartheid stance they had adopted" (Bunting, 2002: 44).

The six white Afrikaans institutions were smaller (except UNISA), mainly conservative in orientation and run in strongly authoritarian ways, with strong

management and administrative systems in place. They also had networks with business and alumni. They did not admit any black students. They did engage in research activity, with growing capacity and potential. However, much of the research agenda focussed on the local South African context, covering largely policy work for government and/or government agencies and technological work undertaken on contract for defence-related industries. "This generally resulted in a lack of critical discourse in the disciplines as well as in more public spheres with respect to pressing social and human problems" (Jansen, 2001:4). The first academic boycott saw these institutions being disconnected from the international academic community. Their implementation of the government's race-based policies is shown by the fact that the combined student enrolment of the six universities was 96% white in 1990 and 89% in 1993. (Bunting, 2002:40).

The broad category of historically white institutions also included a group of seven technikons. Technikons were part of the outcome of the government's particular notion of the nature of knowledge. The technikons were assigned an emphasis on technology (in the sense of the application of knowledge) whereas universities were seen to be emphasising science (systematic or scholarly approach to the development of knowledge). This differentiation led to the notion of separate, but equal qualification structures across the higher education system. These technikons tended to be conservative institutions with authoritarian governance structures and a very high proportion (89% in 1990) of white students. "These institutions had no intellectual agenda other than that of offering vocational training programmes to young white South Africans. They undertook little research and offered very little by way of postgraduate training" (Bunting, 2002: 47).

The government's establishment of the ethnic institutions (referred to as historically disadvantaged institutions or (HDIs) was overtly political and instrumental: "they were instrumental institutions in the sense of having been set up to train black people who would be useful to the apartheid state and political in the sense that their existence played a role in the maintenance of the overall apartheid socio-political agenda" (Bunting, 2002:44). They were

disadvantaged by their low capacity, their low level of research, and their rural locations placing them at the margins of the South African economy and by their lack of financial and other networks (Odhav, 2009). Because their academic staff members tended to come from primarily Afrikaans speaking universities in the early years, instrumentalist notions of knowledge were easily adopted. As a consequence research and postgraduate programmes in these universities were minimal. The challenges of inequality continually manifested themselves through geographical location, staff qualification, student quality and general financial and educational disadvantages.

Historically black technikons were created along the same ethnic lines as the universities; five technikons with 100% African student enrolments and one each for Indian (73% in 1990) and coloured students (73% in 1990) enrolments. The intellectual agenda of these institutions was as narrow as those of the historically white technikons, with no research and very little postgraduate training. The creation of this racially divided public higher education system faced resistance through protracted student protests, strikes and resultant leadership changes resulting in periods of closure of these institutions. As a consequence, many months of teaching and learning were lost affecting students and staff alike. This volatile period (roughly 1994-99) heralded many significant political shifts in demographic profile, culture of leadership and modes of decision-making in universities and technikons (Nkomo et al. 2006)

During the 1980s, South Africa also had two dedicated distance education institutions. Although they were in effect historically white institutions they could admit black students who qualified for admission (all off-campus studies). The university of South Africa (UNISA) was seen to be more strongly aligned to the Afrikaans universities with an instrumentalist intellectual agenda. Even though it had a very large well qualified staff, they engaged in very little or no research, and maintained few international linkages. Technikon South Africa aligned more strongly with the white technikon grouping, focussing primarily on vocational training and upgrading

programmes for the civil service.). Yet, despite the oppressive policies and stratification described, Nkomo et al (2006) point out “whatever the intentions of the apartheid rulers, the fact is that individual students and professors – black and white – made and continue to make, valuable contributions from these venues that were intended as dumping grounds” (p1).

Hence it can be seen that in pre-1994, South African higher education institutions were an integral part of a system which was “ shaped, enlarged and fragmented with a view to serving the goals and strategies of successive apartheid governments “(Bunting, 2002 :52).

In the research context, there was further ideological polarisation, as the social sciences were visibly split either by loyalties to the apartheid system or by resistance against the system. Evidence of this is that most disciplines had two journals and two professional associations. Inter-sectoral and institutional collaborations across these polarisations were non-existent. The relationship between state and scientists at this time could be seen as either that of ally (supporting one’s knowledge production, both functionally and morally) or adversary (threatening one’s autonomy). The choice of ally or adversary was largely one of race, language and ideology, or a combination of these, in selected institutions.

During the late 1980s most South African researchers were isolated by academic boycotts that included selective exclusion from international conferences, forums and international scientific collaborations. This also included the rejection of scientific publications. Equally, if not more serious, however, was the lack of contact within the science community in South Africa. Collaboration with colleagues across political and racial divides was minimal to non-existent, leading to an isolationist scientific culture in a system that was compartmentalised in the extreme (Mouton and Gevers, 2009). The climate of increasing international isolation put pressure on the many areas of science, as well as on funding, with increasing focus moving to the development and monitoring of skilled high-level (white) researchers (Krige and Morrow, 2007). This type of discrimination and inequality of race and

gender contributed to what Badat (2009) correctly refers to as one of the key 'binding constraints' on economic and social development post 1994. The constraints included the shortage of skills, for example, professional skills such as engineering and scientific; managerial skills such as financial, personnel and project management; and technically skilled personnel such as artisans and IT technicians. According to the Council on Higher Education (2004), on the eve of democracy the gross participation rate (i.e. total enrolments as a proportion of the 20-24 age group) in higher education was about 17% and highly skewed by race (70% whites, 9% Africans). In addition, gender and race imbalances were more stark at academic staff levels with 80% of professional staff being white and of those, 34% were women. Although experienced in different ways, during this period both historically black and historically white institutions were "punctuated by major critical changes which could best be described as focussing on the democratisation of higher education" (Nkomo, Swarts and Maja, 2006:130)

This short contextualisation of research in South Africa is presented to highlight the fact that the changing South African context has been uniquely characterised by a strong drive to redress deep inherited systemic inequalities. After 1994 higher education was called on to address and respond to the development needs of a democratic South Africa. The following section briefly maps the changing higher education landscape (mainly post-1994) with particular reference to the research context and leadership issues only as this is the focus of the present research. Research leaders and their mentees who participated in this study were located in disciplinary research environments in various South African research institutions and hence this description provides an overall context.

2.2. South African Research Context (Post 1994)

2.2.1 Policy perspective

The early period of democracy in South Africa (1994-1999) is considered by many as a period of policy vacuum, framework development and weak steering. The new ANC-led government had to take the initiative in policy development beginning with the National Commission on Higher Education and culminating with the Education White Paper 3 of 1997 and the Higher Education Act of 1997. The key levers for transforming higher education were to be national and institutional level planning, funding and quality assurance (Badat, 2009). The Education White Paper, *A Programme for the Transformation of Education* (DOE, 1997) outlines the main research concerns of the inherited system as:

- insufficient articulation between the different elements of the research system;
- insufficient research capacity in higher education;
- stark race and gender imbalances in demographic composition of researchers across the research enterprise;
- a skewed distribution of research capacity and resources in higher education institutions, with black universities having limited research capacity and technikons no research culture at all for most of their history.

Hence, the main research policy aims of the then Department of Education (now known as Department of Higher Education and Training) in the new dispensation were to "expand and strengthen the research base, develop a national research plan and make access to knowledge production more equitable, both at an individual and an institutional level" (Cloete, Fehnel, Maasen, Moja, Perold and Gibbon, 2002:306). The National Plan placed a strong emphasis on the value and importance of research: "Research, in all its forms and functions, is perhaps the most powerful vehicle that we have to deepen our democracy. Research engenders the values of enquiry, critical thinking, creativity and open-mindedness, which are fundamental to building a strong democratic ethos in this country" (Ministry of Education 2001, section 5, par 5.1). The critical education and research documents of the time (Education White Paper 3, White Paper on Science and Technology) made it clear that a new mode of knowledge production was at play, and that higher

education planning, programmes and funding should encourage innovative ways of producing knowledge. The research system, therefore, must "...keep abreast of emerging global trends, especially the development of participatory and applications-driven research addressing critical national needs which requires collaboration between knowledge producers, knowledge interpreters and knowledge managers and implementers" (Department of Education, 1997:31-32). This policy position agrees with the view that research and scholarship are important drivers in the endeavours to make the national economy globally competitive.

But the new (post 1994) South Africa inherited a varying range of post-school institutions (21 universities, 15 technikons, 120 colleges of education and 150 technical colleges) with considerable differences in capacities for teaching, research and development. Government espoused a vision of a rational, seamless higher education system that purposefully dissolved the racial inequalities that existed among institutions. In addition, there was the need to incorporate South African higher education in the fast-changing, technology-driven and information-based economies described under the rubric of globalisation (Jansen, 2002b). The Council for Higher Education (CHE), a statutory body that advises the Minister of Higher Education and Training, was approached to provide advice on the reconfiguration of the higher education system. The emphasis on these policy and planning instruments for reshaping higher education was emphasised by the Education Minister, Kader Asmal, in January 2000, when he requested a set of concrete proposals for the shape and size of the new higher education system: '…until we reach finality on institutional restructuring, we cannot take action and put into place the necessary steps to ensure long term affordability and sustainability of higher education" (CHE, 2000a:2). In March 2001 the Minister appointed a National Working Group (NWG) consisting of eleven persons from business, labour, higher education and Government "to advise on the appropriate arrangements for restructuring the provision of higher education ...including institutional mergers." (Department of Education, 2001:4). The final report of the NWG recommended the reduction of higher education institutions from 36 to 21 through the specific mechanism of mergers. As a

result, the turbulent South African merger experience ensued, dominated in most instances by the 'steering role' of the State and marked by a lack of effective mediation between concerned parties. At the same time, the number of existing Colleges of Education was rationalised, and in January 2001 many colleges were incorporated into the higher education system. These processes resulted in a reconfigured higher education system which includes three types of public higher education institutions:

- Eleven(11) so-called traditional universities with strong(er) research cultures;
- Six(6) universities of technology (previous technikons); and
- Six (6) comprehensive universities (universities merged with technikons).

Not all eleven traditional universities are equally research–productive. The top five research-producing institutions include three historically English medium universities and two historically Afrikaans medium universities. The universities of technology and the comprehensive universities do not have a research culture that is as well-established as the traditional universities, but they have the potential to develop into research institutions. In January 2010 there were also 78 registered and 22 provisionally registered private higher education institutions in South Africa (CHE, 2010). In addition, research is also carried out by 12 major public institutions, including science councils that are dedicated to research and development. There is also a limited number of unique national research facilities that concentrate on specific areas such as astro- and geosciences, biodiversity and the nuclear sciences.

The government's transformation agenda for the research context of higher education was also driven by the introduction of a new funding framework that explicitly linked the allocation of funds to academic activity and output. It is widely acknowledged that the measurement of research output, although common practice among public institutions, is increasingly contested and controversial. There is no automatic consensus about the indicators of

research output. In addition, the case continues to be made for the promotion of diversity in creating and discovering knowledge (Weber, 2008).

The Policy for Measurement of Research Output of Public Higher Education Institutions *(*Government Gazette No 25583) was gazetted in 2003 and came into effect in January 2005 for the research produced in 2004. The purpose of the policy is to encourage research productivity by rewarding high quality research output at public higher education institutions. Subsidies can be claimed from the government for recognised research output from academics, researchers and research students. The policy states that recognised research outputs consist of publications in journals, books (including monographs), chapters in books and edited works as well as conference proceedings (DOE,2005). Higher education institutions receive units and funding based on their research productivity in categories of research output. According to Madue (2006), although the new policy for the measurement of research output of public higher education institutions in South Africa has shown some significant improvement from previous policies, there are many flaws or gaps in its implementation as well as in its relation to other policies such as the Science and Technology Policy (p.90). While the number of publications and their impact through citations may well be legitimate indicators of a country's research outputs and quality the government's new funding mechanism has failed to steer most of South African universities in a more desirable direction in terms of quality research output (Oancea, Hoffman and Engelbrecht, 2009). Several criticisms of policies refer to what is seen as a strong positivist, technicist discourse that is often associated with the use of quantitative methodologies. It seems as if there is a strong emphasis on science and technology and there are concerns that the quality or scientific significance has been sacrificed at the altar of quantitative measures; in other words the largest possible number of articles is produced in the shortest time (Weber, 2008).

The more recent of the policy initiatives, The Higher Education Qualifications Framework (HEQF) was published on 5 October 2007 and signed into effect in June 2009 by the Minister of Education (Gov Gazette Vol 508, No 30353).

The policy operates in the context of a single but diverse and differentiated higher education system and provides the basis for integrating all higher education qualifications into the National Qualifications Framework (NQF) and its structures for standards generation and quality assurance. Its aim is to improve the coherence of the higher education system and to facilitate the articulation of qualifications, thereby enhancing the flexibility of the system and enabling students to move more efficiently over time from one programme to another as they pursue their academic or professional careers. It applies to all higher education programmes and qualifications offered in South Africa by public and private institutions (CHE, 2007). According to the policy, the HEQF is designed, among others, to enhance the development of a vibrant high quality research system. It came into operation in January 2009. Early implementation has seen some rumblings of discontent with specific issues such as the phasing out of the Bachelor of Technology degree, some broad policy concerns and workloads required.

However, policy and practice do not flow as linear activities, and research studies continue to reinforce the complexity of implementation of policy. Policy implementation occurs in a context and is implemented at different levels by various participants across systems and governments. Literature consulted shows that governmental policy is not always congruent with institutional practice. Often laudable policy goals struggle to find expression in practical contexts that are governed by a range of political and strategic considerations (McLaughlin, 1998; Jansen, 2002a; Jansen, 2007; Badat, 2009). A brief analysis of relevant associated research indicators of the post-1994 higher education research sector follows next. It serves to explain the developments in the South African higher education research context during this period.

2.2.2. Research Performance Indicators

Information on research and experimental development (R&D) activities is one of several available tools that facilitate the understanding of the operation of national systems of innovation. It is also possible to measure the extent of

R&D activity in an economy through a series of surveys based on internationally compatible methods and indicators. South Africa conducted its first R&D survey based on the Organisation for Economic Cooperation and Development (OECD) guidelines in 1996, with the official innovation survey conducted according to the format of the Oslo Manual in 2005 (Blankley and Khan, 2005:151). This section highlights some of the key research performance indicators such as funding, research outputs and human resource development in light of particular issues that affect research and development in this country.

2.2.2.1. Research Funding

Greater investment in research is regarded as being necessary to ensure its future growth and welfare. Since 1994 the new government has moved very actively to put into place a new funding regime that would support its commitment to national priorities. With regard to the research context, three early funding strategies that were implemented included the establishment of the Innovation Fund to support strategic collaborative research and development, the birth of the National Research Foundation with the new policy of theme-oriented funding and significant increases in funding via the Technology for Human Resource and Industrial Partnership Programme (THRIP), and the Support Programme for Industrial Innovation (SPII). The latter two programmes sought to encourage closer links between academia and industry (Mouton, 2003).

Expenditure and sources of R&D funding have shifted very noticeably towards the support of strategic and applications-driven research. There is every indication that top universities are now increasingly successful in obtaining contract funding, and that there have been shifts in R&D expenditure and sources of R&D funding (Cloete et al., 2002 pp310-315). In his budget speech of May 2007, the Minister of Science and Technology at the time stated that the amount of R&D as a percentage of gross domestic product (GDP) stood at 0.87% and was on track to reach 1% of GDP. The results of the 2007/08 National Survey on Research and Experimental

Development highlight a 12% increase in gross investment in R&D to R18.6 billion. However, South African research has fallen behind in its attempts to reach the 1% GDP target (Department of Science and Technology, 2010). In order to drive more directed efforts to reach its research goals and priorities, the government has established various new funding opportunities through the introduction of new agencies and/or interventions, e.g. the NRF (1999), Technology Innovation Agency (TIA) (2009) and the South African National Space Agency (SANSA) (2010). It is important to note that the NRF's original freedom to invest the research monies at their disposal at their discretion has been increasingly reduced as government has opted for more strategic investments. The result has been that there are severe limitations on available so-called 'free standing' research funds for academic projects (Van Jaarsveld, 2009).

The business sector now consistently spends the most on R&D (approximately 56%) followed by higher education (about 20%) and the science councils (17%) (Mouton and Gevers, 2009). The table below compiled by the same authors (p.51) list some of the key indicators of the South African science system.

Table 1: Key South African Research and Development Indicators

Indicator	Value 2006/7	Value 2005/6	Value 2004/4
Gross domestic expenditure on R&D(GERD) (Rand million)	**16 520.6**	**14 149.2**	**12 010.0**
GERD as percentage of GDP	**0.95**	**0.92**	**0.87**
Total R&D personnel(FTE)[5]	**30 986**	**28 798**	**29 696**
Total researchers (FTE)[6]	**18 572**	**17 303**	**17 915**
Total researchers per 1000 total employment (FTE)	**1.5**	**1.5**	**1.5**
Civil GERD as percentage of GDP	**0.89**	**0.86**	**0.80**

[5] Full time equivalent

[6]Following OECD practice, doctoral students are also counted as researchers.

Source: Mouton and Gevers, 2009:51.

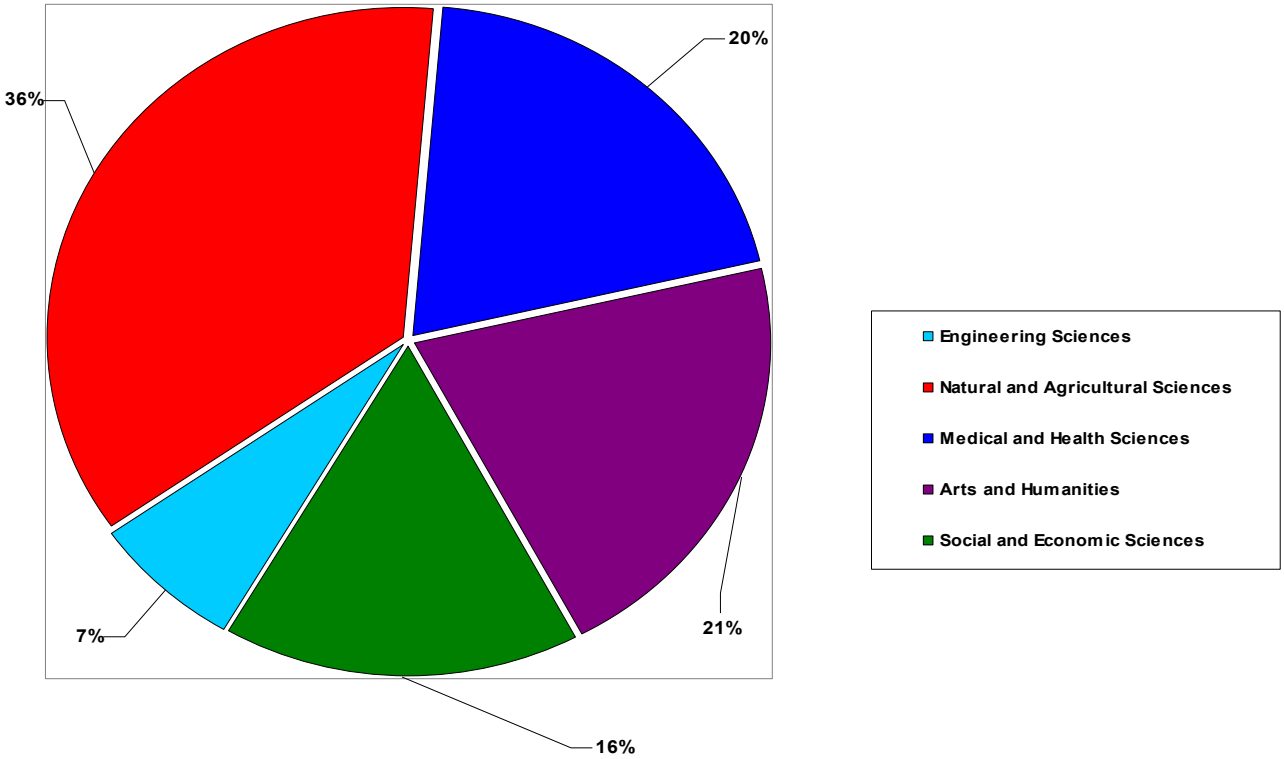
2.2.2.2. Research Outputs

The measurement of research output is usually confined to research articles in peer-reviewed journals in order to make international comparisons. The literature review elaborates on other indicators of performance. Recent surveys of the South African Science and Technology indicators put the total number of potentially publishing researchers in the country at about 16 000. This cohort of researchers publishes about 7000 papers a year, or, on average about 0.4 papers per researcher per year (ASSAF, 2006 pxiii). In a bibliometric analysis of South African science for the period 1980-2000, Pouris concluded that in 2000, South Africa's share of the world's publications, at 0.49%, was lower than its contribution two decades earlier (Pouris, 2003:426). While the absolute number of publications had increased during the previous two decades, the rate of increase had not kept pace with international growth. There is much controversy around the use of ISI-only indicators, especially since ISI journals have a significant Anglophone and developed-country bias. However, while acknowledging the use of ISI-only indicators used in Pouris' study, this downward trend was also suggested by analyses on the SAPSE and SA Knowledgebase (Cloete et.al, 2002:314).

More recent results that analysed the period 1995-2007 using research publications in both ISI and non-ISI journals found that the total article output at South African universities remained very stable from 1987 until about 2003. In 2003 the new policy framework was promulgated and the first significant increase in 15 years was observed. This trend continued until 2006 when the system reached a peak of 7400 article units (Mouton and Gevers, 2009). A breakdown by scientific field shows that South Africa's research output in ISI journals is dominated by the natural and agricultural sciences (53% combined), with the social sciences at 11% (Mouton and Gevers, 2009). It is

felt that this increase cannot be ascribed to a significant increase in the human resource base, but more probably to the host of policy, funding and broader research programme incentives that have emerged in the South African system. South Africa's research output as a function of main disciplinary fields is shown in Figure 2 that represents the breakdown for the period 1990-2006 for output in all Department of Higher Education and Training (DOHET) accredited journals i.e. for journals listed locally (non-ISI) as well as on the ISI index.

Figure 2: Total South African article output by broad disciplinary field



Source:Mouton and Gevers(2009).

In the national research landscape differential research performance also exists across higher education institutions. Eleven out of 21 universities have produced 92% of the total South African output in ISI journals. ISI–indexed publication differences between universities relate to historical factors (e.g. English/Afrikaans medium) the presence or absence of specific faculties and schools, as well as the emphasis on different research niche areas. It is worth noting, though, that the institutional difference in production patterns in foreign

journals affect the extent to which universities enjoy high or low international recognition. An earlier chapter highlighted the South African position in the various ranking systems worldwide i.e. only one university was in the top 200 universities worldwide.

2.2.2.3. Research type

In the various international surveys, the breakdown by type of R&D is recommended for use in all four national sectors of performance. Three types of R&D may be distinguished viz. basic research, applied research, and experimental development. While it is acknowledged that there are some conceptual and operational challenges in this categorisation, the outline below describes general national shifts of emphasis rather than statistics per category.

With the introduction of the Growth, Employment and Redistribution (GEAR) Strategy in 1996 there was a marked shift in emphasis on the economic goals of growth, employment creation and economic competitiveness. The Department of Science and Technology is strongly committed to improving South Africa's competitiveness in the field of science and technology. The growth in South Africa's economy in recent years is predicated on the emergence of knowledge-based, high technology industries. The early interventions in the system were heralded by the National Research and Development Strategy (NRDS) of 2002, where, under the rubric of innovation, the NRDS established five new technology 'missions' that included biotechnology, information technology, technology for advanced manufacturing, technology for and from natural resource sectors and technology for poverty reduction. The ensuing period has thus shown increasing government support for strategic (read applied) and relevant research, with increasing pressures on support for basic and fundamental research. This transformation has been made possible through large funding drivers in order to encourage the system to develop large-scale projects to help create a culture of innovation. In 2008 the DST launched its *10-Year Innovation Plan* that identifies five grand challenges for the bio-economy,

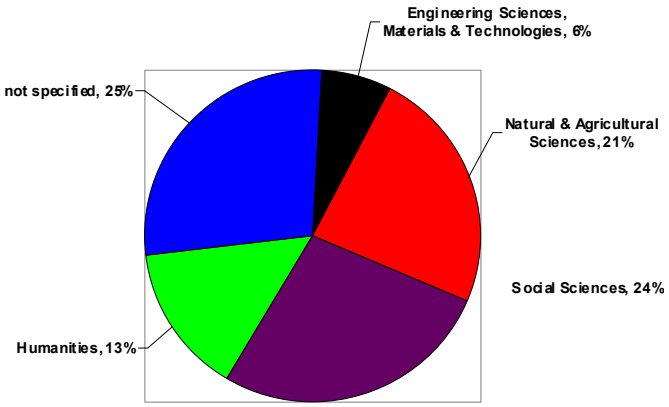
space science, energy security, global climate change science and human and social dynamics. The Plan also introduced the establishment of a Technology Innovation Agency (TIA). The agency was to incorporate, among others, the Innovation Fund and the Biotechnology Regional Innovation Centres. It is envisaged that the TIA will help to establish a network of competence centres focused on market opportunities in partnership with industry and public research institutions. South Africa also needs to find its niche in the emerging market economy. For most commentators in the higher education research sector, the concern about support for basic research and research in the social sciences and humanities remains a challenge.

2.2.2.4. Redress issues

The overwhelming race and gender imbalances at all levels of the inherited national system has meant that changing and broadening the profile of knowledge producers in the research context has been a high priority. However, indications were that the level of full-time equivalent (FTE) researchers in the National System of Innovation remained more or less static between 2001 and 2004 (there were about 17000 FTE researchers) as did the number of permanent, academic university staff with doctorates (approximately 34%) (NACI, 2006:80).

Figure 3: Share of permanent academic staff of public higher education institutions in South Africa with a doctoral qualification by broad field of study.

Source: The PhD Study. Academy of Science of South Africa, (2010)



Women researchers now comprise 38.3% of all researchers in public higher education. This compares very favourably with international trends where the population of female researchers has increased and where women account for 25% to 35% of researchers in most OECD countries, with the exception of Japan and Korea (12% each) (OECD, 2006). In South Africa, very little research has been conducted that draws gender comparisons, particularly in terms of academic publication productivity. The proportion of all papers that are authored by women and produced by traditional universities varies between 14% and 37% (CHE, 2009). There has been a general increase in the number of female authors across all fields but one (Psychology) for the period 1990-2004. However, the national average of contributions by females to research output was only 22% for the period 2002 to 2004 (Mouton and Gevers, 2009). Research conducted by Prozesky (2008) found that even the most productive women – women who were chronologically and professionally mature and at the top of the academic qualification and rank hierarchy – published less than the most productive men. Prozesky's work

explained this difference in terms of factors such as the gender–related lag in completing doctoral studies and the fact that the majority of women had discontinuous careers as a result of shaping their professional lives in relation to the lives of their partners and/or children (Prozesky, 2008 p59). The number and proportion of women among NRF-rated researchers had steadily increased from 18% in 2002 to 25% in 2006. Women were particularly well represented among doctoral graduates in both health and social sciences, but only about 33% of graduates in natural and agricultural sciences and in humanities were female (ASSAF, 2010).

Although there have been small shifts towards improved gender and race representation, progress towards the racial transformation of the human resource base seems to be slow, especially at senior and experienced levels (NACI, 2006:56). Black academics comprised 35% of the university workforce, with 10% of black scholars contributing towards knowledge production (Mouton and Gevers, 2009). The fields of chemical sciences, basic health, education, social sciences and language and linguistics had the highest proportion of black authors by 2004. The figures concerning the race and gender composition of NRF-rated researchers suggested that by 2006 only 12.8% (or 205) of rated researchers were black (National Research Foundation, 2007). It must be pointed out that this increase from 8% in 2002 was influenced by the inclusion of the social sciences and humanities in the rating system.

The production of knowledge has continued to be dominated by white male scientists at five historically advantaged institutions. It was estimated that less than 50% of academics at top producing institutions were productive in publishing and winning contracts (Cloete et.al 2002:437). In addition, the fact that nearly half of the total research output in the country was produced by scientists over the age of 50 remained a major matter of concern (Mouton, 2008:1079). This general trend also means that the production of output by authors under the age of 30 had declined significantly in all fields except for mathematics (Mouton and Gevers, 2009). These are clear indications that

directed purposive efforts at age, race and gender redress need to be accelerated.

2.2.2.5. Research students

The doctorate is usually seen as the central programmatic mechanism to grow the scientific community and therefore the development of the next generation of South Africa's researchers. In 2008 public higher education institutions enrolled 799 490 students in total with 118 622 of these being post-graduate students. The number of international students at South African higher education institutions quadrupled from 12 557 in 1994 to 53 722 in 2006. Sixty nine per cent of all international students came from the SADC region and about a quarter of these were postgraduate students (University World News, 2007). These efforts to encourage international cooperation grew in the research and postgraduate areas of study and helped to support South Africa's growth plans. In 2004 Government announced that the 'youth oriented' higher education system had grown too big and too quickly, with far slower throughput and success rates (Kraak, 2006:149). Despite efforts at massification of higher education and marked shifts in student enrolments and distribution, Kotecha (CHE, 2006:30) points out that in South Africa postgraduate students accounted for 29% of the student population, with only one percent (1%) of these students being at doctoral level.

New knowledge generated via doctoral education is widely acknowledged as an important strategic and economic resource (ASSAF, 2010). South Africa produced 1274 doctoral graduates in 2007, or 26 doctorates per million of the country's total population. Most of the doctoral graduate class of 2007 were white South African males in their 30s (ASSAF, 2010). However, there have been fairly significant shifts in the racial composition with a greater proportion being black and non-South African. Most doctoral graduates are produced in the social sciences.

Table 2: Gender, race, age and nationality of doctoral graduates, 2000 and 2007

Demographics	2000	2001	2002	2003	2004	2005	2006	2007
Gender								
Female	41%	37%	39%	39%	38%	44%	43%	**42%**
Male	59%	63%	61%	61%	62%	56%	57%	**58%**
Race								
Black African	19%	22%	23%	23%	27%	29%	30%	**32%**
Coloured	5%	3%	5%	5%	5%	6%	5%	**6%**
Indian	6%	6%	7%	9%	9%	7%	8%	**8%**
White	70%	69%	65%	63%	59%	59%	56%	**54%**
Age at graduation								
<30	15%	17%	17%	18%	15%	13%	14%	**12%**
30-39	43%	37%	38%	36%	38%	41%	38%	**39%**
40-49	29%	31%	30%	30%	30%	29%	30%	**30%**
50+	13%	16%	15%	16%	18%	17%	18%	**19%**
Nationality								
South African	84%	81%	80%	78%	78%	74%	72%	**71%**
Other SADC * countries	4%	4%	4%	4%	6%	8%	8%	**9%**
Other African countries	2%	3%	7%	7%	7%	9%	9%	**9%**
Rest of world	4%	6%	7%	9%	8%	8%	8%	**9%**
Unknown	**6%**	**6%**	**2%**	**2%**	**2%**	**2%**	**2%**	**3%**

Source: The PhD Study, Academy of Science of South Africa, (2010)

It is generally felt that the production of doctoral graduates in South Africa is growing too slowly. “At current rates, South Africa will take between six and seven years to increase its current output to about 1500 doctorates per year (Mouton, 2007:1008). This is reiterated through the results of the most recent PhD study of PhD training in South Africa (ASSAF 2010) that states that “working only within existing systems, and talking into account available capacity, there is simply no way that a rapid growth in high-level qualifications at the level of the doctorate will materialise in the foreseeable future” (p.107). Post-doctoral fellowships and early career support for young researchers is

crucial, but many are of the opinion that this level has not reached critical mass because of the fragmented approach to interventions along the different stages of the pipeline (NACI, 2006:80). During the last 10 years, science and engineering graduates grew at a slower rate than business and commerce graduates and arts and humanities have seen a substantial decline in numbers of doctoral graduates. The pictures for health and engineering sciences have remained very much the same over the period 2000 - 2005. Besides the quantities and graduation rates there are numerous matters that raise concern about the quality of doctoral students and their studies. Mouton (2008) lists the following systemic issues that still require attention when it comes to postgraduate education:

- Too many overburdened and inexperienced supervisors;
- Insufficient research preparation for doctoral students;
- Insufficient national and institutional financial support for students;
- Insufficient institutional attention and resources devoted to post-graduate support (p.1090).

Hence early analysis clearly shows that it has been much more difficult to address the deeply entrenched legacies of the past with regard to the research context. The supportive and directly driven policy context, the increases in accountability and the injections of funding are recognised as outcomes of the transitional state. As outlined in this chapter, many universities have adopted research policies to encourage research performance through increased publications in ISI-indexed journals. They also encourage staff to become rated in the NRF system and to build international networks. However, despite massive injections of funding and research capacity-building interventions, the scales have not been tipped in favour of significantly increased research productivity or the racial or gendered character of research activity and output have not been adequately changed (Jansen, 2003; Badat, 2009; ASSAF, 2010). This has far-reaching implications for a higher education system that needs to address high quality

human capacity development and new knowledge needs in order to compete successfully in the global research arena.

Thus far the chapter has traced the essential facts of the South African research context. The focus will now turn to what Jansen terms the 'tangible changes in the soft architecture of our institutions' i.e. academic and research leadership.

2.3. South African Research Leadership Context

Research leadership in this study is identified by the hallmarks of excellence in scholarly publication at the cutting edge of the discipline, extensive quality national and international research networks, personal scholarly recognition and prestige among peers, leadership of quality Master's and doctoral programmes, early researcher mentorship and the ability to garner research funding. These indicators collectively speak to the credibility of personal scholarship, the capacity for people management and the consciousness of the global knowledge economy. The post 1994 policy framework has been noticeably silent on issues of leadership or more specifically academic leadership that is needed to address the challenging research scenario sketched previously.

Leadership is closely associated with change and leaders are often viewed as being necessary for responses to change in the environment and the agents of change among colleagues or subordinates. Though limited in volume, much of the documented South African higher education leadership information and research pertains to institutional leadership and administration and most often at the level of the vice-chancellor. In this changing context, the leaders of higher education institutions have largely been confronted with the following challenges in the context of the transformation imperatives:

- Legislative demands to promote equity in access and employment;

- Pressures to address development of higher level human resources;
- Funding constraints that create pressures to diversify income sources;
- Increased competition through the marketing of higher education and an increase in private higher education institutions;
- Centralised and strategic planning with increased emphasis on the 'three-year rolling plans" and institutional performance against planned outputs (Cloete, Kulati, and Phala, 2000).

Ladlendle's investigations (2007) found that a very limited number of South African researchers have described the complexity of leading higher education institutions, but found that their works do not indicate how the understanding of leadership by leaders affects their practice. His research covered senior South African higher education leaders and focused on an exploration of leadership practice by eleven leaders from their own point of view. The data indicated that there are several influences on the leadership development process and that practice is a product of the values and context determinants of leaders (p.465).

Another level of academic leadership that has received some attention in the research literature is that of the Dean. As in many developing country contexts, new Deans in South African higher education are often appointed with the requirement to build and sustain strong research cultures in inherited faculties with a low research performance record and a low-level of research-qualified staff. Koen (2006) reports that in 2003 only 6.9% of technikon staff had PhDs as compared with 37.5% of staff at universities. This is an exceptionally low percentage of staff available for research. Winberg (2005) describes an absence of scholarly identity where "a research culture is not established in an institution, and lecturers do not have higher degrees themselves, or significant academic publications and where strong disciplinary affiliations are not common" (Winberg, 2005:194). The merger of institutions heralded strong challenges for research leadership and development of research capacity. Looking at research capacity development at a merged institution, Balfour and Lenta (2009) illustrate how a merger of three institutions resulted in a new school that started with the qualifications of

most new members of staff inadequate in terms of research capacity and experience. "…only two out of ten had doctorates, six had Master's degrees and two had only honours degrees. Hence most were unqualified for the supervision of higher degrees, at least as far as doctoral level, and were inexperienced in any kind of supervision. Few colleagues had encountered the obligation to publish research in academic journals" (p.10-11). The obligation to address race and gender imbalances among staff coexisted with the requirement to build research capacity.

Naidoo (2009), on interviewing a sample of Deans in merged higher education institutions, found that in some cases there is relatively little reference to research during the interviews. Of the five Deans interviewed, two showed a strong inclination towards research while another stated the frustration of not being able to make research a priority. It may be significant that the two Deans that did not focus on their own contribution to research are about to retire. "It is reasonable to assume that, as deans, they were not personally foregrounding the need for research in their faculties" (Naidoo, 2009:131). The research ethos has not been easy to develop across all institutions in the inherited system and one of the strongest challenges has been the fact that many of the senior academics (Deans, Heads of Department, management) have been such poor researchers themselves that they have not been able to make the kinds of demands on new researchers in their faculty for sheer lack of credibility (Jansen, 2002). Lack of leadership at the supervision level also affects quality research. A case study at a higher education institution during the transition period revealed that many supervisors have no training in post-graduate supervision, are supervising students over a wide range of topics and are using methodologies they have not practised themselves (Chetty, 2003). Latest research results (ASSAF, 2010) point out that supervisory capacity remains a very real constraint to increasing the number of doctoral graduates in South Africa "…there are simply not enough supervisors, even assuming all those available were qualified and that the supervisor/student ratio was evenly spread" (p.107).

Specific interventions have been identified as priority resources to address the research leadership gaps and build world-class research capacity in the country. The South African Research Chairs (SARC) programme is a national strategic intervention established in 2006 and is aimed at strengthening research leadership and capacity in South African Higher Education institutions. The programme was instituted in an effort to address the spiralling brain drain in South Africa that has impacted directly on the quality and quantity of postgraduate student training and outputs. Through the establishment of research chairs the programme seeks to retain world class researchers in higher education institutions and attract similar individuals from industry and from abroad. The objectives of the Research Chairs Initiative relate directly to the issues of leadership and capacity and are elaborated below in the context of the research study that has studied related aspects of research leaders and their post-graduate students:

- To increase the number of world-class researchers in South Africa;
- To retain and/or attract qualified research scientists to the Higher Education sector;
- To stimulate strategic research across the knowledge spectrum and thereby increase the level of excellence in research areas of national and international importance;
- To create research career paths for highly skilled, high quality, young and mid-career researchers that effectively address historical racial, gender and age imbalances;
- To improve and accelerate the training of highly qualified personnel through research (NRF, 2010).

The programme consists of two sub-programmes:

(a) The South African Research Chairs Initiative

(b) Research and Development Chairs; their progress is highlighted through the statistics below.

Table 3: DST/NRF Awarded Chairs as at March 2010

Total number of Chairs awarded	82
Total number of operational Chairs	79
Total number of SARCHI Chairs awarded	80
Total number of Research and Development Chairs awarded	2
Number of participating universities	16

Source: National Research Foundation (2010)

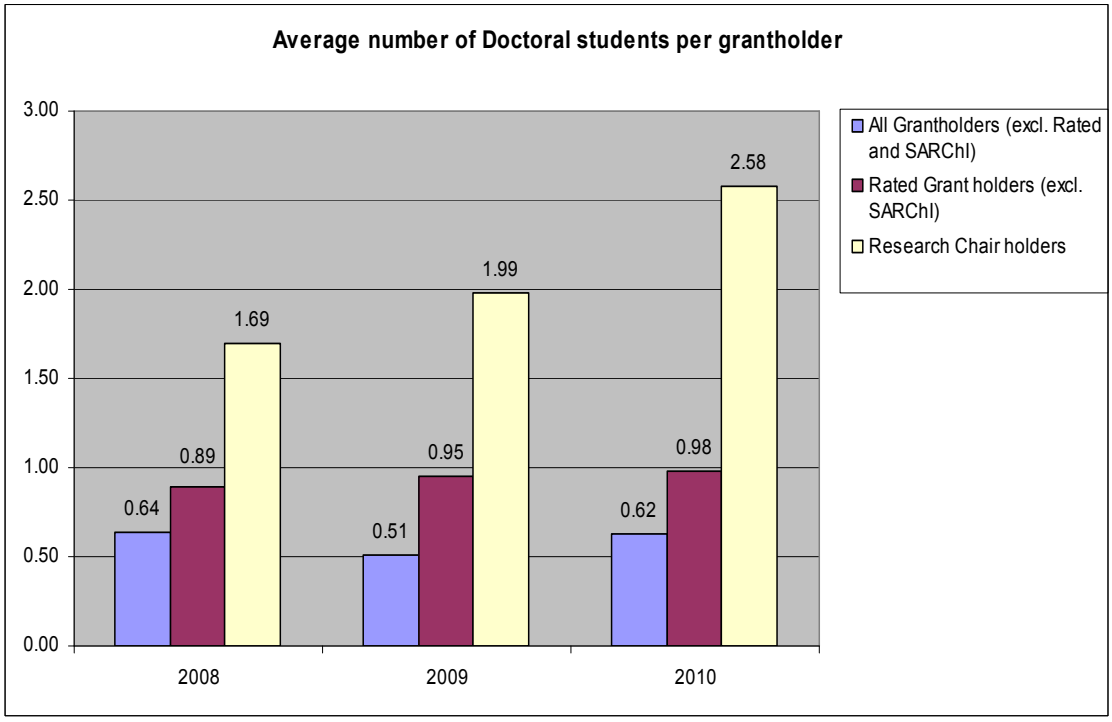
An analysis of key indicators of research output by the SARCHI is included in table 4 and figure 4 below to give an indication of research productivity in line with the original objective. It appears that the research leaders and their teams in these Chairs are producing significant output as well as an increased numbers of doctoral students overall.

Table 4: South African Research Chairs Initiative (SARChI) Performance [ISI Outputs]

Source: National Research Foundation 2010			
	2008	**2009**	**2010**
Publications by SA Authors*	8707	9264	9326
Publications by SARChI Authors	368	404	416
	4.23%	***4.36%***	***4.46%***
Number of SA Authors*	4682	4838	5028
Number of Research Chairs	68	70	78
	1.45%	***1.45%***	***1.55%***

- Includes SARChI due to co-authoring of papers

Figure 4: Doctoral students per National Research Foundation (NRF) Grantholder



Source: National Research Foundation 2011 (Annual Performance Plan)

Women's participation in science has become a central concern, featuring in most of the recent discussions and debates on science and technology in South Africa, and the question of gender and leadership has been a focus of education researchers. Historically, the statistics on the gender profile of academics in South African universities reveal that women have been generally concentrated at the lower levels of the career ladder, with very few women at the uppermost level of professorship. De la Rey (1999) undertook a study of 25 women professors from a diversity of South African universities, academic disciplines, race and age groups whose career paths were shaped largely by the higher education system of the 1990's and earlier. At the time that the study was undertaken, women comprised only eight percent of the total number of professors in South Africa. "The unfolding of the narratives of the 25 women professors illuminated complex articulations between the legacy of apartheid and processes of gender organisation both inside and outside the academy. Both gender and race were pointed to as salient factors

in the subjective representations of academia'' (De la Rey, 1999; Thesis abstract).

Although the number of women in top administrative positions improved between 2000 and 2002, women are still under-represented in senior academic positions such as Deans, Vice–Chancellors, Registrars and management of other major divisions in the university. When looking at gender representation across senior management in the various public higher education institutions, women in the universities make of 40% of the senior management at the universities while they make up 24% of senior management in the Universities of Technology. Only four of the 23 public institutions have women Vice-Chancellors (CHE, 2009). Of the few women Deans, many of them are in the fields of nursing and health sciences, education and very recently, law (Zulu, 2003:101-102). The current status of women in leadership in South African higher education is reflected in Figure 5 shows that the situation is improving, with the proportion of women in senior management increasing from 18% in 2004 to 36% in 2007.

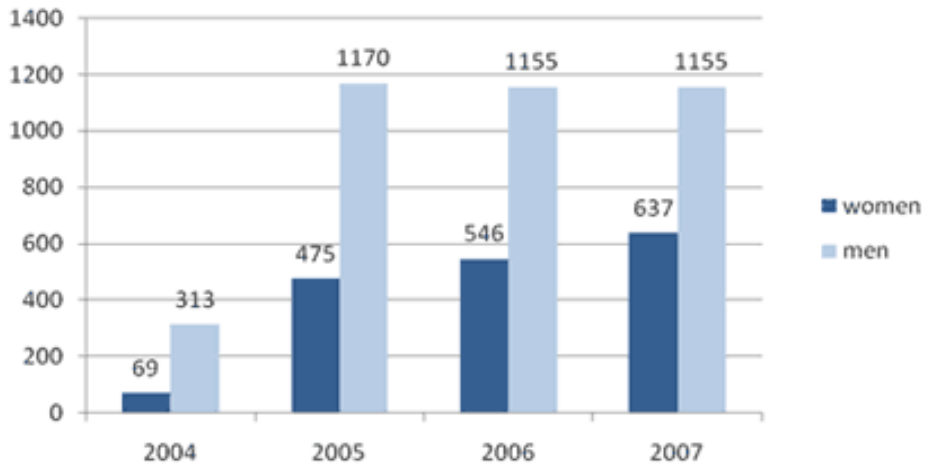


Figure 5: Growing numbers of women in senior management, 2004 – 2007. (Source: HEMIS)

The term leadership metaphorically embodies a gendered hierarchy of labour (Isaac et al., 2009). In the South African research context, as in countries like the USA, the authorial voice of leadership has been largely male and the tenets of good leadership practice taken as that of male administrators. The statistics provided indicate a slow move in a positive direction. Legislation through policy has been improved and regulation through benchmarks, targets and monitoring has been set in place. It would thus seem that the actual *practice* of gender equity in higher education remains the main challenge.

2.4. Concluding remarks

This chapter sketches a broad outline and a summary of key aspects of the South African higher education system. The main focus was on the research context, since this study is based on a view that leadership research is clearly associated with its context. Cloete et.al (2002) concluded, and Badat (2009:464) agrees, that in South African higher education, "most changes occurred not as a result of centrally driven higher education policies, but through complex interactions among policy, societal and market forces and, above all, through a wide range of unexpected institutional processes". Given the preceding outline of the changing research policy environment as well as the main research indicators and research leadership context, it is clear that institutional change in South Africa has been "characterised by stasis in certain areas and great fluidity in others, as well as continuities with the past in some areas and discontinuities in others" (Badat, 2009:465). The indicators highlighted show that significant progress had been made in terms of an extensive policy drive for research development, increasing investment in research and increasing support for strategic research. South Africa's research output in ISI journals is still dominated by the natural and agricultural sciences. However, the publication output seems to have reached its peak by about 2006, and the rate of increase has not kept pace with international growth. As a system, South Africa does not produce sufficient doctoral graduates to meet the needs of a globally competitive economy. The research system continues to struggle to nurture a new generation of academics and

research leaders that are increasingly black and female and with creating a diverse, supportive and productive research culture that is driven by the principles of academic excellence.

The merger of higher education institutions posed challenges for research leadership and research capacity development. Only 40% of staff at South African universities have doctorates. Limited supervisory capacity is one of the main barriers to increasing the number of doctoral graduates in the system. The chapter also outlined a number of specific government financed interventions to increase the quality of research outputs and build a cadre of new world-class researchers. According to Mouton and Gevers (2009) the promise of better mobilisation of talent probably presents the best opportunity for gains in productivity of the science and technology system in the immediate future (p.67). The role of research leadership in stimulating research productivity and preparing the next generation of researchers is thus of utmost importance. In order to investigate this further, Chapter 3 discusses these two key indices viz. research leadership and research performance, in greater detail.

CHAPTER THREE

Literature Review

This study is focused on an exploration of research leadership, with particular reference to research performance within public higher education institutions. In the light of this emphasis, the literature review will focus mainly on the two key descriptors, leadership and, research performance and productivity. The leadership field is expansive and for this reason, the literature review in this study will draw on a leadership typology that will focus briefly on the general leadership literature as an introduction and background. It will explore issues around definitions of leadership and trace broad developments of leadership theory. Secondly, the literature review will focus on academic leadership within the higher education context. Finally, the leadership literature will discuss research leadership as a specific category of academic leadership. The literature study, having been introduced with a discussion of leadership, will then focus on research productivity with specific reference to academic leadership roles.

3.1. Leadership

It has long been postulated that research productivity is unlikely to improve through efforts that rely on formulas, draconian pressures and threats of external intervention. The long- term war will be won by ***credible research leaders*** *who can apply disciplined intelligence and emotional capital in responding to opportunities… (Birnbaum, 1990).*

3.1.1. What is leadership?

Even though there is a vast literature on the topic of leadership, especially in organisational psychology and management studies, it is a concept plagued by debate.. Leadership is hard to define and effective leadership even harder. Leadership research itself seems to be plagued by confusion, criticisms of multiple definitions or lack of definition (Smith and Hughey, 2006; Middlehurst, 2008) and is dominated by trendy nonsense (Maddux, 2002), conceptual

incoherence and a disturbing lack of shared understanding of what leadership is or might be. The clarity of definition for each varies and there are many overlapping concepts (Richmon and Allison, 2003:32). Shattock (2003) is of the opinion that "leadership constitutes an ambiguous quality in universities since leadership style must be qualified by disciplinary cultures as well as by the nature of university organisations" (p.91). Bryman (2007) noted that higher education literature often does not distinguish the terms leadership, management and administration in a precise or consistent way, often polarising management and leadership at different ends of the organisational development spectrum

In addition, Bolden et al. (2008:3) suggest that "...there is (still) no common consensus on how best to develop leadership and leaders, and remarkably little evidence of the impact of leadership or leadership development on performance and productivity". Ball (2007), working with academics in hospitality management, found that an analysis of leadership definitions by academic leaders shows that three particular elements commonly feature. These are "goal-setting and achievement, group activities and influence on behaviour of others" (p.454). These elements are reflected in a definition used by Zuber-Skerrit (2007) when reflecting on experiences of leadership development in South African higher education where "leadership is defined as the ability to influence others towards the achievement of common goals that contribute to a worthwhile purpose…leadership in the new paradigm is principle-centred, collaborative and self-developed leadership in partnership with others" (p.987). Challenges of definition thus remain, as illustrated by the summary that 'across theories, leadership can be (and has been) understood as a process of exercising influence, a way of inducing compliance, a measure of personality, a form of persuasion, an effect of interaction, an instrument of goal achievement, a means for initiating structure, a negotiation of power relationships or a way of behaving' (Richmon and Allison, 2003:34). Leadership thus remains a contested concept (Middlehurst, 2008).

3.1.2. Theoretical foundations

The evolution of leadership theory and research is usually categorised into three eras; trait, behaviour and contingency and traditional definitions of leadership focus on leadership traits, functions and styles. Each era is characterised by a prominent research strategy and focus of interest (Tirimizi, 2002). These historical reviews seem to imply that leadership and the study thereof has progressed through a linear, predictable course and yet practical experience shows that this development is not linear. According to Smith and Hughley (2006) the main research approaches into the nature of leadership can be summarised as follows:

a) Trait ('great man') theory: Theory prominent in the early 20th century promotes the identification of specific traits in unique individuals who are considered to be effective leaders. Heroic individuals are thought to be gifted by heredity with unique leadership attributes. This theory supports the common assumption that "leaders are born".

b) Behavioural theory: This view examines particular actions and patterns of behaviour employed by individuals in leadership positions. In essence the focus is on what the leader does and the impact of the context on the behaviours of leaders and managers. Leadership definitions thus assume that leaders have specific functional duties and roles that set them apart from others in an organisation.

c) Situational/Contingency theory: This theory has been more prominent in the latter half of the 20th century. This view considers the unique contexts of environments in which leadership is practised. The key to the contingency approach to leadership is that the leader must analyse the situation to decide which style or combination of styles is appropriate, given the situation and the actors involved.

These three approaches were usually described as more traditional leadership theories and placed a strong emphasis on rational processes. The

leadership field then experienced a shift in focus, made necessary by social, economic and cultural factors that include issues such as the changing and diverse workforces. Thus the shift was from 'leader-centred' approaches (the leader is born with all the leadership skills) to an investigation of 'followership' and the dynamics of the relationship between leaders and followers. Descriptors such as vision, communication, character, charisma and integrity are more often used. The leadership approaches that followed from these changes are summarised below as:

d) Transactional theory: Transactional approaches define leadership as a set of roles and functions that develop because of the interactions between two or more people (Yukl, 1999). Transactional leadership deals with the management of resources, systems and structures and can be described as compromising mainly the day-to-day relations between employers and employees. This type of directive leadership is thought to be closely associated with needs and rewards for compliance as sources of motivation (contingent reward).

e) Transformational theory: (Lumby and Coleman, 2007) defined leadership in terms of the leader's effect on followers. The theory has a strong emphasis on values-based inspiration and is largely people-centred and morality-centred. This type of leadership is often described as a 'higher order' kind of leadership as it is seen to allow people to fulfil their true potential through intellectual stimulation, individualised attention and inspirational motivation. Lumby and Coleman argue that "the influence of transformational leadership is pervasive throughout much writing on leadership, and thereby acts as a powerhouse towards suggesting (that) alignment of values is a critical task of leadership" (p.71).

f) Distributed/dispersed theory (Bryman, 2007). This view emphasises leadership in operation at all levels and regions of an organisation, in a variety of both formal and informal leadership roles. Socio-cultural context is considered an integral, defining element of this type of leadership and involves trust and openness as a basis of interpersonal relationships. In a

review of the literature, Bennet, Wise and Woods. (2003) suggest that the concept of distributed leadership is based on three main premises:

1. Leadership is an emergent property of a group or network in interacting individuals;
2. There is an openness to the boundaries of leadership;
3. Variety of expertise is distributed across the many, not the few.

Distributed leadership clearly calls into question the traditional attachment of leadership roles to formal 'headship' posts or positions only.

These emerging theories have also attracted critical comment. It is felt that while the move to transformational leadership in the 1980's and 1990's went some way to recognising the need to engage followers, "its emphasis on vision and charisma possibly did more to reinforce than challenge the image of the heroic leader" (Bolden, Petrov and Gosling, 2008:360). In dispersed leadership for example there is still little agreement about the term, with almost no empirical studies of distributed leadership in action (Bennet et al., 2003). Issues of potential conflict over boundaries of decision-making in distributed systems remain unclear. Questions also arise about which leadership tasks are appropriate to disperse and who has the power to disperse tasks i.e. who distributes what to whom and under what conditions? (Bennet et al., 2003; Bryman, 2007; Jansen, 2007). Implicitly, this raises the question of whether distributed leadership is possible in a hierarchically ordered society.

There is also some concern that the key concepts in transformational and distributed leadership are 'consensus' and 'aligned' -layers of sameness; this may be achieved in many cases on the assumption that agreement is or could be un-problematically achieved (Lumby and Coleman 2007). In the view of Walker and Walker (in Lumby and Coleman, 2007) sameness permeates ideas for what makes a good leader, a good team, a good school despite the recognition of increasing diversity. Hence the move is towards attempts to find alternative theories of leadership that could be more genuinely inclusive.

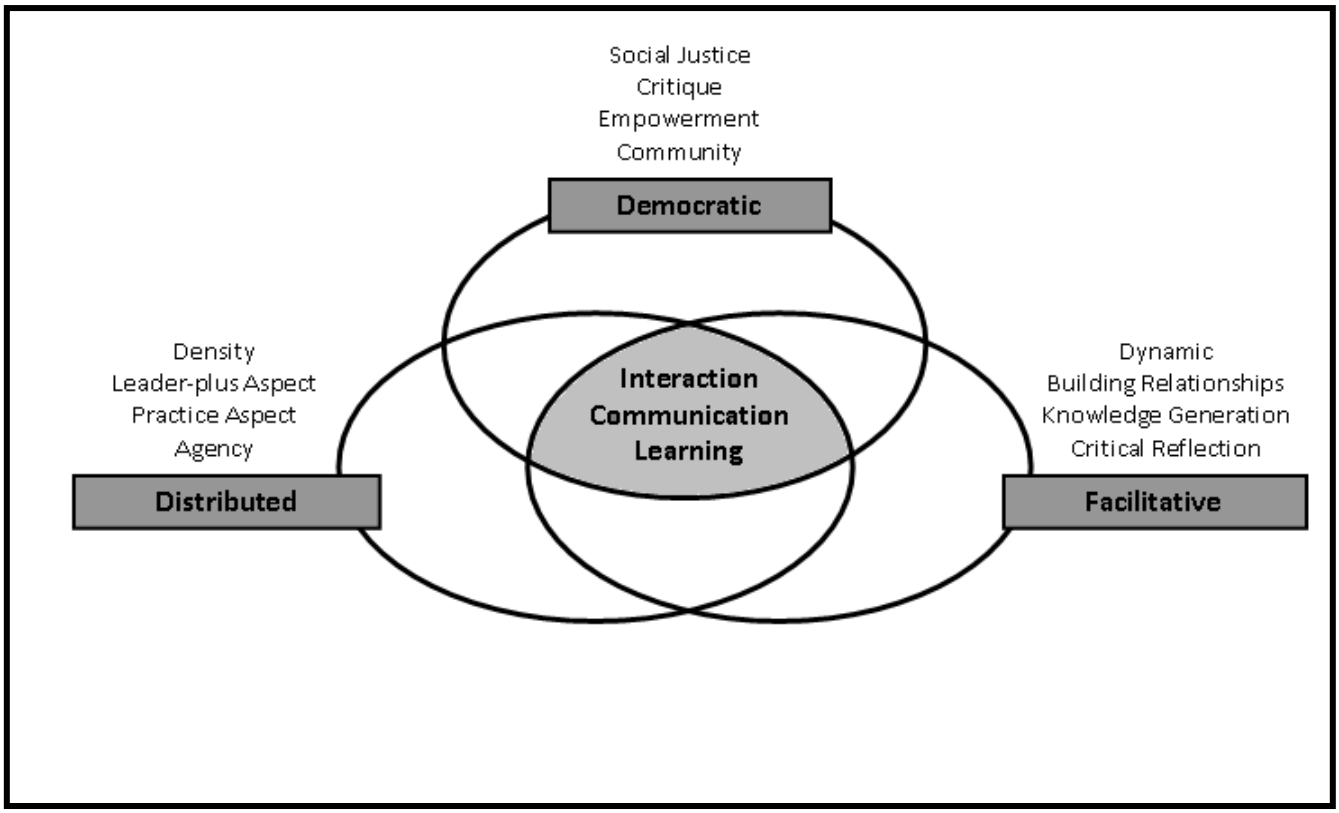
Issues of race and gender were highlighted in the preceding chapter as major challenges within a South African transitional higher education context. Leadership, for the most part, has been unchallenged in its assumptions of a homogeneous leadership. However, critical race theory has critiqued hegemonic notions of leadership, suggesting that the voice of minority ethnic educators is absent in its location. A body of critique of leadership theory constructed in relation to gender has also developed. Researchers in this area conclude that the conceptualisation of leadership is through a male perspective and that the effect of such theory is to create barriers to the entry of women into leadership roles and to undermine their practice when they arrive (Lumby and Coleman, 2007; de la Rey 1999; Chisholm, 2001). Post-apartheid South Africa, with a powerful agenda for social justice, saw a strong policy commitment to achieving greater gender equity, especially at leadership levels. Early research during this period showed that despite an overarching discourse of gender equity to which all subscribe, "discourses of leadership which were both raced and gendered structured the lived experience and identity of both men and women. The dominant construct of 'good leadership' was framed as being white, male, middle-class and heterosexual" (Chisholm, 2001:389). Chisholm felt that the entrenchment of a male-dominated leadership structure raises questions about the relationship between policy and practice and the conditions that continue to shape such events. Jansen (2006) however, in working in the post-apartheid South African school context, found that white school principals who radically decided to change their schools to become more racially inclusive and equitable actually challenged the notion of the great charismatic leader who has powerful visions and leads by him/herself.

The race and gender statistics for research and leadership within higher education discussed in Chapter two shows that transformation in this area has been slow.

Harris, Moos, Moller, Robertson and Spillane (2006), working mainly with school leaders, thus offered a framework of the alternate perspectives on leadership practice. This thinking is based on their premise that, as learning

institutions develop and change, different leadership approaches will inevitably be required and different sources of leadership will be needed to ensure that the development work keeps moving on. The framework links three perspectives of leadership, that, although presented as separate lenses on leadership practice, are linked by a common focus on interaction, communication and learning. As discussed previously, when leadership is viewed from a distributed perspective, the work of all individuals, regardless of position, is allowed for and taken into account. The focus of facilitative leadership is on the different roles of all members of the community in support of knowledge generation. From this perspective, leadership practice must facilitate relationship building.

Figure 6: Alternative Perspectives on Leadership.



Source: (Harris et al. 2006)

In this model the democratic perspective on leadership requires serious attention to the value base of leadership practice and the processes that create and sustain social justice, empowerment and community. Here the

leadership task is also about challenging the wider power structures in which organisations are embedded and committing oneself to work for social change. There is an emphasis on a concern for the welfare of others, including the dignity and rights of minorities and individuals (Harris et al. 2006). In the South African context, emerging leadership studies, although mainly at school leadership level, are increasingly seen to embrace leadership for social justice i.e. leadership that is framed by a quest for equity and redress in the transition of one kind of system to another (Phendla, 2004; Jansen, 2007). According to Jansen (2007), "generic statements about leaders and leadership clearly have limited significance in settings where, for example, racial reconciliation and social justice are demanded in the broader political context" (p.102). Amongst others, these studies are beginning to investigate how leadership practice relates to the core values and commitments of leaders as they lead for social justice in post-apartheid schools.

Hence, in summary, it can be argued that leadership is a complex relationship involving a number of variables including the characteristics of the leader and followers, the nature of the organisation and the external environment. It cannot be viewed (or researched) as a simple, technical, rational and logical frame approached through a toolbox of pre-determined, finite techniques. Ball (2007) quotes the work of Gunther (2001) who argues that leadership is not an 'it' from which we abstract behaviours and tasks, but is a relationship that is understood through our experiences consequently, leadership is highly political and is a struggle within practice, theory and research. This is echoed by Jansen (2005) in his work on South African academic leadership, where leadership is viewed as a "complex political and emotional process in which the outcomes are not always predictable and measurable" (p.325).

3.1.3. Academic leadership

Academic institutions present a different setting than private or public sector organisations, with leadership in academia complicated by the dynamic social, economic and policy contexts in which higher education institutions

operate. Issues of academic freedom are of great importance and relevance in the academic context. Traditionally, the academic department has been seen as the main organisational unit for the delivery of research, providing an organisational, administrative, cultural and intellectual home for both individual members of the academic staff or for research groups (Taylor, 2006). Conversely, the 'uniqueness' of individual departments that emerges from disciplinary authority sometimes has protected enclaves, that has resulted in institutional inertia and lack of change (Shattock, 2003). In the realms of research and scholarship, intellectual leadership is an expectation that is commonly associated with the professoriate who may exercise leadership within a disciplinary context either inside the institution or within the wider society (Middlehurst, 1997). Within the disciplinary context, senior academics have always had a duty to lead. It is often felt that the challenge of leadership is significantly different and arguably more difficult in the professional and collegial mode organisation (such as the university) since it involves persuading rather than commanding 'free, equal and expert' colleagues to join in a collective enterprise of change and development (Middlehurst, 1997).

According to a review of literature on research productivity by Bland and Ruffin (1992), one of the most persistent findings in the literature is the correlation between participative governance and research productivity (p389). One study of more than 100 colleges in the USA found that every one of the top 10 colleges with high morale and satisfaction had leadership that was aggressively participatory in both individual style and organisational structure (p.389). It is suggested that participative leadership, although not the best governance mode in every situation, is most effective for the following reasons:

- The requisite knowledge may be too extensive, the conglomeration of needed skill too complex, or the simultaneity of the decisions too considerable for anything but participative leadership;
- Such leadership heightens members' morale and self-esteem;

- It allows for diversity of perspective and variety of competencies that no one leader can possess;
- It accords opportunity to focus on the task at hand:
- It allows subordinates to have information that increases their abilities to contribute, and it reduces opposition to decision.

Leadership in the university context is usually dispersed in departments, research teams, among administrators or academic research support. Ramsden (2000) presents a series of principles of academic leadership at the dean or departmental level:

- Leadership is a dynamic process that involves creatively managing tensions; for example between tradition and change, having clear goals but giving people the freedom to pursue them, executive action and supporting colleagues, endorsing academic values but coping with external forces and so on.
- Leadership is focused on outcomes, i.e.“ to create conditions that enable high quality research and teaching, and to raise awareness of staff so that they can welcome change”.
- Leadership is relational: it occurs in situations and it must be colleagues who determine whether or not one is a leader.
- Leaders must also be learners about how to complete a task.
- Academic leadership must be transformative; it is about ‘helping ordinary people to do extraordinary things and as a leader “transforming one’s own performance (pp.126-7).

In his summary of research on academic leadership, Ramsden (2000) finds that academic work gets done better when leadership is “ enabling, coherent, honest, firm and competent; when the leadership combines efficient management of people and resources and when it blends a positive vision for future change with a focus on developing staff – a focus on helping them to learn” (p.365).

Universities are influenced by social, political and economic contexts and global changes within these contexts have exerted a major impact on the path of institutional restructuring and organisational change within universities. According to many researchers, the value placed on academic leadership in universities is changing. It is felt that the new corporate style of management seems to favour management over academic leadership within a hierarchical structure. (Smith and Adams, 2008; Johnson and Cross, 2006; Harman, 2002). This new management style has had significant influence on three major areas within universities. These are:

(a) Internal management structures, systems and practices;
(b) Professional academic cultures and identities;
(c) 'Re-imagining and re-imaging' of the university as a knowledge intensive organisation (Deem, Hillyard and Reed, 2007:26).

This opinion also seems to extend to leadership of major scientific facilities and the agencies that run them. According to Macilwain (2010:919) "today laboratory and research facility heads are often selected less for their intellectual brilliance than for being 'good' committee men or women who can cope with the bureaucracy now inherent to the task. The result is often mediocre management by individuals who can get by, but can't inspire". The former image of deans as scholarly leaders and custodians of collegiality has been replaced by an executive image of them as guardians of efficiency who are politically astute and economically efficient. (Johnson and Cross, 2006:34). Hence 'management teams' primarily consist of staff holding managerial positions who are not necessarily academic leaders. The defining characteristics of the modes of academic and managerial leadership in tertiary education institutions are summarised below.

Table 5: Characteristics of academic and managerial leadership in tertiary education.

Academic Leadership	**Managerial Leadership**
Leader is "**an**" authority based on	Leader is "**in**" authority based on
discipline knowledge	position in hierarchy
experience	job responsibilities
peer and professional recognition	control (e.g. budgets, resources)
expertise –teaching, research,	delegated authority
team acceptance	power
Leadership Context: Collegial	Leadership Context: Corporate
Formalisation: bestowed from below	Formalisation: bestowed from above
Leadership vested in the PERSON	Leadership vested in the POSITION

Source: (Yielder and Codling, 2004: 322).

It must be noted that very rarely do these two modes as represented by Yielder and Codling above show themselves as distinct and mutually exclusive leadership types in separate individuals. Senior leadership within the university usually needs to maintain a complex corporate academic web, balancing two, sometimes contradictory roles: "one firmly academic, concerning cross–institutional responsibility for core academic values and mission, the other more bureaucratic or executive, focusing on the burgeoning demands of accountability' (Smith and Adams, 2008 p340). "A key challenge is to train talented scientists in the mundane aspects of project management – without scaring them off or ironing out the personality traits that make them great leaders" (Macilwain, 2010:919).

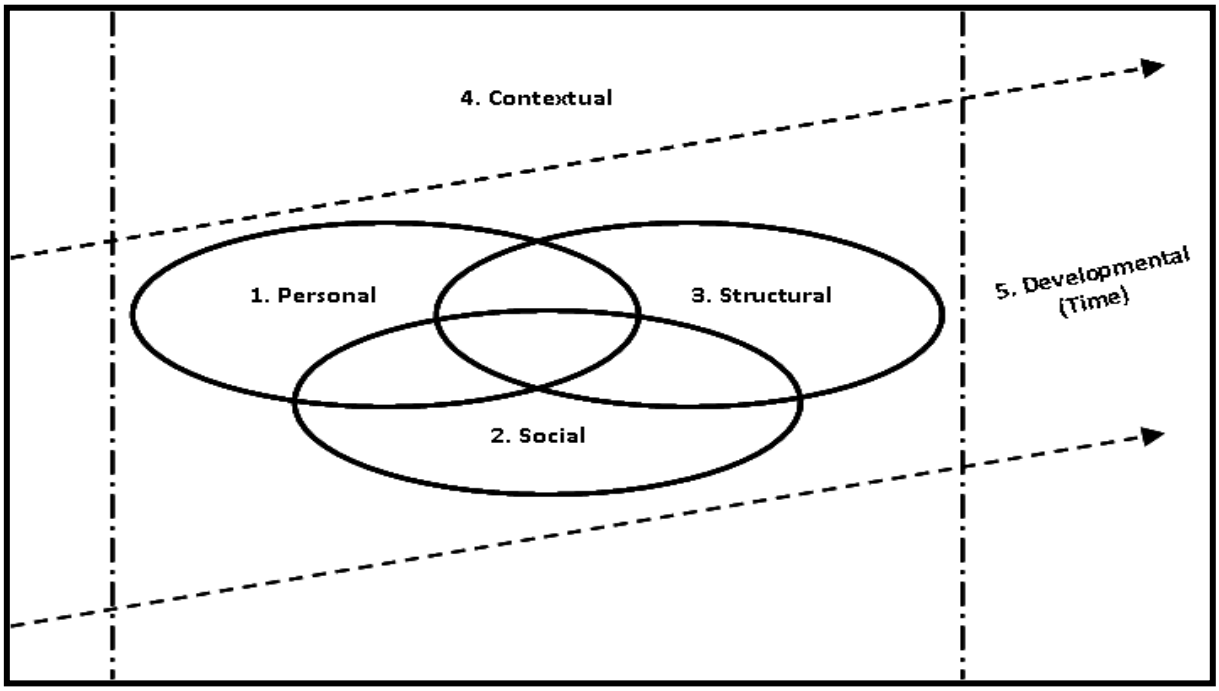
Higher education in South Africa faced a number of academic leadership pressures in the new dispensation. As Kulati and Moja (2002) point out, the different pressures set up tensions between equity and efficiency, leading and managing within a democratic context and maintaining academic autonomy on the one hand, while being responsive to national imperatives on the other.

The post 1994 period found that the wide institutional diversity and history of higher education in South Africa made it impossible to develop an ideal approach to leadership (Kulati and Moja, 2002). With regard to leadership and scholarship, the key challenges among these were the following:

- The creation of a credible class of black (and white) leadership in higher education i.e. 21st century leaders who are credible scholars, strong managers and ethical leaders;
- The building of a new class of researchers, scholars and intellectuals in higher education i.e. creating a new and resilient group of world class academics to sustain and increase the research prestige of South African institutions (Jansen, 2002).

Bolden, Petrov and Gosling (2008) undertook an investigation of leadership and leadership development in higher education in the United Kingdom (UK). The aim was to explore common and competing conceptions of leadership at different levels within universities. The main focus was on the leadership of the academic work of the university, including teaching, research and business and community engagement. The main unit of analysis was the school or department level "as this is seen as the main operational unit of universities, the primary source of future senior academic leaders and the main point of interface between leadership of the institution and leadership of the academic discipline" (p.363). The researchers used the model represented in Figure 16 below to show the multifaceted nature of leadership in higher education. Leadership is represented as a dynamic outcome of five inter-related factors.

Figure 7: Dimensions of leadership in higher education



Source: Bolden, Petrov and Gosling, 2008:232

Personal Dimension: This relates to the personal qualities, experiences and preferences of individual leaders. The research revealed consensus on a number of key personal leadership requirements summarised as follows:

- The need for academic or professional credibility;
- Consultation and openness;
- Desire for inspirational or visionary individuals, particularly in times of change or transition.

Social Dimension: This refers to both formal and informal networks and relationships within and beyond the institution (social capital) as well as the shared sense of identity and purpose within and between groups i.e. social identity (Bolden et al. 2008:366). The research findings reveal that at a personal level, identity tensions may arise from competing motivations and allegiances; for example, manager versus academic, discipline versus institution. This may inhibit the development of a sense of shared social identity with other managers.

Structural Dimension: This refers to the structural context in which leadership occurs and includes all organisational systems, processes and structures, especially those relating to finances, human resources, information technology, strategic planning and even the physical environment. The research findings supported the notion that structural aspects of the situation are an integral part of leadership.

Contextual Dimension: This refers to the external social, political and cultural environment as well as the internal organisational culture, history and priorities. The research findings recognised that, with regard to external contexts, the higher education sector is becoming increasingly politicised and subject to external pressures from competitive markets. An interesting internal context, which is highly relevant to the South African context, is the "finding that the organisation's recent and past history is significant in determining how it is perceived both by those within and outside it" (Bolden et al. 2008:369).

Development Context: This refers to the ongoing and changing developmental needs of individuals, groups and organisations and the research findings indicate a close interdependence between individual, group and organisational development.

The authors of this model argue that it extends the notion of academic leadership beyond the individualistic and managerialist forms most commonly accepted in the literature. A more relational understanding of academic leadership as presented recognises the multitude of forms in which it appears, the diverse array of factors that influences it and the competing priorities and objectives with which universities are faced. This model then is more in line with the central tenet of this leadership study, i.e. that context matters in the practice, understanding and study of leadership.

3.1.4. Leadership of research

A defining characteristic of a university is its commitment to scholarly activities leading to the production of knowledge and ideas. Both teaching and research are about transformation. University academics have always worked in the dual roles of educator and researcher. “Over the past two decades, the academic’s role as a researcher has become increasingly important, both as an indicator of how well the institution is perceived overall and how well the individual academic is compensated” (Macgregor, Rix, Aylward and Glynn 2006: 59).

MacGregor et al., (2006) point out some changes in the Australian research system as a result of changing policy imperatives for funding of research activities in the arts, humanities and social science. Although describing the Australian system, the observations are equally applicable to the South African research system. These include:

- Growth in the number of ‘centres of excellence’ that are seen as evidence of research strength in a particular field;
- Increased competition for research funding from agency grant schemes and research degree scholarships;
- Intensified competition for high quality national and international research students;
- Initiatives that seek to develop home-grown research capacities and encourage retention of skilled researchers as well as institutional rather than individual scholarship.

In his 2006 research study of six top UK research universities, Taylor reported on the importance of management of research. Taylor found that the research universities in the study were characterised by “powerful, visionary leadership, with a firm and unwavering commitment to the research-led mission, and devolved operational responsibility. This leadership needed to exist at the head of the university as a whole, but was also necessary within

academic departments" (p.13). Di Sarli (2002) in Taylor (2006) identified the following good practice at institutional level in the management of research:

- Clear definition of the mission of the university;
- Definition of priorities in research fields;
- Definition of policies to balance fundamental and applied research;
- Definition of policies to support local development;
- Definition of policies of social accountability and operational transparency in the use of public and private funding.

Within research contexts then, evidence from the limited research available suggests that leadership is important for the advancement of research in universities (Middlehurst, 1993; Ramsden, 1998; Taylor, 2006; Ball, 2007). But what form would such leadership take, given that the skill sets to be a good researcher requires slow, deliberate, measured acts built on an in-depth knowledge base that makes a researcher an expert in a particular field. In addition, research is carried out for the most part, in isolation or within small groups of extremely like-minded colleagues by individuals who thrive on independence and resent interference (Wolverton Ackerman and Holt, 2005:229).

Research leadership seems to suffer the same 'definition confusion' of the general leadership literature. This is illustrated by the work of Ball (2007) who conducted a UK research study that was concerned with the perceptions of academics about the nature of research leadership, the interpretation of the experience of leadership of individual research leaders and the experience of leadership on others. He found that despite variations, "the majority of definitions of research leadership by academic respondents focused on one of six aspects; the leader, the people involved, level, the purpose, the functions of research and the action/influence" (p.470). The overall view of research leadership that emerged from his study is represented in Table 6 below:

Table 6: The view of Research Leadership.

Leadership is both formal and informal and varies according to social systems.
Leadership is dispersed.
Self-leadership is a feature of academic researchers.
Leadership is complex and consists of many relationships.
Leadership is concerned with the leadership of people and the leadership of the subject.
Leadership is different from management but there is overlap.
Each leader possesses different characteristics and offers different services.
Leadership is important to the undertaking of research.
Context of leadership is complex but crucial.

Source: (Ball, 2007:p474)

According to Ball, the existence of self-leadership and the duality of leadership between the subject and the people are key elements that distinguish research leadership from leadership in general. Research leadership in this study is identified by the hallmarks of excellence in scholarly publication at the cutting edge of the discipline, extensive quality national and international research networks, personal scholarly recognition and prestige amongst peers, leadership of quality Master's and doctoral programmes, early researcher mentorship and the ability to garner research funding.

Research leadership in public universities under change is also faced with challenges for change. Some of these challenges emerge as governments place greater focus on science and technology disciplines, on the balance between basic and applied research, on knowledge and technology transfer activities and intellectual property. "Institutions able to match research priorities with national priorities, as determined by technology foresight studies, are well rewarded" (Hazelkorn, 2005:22). Many argue that these changing conditions in higher education have opened up possibilities to create other forms of organizing, and viewing new opportunities in new combinations of disciplines and practice. To this end, researchers such as

Hansson and Monstead (2007) are of the opinion that a new framework for entrepreneurial action among researchers has emerged. This framework is characterised as follows:

- Funding is tied to collaborative networks of researchers that cross both national borders and boundaries between universities and industry There is a much stronger emphasis on applied research, i.e. research that is relevant for industry and often co-funded by industry;
- Entrepreneurial researchers apply for large projects through which they establish research groups or centres with strong ties to external funding.

Kearney (2009) outlined additional activities that form part of these innovation systems where universities have expanded their research links with industry, commerce and government, as well as the community at large. These include:

- Incubation activities to foster innovative projects;
- Financing of innovative processes to facilitate the commercialisation of knowledge;
- Networking through markets and mechanisms with interactive learning amongst the institutions involved;
- Consultancy services for technology transfer and the legal and commercial aspects of innovative activities (p.7).

Hanson and Monstead report that dealing with this new framework in the university requires creative and innovative research leadership that covers the opening of new research perspectives, the emergence of new forms of networking and organising and the initiation of new types of collaboration with industry and public sector institutions (Hanson and Monstead, 2007). They thus 'redefine' the concept of "*research leadership as entrepreneurial leadership* (author italics) where dilemmas, uncertainty and complex relations to other managerial systems in the universities are in the forefront" (p.5) In research leadership they focus on two aspects: the role of networks and brokerage and organisational entrepreneurship In other words

"entrepreneurial leadership in research is viewed as a kind of knowledge management" (p.15). The understanding of the processes of research leadership is tied to the initiatives and entrepreneurship of researchers to generate new resources both externally and internally. The ability to create these opportunities becomes one of the most important leadership competences of research managers. Essential features would include economic aspects, efficiency and competitiveness. Their study of research leadership at the Copenhagen Business School demonstrated the need for special qualities for research leadership, such as:

- Personal qualities (scientific capital and charisma) in order to create respect and formulate research programmes;
- Ability to be a broker between networks in teaching and research;
- To be able to use the external contacts and dissemination of research for access to further research;
- To be able to use rules and negotiate in the bureaucracy and develop organisational openings in a creative way;
- To create an environment of self-management in a collective organised research group to mobilize young researches to take their own initiative.

A study by Hemlin (2006) of commercially embedded research groups in the biotechnology field, found that leaders and their behaviour are generally perceived as more important than organisational support factors for creativity and innovative processes in biotechnology. This result confirms a number of previous studies of research group performance in a variety of fields of learning, where leadership was found to be crucial. Some of the results of the study tend to agree with research policy literature (even in South Africa) that university research, and particularly fields like biotechnology have increasing applied capabilities.

Thus, given both traditional and emerging academic leadership models and the demands of the changing institutional landscapes as outlined above, research productivity that emerges under these contexts will follow.

3.2. Research Productivity

The outputs of an educational institution or an educational system are very much more than numbers of graduates or quantities of knowledge. The effects of higher education spread far and wide and touch the heart of human hopes and ambitions (Ramsden, 1998).

Productivity within higher education has an obvious multidimensional character as it relates to both knowledge production and knowledge dissemination through the various forms of research, teaching and outreach activities. However, defining research and measuring its output has become a somewhat controversial issue, as questions are being asked about which institutions should do research, what kind of research they should do and how the research performance will be assessed. Research productivity in particular has received a great amount of attention and critique and there exists a large world literature on research productivity and its correlates (Dunbar and Lewis, 1998; Babu and Singh, 1998; Smeby and Try, 2005). Ramsden (1994) drew four conclusions from the large body of early work on quantitative research productivity and these conclusions are still applicable to the current research context:

- There has been exponential growth in research output.
- The average output though is not very high and hard to estimate accurately.
- The output is extremely variable or skewed across institutions and individual academics.
- There are multiple effects on levels of productivity.

As research expenditures have risen and as sources of research funding have become more restricted, an increased emphasis on research productivity and the factors that promote research productivity has developed in research institutions. This occurs within the context of increased competitiveness and accountability of scientific performance and internationalisation of cutting-edge research activities. In the fast changing

global context of higher education, increasingly the keys to global competition are research performance and research reputation, that is partly fed by research performance (Marginson, 2007:132). Many user communities actively seek reliable intelligence about the whereabouts and characteristics of research excellence for strategic usage. Global rankings, despite their associated controversies, are less than three years old, but they have already reshaped the global context of higher education. Rankings have exacerbated competition for the leading researchers and best young talent, and are likely to drive up the price of high-performing researchers and research groups. Marginson points out that a rationale for using research performance data is that "arguably research is the most important single determinant of university reputation and widely accepted as merit based" (p.133).

3.2.1. Measures of research productivity

There are several possible ways of measuring research productivity and the influence or impact of research amongst peers and society in general. The selection of appropriate productivity or output measures usually must have meaning across all types of institutions, permit comparisons with previous research and be able to be used in promotion decisions at most research institutions. The unit of analysis for research productivity can be at individual, departmental or institutional levels, although even at these levels the literature has emphasised multi-dimensional measures of performance (Roy et al., 2003; Tijssen, 2003). Ramsden (1994) draws attention to the useful categorisation of evaluating research performance made by Harris (1990). These four related but distinct ways of evaluating research performance include:

1. *Quantity* – the simplest of measures and concerns the number of publications or pages produced.
2. *Impact* – a measure of influence of a piece of research and is evaluated by means of citation counts. There is a strong correlation between impact and quantity.

3. *Importance and 4. Quality* - evaluated through expert value judgements, typically using peer review. Neither importance nor quality can be captured through bibliometric indicators alone (p.208).

Tjissen (2003) works on the premise that "research excellence is a multi-dimensional phenomenon which is hard to define both conceptually and in operational terms, and is not directly measurable in a generally accepted valid manner" (p.93). He is of the opinion that no single indicator of research excellence can be used in isolation, but that "it is in the combination of many characteristics that research excellence is to be found" (p.95). He distinguishes "four broad performance dimensions associated with the major stages in the knowledge creation and dissemination trajectory":

- *Inputs*, in terms of funding, human capital, physical capital, infrastructure and social and intellectual environment;
- T*hroughputs*, processes that combine inputs activities and infrastructure to support or achieve outstanding results;
- *Outputs,* in terms of first order results such as breakthrough scientific findings or developing novel scientific techniques;
- *Outcomes*, in terms of second-order results and impacts of those achievements having a significant influence on user communities within or outside the immediate environment of the research entity directly involved (p.95).

By far the most commonly used measure – the gold standard for research productivity - is the number of faculty publications in selected outlets such as academic journals, or a summative index constructed from counts of conference papers, journal publications and books (Toutkoushian, Porter, Danielson, and Hollis, 2003; Pouris, 2003; Fairweather, 2002; Dunbar and Lewis, 1998; Babu and Singh, 1998). Research productivity is conventionally measured as the ratio of publications to number of programme faculty. Usually these are limited to a specific period of time and are not adjusted for prestige of publication source or multiple authorships. The availability of the

publication data from large databases such as ISI has increased the use of publications as a commonly used productivity measure. Empirical data should be reliable and informative to ensure sound metrics and is generally valuable as a first step in a search for centres of research excellence. Researchers who favour bibliometric indicators and patent analysis are of the opinion that the indicators are well defined and unambiguous, making sub-categorisation of scientific fields and international comparisons possible (Pouris, 2007:621).

Measurable research outputs increasingly determine the amount of public research funding received by an institution. South African universities receive research support from the Department of Higher Education and Training according to their research outputs. The Policy for Measurement of Research Output of Public Higher Education Institutions (Government Gazette, 2003) recognises, for the purpose of subsidy, three main types of research output viz. journals, books and proceedings. The list of outputs is designed to compare relative output between institutions of higher learning, across a selective sample of publications that meet prescribed criteria. The policy does not support differentiation within these types of outputs. Research papers are considered the most important output and researchers receive more than R120 000 for each article they produce. It is felt that the funding formula favours intrinsically prolific disciplines, even though attendant quality criteria do not distinguish between high impact and low impact articles. All articles in a list of accredited journals qualify for the same subsidy (Pouris, 2006). Faculties usually generate research funds through a process whereby a portion of the subsidy earned by each staff member for an accredited publication is paid into their respective central funds. There is a feeling that the pressure to produce significantly large numbers of publications for subsidy income and performance appraisal can lead to a numbers game or ‘game of publications’ without the concomitant focus on the quality of the research. In addition these practices underlie the tensions between the national policy imperative to increase research output while maintaining standards of excellence.

The analysis of journal articles is not without it's own set of problems and these relate to matters such as journal quality, types of publications and multiple authorship (Dunbar and Lewis, 1998). Use of scholarly journals only (e.g. from ISI indexes) excludes many other forms of publications such as books, book reviews, corrections, editorial material and letters. Hence a focus on journal articles only does not seem to take account of the considerable variation that exists regarding the determinants of research productivity among disciplinary categories. For faculty members in the fine arts, a related measure is the number of exhibitions or performances held. Thus the arts and humanities may appear less productive in such analyses, as these areas are thought to have traditionally placed less emphasis on publishing in scholarly journals (Toutkoushian et al., 2003). In addition, despite the impressive breadth of coverage of the ISI databases, some academic journals and publication outlets are not monitored by the institute. Journals in the developing countries, including South Africa, are not well covered in the ISI database simply because many of them are very local journals with small subscription bases and consequently very low international visibility (Mouton and Gevers, 2009:53).

In response to many of the criticisms, some scholars favour a count of the total number of citations the author received or relate the number of citations received to the number of items published (impact). Citation analysis is often used as a method for measuring the utility or the impact of the scientific work of individuals or groups. Hence the added value of citation impact indicators lies in the fact that they disclose the actual scientific influence of papers on the outside world – a key indicator of research excellence from a user-oriented point of view. Citation counts are also not without their concerns and limitations. A case study by Tijssen found that in a certain university faculty, many research articles in top journals were not very highly cited. It was thought that the targeted journals were possibly not the most appropriate outlets to reach the relevant scientific audiences that might cite the published work. This lead to a review of the publication strategy of the researchers concerned and an inclusion of citation measures (Tijssen, 2003). Factors such as reputation of the cited author and the visibility, prestige and

accessibility of the cited journal may affect, to a greater or lesser degree, the work the author chooses to cite (Jacobs, 1998).

Criticism of the use of publications counts abound since it is felt that several other factors that are likely to have an influence on and contribute to the research performance of departments are not considered. Assessments cannot be reduced to mere numbers without losing contextual information that is essential for proper interpretation of findings. These would include personal as well as organisational factors. Local promotion or annual review decisions usually use a broader definition of scholarly output than refereed publications. Fairweather (2002) identifies a number of productivity measures besides publications. These include:

- Principal investigator on an externally funded project is highly valued;
- Total research funds generated by researcher;
- Number of conference presentations or workshops held.

A case study of the evaluation of a public university faculty programme in the Netherlands included quality dimensions as listed below:

- Originality of approach and ideas;
- Coherence of the programme;
- Publication strategy in view of stated mission;
- Scientific publications (scientific impact);
- Distribution of published output over the team members;
- Significance of its contribution to the field;
- Prominence of the programme director;
- Prominence of other members of the research group.

From this diverse set of items it can be seen that some criteria relate to tangible, quantifiable aspects (publications) others to intangible features (originality) or a blend of both (prominence of senior researchers) (Tjissen, 2003).

Toutkoushian et al. (2003) argue that measures such as funding often represent the resources available for producing research rather than the quantity or quality of research actually produced by an institution (p.126). Nonetheless they do acknowledge that there is a very high correlation between the level of resources expended or received by institutions and the number of publications produced (p.143). Kraak (2006) identified two further measures of research activity and these include:

- Number of staff with PhDs;
- Number of postgraduate students enrolled for Master's and Doctoral programmes.

The number of postgraduate students that researchers attract to conduct research under them is also viewed as a measure of productivity. The researcher characteristics that they exhibit are personality, co-operation, recognition by peers as scientists in a particular field, commitment to a profession and willingness to share expertise with students (Jacobs, 1998). Earlier studies of doctoral programmes in the United States noted that reputation for scholarly excellence can, in turn, result in an increased capacity for attracting research and high–ability graduate students to the programme (Dunbar and Lewis, 1998). Although reputation is closely linked to research performance, it is also affected by other factors such as seniority and length of service. De la Rey (1999) draws on the work of King (1994) who is of the belief that reputations are not just simple translations of research productivity, but are cultural constructs.

However, there remain serious challenges in measuring research performance. The wide variety of measures used in assessments indicate that perceived results across institutions may be misleading owing to the existence of an alternate form or measure of research productivity. Traditional performance measures are found to be inadequate for Research and Development organisations where the nature of the outputs is often long-term and intangible (Roy, Nagpaul, and Mohapatra, 2003). The choice of an appropriate research and development (R&D) measurement metric depends

on the user's needs for comprehensiveness of measurement, the type of R&D being measured and the amount of effort the user can allocate to it. "More comprehensive and balanced assessments of research excellence require ample information on resources and size of faculty and departments, as well as their cognitive and organisational heterogeneity" (Tijssen, 2003:99). Studies of research productivity remain part of a highly contested debate.

3.3. Concluding remarks

The literature review on leadership makes it evident that leadership is essentially still a contested concept. Over time the field has seen moves away from the more traditional, individualistic models of leadership, towards more collective, flexible approaches that are seen to be more inclusive of the diversity of societies. There is a stronger focus in the research literature on the value base of leadership practice and the processes that create and sustain social justice, empowerment and community. Global changes in the knowledge economy have meant that leadership of higher education has become more multi-layered and multi-faceted, with tensions evident between traditional academic roles and increasingly entrepreneurial demands. Most recent models of academic leadership emphasise the fact that leadership is influenced by social, institutional and individual factors.

The literature also indicated that studies of research productivity remain part of a contested debate. The main debate centres on the choice of indicators or measures of assessment that are used as counts for productivity. Although the number of journal articles is the most commonly used measure of research performance, it has been shown that this does not take account of the variation that exists across disciplinary domains. Funding, number of postgraduate students and significance of research contribution to the field are increasingly accepted measurements towards indications of research productivity. Since research productivity (via measures agreed on) is variously used as the basis for academic promotions, funding decisions, or research assessment exercises of individuals, teams or institutions, an

exploration of leadership that influences research productivity is considered important.

CHAPTER FOUR

Towards a model of research productivity and leadership: A theoretical framework

This research is located in the family of studies on research productivity. However, the main focus is on research leadership and its influence on research productivity; hence this chapter will look at the development of conceptual models of factors influencing research environments that include the role of leadership as a specific contributing factor. In this case the study aims to provide an exploratory view of leadership through the lens of research productivity. The challenge, however, remains in the fact that leadership is played out in complex, dynamic and changing social systems, and hence "not enough is known about exactly what makes an individual effective as a leader in the higher education context, and what in turn makes them ineffective" (Bryman, 2007:14). Traditional notions of leadership suggest that the impact of leaders on performance is direct, visible and tangible, assuming a linear causal linkage and suggests that a more useful approach to understanding a leader's influence is to distinguish between direct and indirect impact on organisational performance. He is cognisant of earlier work by Lord and Maher which is still applicable in thinking about leadership and performance viz. "that the range of mechanisms linked to successful outcomes tends to be diffuse, spread over time and more difficult to associate solely with the work of top leaders" (p.333).

The short preface highlights the challenges of enthusiastically linking performance in a changing context to the leadership practices of individual research leaders. This must be borne in mind as the chapter now moves on to outline a number of research efforts undertaken to discover the various factors that stimulate and maintain research productivity. For this study, where both leadership and research productivity are both contested fields (as shown by the previous chapter), the challenge is to understand the relational nature of these two aspects, possibly through a multilevel model of leadership that includes attention to the leaders' influence on research productivity.

4.1. Factors affecting research productivity

Early researchers suggested that “factors which determine the productivity of scientists are admittedly complex and perhaps not amenable to real scientific analysis” (Babu and Singh, 1998:309). However, the question of how to raise the productivity of individual scientists and groups has persisted for several decades. A number of studies on faculty research productivity identifies sets of facilitating factors and authors in the field (discussed individually below) have clustered these major factors that are seen to have an impact on research productivity. The majority of the early studies to explain research productivity are correlational: their tasks seem to have been to search for as many predictors as possible (Ramsden, 2004). The disparate studies vary widely in their study designs and populations, but generally try to answer the questions we face in our efforts as South African institutions and/or individual researchers: How do we develop productive research environments to build emerging and evolving new faculty and/or new disciplines? How do we maintain productive research environments in the face of constraints and mission redefinition? Although the studies cannot assume a linear causal link between factors, researchers have used these clusters to begin to identify models that may explain faculty research productivity? Some of these studies are outlined below in efforts to understand leadership influence on research productivity.

Most early work in the area of research productivity investigated the personal characteristics of a productive researcher. This body of work showed that leaders of productive research groups were highly research-oriented, internalised mission, kept research emphasis clear to the group and exhibited the behaviours one would expect of a leader with a participative governance style (Bland and Ruffin, 1992).

Given the research on personal characteristics discussed above, Bland and Ruffin (1992) tried to answer the question: ‘What environmental factors stimulate and maintain research productivity?” They carried out a review of books and articles on research productivity published between the mid-1960s

to 1990. This review revealed that a consistent set of 12 characteristics was found in research-conducive environments:

(1) Clear goals that serve a coordinating function;
(2) Research emphasis;
(3) Distinctive culture;
(4) Positive group climate;
(5) Assertive participative governance;
(6) Decentralised organisation;
(7) Frequent communication;
(8) Accessible resources;
(9) Sufficient size, age and diversity of the research group;
(10) Appropriate rewards;
(11) Concentration on recruitment and selection; and
(12) Leadership with research expertise and skill.

(Bland and Ruffin, 1992:385).

These factors were found to be interdependent and while the differential weights of the 12 individual characteristics were unclear, the authors felt that the role of leadership was clear: “without question, leadership is the most influential organisational variable our literature review uncovered. It is the one variable that affects all of the other organisational characteristics. This, in turn, influences research productivity” (p.392). Their findings indicated that “the leaders of productive research units must be perceived as highly skilled scientists, with the quality of the leader correlating highly with the group climate. The quality of the leader was measured by scientists’ ratings of the leader’s technical competence, knowledge of the field, personality and character, amount of work he/she does and level of support he/she gives to others’ research”(p.393). It is important to note the emphases that although twelve individual factors were identified, they did not function in research groups as isolated characteristics.

Ramsden (1994) carried out a survey of full-time staff working in 18 Australian universities, covering the areas of humanities, commerce, science, health science and engineering. Of particular interest were the joint contributions of individual/personal and structural factors as influences on research productivity. According to his model, research activity at aggregate level is influenced by the nature of the perceived environment. This aggregate activity influences individual output through individual activity. Results showed that the strongest individual correlates are "early interest in research, involvement in research activity and seniority of academic rank" (p.218). The strongest structural predictor of individual output is the academic's membership of a highly active research department (p.219). Ramsden's general model is shown in Figure 8 and it implies that an individual's academic research performance can be explained by a mixture of a relatively small number of personal and structural variables. An academic unit's average productivity is influenced by the type of institution in which it is situated, its subject area and the degree to which it provides a cooperatively managed environment. An important practical implication of Ramsden's study is that the unit of analysis is not the institution, but the department and the individual. These factors, however, all interrelate in a complex manner, with environmental factors more amenable to intervention than personal characteristics (p.224).

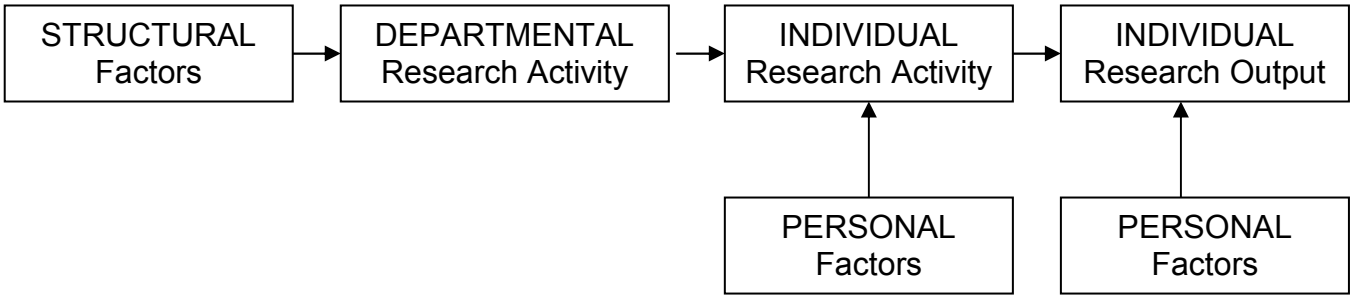


Figure 8: Model of Research Productivity (Ramsden, 1994:221)

The study suggested that "cooperative management structures, participative governance and collaborative leadership may be critical factors in enhancing research productivity across the system" although their research did not determine exactly how these influences operate (p.224).

In order to study the research productivity of scientists, Babu and Singh (1998) studied a cross section of scientists ranging from Fellows of the Indian National Science Academy to young agricultural scientists. Mailed questionnaires and personal interviews were used to collect the data. Their results identified eleven factors that are felt to have an influence on research productivity. These factors fell into two groups, viz. personal factors and organisational factors, with a dominance of personal factors. Factors in the personal group included persistence, initiative, intelligence, creativity, learning capability, concern for advancement and professional commitment. Organisational factors included resource adequacy, access to literature, stimulating leadership and external orientation (p.327). Stimulating and facilitative leadership in the organisation was found to be closely related to the 'urge for excellence'. They found that "those who had prestigious superiors were indeed more likely to be productive" (p.323).

The proposed model of research productivity of Dunbar and Lewis (1998) was based on a study of more than 3 600 research-doctoral programmes in the United States. The model is primarily associated with two categories of factors, viz. individual attributes (innate abilities and personal environmental factors) and institutional and departmental attributes (leadership, structure, culture and working conditions) (p.614). They found that factors which influenced productivity included programme and department size, being a private rather than public institution, the number of full professors and increased financial support.

The research literature in the medical field shows an increasing emphasis on developing and stimulating research activity. According to Holttrum and Goble (2006), an examination of low research activity in some medical disciplines suggests that this phenomenon is influenced by both the research training delivered on courses and the lack of infrastructure for research in practitioner settings (p.340). When the transfer of nursing education from hospital based to university–based education occurred, the nursing field found itself facing the challenge of insufficient numbers of aspiring research leaders and thus embarked on many programmes to build research competence with the

requirement to publish being inherent in the job description. (Green and Ridenour, 2004; Segrott, McIvor, and Green, 2006; McCarthy and Fitzpatrick, 2008). McCrathy and Frederick (2008) report that three key areas that they remain focused on in future nursing research development are: strong and visible leadership, developing research expertise and increasing the capacity of individuals. Programmes in fields like psychology have been characterised by the 'scientist-practitioner' model for the training of clinical psychologists. However, a growing concern has been the relative lack of research participation by the majority of trained doctoral clinical psychologists in the USA. Holttrum and Goble (2006) have suggested a more complete model of factors influencing clinical psychologists' research activity. The model has been strongly influenced by the theory of planned behaviour. Factors include vocational preferences, research training experience, practice context, research values, perceived norms in relation to doing research, research self-efficacy, professional identity and sex-role identity. The model suggests relationships between the various factors, but there is still a need to test these relationships.

The various studies in research productivity have not been able to assess the combined impact of features by studying all the features at one time in one institution. Nevertheless, it would appear that many of the diverse research studies discussed thus far support the conclusions of earlier work, that suggests that a successful research unit requires a particular set of personal characteristics in each of its researchers, a supportive set of organisational features, and leaders who are research-oriented and skilled in participatory governance (Bland and Ruffin,1992: 395).

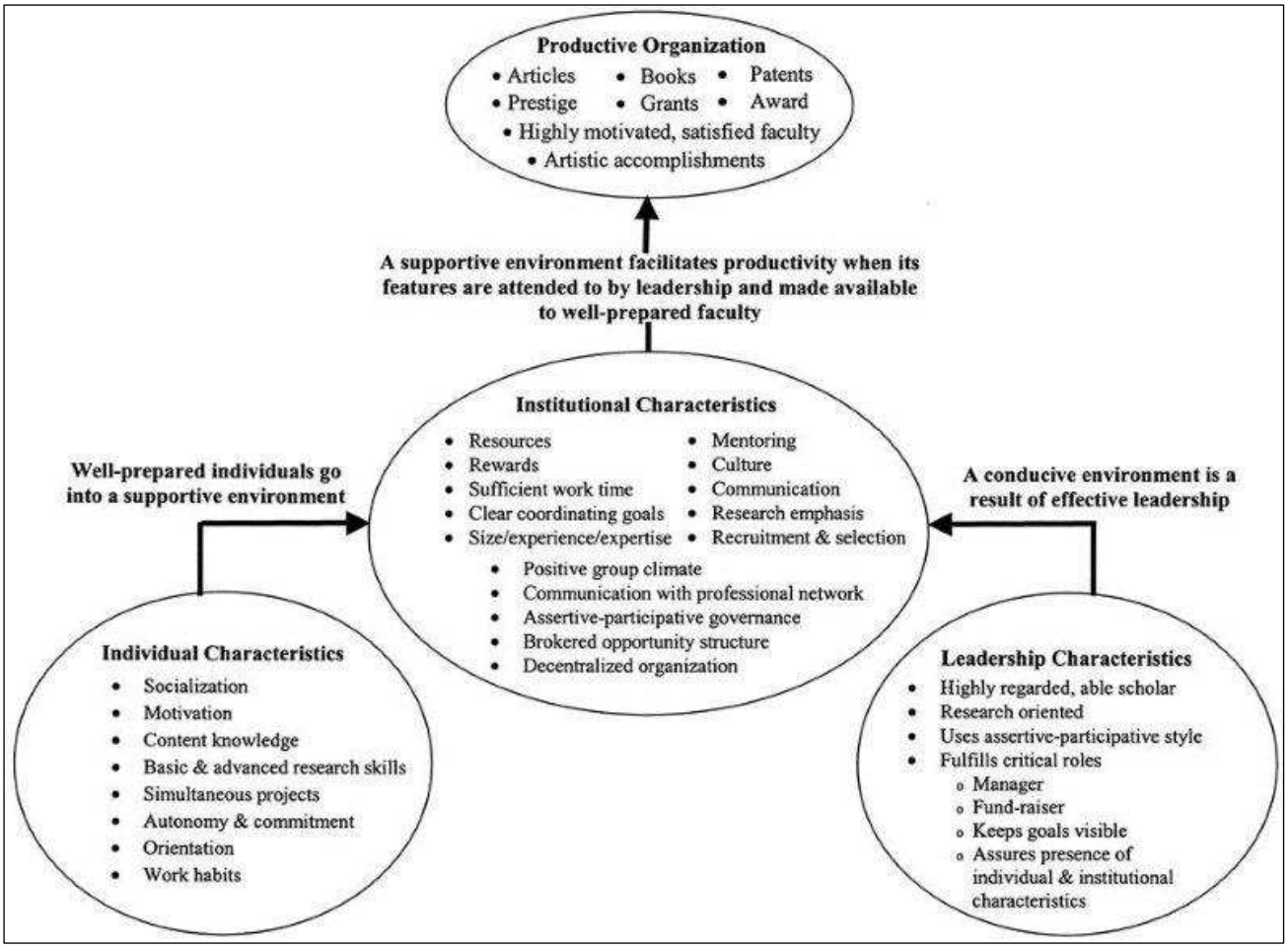
4.2. A Conceptual Framework

Bland, Wersal, Van Loy and Jaccot (2002) devised a model that built on the prior work of numerous studies in research productivity, such as those listed above and their own work, discussed earlier. They investigated "how the multiple characteristics thought to facilitate faculty research productivity

actually simultaneously affect faculty productivity" (p226). The Bland et al. model asserts that high research productivity is strongly associated with eight individual characteristics, fifteen institutional characteristics and four leadership characteristics (Bland, Center, Finstad, Risbey and Staples, 2005:227). They assessed the validity of this model in the context of a large US medical school through a survey of its 615 full time faculty members and confirmed the three broad groupings of individual, institutional and leadership as necessary for high levels of research productivity. For optimal productivity, *all* features in each component must be present and accessible. The model is displayed in Figure 9 below.

The model clearly identifies leadership as an important factor for research productivity. While it could be said that research could be undertaken without leadership, the underlying stance in this research study is that effective research leadership can improve research productivity. Similar views are also taken by Ball (2007) and Bushaway (2003). The argument that leadership contributes to research performance is even stronger today, given the climate of output-driven systems, precious financial resources, heightened competition and the continued serious skills shortage in the South African context.

Figure 9: Components of a productive research environment: the individual, environmental and leadership characteristics.



Source: (Bland et al. 2005: 227)

The model highlights that the core features never function in isolation, so a study of leadership will indirectly bring to the fore features that are both institutional and individual in nature. For optimal productivity, all features in each component must be present and accessible. The model also suggests a hierarchical order to these three sets of qualities. That is, the individual characteristics are essential, but their degree of influence is dependent upon how research conducive the faculty member's institution is. This confirms that an individual's research productivity is influenced by a combination of individual characteristics and institutional characteristics. The impact of the institution is mediated by the qualities and style of the leader. This also confirms the importance of research-oriented leaders. "The department head

keeps the core missions in front of faculty, makes the generation of dollars through research a high expectation and assures communication" (Bland et al., 2005:232). The leadership features in the model are highly correlated with the institutional features and according to the research around this model, "institutions that want most of their faculty, instead of a few stars, to be highly research productive, should emphasise institutional and leadership characteristics such as clear co-ordinating goals, research emphasis, communication and assertive, participative governance" (p233).

The leadership characteristics of the model are further detailed as follows:

1. **Scholar**: Highly regarded as a scholar; serves as a sponsor, mentor and peer model for other group members;
2. **Research-oriented:** Possesses a 'research orientation" – has internalised the group's research centred missions;
3. **Capably fulfils all critical leadership roles such as:**
   - Manager of people and resources;
   - Fund raiser;
   - Group advocate;
   - Keeps the group's mission and shared goals viable to all members;
   - Assures the presence of individual and institutional features that facilitate productivity.
4. **Participative leader**:
   - Uses an assertive, participative style of leadership;
   - Holds frequent meetings with clear objectives;
   - Creates formal mechanisms and sets expectations for all members to contribute to decision making;
   - Makes high quality information readily available to the group;
   - Vests ownership of projects with mentees and values their ideas.

"Taken together, the separate analyses of this study reinforce the perception that a highly research productive organisation is indeed a function of the integration and interplay of the individual and institutional features. The

successful synthesis of these features is highly dependent on effective leaders" (Bland et al., 2005:237).

The Bland et al. model described above is a model that can be a useful starting point for this study. It does provide a link between the two main indices of research leadership and research performance. However, some challenges remain for the use of such models and more especially in relation to the proposed research study. Traditional notions of leadership assume a linear causal link between leaders and performance. As pointed out by Middlehurst (2008), a major difficulty in many research studies in the leadership field however, has been isolating leadership from other variables, including size of organisation, individual leadership versus collective leadership, and leadership independent of other systems (such as human relations practices). In addition, as highlighted earlier in the literature review, leadership is 'relational' between leaders, followers, situation and context, and indeed between governance, management and administration. "There remains a need for those in leadership positions to discuss, negotiate and learn about the leadership that needs to be exercised in specific settings and circumstances" (Middlehurst, 2008:333). In many cases the models are developed outside the context of the research and hence care must be taken in 'importing' models directly for use into new contexts. The models represented in this chapter are international (mostly UK and USA) in both source and validation studies to date. To date there are no published South African or African models of research leadership and links to research performance against which to benchmark the international work. This research, rather than an exercise in strict verification of proposed models, seeks to more fully understand the leader and leadership in relation to research productivity and seeks an inductive, comprehensive approach for studying this relationship. In this aspect the research is generative as it is expected to produce new conceptions about research leadership in the South African context.

4.3. Concluding Remarks

This chapter outlined studies that have looked at the multiple factors affecting research productivity in academic environments. Leadership (as collaborative or participative governance) was found to be a critical factor in research productive environments, although few studies were able to say just how the influence was achieved. Bland et al. (2002) devised a model that illustrated that three broad groupings of characteristics are necessary for high levels of research productivity i.e. individual, institutional and leadership. The model suggests that all features in each component must be present and accessible and that there is a hierarchical order to these three sets of qualities. The model will be used as a starting point for the conceptual framework of this study, leaving space for the adaptation of the model to a South African context, should the research prove this necessary.

CHAPTER FIVE

Research Design and Methodology

The focus of this study is on research leadership and its influence on research performance in the context of the South African research enterprise. The aim is to understand successfully performing research leaders and how they influence the research performance of their units, teams or faculties. This involves an understanding of who these leaders are, what their own research development trajectories are, and what their research leadership views, values, assumptions and roles are in driving increased research performance. The research studies and resultant models discussed in the literature review point to the importance of research leadership in improving research productivity. However, as highlighted in the models discussed earlier, both research production and leadership are best thought of as contextual, with interaction between complex phenomena, so that simple cause and effect analysis is inappropriate for addressing the research questions. As such, a qualitative research study was selected as the most suitable research design. In this instance the research is informed by the use of a grounded theory approach with a case study design.

5.1 Grounded theory research

The goal in grounded theory research is to produce theories from data rather than from some apriori standpoint. The literature review above has shown that there are models that exist to link research productivity, leadership and other variables, for example institutional culture, in connected patterns that can explain possible influences in research productivity. Although these models are available, the choice of grounded theory for this research rests on a number of factors:

a) the models are incomplete since they do not address all leadership variables of interest to this research;

b) the models and samples were developed mainly on Western populations (mainly United States and United Kingdom) that did not necessarily consider the context of change imperatives and transformation in the research enterprise; and
c) a grounded theory approach can be used to explain research leadership from the point of view of the leaders in the South African context. We may then be able to compare with models from other countries and stimulate new dialogue through the data.

The term 'grounded theory' refers both to a method of inquiry as well as to the product of the inquiry. For the purposes of this research grounded theory is understood as a qualitative research design in which the inquirer generates a general explanation (theory) of a process, action or interaction, shaped by the views of a number of participants (Creswell, 2007). The grounded theory approach will be more strongly located in the constructivist views of Charmaz (2006) who challenges the positivist traditions of early analysis in grounded theory, and places more emphasis on the views, values, beliefs, feelings, assumptions and ideologies of individuals. It is also thought to uncover experiences with embedded, hidden networks, situations and relationships, and makes visible hierarchies of power, communication and opportunity (Creswell, 2007). This approach provides a flexible framework in which to investigate research leadership and its relationship to research performance. It will allow the investigation of how leaders interpret and enact their role in the production of research. The data will look to provide details of a qualitative nature such as discovering what occurs, the implications of what occurs and the relationships linking occurrences. According to Chamaaz, "grounded theory methods hold untapped potential for innovative studies at the organisational, societal and global levels of analysis" (p.514). The grounded theory analysis procedure is used in a multiple case study design.

5.2. Case study design

Since the focus is on broadening our understanding of the nature of research leadership and the range of leadership factors contributing to research performance in the research enterprise, the case study method is selected as an appropriate tool for this exploratory project. As Yin (2003) comments "you would use the case study approach because you deliberately wanted to cover the contextual conditions – believing that they might be highly pertinent to your phenomenon of study" (p.13). The position adopted in this research is that context has been crucial to leadership of the research enterprise, either in the university or in other research-performing organisations, and hence it is likely to shape the leadership of academics and influence their research productivity and shape the research experiences of their mentees. The case selection is crucial, since achieving the greatest understanding of the critical phenomena depends on choosing the case well.

All research leaders and post-graduate students who participated in the present research study in their bounded research context can be considered a case. Case studies were developed of ten effective research leaders from three higher education institutions in the South African research system. One case would be sufficient to provide an in-depth analysis of an individual leader, yet I decided to include 10 cases (study of 10 leaders and their identified mentees) to gather sufficient information to present a comprehensive picture through detailed descriptions. The richness of the data is enhanced by the diversity of research leadership across scientific disciplines, institutions or different types of institutions being addressed and by race and gender being considered.

In the multiple case design, it becomes necessary to undertake an in-case analysis, followed by a thematic analysis across the cases. Cross–case analysis enhances the generalisability of the findings to other similar settings and deepens the understanding and explanation. Even though cross-case analysis was undertaken, this was not intended to be a comparative study,

but the intention was rather to build from the individual portfolios and then to provide a broader understanding of research leadership in different contexts. Stake (in Denzin and Lincoln, 2005) raises a point that needs to be borne in mind for this research. He stresses that damage occurs when the commitment to generalise or to theorise runs so strong that a researcher's attention is drawn away from features that are important to understanding the case itself. There is thus tension between the reconciliation of the individual uniqueness of each case and the need for more general understanding of generic processes that occur across cases.

5.3. The sample

When qualitative fieldwork is carried out a purposive sample is drawn, variety is built in and opportunities for intensive study are acknowledged (Stake, 2005). This research study intentionally targeted and selected participants who could be identified as effective research leaders and could thus contribute to the development of a theory. The definition of research leadership used in this research study was the main criterion used in deciding whether a researcher was 'effective'. This type of non-probability sampling allowed for cases to be chosen that could purposefully inform an understanding of the research problem and central phenomenon in the study (Merriam, 2003; Creswell, 2007). A criticism of much leadership research is an "acknowledged weakness (and methodological challenge) that it is often a trawl of the views of the leaders not the led" (Smith and Adams, 2008:342). The sample of 'the led' in this research study was gradually informed by the final sample of research leaders. This is in keeping with the grounded theory approach where, theoretically, a researcher continues to select the sample as she/he develops the theory (Neuman, 2001).

5.3.1. Case selection

In this study research leadership is identified by the hallmarks of excellence in scholarly publication at the cutting edge of the discipline, extensive national and international research networks of high quality, personal scholarly

recognition and prestige among peers, leadership of quality Master's and doctoral programmes, early research mentorship, and the ability to garner research funding. Excellence shown in scholarly production was regarded as a major criterion. The criteria for the selection of effective research leaders for the study were formulated as follows:

5.3.1.1. Possession of an NRF rating

"Rating and rewarding individual researchers is an approach used internationally (e.g. in Mexico, Taiwan and New Zealand) in order to promote excellence, retain skills in the research environment and prevent brain drain" (Pouris, 2007:54). In South Africa, the National Research Foundation (NRF) is a government research funding agency. In its efforts to promote and safeguard research excellence, the NRF operates a rather unique, voluntary, researcher evaluation and rating system. It uses the system to nurture scholarship and grow the country's research capacity. According to the *NRF Facts and Figures* (2010) the evaluation and rating system reinforces the importance of internationally competitive research and stimulates healthy competition between researchers and research institutions: "It is a valuable tool for benchmarking the quality of our researchers and our entire research system against the best in the world" (p.2).

The evaluation and rating of researches in the natural sciences and engineering was introduced in 1984. The objective of the system was to support self-initiated research and to encourage the development of a new generation of researchers. In the first year of evaluation and rating there were only 508 rated researchers, all of whom were from the natural sciences and engineering. The NRF rating system was extended to researchers in the social sciences and humanities in 2002 after which the number of rated researchers increased to 1267. In 2010, 2144 researchers of approximately 16000 staff members in academic and related positions in higher education institutions in South Africa held valid NRF ratings. Across all categories, most rated scholars were in health sciences, followed by animal and veterinary sciences, engineering, mathematics and physics, with two thirds of all these

rated researchers concentrated in five South African Universities – Cape Town, Stellenbosch, Pretoria, the Witwatersrand and KwaZulu- Natal (NRF, 2010)

The NRF rating system is a benchmarking mechanism based on peer review of recent research outputs and the impact of the work of individual researchers. The system rates researchers across 22 subject fields. Peer reviewers appraise applicants on two criteria:

- The quality of the research-based outputs over the previous seven years as well as the impact of the applicant's work in his/her field and how it has impacted on adjacent fields.
- An estimation of the applicant's standing as a researcher in the field in terms of both a South African and international perspective.

The rating system provides for **A** (leading international scholars), **B** (considerable international recognition) and **C** (established with sustained research records) categories and sub-categories. Young research stars (**P** category) who demonstrated exceptional potential in their published doctoral or research work and are considered likely to become future leaders in their fields are also recognised. An additional category was created for those who had entered the research system late and who were deemed capable of establishing themselves within a 5 year period (**L** category). In 2009 the elite "A" category comprised just 81 researchers from among the 2144 NRF-rated researchers. The majority of the A rated researchers are from three universities – Cape Town, Stellenbosch and Witwatersrand, with the highest number of A-rated academics working in animal and veterinary sciences. In the social sciences and humanities, the highest number of A-rated academics came from law and literary studies, language and linguistics. More than 50% of all rated researchers were in the C rating category (defined as established researchers). Black researchers comprised 17% of the total pool of rated researchers, and by 2009 nearly one third of all rated researchers in South African higher education institutions were women. Despite these increases,

the NRF acknowledges that the process of transforming the community of rated researchers is frustratingly slow (NRF, 2010).

The rating system has endured since its introduction but there has been divergence from the original conception, especially in relation to the link between rating category and funding levels. The 'liberty' allowed academic researchers before 2000 was best epitomised by the original philosophy of the rating system: provide funds with the minimum conditions and the good researcher would produce quality research. "Despite the fact that baseline incentive funding to all rated researchers accounts for only 10% of the NRF's total annual research investment (around R100million a year), rated researchers produce some 70% of the research students funded by the NRF, as well as 70% of the ISI research outputs generated via NRF funding" (NRF, 2010:2).

However, it is acknowledged that the NRF rating system has been the subject of much debate, discussion and criticism over the years. Many of these criticisms relate to its current ineffective link to funding levels, the perceived subjective nature of terms used in the rating categories, challenges with regard to the review of multidisciplinary work, the administrative burden, and its 'unofficial' use as a performance management tool by many higher education institutions (Cherry, 2008; Lombard, 2007). In addition to the above factors, the 2007 review of the NRF rating and evaluation system by Higher Education South Africa (HESA) also highlighted the following key recommendations:

- The focus on excellence must be sharpened;
- Accurate information about the rating system must be more widely disseminated;
- Administrative issues such as the complexity of the application process and the lack of transparency and format in which feedback is given to applicants must be addressed.

Despite the criticisms above and the acknowledgement that the majority of researchers in higher education are not rated, its choice as one of the criteria for this research study that focuses on research leadership of individual researchers in the South African system is justified because it is based on a number of considerations, some of which have emerged from the review of the NRF system of evaluation and rating (NRF, 2008). These considerations include the following:

a) It is an available peer reviewed assessment of individual scholarly production in the South African context;
b) The rating system has a degree of credibility despite some criticism, scepticism and varied perceptions;
c) Substantiated data indicate a positive relationship between rating and research productivity;
d) Evidence suggests that the number of rated researchers at universities has become one of the indicators of research excellence of universities;
e) Evidence suggests that the rating system has had a positive effect on the careers of individual researchers in institutions that use it.
f) In terms of data collection, the database of rated researchers is available from the NRF (www.nrf.ac.za.)

5.3.1.2. 'Expert' advice or judgemental sampling

In 2009 there were approximately 2144 rated researchers (of approximately 16 000 staff members in academic and related positions in South African higher education institutions) on the NRF database (NRF, 2010:6). Hence it can be seen that the sample selected for the present research, although a small percentage overall, is still too large to be refined in accordance with the definition used in this research. Hence, further sampling (beyond the NRF rating) made use of 'judgement experts' in selecting research leaders from the initial database of rated researchers. Institutional academic leaders at the level of Deputy Vice Chancellor (DVC) Research (or equivalent in other research enterprises) were contacted by email with a formal request for permission to undertake the research study with researchers from their

institutions and a request for their offices to identify the six most 'effective research leaders' (rated researchers only) of the institution. They were asked to make their recommendations taking the following items into consideration:

- The definition of research leadership used in the research study;
- Individuals had to be NRF-rated staff members of the institution;
- Individuals could be selected from natural sciences, social sciences and humanities.

In addition to the above generic items, the judgement experts were supplied with a list of additional indictors that would be useful in guiding their recommendations. The research and leadership indicators they were asked to consider included the following:

a) excellence in scholarly production at the cutting edge of the field;
b) personal scholarly recognition and prestige among peers;
c) leadership and/or teaching of quality postgraduate programmes;
d) mentorship of early career researchers
e) research or scholarly awards;
f) fund raising;
g) contribution to management in support of research excellence;
h) innovation in research performance;
i) appointment to position of research chair or centre of excellence;
j) selection to academy of sciences;
k) any other indicators deemed relevant to research leadership and performance.

Unfortunately this selection process by the judgement experts did not prove to be as simple as outlined above and face-to face-meetings were subsequently held at each institution with either the DVC Research or her/his designated substitute. In order to contextualise the sampling process, the issues that arose for discussion and/or consideration during this phase are highlighted below:

Ethical considerations:

Institutions were concerned about the ethical procedures and the protection of their researchers, especially as regards voluntary participation and confidentiality. They were assured that the study had received ethical clearance from the University of Pretoria. Two institutions first consulted their own ethics committees before granting permission (this caused some delays in finalising samples); two institutions gave permission without further consultation in their own ethics committees and one institution requested the submission of a detailed application to their own ethics committee before they would consider granting permission. In light of the time constraints in finalising a sample, the research supervisor wrote directly to the latter institution with the assurance that the institutional ethics procedure that had been followed was efficacious and reliable, and requested the new ethics submission to be waived. However, the institution was not willing to consider this request. In the interests of time and the completion of the study the researcher chose to withdraw this institution from the initial list of five institutions in Gauteng and proceeded with the remaining four institutions. These four institutions included three universities and one research performing science council. The *National R&D Survey* (2006/7) shows that science councils accounted for 17.3% of total national expenditure on R&D and employed 23% of the total full time equivalent (FTE) R&D workforce (Mouton and Gevers, 2009). In 2008 there were three A-rated researches in science councils, thus science councils were included as part of the sampling institutions.

Use of NRF-rated researchers:

It was clear from the discussions that opinions about the NRF rating system differed across institutions, and were similar to some of the criticisms highlighted earlier. In the science council, the sample was very small simply because the majority of researchers in that council were not rated. A senior member of one research office in the higher education institution cluster was taken aback by the 'limitation' (his choice of word) of using only rated researchers. Although the reasons for that criterion for this research study were discussed, the final list submitted contained names of researchers who were not rated. These recommended researchers could not be considered for

the sample that meant that there was much negotiation until a list of recommended rated researchers could be obtained from the institution.

Recommended researchers - 'system reflections'.

The first draft lists of institutionally recommended research leaders submitted by the four institutions did not include any black females and only a few black male rated researchers. In 2010 black rated researchers made up 17% of the total number of rated researchers and rated female researchers made up approximately 33% of the total number of rated researchers (NRF, 2010). Each of the institutions was contacted again and further recommendations were obtained. It is interesting to note that those names were not the first recommendations. This indicates that using rating as a selection criterion was especially limiting. However, it also points to the broader issues of gender and equity that still plague the South African research system, even though the stringent peer review system of the NRF rating process is intended to nurture scholarship and grow the country's research capacity.

5.3.1.3. Supporting research data

It must be noted that the definition of research leadership used in this research is more than an assessment of individual scholarly production. The rating system does not reveal data about other factors that are considered important within the definition. These include postgraduate training and mentorship, individuals' management of teams, innovation, multi-disciplinary work, management capabilities, research funding obtained, and so on. Data on postgraduate training, teamwork and research funding was obtained from relevant databases of the NRF and the central research offices at all research enterprises. This data was mapped against short-listed candidates identified by institutions. A final sample that informed the study was selected by the researcher. Considerations included the richness of the diversity of the sample as well as practical concerns such as reasonable accessibility (geographical, financial) for the researcher.

5.3.1.4. Geographic location

At the time of conducting this research the researcher was based in Pretoria, Gauteng and accessibility to the research participants was a major consideration. Hence the decision was taken to limit selection to research institutions and or research enterprises in Gauteng. Given the fact that the target sample consisted of rated researches, the original participants were selected from a total of five Gauteng institutions, viz. four higher education institutions and at least one research-performing science council. The sample of higher education institutions excluded all universities of technology since they were considered to be working towards becoming fully research-led institutions. All institutions selected had a clearly-stated research mission with two of the universities being part of the established 'Big Five' research universities of South Africa. One university was a distance learning institution and the remaining university was a merged institution (a university merged with a technikon). This sample of five public funded institutions provided a diverse institutional mix from which the research leaders were selected.

5.4. Participants in the study

- **Researcher**

The researcher is a senior management employee of the National Research Foundation, but not currently directly involved in the evaluation and rating of researchers or linked in any way to the grant funding of research programmes. There is contact with some researchers in the current portfolio but mostly through programmes or projects of science communication rather than research funding. The researcher previously managed a research focus area and worked with many different researchers. Thus she is familiar with the institutions used in the sample, as well as many of the aspects of research management in higher education such as research programmes, assessment of research proposals, student support and development, capacity building interventions and grant funding.

This experience and understanding of the research community supported the primary interview activity with research leaders. The researchers were aware

that the researcher worked for the NRF and since many of them had received research or student grants at some stage, there was some acceptance of and familiarity with the dynamics of the research funding environment. This facilitated both the securing of the interviews and the discussions that followed. In one or two instances problems experienced with the NRF were raised in the discussions (mostly with the rating system), but these were quickly followed by a wry smile and a comment that 'you are probably not the one I should be saying this too'.

At one level the researcher was a representative of NRF senior management, and at another level she was a doctoral student collecting data. There was self-awareness of how these two roles juxtaposed throughout the interview process, but there did not seem to be any sense of mistrust of the researcher or her position in the NRF that impeded the research interviews in any way. Positive email follow-up communication was received from all except one research leader who did not offer any feedback at all.

- **Research leaders**

Each of the final four participating institutions submitted a list of recommended rated research leaders. The number of potential respondents across institutions varied as the number of rated researchers across disciplines varied in each institution. In three cases, the submitted list far exceeded the initial request for at least six. This was helpful, as these lists were used to finalise a sample that included considerations of institution, discipline, as well as race and gender. The original list consisted of 12 selected research leaders and allowed for possible non-availability or drop out along the way. Each listed researcher from this group of 12 was sent a formal invitation to participate, providing them with the background information on the research study and informing them that their institutions had recommended them. Two research leaders declined the invitation to participate due to work commitments. The remaining ten research leaders agreed to participate in the interviews. Much time was spent negotiating times for the interviews to take place in their busy schedules. Eventually it took nearly four months, from August to November 2009, to complete most of the

interviews. The last interview was held in February 2010 when the participant returned from an overseas sabbatical.

The summary of biographical data presented in the tables below (Tables 7.1 to 7.4) indicates the composition of the final sample of research leaders while being mindful of confidentiality. The extensive combined research leadership inspired confidence in the kind of information that would be obtained from this grouping.

Summary of Research Leader Information collected at time of research.

Table 7.1: Age, Race and Gender

30-40 YRS	**41-50YRS**	**51-60YRS**	**61+ YRS**
1	3	5	1
male	2 females 1 male	2 females 3 males	female
black	black female white male, white female,	2 white females 2 black males 1white male	black

Table 7.2: NRF rating categories

A category	**B category**	**C category**	**TOTAL**
4	4	2	**10**
2 males (1B) 2 females(W)	2 males (1B) 2 female (1B)	1 male (B) 1 female(B)	3 B males 2 W males 3 W females 2 B females

Table 7.3: Disciplinary Base (s) and primary research areas

NATURAL SCIENCE AND ENGINEERING		
	Engineering	2
	Biological sciences	3
TOTAL		**5**
SOCIAL SCIENCES AND HUMANITIES		
	Health	1
	Business Administration and management	1
	Economics	1
	Education	1
	Law	1
TOTAL		**5**

Table 7.4: Institutional positions (Highest)

POSITION		**RATINGS**	**NOTES**
Professor in a department	2	A, C	A -rated participant in this group had previously been a Head of Department for 8yrs and had recently moved institutions
Professor and Director of Research Centre/Research Chair/ Centre of Excellence	5	2A, 3B	
Professor and Research Director	1	A	Previous Head of Department

Professor and Executive Dean	1	C	Previous Head of Research Chair

- **Research 'followers' or mentees**

This group of participants was selected as the study progressed. They were identified in order to provide the perspective of those that had been "led" by the identified research leaders. Their role is important to ensure that the research data are not just self-reported leadership stories, but that they should be substantiated or contested by the views of those who have experienced the leadership, especially its influence on their own research productivity and development. A snowball selection process was used to select participants who had been led by the research leaders but who occupied their own 'positions of influence' in the sector. After each interview the participant was requested to provide a list of post-graduate students who could be contacted for inclusion in the research study. The request was for names of doctoral and post doctoral students, but Table 8 below illustrates that a cross section of supervised degrees was submitted. In eight cases the participants sent lists of names per email the next day, while in the other two cases they provided the researcher with a list of students from an available list on the day of the interview.

Thirty completed mentee questionnaires were finally analysed. This group comprised 14 male and 16 female respondents, 20 of whom were South African and ten were foreign students from Africa, the USA and Germany. All the degrees had been supervised by the leaders and completed during the period 2000–2009, with at least four respondents involved in ongoing doctoral studies in 2010. An analysis of completed questionnaires with regard to degrees supervised and 'follow-on' career paths is summarised in the table below.

Table 8: Follow-on career paths of mentees

Mentee Degrees supervised by leaders	**Current positions of mentee respondents**				
	Ongoing PhD	**Post Docs**	**Research positions (HEI)**	**Private Practice/ Industry**	**Government**
4 x Masters Degrees	4				
1xPost doctoral degree			1		
25 x PhD		1	16	6	2

In this sample it is noted that 83% of those that had completed doctoral degrees with the research leaders progressed to positions in the research sector, mostly universities. Those in government positions were assigned to research or legal (law candidates) positions in their units. Those in private practice or the industry category included engineers, health professionals and business management professionals. This contextualisation refers to building research capacity and transforming the research profile of the national system of innovation in South Africa and is further discussed in the analysis of the results

5.5. Data Collection strategies and instruments

Typically in grounded theory research, where the aim is to generate a theory using constant comparative analysis throughout the research process, interviews are primarily the main data collection activity (Creswell, 2007). In case study research, interviews are supported further by relevant documents and records. The main data collection methods for the present study were interviews, questionnaires and document analysis.

- **Interviews**

Face-to-face, semi-structured interviews were conducted with each of the research leaders. This included a minimum of at least one interview each, with interview time ranging between one and a half and three hours each. One of the most challenging aspects of the data collection process was the delay in setting up the interviews in the busy schedules of the participants. Despite this, the fact that interviews were secured with ten consenting research leaders was considered to be a major accomplishment given the context of their daily commitments. One respondent was overseas at the time most of the interviews were conducted and agreed to grant an interview when he returned to South Africa six months later. Because participation was important the researcher agreed to this request since it allowed her the opportunity to continue with parallel processes in the interim. In other cases, interview appointments had to be rescheduled several times owing to unplanned occurrences such as emergency calls to meetings and illness. The fact that all the interviews were held at the research leaders' institutions, was helpful in creating a context and observing the hectic nature of many of their schedules as the interviews were often interrupted by knocks on the door from staff and or students, or telephone calls that had to be attended to (with apologies).

All interviews were audio recorded and later transcribed. The discussions were aided by an interview schedule containing a list of themes and broad questions that sought to understand the development of the participant's research career. Previous studies of leadership development have used retrospective accounts of leaders' lives in written biographies or oral interviews in order to discover events and experiences that had contributed to their development (Shamir Dayan-Horesch, and Adler, 2005 p.16). The focus of the discussion with the research leaders in this study was on tracing the development of research leadership according to the criteria used in this study. Initial broad themes included:

a) background details related to research experience or research career trajectory;

b) views about research and their involvement in research;
c) opinions and experiences of research leadership;
d) mentoring, building capacity and research productivity.

The interview protocol was piloted with an executive colleague who had previously been an Acting Deputy Vice Chancellor (Academic) with experience in research publication, doctoral student supervision and roles in academic journal publication. Although not rated, this colleagues' academic experience, administrative and strategic involvement in the NRF rating system, willingness to be interviewed and accessibility provided a sound platform for the pilot. The introductory email, invitation to participate, letter of consent, as well as interview questions were piloted during this first interview. The pilot interview lasted for one hour and forty five and was audio recorded while the researcher made extensive hand written notes. The questions were found to be appropriate, but the researcher felt that she had rushed through them in an effort to make sure that all questions were covered during the interview. This made the interview a limited question-and-answer session and the researcher realised that the answers to some questions over-lapped. Thus the researcher was able to reconsider her approach and decided to concentrate on important general questions and thus introduce flexibility to the sequencing of questions. This allowed for a better flow of conversation and the opportunity to probe for more information.

At first, many of the participants were not comfortable discussing themselves or had not considered their research trajectories in a structured manner. The role modelling function of leadership is very important and "is performed not only by leaders exhibiting certain behaviours in front of followers, but also, sometimes even primarily, by the traits and behaviours reflected in the stories leaders tell about themselves"(Shamir et al., 2005:15). The discussions often veered towards opinions about broader institutional or system issues and the researcher had to redirect the conversation with questions such as 'but what about you, Professor, what about your role, or position, or influence?'. This was especially evident in some statements made after the interviews, for example: 'I haven't seriously stood back and thought about all this stuff

before' and 'I hope you found something useful in all of that. I feel like I've been sharing my history with a friend'. The biographical data consulted as part of the purposeful sampling revealed that many awards and research recognitions had been bestowed on the participants, and yet unless specific questions about this aspect were asked, very few offered the information. In some cases they seemed almost embarrassed to be reminded of these things. Nevertheless, generally speaking, the researcher found that the telling of the research stories was similar to what Reddy (2000) found when investigating the life histories of black South African scientists. According to Reddy, each of the participants recounted their stories differently. Throughout the story telling, they all had different points of emphases, different ways of telling, and different amounts of reflection.

When the findings were interrogated it was evident that the initial interview questions did not address the issue of research leadership as an agent of and for the transformation of higher education sufficiently. The data collected from the interviews addressed many issues of transformation, and while some aspects could be surmised from their discussions, it was felt that the participants needed to be given another opportunity to answer further questions. As a result, each participant was contacted via email and requested to answer two additional questions with regard to their research development in an apartheid context as well as their personal leadership contributions to transformation in a post-apartheid South Africa. Five of the ten participants provided email responses to the two questions posed. In some cases their responses verified earlier interview data, while in others new information allowed for more informed interpretations of the earlier findings.

- **Questionnaires**

The original research proposal suggested that focus group interviews would be held with identified past doctoral or postdoctoral students who had been led by the participants. The aim was to create focus groups of two members each (per research leader), with each interview lasting approximately one and a half hours. The discussions would be structured to provide information

about the student-participants' views and experience of the research leadership provided by the identified research leaders. However, after the first interview with a research leader, the researcher realised that this would prove practically impossible since the list of past doctoral students indicated that many were scattered at institutions throughout the country and some were even at institutions abroad. Consequently, after discussion with the supervisor, the researcher decided to compile an electronic questionnaire that could be distributed by email.

At each interview the research leader was asked to provide the names of three to five doctoral and or post-doctoral students who had experienced their supervision and mentorship and who had moved on to fill niche areas of their own. Each identified mentee was sent an electronic letter of invitation to participate in the study, explaining that their participation was based on their research experiences when working with the supervisors. Each mentee who had indicated a willingness to participate in the study was sent an electronic questionnaire for completion and return. All sent and returned dates were tracked with the use of a spreadsheet. The tracking process required frequent follow-up email requests with what came to be termed as 'gentle nagging' in ongoing correspondence with the mentees over many months. For the most part, those who returned completed questionnaires did so in a very positive spirit. The response rate for returned questionnaires was 64%. An analysis of all questionnaires sent and returned is summarised in Table 9 below.

Table 9: Mentee questionnaire information

Total No of mentees contacted by email	NIL response	Number who responded, but DECLINED to participate	Number who indicated that they were willing to participate but did not return questionnaires	Number who returned completed questionnaires
47	**7**	**2**	**8**	**30**

- **Document collection**

The research leaders were asked to provide a copy of their most current curriculum vitae. This was used to substantiate some details of the personal stories and research trajectories that formed part of the interview protocol. Copies of the research records were obtained (with permission) from the NRF database, as well as information about grant funding and student support. Any research data not captured through NRF support was requested directly from the participant or institutional research office. Where applicable personal web pages, institutional web sites, annual research reports, special research or institutional commendations or awards as well as any reports in print media were sourced and examined.

5.6. Data Analysis

The method used to analyse the data consisted of simultaneous data collection and analysis, with each focussing and informing the other throughout the process. Each interview was recorded using a suitable MP3 recording device. Each audio interview was downloaded onto the researcher's computer and transcribed as a hand written verbatim version. While this process was slow it provided the opportunity to listen very carefully to the interview.

The researcher transferred the hand-written versions to a typed format from where she organised the verbatim data to correspond with the questions. For instance there were times where the conversations had digressed from the main issue. This repeated interaction with the data was very helpful in developing a sense of emerging issues or even ideas before starting any detailed content analysis. The final transcribed copy was sent to each of the participants for comment. Those who responded to the request made minor corrections of formatting, names, spelling and so on. None of them disputed the transcription as provided. One participant was concerned about anonymity since it was felt that some of the opinions expressed in the interview had the potential to be viewed in a negative light by either the home institution or the NRF. It was agreed that the said comments would not be deleted since they were an honest reflection of the situation at the time, but

that anonymity would be assured as far as possible through the use of pseudonyms. In light of the fact that the South African research community is comparatively small, some disciplinary views may allow searches and endeavours to identify participants. However, the researcher did not regard this as a means for possible malicious targeting.

Since this research study is a multiple case study of different research leaders, both in-case analysis and cross-case analysis were carried out to build a rich portrait of each individual research leader and to make abstractions across cases. Grounded theory is a comparative method in which a researcher compares data with data, data with categories and category with category (Chamaz, 2005). A researcher attempts to see processes and outcomes that occur across cases to understand how they were qualified by local conditions and this develops more sophisticated descriptions and powerful explanations (Miles and Huberman, 1994;172). In this research semi-structured questions were used in the interviews while most of the questions in the mentee questionnaires were open-ended. Because of this, the data was initially interrogated through thematic analysis, a technique in which themes and patterns are identified from the responses reflecting the participant's experiences.

5.6.1. Computer Aided Qualitative Data Analysis

Having transcribed the ten interviews and typed them herself, the researcher had ample opportunity to listen to the interviews several times and read the typed transcripts. This allowed for deep immersion in the data, so that a sense of emerging themes across the interviews gradually developed. As Stake advises (in Denzin and Lincoln, 2005), "Place your best intellect into the thick of what is going on. The brain is ostensibly observational, but more critically, it is reflective" (p.449). When data gained from casework is considered, sometimes it is pre-coded and continuously interpreted. The early stage of the present research used a primary form of inductive logic where the researcher worked from the text and recognised the emergence of some common themes. As this provided a superficial sense of data emerging, the researcher proceeded to the use of a software package to aid code-based

analysis. The analysis was aimed at organising, describing and interpreting the data by identifying patterns or themes and constructing a framework through which this essence could be communicated meaningfully.

Atlas.ti was used for the analysis of both the interviews and the mentee questionnaires. Atlas.ti allows for the analysis of textual, graphical and audio data (Scientific Software Development, 2004). This software tool allows one to organise data in terms of three levels of coding suggested for grounded theory research. These include open coding (developing categories of information), axial coding (interconnecting the categories) and selective coding (building a story that connects the categories) (Creswell, 2007).

Each interview was assigned codes as they emerged throughout the document. The line-by-line coding enabled the researcher to be involved in a close study of the data and to lay the foundation for its synthesis. The same process of assigning codes was applied to the mentee questionnaires and new sets of codes emerged in this data set. Codes were thus generated through an inductive process and allocated to each unit of text. The inductive approach works well when the terrain is unfamiliar and/or complex and the intent is exploratory or descriptive. The codes match fairly well to the clusters of questions that were answered in the interviews and in the responses to the questionnaires. Sometimes a new code was developed during analysis of one of the later interviews, and the researcher was able to go back and take a fresh look at earlier interviews. This is in line with Chamaz's work where she reminds us that "in working with grounded theory the researcher can give data multiple readings and renderings" (p.517).

Once coding was completed, codes were clustered together in meaningful groups to generate families or themes. The groups were collapsed in some cases where the overlap became evident as the units were analysed in greater depth. The software package allowed numerous iterations of organising the data, including all codes for participant interviews or mentee data, as well as linking mentee data to each of the relevant participant research leaders. Atlas.ti was thus able to provide an easily accessible audit

trail (See Appendix H). The detailed output documents generated for each selected data combination were then used to guide the in-depth analysis that follows in the next chapter.

5.7. Towards validity and reliability

Even though it is acknowledged that no observations or interpretations are repeatable, one still needs to clarify meaning by identifying the different ways in which a case is seen and to present a holistic interpretation of what is happening (Stake, 2005; Merriam, 1998). This allows one to lay bare any researcher bias that might mean that the researcher brings her own assumptions and worldview to the research and its analysis. Earlier in this chapter the role of the researcher is outlined and the awareness highlighted of how her roles as a senior member of a research funding agency (NRF) and a doctoral student were juxtaposed throughout the interview process. Her experience of the research funding environment and the institutions in which the participants were situated, as well as her proximity to one of the major government departments involved in research, all had the potential to encroach on the research process and on her interpretations of the data. She was acutely aware of her own potential biases and she kept this awareness in the forefront especially during the interview process and when she was engaged in repeated data 'renderings' in pursuit of validity.

The focus of qualitative research is inherently on multi-methods and objective reality cannot be captured (Denzin and Lincoln, 2005). The combination of multiple methodological practices, empirical materials, perspectives and observers in a single study is then best understood as a strategy that adds rigour, breadth, complexity, richness and depth to any inquiry. In this research study the researcher specifically set out to counter the self-report data of interviews by combining them with mentee reflections of their experiences of research leadership. This was also supported by empirical research data such as research funding, publications, student training and a range of diverse indicators. In this case the leadership experience is viewed from different points of view. This supports the view of triangulation as the

simultaneous display of multiple-refracted realities where readers and audiences are invited to explore competing visions of the context (Denzin and Lincoln, 2005).

With regard to internal validity, the multi-staged process of selection of the research leaders is reiterated. Given the comprehensive indicators used for research leaders, there is a level of confidence that their combined research experience and current research leadership, as outlined, enabled them to comment accurately and with authority on their research experiences within the wider system of research and innovation in South Africa and abroad. This confidence in case selection contributes towards the 'trustworthiness' of the data that has emerged.

Ensuring that data are accurate is a key principle of qualitative research studies. In this study all data transcribed from interviews was sent to all the research leaders for consideration and to identify any technical errors in the reporting of the conversations, as well for verification of the accuracy of their perceptions and or attitudes expressed in the interviews. A similar process of data checking or evaluation was used to include peer evaluation in the study. The researcher works in an environment with easy access to colleagues experienced in higher education management and research management. This enabled her to ask colleagues to comment on tools used (interview protocols and software) as well as on the findings as they emerged (Merriam, 1998).

5.8. Limitations of the Study

If we begin from the worldview of qualitative enquiry as discussed by Stake (2005), where "there are multiple constructions of reality, where the researcher is the primary instrument of data collection and analysis and where understanding and meaning are of paramount importance", then questions will always be raised of both the researcher and for those being studied. Thus it is important to be mindful of the limitations that the research study faces and these are identified as follows:

1. Case studies based on a sample of 10 research leaders, can at best be considered as a snapshot of personal responses from the research participants involved in the study.

2. Qualitative research is a situated activity and the case to be studied is a complex entity located in a milieu or situation embedded in a number of contexts or backgrounds.

In this research study the identified research leaders' experiences were located in a changing and transforming research context of higher education over a period of time and hence the results will not be able to be generalised to other researchers, institutions and or across scientific disciplines.

There are two main limitations that relate to the sample selection in this study. Firstly, the decision to use only rated researchers to identify the first phase sample of research leaders can be viewed as a limitation since this criterion then excludes the majority of researchers in South African higher education institutions who are not rated. The reasons for this particular choice were discussed in the methodology section and relate mostly to choices of criteria to identify a pool of acknowledged researches where that independent acknowledgement relates strongly to research scholarship and performance. The use of rated researchers for this sample does not in any way imply that non-rated researchers are not research leaders as per the definition used in this research study.

Secondly, the final sample of institutions selected was influenced by decisions of available time and resources as well as accessibility of participants to the researcher who is in full time employment in Pretoria/Tshwane, Gauteng. In the final sample all 10, participants were employed across only three higher education institutions in a single province in South Africa i.e. Gauteng. All Universities of Technology, even if in Gauteng, were excluded from the sample of institutions as they were felt to be developing research institutions.

The study is centred chiefly on interviews with the research leaders. This data can be considered as largely self-report data, as the research does not include observations of the leaders in their professional environments over a prolonged period of time. The literature has acknowledged this weakness of leadership research and thus questionnaire survey responses from mentees who had studied or worked under the guidance of the identified leaders are included to provide a 'mirror' to the self-report data.

Kvale (2006) states that the interview is actually a hierarchical relationship with an asymmetrical power distribution between the interviewer and interviewee. His reference is mostly to the interviewer as being in the 'power position' that rules the interview. However, there is a possibility that this power dynamic may have existed in this research context, but was assigned differently between interviewee and interviewer. Unequal power dynamics may interfere with the context where a PhD student without a research record interviews research leaders about issues of research productivity, where research productivity is itself still a contested field (see section 5.3.1. p. 33). The researcher would need to establish a rapport with the participants so that they would be encouraged to respond openly and honestly within the limits of the research study. The researcher feels that this rapport was created and that the interviews were conducted in as open an environment as possible for the context. Some researchers provided feedback about the 'conversational tone' and ease of talking once they 'got started'. An additional factor that must be reported is that of the role of the researcher as a member of staff of the funding agency from which many of the participants had received research grants. It was known that she was an employee of the NRF, and this was acknowledged in various parts of some discussions as illustrated in earlier parts of this chapter. These were senior academics who felt comfortable with this fact and the researcher found that her association with the NRF did not preclude or prevent them from offering strong opinions about issues related to the NRF e.g. rating, funding levels and policy issues. These are captured in the coding category of the data analysis and hence my opinion that this factor of being an NRF employee did not hinder the interview process.

5.9. Ethical considerations

Qualitative researchers usually face many ethical issues that surface during data collection in the field and in the analysis and dissemination of information. In this study ten research leaders were interviewed and the interview included sharing of personal and professional views and circumstances. These participants were all employed in public institutions and although not named or directly linked to an institution, one is mindful of the fact that those whose lives and expressions are portrayed, are placed at some considerable risk of exposure. Hence in the words of Stake (2005) the researcher was “a guest in the private spaces of the world” of the research participants and that necessitated a “disclosing and protective covenant, usually informal but best not silent, a moral obligation” (p. 459).

Before the research began, permission was obtained to undertake the research in each institution (Institutional Ethical Clearance Protocol). This was provided by the various institutions as explained earlier in this chapter. One institution was withdrawn from the original sample because of the additional processes that were required to be followed for ethical clearance. Permission was also obtained from the NRF to extract data from their databases that are protected, namely, curriculum vitae and rating information and grant funding applications. After a clear explanation of the research study and its possible benefits over risks, identified research leaders were invited to participate voluntarily. Each research leader interviewed signed a letter of consent that gave permission to use some of their NRF records for secondary data collection as required but also indicating that the researcher would also have to provide participants with a right to privacy of their information and anonymity so that they are not necessarily easily identified through the study. To achieve this, pseudonyms have been used for researchers and as far as possible direct institutional affiliation is avoided in the text.

As pointed out earlier, a participant raised some concerns about possible personal negative repercussions if the transcribed interview became more widely available or certain parts of the interview were quoted verbatim. One

mentee requested that the completed questionnaire should not be shared with the research leader as it was not clear whether he or she was aware of the mentee's 'less than positive' experiences in some areas of leadership. These concerns were addressed individually with the participants and the mentees concerned and the issues of anonymity were reinforced after the data collection process as well. Where information that was supplied was deemed to be critical of the institution or the research sector, the participant is not named if that text is used. Instead, in these instances the text refers to 'one of the leaders said' in efforts to protect the participants. Although confidentiality has to be assured as the primary safeguard against unwanted exposure, watertight confidentially is, however, difficult to achieve; this is especially so within a research community that is relatively small, where each of the participants came from different disciplines that are clearly stated and where the NRF list of rated researchers is publicly available information from both the NRF and various higher education institutions themselves.

5.10. Significance of the Study

As highlighted earlier, this study focuses on the leadership of the academic work of the research enterprise, in particular research with special attention to how this influences research performance. It explores the dynamics of leadership and influence in the research enterprise. In particular, it aims to understand the nature of quality research leadership and to identify a range of leadership factors or indicators contributing towards research productivity and, in doing so, highlight likely areas of difficulty as well as opportunities for improvement. This exploratory, generative research is of significance since the literature shows that there is a dearth of academic leadership studies in the South African context. Our own policies have not addressed the importance of research leadership or focused on its development. Certain leadership development courses have been introduced at institutional level (e.g. University of KwaZulu-Natal, University of Cape Town) or more broadly by organisations such as Higher Education South Africa (HESA). However, none of the available interventions directly addresses the broader research

context of understanding what makes quality research leadership work in the SA research environment. This research can thus help to inform the development and support of research support interventions by institutions and funding agencies.

CHAPTER SIX

Becoming a Researcher

The purpose of this study is to explore the professional and personal nature of leadership that enables and stimulates high quality research performance within the context of the research enterprise. The main research instrument used was the interview and data collected in this manner provides a view of the research pathways of ten individual research leaders participating in the study. These are not full life stories, since the main focus was on the research career. These research stories are then reflected against and interspersed with the reported research experiences of a sample of post-graduate mentees who have been supervised and mentored by these researchers. The reporting of the findings and initial analysis have been largely shaped by the definition of research leadership used in the study and hence have been divided into three individual chapters that build an overall portrait of the main tenets of their research leadership. Firstly, in this chapter, the focus is on the research leader's research trajectories and some salient factors of influence on their careers. It includes a summary of their academic qualification history as well as institutional affiliations. Factors that seem to have had an impact on the academic pathways of the researchers are discussed in more detail and within the context of the South African higher education system. This chapter then seeks to provide an answer to research question one: *How have these research leaders emerged i.e. What are the career experiences and academic pathways traversed by these research leaders?*

Chapter 7 will focus on experiences and attributes of leadership roles in the research field and their leadership of the people. This will include a focus on intellectual leadership, personal scholarship and recognition by peers. Chapter 8 will consider the role of research leadership in one of the most important responsibilities of research leadership, namely, the preparation of the next generation of researchers. This chapter will explore the mentees' experiences of the researcher mainly through their postgraduate programmes

and early post PhD experiences in academia. Where possible the chapters focus on providing both the self report of the research leaders and the mirror report of the mentees in efforts to avoid one of the major criticisms of leadership research i.e. that the research data consists mainly of reported leadership stories. Interrogation of data as presented in Chapters 7 and 8 will address the second research question: *What are the attributes and leadership experiences of research leaders in the context of the research enterprise?*

6.1. Research trajectories

The research leaders in this study are all at different life and career stages. The majority of the sample can be considered to be established researchers whose academic identity and leadership roles have been clearly established. For these researchers this study provided an opportunity for 'looking backwards'. The overall career path of each researcher is initially summarised in Table 10 in terms of research qualification and training and current academic positions occupied. This data was obtained from the curriculum vitae of researchers and the discussion of their research pathways that follows will be contextualised within the South African research environment.

Table 10: Career Trajectories: Profile of research leaders

Pseudonym	**Citizenship**	**Undergraduate Studies**	**PhD**	**Post – Doctorate Position**	**NRF Rating History**	**Current Academic Position**	**Executive Management /Business Qualification**
1. AGRI	Dual South African citizenship	BSC Africa	1989 North America	YES	B (2005)	Director of Research Centre(**2001– present)**	NO
2. BLOOM	South African	BSC South Africa	1983 North America	NO	P(1989) A(1996 - current)	Director of Research Institute**(2001 –current)** and Centre of Excellence **(2004-current**)	YES North America
3. BRIGHT	Dual South African citizenship	B.S. North America	1983 North America	NO	B(2005)	Professor and Director of Research-	YES North America.

						(**2009 - current**) Previous Head of Department(**9 yrs)**	
4. FRANKIE	South African	BSC South Africa	1996 South Africa	NO	B1(2001) A (2006–current)	Professor and Chair **(2002/2007 to current**	NO
5. LIU	South African	BSC South Africa	1989 South Africa	NO	Y P (1995) B A(2004) B	Director of Research Centre(**1999-current)** and Research Chair (**2007-current)**	NO
6. LUNGA	Dual South African citizenship	BSC Africa	1982 Europe DVSc (1999)		B(1996) B A(2007)	Professor (immediate previous: Head of Department **(xxx -2009)**	NO
7. NELWA	South African	B.Eng North America	2001 Europe	YES	P(2001) C(2008)	Executive Dean of Faculty **(2008-current)** (immediate previous Director of Research Chair	YES North America
8. MARIE	South African	BSC South Africa	1998 North America	NO	C(2004) C(2009)	Professor (**2007 – current new institution**)	NO
9. SANDY	South African	BA South Africa	1983 South Africa	NO	A (2003) B (2009)	Professor and Chair**(1990 – current)**	Some coaching experience
10. WAYNE	South African	BA South Africa	1998 South Africa	NO	B (2002) B(2007)	Director of Research Centre **(2007 –current)**	NO

The youngest researcher to have assumed research leadership positions in this sample is 39 years old and the oldest is 63 years old. The average age of the participants in the sample is 52.4 years. This sample profile seems to support the ageing research profile of the South African science system with many of our senior research leaders (at least 50% of this sample) with strong international research profiles having thoughts about possible retirement strategies. As mentioned in Chapter 2, the concern is further compounded by the fact that "nearly half of our total research output in the country is now produced by scientists over the age of 50 and this remains a major matter of concern (Mouton, 2008:1079). This research productive group referred to by Mouton comprises largely white men over the age of 50 years. This sample however, indicates that a considerable number of our senior black professors and female professors are also productive yet ageing. In this sample of researchers, 60% of the participants fall in the (51-61+ years) age range. All the NRF A-rated researchers in the sample fall in the 50-59-year age range. In terms of both age and gender, the findings reveal that this age group (51+) includes 50% females and 50% males, as well as 50% black researchers and 50% white researchers. Productive researchers at the forefront of their field are critical to developing the next generation of researchers. Their exit from the system would surely leave a considerable vacuum if research leadership succession is not part of the long–term planning of both individuals, and their institutions.

Two of the research leaders were in their late 20s when they were awarded their doctoral degrees. Seven of the researchers obtained their PhDs in their 30s (at average age of 33 years) and this is in line with the findings of the PhD study that stated that the vast majority of doctoral graduates within the South African system are 30 years of age or older. (ASSAF, 2010). One leader from the social sciences and humanities was awarded a PhD at age 45, something that is not uncommon in the field. A statistical profile of South African doctoral students showed that by 2007 young graduates of all races (i.e. less than 30years) made up only 3% of both the social science and humanities cohort of students. In general, in comparison with international

standards, South African doctoral students are relatively mature when eventually awarded a doctoral degree.

Four researchers obtained their PhDs from South African research institutions and all four of these researchers are still employed within their PhD awarding institutions. Within this group of four, the shortest post PhD period within the same institution is 12 years and the longest post PhD period within the same institution is 27 years. Three of these researchers are female (all have been A-rated), one is male and all are white. They all obtained their pre-tertiary and undergraduate education during the South African apartheid era of segregated education with three attending an English medium historically white university and one an Afrikaans medium historically white university. This description by one of the research leaders offers an educational view of that historical educational context:

The high school I went to did not have a science or biology lab, did not have much of a library, but the teachers were good and dedicated. Similarly, at university we had qualified, experienced staff. The labs were well equipped and the classes were small. Thus the education system at secondary and tertiary levels worked reasonably well for a person like me in apartheid South Africa, and so allowed me to become the first person in my family to get a university education. Furthermore, because of funding from industry, I was given a scholarship and so my education basically did not cost either me or my parents anything. After my bachelor's degree I worked and studied part-time for the most part. (White Research Leader)

Their current 'home' institutions are recognised South African research universities with strong research cultures. An example of one professor's research career positions within the same institution is summarised as follows:

Senior Lecturer------ Chair ------- Chairperson of School ------Director of a Centre-----Head of Division-----Director of Centre-----DST/NRF Chair

This long service, however, has been interspersed with visiting fellowships at numerous international universities. The research trajectories of these four researchers thus suggest fairly stable career environments within these

institutions, where the assumption is that they have been institutionally supported to develop as highly rated researchers.

The remaining six researchers obtained their PhDs from overseas institutions- North America (4) and Europe (2). All the black researchers in this sample obtained their PhDs outside of South Africa and of the African continent. When considering this cohort of black researchers, the choice to undertake doctoral degrees outside of the continent related to a number of reasons. For the professors who moved to South Africa from other African countries, there was recognition that there was insufficient research structure or incentive to produce research output in the universities of their home countries. According to the professors in the sample, research was not a high priority within the home universities at the time and access to research funding was limited. Hence the decision was taken to complete their doctoral studies abroad. They then subsequently moved to research posts within the South African universities and science councils where they now occupy senior posts as per summary in Table 10. Internationalisation of higher education has increasingly become an integral part of higher education as developing countries struggle to address national needs while engaging with global developments. South Africa, in order to become increasingly responsive to globalisation challenges, has had to develop human resources that make the country a partner in a globalised world. This has seen the influx of many students and staff from international countries. Further chapters will address the increased regional and continental engagement through the research projects, student mobilisation and international networks of the research leaders.

For professors in the sample who moved from research universities abroad to South African institutions, the feeling was that their research output suffered. One professor mentioned described the initial effects of the career move thus:

The move stunted my career for a while. My research productivity went down as I recognised many obstacles to doing leading edge research in South Africa.

Institutional factors listed as obstacles included the high demands of teaching, lack of research assistants and secretarial support. Most important, the professor(s) found that many colleagues in the department did not have PhDs and some were employed without Master's degrees.

This lack of critical research conversation and access to high quality local conferences where you get feedback and critique created a sense of isolation for me. Many of my colleagues did not seem to be aware of what was happening at the cutting edge of the field.

Admittedly this professor's first appointment on arrival in South Africa was not within any of South Africa's top research-intensive universities and the comments made highlight some common criticisms of research developing contexts. A recent career move has been made to a top research university with the understanding that the move to the new institution has more to do with the fact that she will be focusing on research.

For black South African citizens who had completed their pre-tertiary education in the South African system, the routes to the international PhD were varied and fraught with contradictions, especially since accelerated programmes and the judicious use of external scholarship assistance was a short-term solution in apartheid South Africa (Nkomo, 1990: 232). One researcher completed both his undergraduate degree and his doctoral degree overseas. This was during the period when there was widespread interest within the international community for providing scholarship assistance to black South Africans in particular. Nkomo (1990) explained that in order to deal with the daunting challenges of the present (Bantu education) and equip themselves for the more challenging tasks of a transformed South Africa, black South Africans had to take advantage of these opportunities. The participant was awarded a scholarship to North America by the Educational Opportunities Council (EOC) for his undergraduate degree. This EOC bursary funding (and others like the Fulbright Scholarship) is a significant part of the education history of many black South Africans and is especially pertinent when looking at the early period of research development of many black

researchers in South Africa. An extract from the South African Education Programme (SAEP) website helps to contextualise the role of external funders in providing university opportunities for black South Africans during the apartheid era.

In 1979, the Institute of International Education (IIE) established the South African Education Programme (SAEP), a landmark programme to increase higher educational opportunities for black South Africans. The programme ran from 1979 until 2001 and approximately 1,700 participants completed their educational programmes and returned to South Africa. Areas of study included education, business, law, health administration and engineering with over 1,000 students awarded graduate degrees and over 600 students completing their undergraduate programmes in the United States. In 1979, the Educational Opportunities Council (EOC) was established in South Africa with Nobel Peace Laureate Archbishop Desmond Tutu as its founding chairman. The EOC shared responsibility with IIE for the recruitment and selection of participants to the programme for nearly 20 years (www.saep.org).

Currently many of the alumni of these scholarship programmes hold senior leadership positions within our universities, government and corporate sectors. Another black research leader in the sample completed her undergraduate and Master's degrees at a historically white South African university that was still developing its research capacity at the time of her studies. Her choice to move to North America was based on the lack of a research unit in infectious diseases at master's or doctoral level at her local university. She received a Fulbright scholarship for PhD studies at a North American University that was renowned in her area of research. As she explained:

I did my PhD at (name of university) and decided to learn as much as possible and then to come back to a research position in South Africa. On my return I was the only black female PhD in the Faculty of Science at this institution for a number of years, starting in 1997.

One black and two white researchers (30%) in the sample obtained NRF P-ratings in their immediate post-PhD research careers. They were all from the natural sciences and engineering disciplines, since researchers from the social sciences and humanities only joined the NRF rating system in 2002.

The attainment of the P-rating indicates a concentrated emphasis on early research development and identification of early excellence. The researchers were younger than 35 years at the time and were recognised on the basis of exceptional research performance and output from their doctoral and/or early post-doctoral research careers. According to the rating system, P-rated researchers are "likely to become future international leaders in their field". Two out of these three researchers have since obtained A-ratings where they are "unequivocally recognised by their peers as leading international scholars in their field" (NRF Facts and Figures, 2010). This identification of and support for early excellence reinforces the strategic imperative to develop young researchers continuously, especially during their PhD studies.

The focus on business qualifications for academic leaders is in line with the move towards market orientation and commercialism in higher education and the need for leaders to be effective in multiple roles. Two researchers from the specialisation areas of biological sciences and engineering have obtained formal business qualifications from North American Business Schools within the last five years. These qualifications include the Advanced Management Programme (2008) completed by a 54-year old professor and the Programme for Leadership Executive Education Development (2007) completed by the youngest member of this group. The reference to age at which these qualifications are obtained indicates that the university system is investing in senior leadership development from across the age spectrum. It also suggests that younger, research productive professors may be moving much faster into research management or executive positions within the higher education system. The university pressures of race and gender representation in senior management may also mean that fewer talented researchers stay in academic research careers for extended periods of time. In general where research performing scientists have moved into administrative and managerial positions, the-result has often been the creation of a void in academic leadership, research output and third stream funding. The entrepreneurial university context does present different challenges to the more traditional research team as was pointed out in the

literature review. The non-traditional shifts are illustrated by the leadership challenges facing Professor Liu in her research centre:

The team is splitting and one group is now forming a company. I am going to have a challenging time - an industrial group and a research group together - and I am sitting on both sides. It is going to be interesting to see how we marry the groups and their roles. I am proud we work like this, but there are challenges.

This requirement for executive management qualifications for senior professors has been increasing in some universities and the shift, although accepted, has not always been a smooth adjustment for the discipline-based researchers. The experience of one of the researchers is outlined below:

I went, rather reluctantly, at the request of the university, to do an Executive MBA at (name of institution). I had never done a finance course before. I did not enjoy parts of the course and in fact the two-and-a-half months of the programme was one of the most interesting yet frustrating, infuriating and exhausting experiences of my life. But I learnt a great deal and I am starting to realize the value of some of that stuff now. (Professor Bloom)

However, this increasing importance of the business qualification in university management and leadership has not been equally well received in all quarters and the opinion of one of the research leaders supplied below aligns with some of the more general findings reported earlier with regard to executive management/research tensions within higher education:

These days I think that universities want people with MBAs to be running things. I think that's the trouble, because when MBAs (instead of leaders) are running the university, they don't actually recognize the core values of research and research processes.

These responses tie in with the discussions on research/management tensions and indicate that this is an area of conflict for some researchers and an area of accepted practice for others.

The discussion thus far has drawn from the quantitative data of the sample with regard to age, race and gender profiles and how this aligns with or differs from the prevailing research context outlined in Chapter 2. It also draws on

the qualification history (doctoral and/business) since this forms an important understanding of the overall summary in relation to the context in which this research development has occurred. This chapter will now move on to discuss some detailed, though less quantitatively visible aspects of the research trajectories of the researchers in the sample.

The individual trajectory of each research leader can be drawn up from curriculum vitae data supplied and gives an overview of the education and research career history of the participant at the time of the research study. It also links this education to the scientific outputs and academic awards of the individual, in line with the definition of research leadership used. It does not provide background details about the pathway or provide any reasons for career changes along the trajectory. One research portrait is supplied within the chapter to provide a sense of a research career pathway followed. There is no 'typical' research trajectory that could be drawn from the sum of all ten trajectories, since career stories followed very individual paths. As pointed out by a study that explores and contrasts the academic lives of two professors in the same university, "though the rank of full professor is considered the pinnacle of the normal academic trajectory – and not easily achieved by any person - our paths to this place are dissimilar and our lives in the academy are dissimilar" (Johnson-Bailey and Cervero, 2008:311-312). In this chapter a single portrait will be used to provide a sense of a career trajectory, and will be used as a backdrop to discuss more general issues related to research leadership development. Other more in-depth parts of these trajectories will be detailed as the thesis progresses through the aspects *Fully Engaged Research Leadership* in Chapter 7 and *Preparation of the Next Generation of Research Leaders in* Chapter 8.

RESEARCH PORTRAIT OF PROFESSOR NELWA

EDUCATION AND CAREER POSTS

Professor Nelwa matriculated from a local public school in Limpopo province, South Africa. In his final matriculation year at school, he entered and won the National Youth Science Olympiad, a science based-competition where the top prize was a trip to the United Kingdom to attend the London International Youth Science Forum. His subsequent university education spans a number of countries and institutions. He was awarded a scholarship by the Educational Opportunities Council and obtained his Bachelor's degree (Magna Cum Laude) from a university in North America, his Masters' degree from a local South African university and a PhD from a university in Europe in 2001. He then took a position as a research scientist at a science council in South Africa where he remained for about five years. He subsequently proceeded to a post-doctoral research position in Europe. On his return to South Africa he worked in industry for a short period before returning to a research university appointment as an associate professor. He was appointed Professor Extraordinaire at one of the local South African universities (2003-2005), and has been a visiting fellow and scholar at universities in the United States and Europe. He is a full professor and has been a leader of a DST/NRF South Africa Research Chair with the most recent appointment being that of Executive Dean of Faculty. He has also recently completed a Programme for Leadership Development at a North American University.

SCIENTIFIC OUTPUTS (among others)

Professor Nelwa has made fundamental contributions to his field and has received over 41 awards to date. He has published over 170 articles in refereed international journals, conference proceedings and book chapters and has successfully supervised approximately 30 postgraduate students at Master's and PhD levels and has collaborated with 44 national as well as international researchers. He holds three international patents.

In summary then, the trajectory is that of a research professor who received his primary school education within the public school system of apartheid

South Africa. He attended a local school for black students only and his talent for mathematics and science was discovered at an early age through a national school science competition. Academic capability and access to resources through scholarships allowed him to complete his undergraduate and postgraduate studies at research intensive institutions across three continents, thus offering an international research experience as a platform for career development. His research career in South Africa was developed across experiences in industry, a science council and research–led universities within South Africa, with an NRF–P rating providing further emphasis on and system support for early career excellence. He has built up an impressive publication history, student training record with a strong emphasis on capacity-building and has won a number of international and national awards. He has moved into university executive management at a young age, where time for personal research has now become somewhat limited. His biggest leadership challenge in his current position is to develop and sustain a strong research culture in a merged South African higher education institution with a limited history of quality research. Given this research trajectory of one researcher, what might be some of the factors influencing overall research development of the research leaders in the sample?

6.2. Early influences

In trying to extract more of the personal nature of the research trajectory, one may ask the question: Why research? In the interviews research leaders were asked if there were any early influences or critical incidents that influenced and/or strengthened the decisions to follow a research path. Firstly, there was overwhelming consensus amongst the group that the earliest motivator seemed to be an innate sense of deep curiosity and personal interest in things around them at the time. There was talk of a mind that enquires and a need to explore. Across the career trajectories, this initial curiosity and interest seems to have developed into a deep passion over time and the strong sense of personal commitment and enjoyment came through for most

research leaders that were interviewed. This was expressed variously as illustrated below:

For me it is very personal. This project of human rights is in a sense what my life has come to be defined by. So for me it is almost too absorbing and maybe you can only be so into all of this if you stay focused. It would be very difficult for me to do if it were not something I felt passionate about. (Professor Wayne)

I feel very privileged to be at a space where my enjoyment of my work drives my passion. (Professor Bloom)

People who touch one's life along the way are also very influential, and for the researchers, these influences were received from different people. One of the professors described these crucial people influences as an important chain of informal and formal mentorship all along the career path. Early influences were identified at the family level, with strong role models found in a visionary grandfather or equally science-passionate spouse. In a single case the influence was found in the public school context, where there was a strong work ethic and strong, competitive classmates who turned out to be good role models. As explained by Professor Nelwa:

Many leaders emerged from my school group and over time have occupied various very senior corporate positions throughout the country. It seems that this was a special school that produced very good students who had staying power.

This factor of influence seemingly provides an anomaly of sorts since this school is a local public school in one of the lesser educationally resourced provinces within the South African public school system. In addition, as a country our education system is noted for poor achievement in mathematics and science in international and national assessments (e.g. TIMSS 1995, 1998, National Assessment Tests, 2011). However, this local school is still currently one of the consistently best performing black public schools within the province and this may explain the influence on Professor Nelwa.

One professor felt that her environment was probably the strongest early motivator of her career choices:

My family was poor and I did not like not having things. I used that as a motivation for a better quality of life. The belief was that you must get educated to get a better life and my parents pushed that. I arrived at the decision to follow a research path through my own personal motivation.

Achieving a doctorate is an important achievement in one's personal academic history but it cannot be separated from the broader political and economic structures of a society. This emphasis on the value of education as a means towards a better quality of life is consistent with the findings of Reddy (2000). Her life history study of ten black South African scientists who had gained doctoral qualifications under the extreme constraints of the apartheid system, found that families valued education very highly and there was a strong expectation from parents for their children to have a higher education than themselves.

In many cases however, the main influence on decisions about research careers seems to have come from their own PhD supervisors, or other professors within their early research contexts. As Professor Lunga pointed out:

My PhD supervisor was instrumental in exciting me deeply enough to stay in the research activity. In the beginning he was somebody to guide me and develop my interest in the field. He gave me the freedom to explore and discuss and challenge and debate things with him as much as I possibly could.

This type of experience is common to many of the research leaders in the sample and points to the influential role of the research leader or supervisor in the career development of the emerging new generation of researchers and scholars. South Africa has a situation of limited quality supervisory capacity at doctoral level, and hence the continued concern about the presence of sustainable catalysts for early research career motivation.

6.3. Career moves

Research can offer a very rewarding career in which a researcher embarks on a voyage of discovery, and in which opportunities may arise to develop new and important solutions to challenging problems. But not all careers in research follow a singular pathway. Understanding the institutional climate and being able to function within it are considered important keys to job success. How well do you fit in? What is your place and connection to the institution? (Johnson-Bailey and Cervero, 2008).

As highlighted earlier, four professors in the sample have remained within their PhD awarding institutions for varying periods of up to 27 years. The professors are all productive, NRF-rated and in senior research leadership positions and hence one can assume that they have been able to use their university research context to grow their research careers. Their universities are among the top five research producing institutions in the country. Except for one, researchers did not indicate any major dissatisfaction with their institution and had managed to succeed in spite of any/all institutional changes experienced over time. None of the universities in which these professors reside were affected by the merger context of the early 2000's. Given the historical beginnings of the South African higher education system, it is important to point out that these researchers are all white professors who studied and then were/are employed within the same historically white (English and Afrikaans medium) universities. This trajectory within the same institution(s) for each of the individual researchers may open a space for the concerns raised earlier by Lumby and Coleman (2007) in the literature review i.e. that some of the key concepts in transformational leadership are 'consensus' and 'aligned' which are seen as layers of sameness - can this be unproblematically achieved between individual and institution? Generally research leaders in this group portrayed a strong sense of institutional autonomy at this stage as senior researchers as is illustrated by comments provided:

We see ourselves as semi-autonomous within the university context. We raise all our own funds since the university still does not support us financially. We can be seen as similar to an non-governmental organisation (NGO) if you like. The NGO status gives you your own identity and freedom of expression. But sometimes this may be in conflict with the university. (Research Leader).

And then I got the chair! I was now in a position where I had some money and I had the position to take the leadership role. The biggest plus for me in being awarded a research chair is that it gives me relative independence in that it pays my salary and that creates a sense of making a huge contribution to the well-being of the school (Research Leader).

This contrasts rather strongly with a limited number of research leaders and students in the same sample who at this phase and time in their research careers question their place in and connection to their institution.

I think I am really angry about certain things and by the lack of consultation and support by the university around an issue that was important to my credibility as a researcher. To be honest I have felt alienated from my institution for the past three to four years. I actually feel that unless I work within a narrow framework and with narrow blinkers, then I would feel unrecognised by my institution. (Research Leader).

This feeling of institutional discontent comes through in this research leader's discussion about future options for the career trajectory:

Another institution is an option, but possibly not in this country. I would like to change, possibly need a change. I'd love to go to (name of institution in South Africa) but not in my profession. It would have to be more in a multidisciplinary capacity or a leadership position. I think I have strong leadership capacities.

Hence, although limited, this study indicates that some senior white research leaders may be considering moves from their historically white institutions based on a disconnection between their personal and professional experiences and the changing institutional cultures. It may be that disillusion with management has emerged through contestation around the meaning and content given to institutional transformation. This research did not test whether the institutions were aware of particular cases or whether they had contingency plans in place for the "brain drain" of highly rated researchers.

Thirty percent of the group of research leaders within the study have already moved between higher education institutions in recent years. In all cases the move is reported to have been related to research and their research careers and has occurred between historically white institutions. In most cases career moves mentioned by the researchers are characterised by the practice of 'head-hunting' and research productivity seems to be a factor upon which the decision to approach a person (head-hunt) is made. Potgieter (2002) explored the experiences of black academics who moved between institutions and found that "being head-hunted by institutions within a context of clear indications of institutional change provided a strong inducement to move"(p.22).

…and then another university wanted to build their research productivity and (name) approached me to move to (name of institution). I had a P-rating at the time and we were a highly productive unit.

…in my new role I had to develop some form of research culture, to start changing the profile of the staff. The idea was to bring in new staff that can build research capacity and thus populate the community with researchers. This was achieved by targeted head-hunting of people who had research experience.

In some cases discussions of career moves between institutions illustrates the researchers' opinions about the lack of fit in the departing institution and the apparent connection to the promises of the receiving institution. Two cases, as expressed by senior black researchers who left one historically white institution for another, are illustrated below.

I felt that my previous university was not willing to contribute to my research in the way that I needed them to, in order to reach my particular goals by a certain time. I do not think they understood how important this was for me. University X approached me, offered me a job and made some promises. There was a stronger commitment to the type of research idea I was going to take forward. They have been very supportive in terms of research. However they have not yet delivered on all their promises. (Research Leader)

The workload at my previous institution was enormous. The late nights and weekends were the only times you could draft the research papers. And over long periods of time positions would become vacant and the university would close them down for financial reasons. And the remaining people would take

on the additional workloads. I was putting a lot of pressure on myself as head of school and maintaining an A-rating. So it was a question of deciding whether I want to stay in research or get out. My decision has always been to stay in research. Hence I have now moved to a research position in a different institution, where much of my time will be spent on research and supervising students. This institution expects greater research productivity from me, but with a lighter teaching and management load I don't have any problems with that. (Research Leader)

These types of career moves have characterised the South African research context where the quest to build research capacity, strive for research excellence and grow a representative science workforce has been championed alongside the reality of budget constraints, the increased entrepreneurial nature of higher education management and efforts to address the transformation imperatives of our system. Earlier research on the movement of black academics between institutions (Potgieter 2002) cited one of the main rationalisations for these career moves as a lack of support for their academic development within host institutions. Jansen (2004) is of the opinion that economics, "is as much an explanation for the constant migration of a new class of black academics from one lucrative position to a more enticing position elsewhere, as might be disaffection with a particular institution" (p.10). Results from this study suggest that strong research performing NRF-rated researchers, especially black researchers (male and female), are head-hunted more actively and hence have increased choice over research career moves.

6.4. Complexities of Gender

During the interviews with both male and female research leaders there was no explicit question asked about the role or effect of gender on research pathways. Yet the analysis of the interviews indicated ways in which gender dynamics did affect research trajectories. These gender effects seemed more pronounced in the early parts of the research trajectories where individuals were, either consciously or unconsciously at the time, building research legitimacy for themselves.

The impetus of career direction towards a focus on research (PhD) frequently came from an external source for most women interviewed. This was usually expressed as a sense of surprise that this was an option at the specific point in each of the research careers. De la Rey (1999), in her work with professional women in higher education, referred to this external identification of possibility as 'agency unclaimed'. This is illustrated by comments from the female professors, especially with regard to their decisions to take the all important step in their research pathways i.e. to join a doctoral programme.

I remember finishing my master's work with Professor X and he said "What about a PhD?". I had never even thought about it. I didn't plan a research career and so it seems like I stumbled into it. (Professor Liu)

When I got the MBA I had the option of returning to industry. One of the academics said to me "Have you ever thought about an academic career?" And I said ''No, not really". After teaching on contract for one year he said to me… "If you really want to be an academic, seriously, then you have to go out there and get yourself a PhD". So I thought yeah, maybe. So for me it was important that somebody said "you want to be an academic", although at the time I really didn't understand the research component. (Professor Bright)

I am grateful to have taken this path, almost by default, since I didn't really know what I wanted to do. I had a very positive research experience in my fourth year. The primary driver was Prof XX(male) who served as an incredible mentor for me and one of the finest minds, I believe, in this university. (Professor Sandy)

The female professors in the sample seem to be able to 'pay it forward' as well, in providing the same recognition of talent in their female students:

The mentoring gave me the confidence to pursue a goal I had never considered for myself. She recognized something in me that I could not see in myself. She took me to a level of education I would not have aspired to if she had not been in my life (Professor Bright's mentee).

My relationship with her started off as a mentor-mentee relationship in the research environment. I felt completely free in terms of where I wanted to take my research and it was the first time that I actually thought that I could contribute using my own approach and way of thinking. She enabled and taught me to walk a structured and logical path towards the new and unknown (Professor Liu's mentee).

Marriage and children were also factors that impacted on career decisions, although none of the women presented these as negative influences. In the descriptions of their personal research trajectories these factors were acknowledged as having impact, but largely explained as an accepted, though difficult, part of the experience of being mother, wife and academic. As one of the more senior professors stated about her early career stage: "I didn't feel that gender barriers really affected me then. We even brought our babies back to the office because of the (limited) one month allowable maternity leave at the time". Decisions to move between full-time and part-time studies were largely influenced by the age of children as related by Prof Frankie 'I was married with two kids and couldn't go anywhere else, so I was going to have to do it part-time at (name of institution).'

Post-doctoral positions are an important part of research development, and even here decisions were influenced by family contexts of the married female professors as evidenced by the comment of Professor Liu…

But women have particular challenges. I was married at that stage when a post doc may have been the next stage. Even now, getting an award to go to an overseas university is not easy to take up with the family situation.

At the current research career stage, marked by positions of increasing research leadership status and management responsibilities, this consideration for children is still seen by the strong statement of one of the professors: "So being a mom, I always weigh up what I'm doing with its importance against spending time with my kids. I have actually become quite ruthless about my involvement in different kinds of stuff". During our interview, this professor asked to be able to take a phone call on her cell phone. "It is from my son and I always make every effort to answer since I know that he would not call on a whim. He understands the importance of our work here". She is an internationally recognised researcher working at the cutting edge of her field while still being very clear about creating her own balance between the roles of mother and academic.

Gender complexities within the institutional milieu were presented as a mixed bag of responses, based on varying personal experiences. Some professors found that the universities had generally been good about gender policies and creating enabling environments. However, changes were noted with regard to more recent re-structuring and/or mergers within universities - "it has only been recently, in terms of school structures, that I have felt that there have been gender barriers. This may be because of school headship that is rather complicated. The current head is male". A younger professor's experience of gender differentiation within the institution was however instrumental in a decision to change institutions:

I do not think that (name of institution) understood how important it was for me to reach certain goals at certain time points of my career path. They were asking me to wait for things I was not prepared to wait for, and especially when the males didn't have to wait.

The dilemma of the 'white male' within the South African context was also variously referred to although with different emphases. All three findings presented relate to different aspects of the race and gender transformation agenda as highlighted within the research context descriptors of Chapter 2. In all cases the comments illustrate the general system concerns for sustainable research capacity and leadership.

I feel terribly sorry for white men in this country and I confess to sometime advising (graduate students) to leave. Access up the system and recognition for them is almost impossible. This is a shame, since there is a loss out there (White female professor).

There is this middle group in the university structures, especially white males who have taught a lot but have not done much research. So confidence in that area is low, although their ideas may be interesting. That is the group that needs attention (Black female professor).

We are three white men in charge of the Centre. It is important that we bring in someone different if possible. This would be nice, so I'm looking and even though I am just two years down the line (this is a four-year appointment), I am thinking about the exit strategy, though not in a negative way (White male professor).

The students who were supervised by these research leaders also illustrated struggles with gender complexities that point to the fact that gender issues prevail, despite improved efforts at policy formulation and implementation within higher education. Gender complexities were most evident in black and white female students' responses to the questions about why they embarked on a PhD and any critical incidents that affected that pathway. It is interesting to note that none of the gender statements related to their relationship with or treatment by supervisors. Some remarks below illustrate the ambitions and also the levels of frustration associated with the gender specific complexities of study and family:

I think I wanted to prove to myself that I, as a woman, can do well in an engineering environment and be able to contribute to the knowledge globally.

My PhD was something I did for myself after hours, at times when I could scrape a few moments together. As mentioned, I have a husband and children - one of whom, (my middle child) was born during my second year of registration. Having a baby during the second year slowed down my productivity enormously.

The same student's response to a question about her post-doctoral status (at time of research study) was;

I am currently working full time in my profession, enjoying the status that comes with being able to call myself Dr. Proud that I got through the process with my marriage and family intact.

Many students in the social science and humanities do their PhDs on a part-time basis even though this is not the preferred option of all Professors interviewed in this sample. The female student, working-full time while undertaking doctoral studies, is faced with the tension of roles as described below by a mentee:

I also worked pretty much full-time in my private practice, meaning that I had a full work-load in my professional life as well. Had I been in a different phase of my life, I am sure I would have enjoyed the process more and made more of it. The truth is that I struggled through the four years feeling quite burdened and anxious a lot of the time. My point is that I could have utilised more opportunities, I could have written more articles, I could have submitted more for publication, I could have presented more overseas. But I did not invest

myself too much in that process because I had to balance my academic life with what I consider my real life - my family and work.

These responses find resonance and critique in gender studies on academics found in the literature (Prozesky 2008, de la Rey 1999, Walker 1998). A common finding in these studies is that the academic careers of men follow a much more orderly or at least linear progression, than that evidenced by the responses of the female students above. Women often postpone their PhDs to raise small children and/or interrupt their research and publication momentum because of family related demands on their time and energy (Prozesky, 2008: 61). It appears that the practice (as opposed to policy or implementation) of gender equity still remains a challenge.

An additional point of interest was a 'mothering attribute' revealed through the interview data, but, interestingly, this attribute was not specific to females only. In various instances the research, the institute or even the students were described by the research leaders in terms more commonly associated with family or children. This illustrated a very protective nature over the research enterprise and was usually spoken with much passion. In describing what keeps the team productive, the Professor answered:

I think it is just the joy of research. It is like raising kids in some way. You put them in an environment where they are happy and provide what they need and leave them to it. Expect certain behaviours of them and if they know what is expected they behave that way. (Female research leader)

On looking towards a future scenario, a Professor was at pains to point out that although ageing, he had no plans to leave just yet. He felt a close bond with the institute:

The institute has been like a baby and you love it like a baby and you want to see it do well and become successful because you care about it beyond it being a job (Male research leader).

When describing the roles of the research leader, mentoring of students was often central for all research leaders. There were nurturing descriptors, but always carefully balanced with the need to develop the students as well.

It is to be able to hold them through the terrible periods, because everybody hits the terrible patch. Hold them, but not in a way that creates dependence (Female research leader).

Student responses revealed their own experiences of the parental role of the research leaders:

She acted almost like a mother to us all and yet gave us very firm nudges where we waivered (Professor Farnkie's mentee)

Much as Prof was tough, he was also like a father and knew how to motivate one when the going was tough. This helped me through tough times (Professor Agri's mentee).

The discussions thus far support the notion that within academia our lives are encrypted by our race and our gender. Although all researchers in the sample are judged successful by virtue of research leadership and research productivity, "…the lived contexts in which individuals achieve that success are different." (Johnson-Bailey and Cervero, 2008: 311).

6.5. Management/Research

Bolden et al. (2007) found that there are several competing tensions within academic leadership, each of which can give rise to multiple and conflicting identities that can discourage academics from actively seeking and embracing formal academic roles. One of the interview questions of this study was about whether the researchers experienced any tensions in assuming their leadership roles since there is often a (perceived) tension between the 'administrative burden' of management and leadership roles and the requirement for excellent research performance of both the individual and the research unit. This tension was discussed in the earlier literature review and clearly expressed by a participant as follows:

It is ironic that as you climb a ladder in the university you are expected to assume so many more managerial responsibilities, and although I am good at that, it also takes a great deal of time.

While all participants acknowledged the heavy administrative workload of the senior academic research positions that they occupied, the leaders seemed to express different views and have different ways of coping with this tension. The mixed scenarios presented below illustrate the following:

(a) The level of frustration experienced in some situations;

You lead research, you administer research and you make sure that everything in the centre is still going ok. I am not only an academic, but also an administrator as well. I am busy the whole day shifting papers, as it were, but in my mind I want to write and do my research. When I think of my writing, it certainly has declined since I really became so involved. For me personally it is still important to maintain my personal research on top of this administrative role. This is the ultimate challenge for me and it still frustrates me terribly (Professor Wayne).

A crises situation developed at my institution and because of my business background, I was roped in to a post that was like an MD job in a company. I was dealing with logistics, maintenance, tenders, staffing etc. I was asked to help out for six months. It lasted 18 months in the end. My daily work had nothing to do with research and I was miserable. (Professor Bright)

The research leaders point to the lack of research assistants and insufficient research administration capacity to support and sustain the activities of these highly active research institutes or centres. Thus it would seem that research leaders running successful doctoral programmes and serving wider international research roles need to be provided with adequate support structures and systems to enable them to focus on the research needs rather than the administrative loads of the institutes. The general feeling about the administrative tensions is "…to get the right people to do the job in the first place". But staff costs for the right people at the level at which they are required are thought to be a major barrier. The overall feeling amongst this group of research leaders is that this type of workload is something that one can do for a time because of personal fulfilment, but that it is not certainly sustainable at the current pace and level of research output.

(b) Coping mechanisms used by some leaders to ensure dual academic excellence and leadership roles;

There is no tension for me in these areas. I think that if you are successful in research this lends itself to being a leader in other areas as well (Professor Marie).

I interpret this as you asking whether the only way up the university system is to leave the science behind. It is an issue for many scientists and academics in the system, but it has not been as issue for me. However, for me to operate the institute at its current level of productivity leaves no time for anything else. I have a formula I follow very tightly. This includes 40 hours a week on executive management work and 40 hours a week in the lab or directly related to the research with my students. I feel that the executive work is core work and I enjoy it. It is big picture stuff (Professor Bloom).

(c) Choices to focus on academic excellence without a formal leadership appointment (such as Head of Department).

My own personal experience has been that these two things clash rather than support each other. Now I have research to get my teeth into as opposed to going the management route. I did think about Head of School at various points, because the management route would have been an option. But given this context, I don't think that it's a do-able job for one person and the structure in the university is unlikely to change that (Professor Frankie).

However it (A rating) became an albatross around my neck, something which eventually backfired on me after five years of feeling this incredible pressure to retain my rating while chairing a department and resolving a whole lot of administrative issues. I don't think that anybody could have been able to retain that level of productivity. This (giving up head position) has been a good move and frees one up to concentrate (Professor Sandy).

Only three of the research leaders in the sample have received business qualifications in line with managing the multilayered, complex environment of the 21st century university. Yet all research leaders are faced with the responsibilities of leading research centres or institutes, fundraising, and the administration thereof. In the absence of effective and efficient administrative support services, the administration burden becomes overwhelming and takes a toll on both personal and professional choices and research performance.

6.6 Funding

The world of global science is expensive to join and sustaining participation at increasing levels of excellence is also costly. The 2010/11Times Higher Education World University Rankings uses research income as one of the indicators in the research category (volume, income and reputation worth 30%). The overall ranking of 5.25% is determined by the university's income, scaled against staff numbers and normalised for purchasing power parity (Baty, 2010). As with the overall use of world rankings, there is also some controversy about the use of the income indicator used in this way, since it can be influenced by national policy and economic conditions. According to world rankings officials, "research income is crucial to the development of world-class research, and because much of it is subjected to competition and judged by peer review", it has been included as a valid measure (http://www.timeshighereducation.co.uk.world-university). In addition, the ability to garner research funds is seen as one of the important indicators of the research leadership definition used for this study. The universities in which these participants undertake research differ in context, but funding is still a key variable that universities use to position their research performance and status.

Funding issues are presented as a contextual matter of influence for two main reasons:

(a) It came up in almost all discussions and hence seems to be an important research factor at leadership level;
(b) There is a possible link between research reputation (and hence, intellectual leadership) and the ability to raise funds for research or new students.

When it comes to research funding there seems to be consensus amongst the research leaders in the sample that:

- Research is expensive;
- Funding can be a major constraining factor;

- The university will not provide all the funds required to run high level research institutes;
- Third-stream funding must be raised from external sources;
- Fund-raising is an important, although time-consuming role of the research leader within the current university context.

However, contextual funding differences were apparent across the sample and an overview indicates that the differences related strongly to the disciplinary context of the researchers. Professor Lunga is an A-rated scientist and works in the animal sciences. He describes his research as mainly pure or basic research. At the time of the interview he had two local and two international post-graduate students and he is of the opinion that it is a struggle to get funding for basic research in areas such as his. This is in line with a shift in focus in the second half of the decade from fundamental to applied research, mostly in service of national social and economic goals. According to him “the area of research is interesting at a personal level but does not attract a lot of funding”.

The funding situation for those centres working closely on issues directly affecting humanity and quality of life, people rights and matters of environmental management in Africa was contextualised differently. These centres have to raise money to fund their research, but they do not seem to struggle too much to find willing funding partners. The scenario does however create the potential for funding dependence. This is characterised by endless meetings with funders and large administrative workloads in terms of proposal writing and reporting. In these areas funding seems to be sourced mainly from large foundations and international organisations like the European Union (EU). The comments of Professor Agri illustrate the funding context in his centre:

Fortunately we have established a track record and reputation and so we don’t have a serious problem with funding. We do actually receive expressions of interest from donors and we have resisted big requests in some cases. We are trying to resist going beyond our optimal size and compromising quality.

Professor Bloom explains his institute's ability to attract students as follows:

Actually we have lots of students and this is driven by reputation and money. You have to have money to fund students but you get money based on reputation. These two are very important levers. We draw very good post docs based on our reputation.

Those disciplines that have practical applications and closer links to industry have yet another funding model. This seems to apply to the engineering and technologies (e.g. biotechnology) sectors. Here funding requirements are huge and there is a drive to raise funds from industry but yet not be controlled by the industry partner. Issues of intellectual property are also crucial in this sector and hence funding can be tied to specific rules and regulations. Professor Liu describes the funding context of their centre of excellence:

Most of the funding we have comes from work we do mainly with overseas companies. It is very much a case of industrial consulting to fund our research. Recently we had to bring in about an additional R15 million per year. Any time we do not do achieve this we have about 40 research students that we cannot pay. We have to raise enough money to pay all in line with industry standards. We had to develop a whole new funding model to ensure that this can happen.

In the interdisciplinary health science areas (esp HIV/AIDS) many research directions of the research communities seem to have been strategic because of the availability of funding in these targeted areas. But the politics of research funding seem to be most visible in these areas as well, as illustrated by the comments of Professor Marie:

It irritates me that a particular group of people can control research money. I think that it is unfair, especially for people coming in with new ideas. With HIV research, it seems like people in (name of province) want to control the type of research that is done, where the money goes, etc. This is unacceptable to me. Research should not be linked to groups of people and what they think is important. Funding should not be there to protect certain ways of doing research.

From the discussions it is clear that funding is seen as a serious threat to the work of the researchers and their research institutes or centres. Funding for student training is a major concern for large research teams that cross-

subsidise their own costs, as well as funding for much needed expensive research equipment and laboratory costs to enable cutting edge research. The concerns of the research leaders and students relate to the broader South African higher education system issues of "general availability of funds, the bureaucratic process of accessing and managing funds and the continuous change in the strategic thinking of the funding agents" (ASSAF, 2010:95).

6.7. Synthesis of chapter

This chapter has provided a biographical overview of the research leaders in the sample, their research trajectories and certain contextual factors that have impacted on their research development. Synthesis of the findings from the quantitative data presented indicate that the research career trajectories of individual research leaders currently within South African universities are as varied as the individuals themselves. The academic positions in research may be 'typical', but the pathways to these positions and the factors of influence along the way have created very individual career portraits. The age profiles support the general system concerns about the ageing science workforce, although the sample also highlights this ageing within the female and black professoriate. Where highly qualified and productive female and black researchers are still in the minority in the South African higher education system, their exit through natural attrition raises further cause for concern.

If the PhD experience and qualification is considered to be the entry level stage of a research career, then the findings illustrate that both national and international doctorates have resulted in research leadership positions in later career stages in South Africa. The varied doctoral experiences and subsequent research development stages (e.g. career moves) have been shaped by the South African social and political influences on higher education, especially with regard to choices about research-led programmes and/or institutional affiliations.

The executive management tensions vis-à-vis traditional research management approaches mirror general findings within the international literature as outlined in Chapter 2.

In this sample, indications are that the NRF rating system has assisted in recognition of early excellence in young researchers (P-rating) and a focus on driving excellence in female researchers (A-rating). Both must be target areas for continued system-wide support in order to drive a transformed higher education human resource base. Even though South Africa is known for the strong focus on matters of gender equity, the findings illustrate that complexities of gender at senior leadership levels still exist, are closely intertwined in the day-to-day fabric of institutional life and are still affecting the career choices and current research trajectories of young female researchers within universities. Funding is seen as a systemic barrier to research performance and the chapter has outlined the challenges research teams face in times of budget constraints. Different disciplinary fields seem to be able to draw from different funding sources in line with their eventual outputs. The social sciences and humanities rely on external donor funds while the more applied fields use industry as the main source of funding. The research reputation of the research leader and the research institute/centre seems to influence the ability to raise external funds directly. However, any program that is supported largely by external funds is in constant threat.

Given some of the system and individual challenges to research development outlined in this chapter, the next chapter will outline the research contributions of scientists and show how they have played a significant part in the advancement of science to the benefit to the country. Chapter 7 will thus look in greater depth at the notion of fully engaged research leadership namely, aspects of intellectual leadership of the discipline or subject matter and leadership of the people

CHAPTER SEVEN

Fully Engaged Leadership

The definition of research leadership used for this study is repeated below to contextualise the findings as presented:

Research leadership in this study is identified by the hallmarks of excellence in scholarly publication at the cutting edge of the discipline, extensive quality national and international research networks, personal scholarly recognition and prestige among peers, leadership of quality Master's and doctoral programmes, early researcher mentorship and the ability to garner research funding. The focus is on excellence in scholarly production as a major criterion.

In this sample most of the participants (nine out of 10) held or had held formal leadership positions at the level of Head of Department, Head of School or Director of a Research Centre, Research Chair or Centre of Excellence as well as positions at Executive management levels in the university context. According to the definition of research leadership mentioned above, the experience of research leadership across the group must include both the credibility of personal scholarship (leadership of the subject matter) and the capacity for people management (leadership of the people). According to Ball (2007) the existence of self leadership and the duality of leadership between the subject and the people are key elements that distinguish research leadership from leadership in general. This chapter explores these aspects among the sample of research leaders, starting with an in-depth look at leadership of the subject (intellectual leadership) followed by aspects of leadership of people.

7.1. Intellectual leadership – the credibility of personal scholarship

The sample of research leaders who participated in this research study were all NRF-rated scientists. The reasons for including this criterion are explained

in Chapter 5. Forty per cent of the sample had NRF A-ratings, identifying them as leading international scholars. The other 40% were B-rated, identifying them as having considerable international recognition. Hence from the outset, the credibility of the personal scholarship of the sample had been established and there is no need for further discussion on this matter. However, the aim of the research is to build a rich, description of research leadership in South Africa. The researcher attempted to see processes and outcomes that had occurred across cases to understand how these were qualified by local conditions and this develops more sophisticated descriptions and powerful explanations (Miles and Huberman, 1994:172). This deeper understanding of research leadership is important in a national context where constraints on research capacity in certain disciplinary fields and especially in senior leadership positions exist. The first section of this chapter discusses the issue of intellectual leadership and personal scholarship of the research leaders by looking more closely at their roles in each of the following areas:

- Establishing the field – moving boundaries;
- Driving excellence through cutting edge research;
- Forging an international reputation.

The next section considers how the dimensions of intellectual leadership discussed here are linked to personal scholarly recognition and prestige among peers.

7.1.1. Establishing the field – moving boundaries

A deeper interrogation of the interview data reveals that many of the research leaders had been instrumental in leading field developments in their disciplinary domains. Across the sample of research leaders these efforts included building research legitimacy in a field, introducing cross-disciplinary strengths, building new research groups that produced groundbreaking research results, and conceptualising and implementing unique international

programmes, usually from a South African base. These research milestones form an important hallmark of personal scholarship. The discussions below use three in-depth, although different examples from the findings to illustrate the nature of the pioneering work undertaken by the participants. As mentioned above, all the participants were A- or B-rated researchers at the time of the research, yet their early pioneering paths through varying disciplinary contexts illustrates different research leadership roles that had contributed to broader field developments.

Professor Bloom, a South African by birth, did all his undergraduate studies at South Africa universities and then completed his PhD in the 80s at a North American university. He then returned to a South African research institute and worked as a researcher and then as an assistant specialist scientist in a dedicated research post where, in his words "he was producing a lot of stuff". Five years after completing his PhD, Professor Bloom was approached to join another South African university that wanted to increase its research output. This move to a new university included increased access to significant equipment for the study of molecular genetics. This leading technology (at the time) allowed his newly-formed research group to increase the quality of the research work to a point where they had produced more DNA sequence data than any other group in the world. The specific expertise available in the group was able to further push the boundaries by bringing molecular genetics and molecular phylogenetics into the field of microbiology. This type of innovation (technological and cross-disciplinary) gave the group led by Professor Bloom an edge that was able to influence the discipline-specific research community quite strongly. They were breaking new ground. Professor Bloom obtained an NRF P-rating during this period (1989-1992) and the group was recognised as one of the highly productive units at the university at that time. After about 10 years he was approached to join another university and his whole team of 55 persons changed institutions with him. So the move to a new institution came with an already active research team working at full strength. That work and the initial team formed the basis of what is now South Africa's biggest single university research institute working in his specific field. Today the research institute is significantly

recognised globally in certain domains. In addition, in 2004, Professor Bloom was appointed as the director of one of the first six Centres of Excellence of the DST/NRF that had been established within the South African science system. According to Professor Bloom, "the institute has been an enormous challenge, but there are very few people in the world who have had the opportunity that I have had to build something entirely new."

From this description a picture emerges of the level of research excellence in the biological sciences that exists in South Africa, with considerable emphasis on modern biotechnological research and its applications in South Africa. Professor Bloom was involved in early developments in the field and the combination of academic ability, international research experience at PhD level, local research experience at research-intensive institutions in South Africa and substantial access (at the time) to funding through the resource-rich university (ies) of employ, the P-rating grant mechanisms and industrial partners supported the rapid advancement of a research career. Given the higher education context in South African during the 80s and early 90s, it was also politically advantageous to his early research career that he was a bright, young, white male (English-speaking) who was taken up into research posts at the major resource-intensive Afrikaner universities in the country. This early career immersion in supportive research environments is considered one of the primary motivators of research development towards excellence.

The introduction of and access to highly specialised laboratory equipment was also an enabler that added to the possibility of pushing the boundaries and making new discoveries. Early discoveries and productivity were achieved within the company and influence of a growing research team of post-graduate students and fellow expert scientists over an initial period of only ten years. This was the start of an important group of researchers in the field. All career moves were at the request of institutions wanting Professor Bloom to join their research portfolios. This headhunting was largely based the research reputation built through the groundbreaking work and 'production of lots of stuff'.

Since about 2000, the National Government has dramatically improved national funding for biological research and the infrastructural base required by modern molecular biology, through the policies of the Department of Science and Technology (DST). This is illustrated through the introduction of a funded Centre of Excellence with research output and student training at significantly high levels.

A different, although equally 'research pioneering' role was assumed by Professor Frankie who had spent ten years prior to entering higher education teaching in a non-governmental organisation that focussed on adults and out-of-school youth. Her entry into university teaching opened up the research question about language and learning and provided the impetus for her doctoral studies. She found herself teaching in a liberal English-medium South African research university where very little internationally competitive research in her field was taking place at the time. Professor Frankie's portrait illustrates the different challenges faced by many early researchers in the social sciences and humanities while they tried to build research legitimacy in their disciplines.

She explained that: "There was no research legitimacy. Serious research is disciplinary research and educational research was not seen as serious research". Previously good work in the area had been done at the university, but no publications of significance had emanated from it. At the time there was nobody who could stand up and say "I'm a recognised researcher and I have all these publications, international reputation etc. It was here in South Africa that you had to show international recognition first before getting national recognition (unlike in the USA)". She embarked upon a PhD and struggled to identify local experts who could supervise doctoral studies in her field. "But I think I found my intellectual home in the international community". Professor Frankie, in efforts to develop both herself and the field, established international relationships, engaged with others at international conferences and generally became more involved in the international community. Her PhD was well-received with two to three scholarly publications immediately after

graduating. In 1997 she was the most experienced South African researcher in the specific area at the time, even though she had just completed her PhD.

She worked hard at her role in academia and tried not to polarise research, and she worked in schools and in community development at all levels. Nobody could argue with her research output or its quality or the position that she had earned both in the field and nationally. In this context, without an extensive research track record at the time, she applied for and was appointed to the position of Research Chair.

That was a massive turning point for me. It was quite clear to me that what the Research Chair had to do was to establish the field, rejuvenate it. You cannot do that with one person. There has to be a community. You have to build the next generation. The first step was that there had to be people with PhDs. We had to get research going.

She started new doctoral programmes and collaborations with corporate partners to fund a new research centre for the field. In 2010 Prof Frankie, the only NRF A-rated researcher in her discipline, was awarded a new chair in her discipline. She made the following comments: “So it is not about the status. We have a real opportunity here to set benchmarks, to set the path ahead. Given my seniority, I see that as my role. This is an opportunity to think big”.

The two different pioneering portraits presented thus far are about as far apart as the historic separation of the natural sciences and the humanities in this country’s knowledge system. It marks a different stage in the higher education system in South Africa, with the first South African doctoral degree and publications in this specific field of specialisation obtained only in 1997. Professor Frankie had also entered her research career (doctoral studies) at an advanced age compared with the early PhD in the natural sciences and engineering groups of this sample. These factors are indicative of the lagging development of research in the field of education in the domain of the humanities. The initial intellectual developmental support was mostly external, with expertise for research development coming from international (mostly

European) contexts. The allocation of a research chair made an important difference by providing research prestige to a fledgling discipline, much-needed access to funding and increased opportunities for supporting doctoral students. Education still remains one of the country's biggest challenges.

Professor Bright obtained her doctoral degree from a North America university and was employed there during her early post-doctoral career. In looking at her pioneering efforts in her field, she talks about going against the traditional research paradigms of her time. She professed that her interest in race and gender came from her background as black female professional in mostly white organisations all the time. In Professor Bright's portrait one can see how the racial and gendered nature of society can impact on research undertaken at any specific socio-political period in the history of a discipline.

I had always had an interest in race and gender in organisations. At my institution this was not a common topic, it was not main-stream and was not anything a committee would approve. A fellow colleague with a similar interest, and I, then decided to do some collaborative work on race in organisations. Nobody was doing this work. Nobody in organisational studies wanted to hear about it. I started writing about what was invisible in the literature. It was about taking a topic that nobody said I would be successful in, but about which I was deeply passionate. In the beginning we would get strange letters from editors saying that this work was not important. The top journal in our field declined our request for a special issue on race in organisations. They declined our request saying "we do not think that race would be of very much interest to the members of the academy" (approximately 1990s). That became my motivator. So I sat down and wrote an article in 1992 that was provocative, but which proved to be a seminal piece and has become a classic in our field. This article got published in the top journal in our discipline after all, since the editor was open to change at the time, ready for the required paradigm shift. For me, leading research is about new ideas, about pushing boundaries, questioning my paradigms, about adding value. This is critical in developing confidence to have something to say, especially as a black woman..

All three examples illustrate that research that is moving field boundaries is about doing research that makes an impact, not about repeating the status quo. “It is about critically not accepting what is out there as a body of knowledge, about really questioning that body of knowledge – what it is telling us and where does it need to go” (Professor Bright). The findings reveal that undertaking research that moves field and discipline boundaries requires a personal drive and academic capability, confidence to challenge the status quo in research-intensive institutions, and access to funding and other support that will sustain the research contexts.

7.1.2. Driving excellence through innovative research

Many of the research groups led by the research leaders in this study are working at the cutting edge of their disciplines and usually form a core of expertise in and across various research focussed institutions. This is demonstrated by the fact that they are usually the only team or institution doing research or offering research programmes in a particular field or in a particular way. These are usually innovative, first-of-its-kind interventions as illustrated below:

We are the only place in Africa that really specialises in this area that is growing in importance and the demand is very high. (Professor Agri)

In South Africa my research group is one of the first groups to do metabonomics for HIV, a new field of research. I wanted to make sure that we published the first set of papers for this specific NMR work. (Professor Marie)

We are using methods of social science and applying it to medicine, but doing it in a particular way, informed by my expertise. My work cannot be done in isolation and it requires collaboration with large teams e.g. I have a large project with 32 teams across Africa. (Professor Sandy)

We are certainly the Law Faculty with the most graduate students doing PhD’s and they are certainly mostly from our Masters programme. This is quite exceptional because in Law people are not easily interested in studying a PhD because it is not really useful as such to daily practice. (Professor Wayne)

Professor Liu, working in an engineering discipline, explained the kind of research pathway that earned her an A-rating and numerous local and international awards in recognition of outstanding work in her field.

It took little steps, of doing things I consider important in pushing research ahead. The questions we were asking were unique and we had been working at it for a long time. Eventually we found a solution to the question that nobody had been able to answer. We also continued to ask questions that we thought were the right questions. In this space you are not limited by what other people think, not influenced by that type of framework. Kind of like mmmmmmm….. this is an interesting question and I think I am going there. Eventually you become a world leader, doing very novel, very different research.

The same uncompromising commitment to excellence is expected of students working as part of the research team where the young people are expected to do their best. Prof Liu often speaks about the privilege of working with the "best of the best" in the research area. She shares this message with students. She explains:

You are in an area where you have the best in the world working with you and you will learn from them and you will get there. We choose our topics, so we are working in an area where we know what leading edge is. So if somebody comes into the team they are very quickly brought up to speed as to what is leading edge. The work that is done here is leading edge and the students love it. They actually see the vibe and feel it and it is good for them and us. Here you are not going to be allowed to be your average engineer.

Student views and experiences of the leadership provided by research leaders as reflected in the questionnaire seem to reflect and reinforce this message of striving for excellence:

Prof never allowed mediocrity. He strived for excellence and thoroughness. These attributes are useful in research as they always ensure high quality research.

Prof places a very strong emphasis on publications and continually stresses how important that is. He implemented a "1x1000" reward system for publications. The aim was twofold; firstly to encourage students to publish their work and secondly to get students to publish in good international journals. This has been an excellent incentive and has made students criticise their work and think beforehand about where they would like to publish.

The inspiration to meet productivity expectations did not come from a fear of disappointment, but was rather driven by the respect I have for the research and professional reputation of Prof Wayne and the Mellon Foundation as an institution. I should add that I always aim to strive for excellence within my professional life and that the completion of the PhD in itself was reward enough.

This continued stress on expertise and excellence is evident in some of the professional profiles of students once they have gone on to fill niche areas of their own. The group of mentees who have remained in the research enterprise include an executive dean and dean of faculties,a research director of an institute, full professors and associate professors, heads of research laboratories, managers of research and development, senior scientists and senior lectures who work both nationally and internationally. Five mentees supervised by the research leaders who participated in this study have obtained NRF-Ratings themselves. These include one Y-rating, one P-rating and three C-ratings which means that they are all considered to have established themselves as independent researchers in their fields and can access competitive research funds. Those who have gone into the corporate world occupy senior positions such as Chief Executive Officer, General Manager, Directors, senior process engineers, and senior practising health professionals. In the words of Professor Frankie, when talking about her students, she feels that "they take leadership roles when they complete their studies because of the kinds of experiences they have had here. It is not about going back with a qualification, but with academic expertise." Mentee feedback on their current research roles are listed below and give an indication of their extensive research footprints.

"I am involved in international advocacy campaigns, including at the United Nations level and have been invited by the UN as an expert to present and engage in discussions on some key human rights issues."

"In my area of research I am acknowledged as a contributor to world leading research and in terms of the practical application of the skills I developed through my research, I would modestly place myself in the top 10% in the world."

"Not only do I have publications in international peer reviewed journals, but also a provisional patent for active anti-cancer gold compounds. It is excellent."

"I am an established researcher with international recognition. I got a C1 rating from the NRF within five years of obtaining my PhD. I get invitations to present my work at prestigious international conferences."

I am now a renowned researcher/expert in the economics of water in the SADC region and beyond - the niche which I now have because of the nature of leadership and training received from Prof Agri. I offer professional training in the economics and financial issues of water management and provide consulting and research services."

One is reminded of the findings of Babu and Singh (1998) with regard to leadership and followership, where they found that those who had prestigious superiors were indeed more likely to be productive (p.323).

7.1.3. Forging an international footprint

Historically, international cooperation has been limited as a consequence of South Africa's longstanding isolation from international politics and the marginalisation of its higher education institutions. However, science in the 21st century is truly global in scope and quality national and international research networks in post-apartheid South African higher education institutions have generally increased in line with South Africa's greater international acceptance and global integration.

In this study a quality global research footprint is seen as one of the hallmarks of research leadership, where research leaders lead and/or respond to changing global pressures, influences and trends. An essential leadership role is that of building and nurturing networks of interaction and interdependency. It may be argued that all active researchers have established networks in order to foster meaningful collaborations, so that this criterion would not be a specific 'leadership marker' in the research world. Perusal of the curriculums vitae of the participants in this study reveals that they have served as visiting fellows at universities across the globe, have served and still serve on international bodies, have been invited speakers to prestigious conferences or have organised some of these prestigious events themselves and have undertaken collaborative research with a diverse range of global partners.

Their research teams comprise both local and international students and their students are exposed to diverse research environments through study visits abroad. In addition, in the case of the A and B-rated scientists, the international recognition is very important and, at minimum, are viewed as 'considerable'. In the words of one of the participants interviewed: "My own research connections are all over the world and it has been that way for a very long time. My network should probably not grow any more since it is just too big".

Given the existing broad international footprint of the participants in this study, the findings presented here aim to illustrate the quality of some of the leadership roles they have played in driving quality global networks rather than to enumerate the length and breadth of their publication lists.

Professor Frankie, who was instrumental in driving local research in her field as outlined earlier, found that this role extended internationally as well. In describing her early entry into the international community, she explains her role as follows:

I think that I hit the research community internationally at a time when they were trying to make sense of the developing world and I was a good conduit for that. I was a good spokesperson. It was an opportune time for my research to really be heard even though it was not always heard well. There were many arguments about how some research done in developing countries gets "exorcised" and marginalised if you don't enter it into the main stream.

This role was further expanded by the appointment to leadership positions and hence positions of genuine influence in international bodies.

I was on the Executive of a scientific organization that draws its over 500 members from more than 40 countries around the world. I was then appointed vice president of the International Congress of our research field. From that leadership position there was a clear goal and that was to get the international community to understand what working with the developing countries meant. It didn't mean paying for one or two people to come to a conference. If you want to understand what is going on there (developing world), then you must go there. So we set up an Africa Regional Congress. So at that level of global leadership I was able to do that stuff and it all

accumulated towards being more visible, more central to the research community".

The international recognition that results from these international roles is most influential in the local research environment. She explained it as follows:

I work hard but I enjoy it. I establish the connections so I have very strong relationships with leading researchers elsewhere. I am recognised for who I bring in here at my institution. They come here because it is good for them to work with me here in South Africa and they are not doing me any favours. Repeat visits and contributions to funding show that they want to come and work with me and my students and that is because it helps their work as well as mine. So international recognition is also built through research partnerships and co-authored as well.

Students also seem to be drawn to these research leaders and their teams, usually as a result of professional recognition and/or personal exposure. In turn, the success of past students has a huge impact on the international footprint of successful research institutes or centres. Professor Wayne is the head of a centre started in 1986, partly as a response against apartheid and a means of working towards a constitutional culture in South Africa. The current focus of the centre is more extensive and on broader human rights in Africa, and the flagship project is a Masters' programme that draws students from all over the continent. This is done in collaboration with seven other faculties from Africa, and there is a Council with members from across Africa. With regard to the global footprint of the centre, Professor Wayne explains:

…….*so we have a network of about 300 lawyers in Africa and other parts of the world which really creates this network of research. Not only that, but people come here to engage and spend time here and there are many spin-offs for us. And obviously we can stay on top of the field, focussing on human rights and democratisation as it develops in Africa.*

Thus students are drawn to local expertise through quality international networks and highly motivated researchers, as reported by a mentee of Professor Wayne. The following account illustrates the role of internationalisation in growing the student experience and exposure into Africa, as opposed to a one-way flow into South Africa.

My participation in the All Africa Moot Court competition in 2000 in Ghana exposed me to the field of international and comparative law. This experience also introduced me to Prof Wayne (South Africa) and it was after his talk on the African human rights system that I decided to enrol for the LLM in Human Rights and Democratisation in Africa. This exposure in turn motivated me to embark upon a research journey which took me from an LLM in human rights to a LLD within the same field.· Whilst working towards my LLM, I was exposed to the African regional human rights system and, coming from South Africa, where my exposure to the rest of the continent was extremely limited throughout high school as well as during my first degree at university, it was the interaction with other students (in my LLM class) from all over the continent that served as a further "critical incident" in triggering my specific research interest in the context of African circumstances. The opportunity to travel to all four regions of the continent and various countries to conduct research, as well as the opportunity to attend a number of sessions of the African Commission on Human and Peoples' Rights definitely shaped my specific research focus.

However, Professor Agri describes the development of these quality networks as a "two-edged sword", especially for African research leaders who establish quality research institutes that then develop increasing international reputations.

International and regional initiatives are always looking for representatives from developing countries and especially from Africa. However capacity in this field is still very slim (very few trained yet) and so there is a great demand on my time. You find that you are asked to sit on advisory boards and international steering committees and editorial boards of journals. There are lots of things that come your way. These are very important global involvements for Africa with real professional significance, and it is important that we, as Africans and South Africans, participate, but it is sometimes too much. We are trying to develop more senior expertise in our field so that others can participate in international and scientific events.

Quality international networks are vital to global discussions on science and scholarship and to participation in research in fields relevant to national, regional and international development. At the senior level represented in this study, the South African researchers have been shown to be the expert in many cases, with roles of international responsibility and power equally shared between partners. Comments show that the research leaders value the expertise on the African continent and many of the joint research projects contribute to continental and regional empowerment and development. Our research leaders are pivotal nodes of connection in the knowledge network.

Chapter 9 of this study addresses the possible link between this level of internationalisation and the transformation of South African higher education.

7.2. Personal scholarly recognition and prestige among peers

"The Nobel Prize, the Pulitzer Prize, and the Olympic Gold Medal are recognized world-wide as symbols of human excellence. These awards are bestowed on individuals in recognition of achievements that have made significant contributions to society. When individuals are recognized as outstanding, the entire culture benefits because our ability is pushed to the outer limits of what is possible and imaginable." This is part of the forward of an annually published award booklet for a fire department (Clark, 1997:2). It succinctly captures the widely accepted notions of recognition for achievements at the global level. Researchers pushing the boundaries of their disciplinary fields through innovative research while building and influencing quality international networks are often recognised through a system of national and international rewards. Personal scholarly recognition and prestige among peers is considered one of the hallmarks of excellence in the definition of research leadership used in this study. Awards are usually won through a competitive process among peers, and one of the ways one can judge international and national recognition is through the awards received by the research leaders. Because awards can have personal, professional and organisational impacts the decision was made to interrogate this aspect of the research trajectories of the research leaders. However, it is recognised that scientific eminence, while stemming from scientific performance, may delay performance and persist after performance has declined (Reskin, 1979:131). While this was not an area that the participants talked about unless prompted, the lists of achievements were obtained from the curriculums vitae.

In early research on productivity and prestige (Scott Long and McGinness, 1981) a number of indicators of eminence were coded, ranging from election to the national academy to the numbers of honorary degrees, postdoctoral fellowships, or scientific awards received. They then used a weighted count of

prestigious awards such as the Nobel Prize and election to the National Academy of Science as having the highest weighting. This study does not use a weighting of measures, but aims to contextualise the different awards that are currently received by researchers in higher education in South Africa. Awards are generally based on the quality of the research outputs. However, given the unique education history that was characterised by race and gender imbalances, in South Africa many of the awards presented to female researchers are given in recognition of excellent contributions to research capacity building, social impact and advancing scientific excellence. While international awards are always highly prized, an increasing number of national science awards have become visible and credible indicators of excellence and are often used to the advantage of research faculties and the university in terms of benchmarking. In terms of benchmarking, universities recognise the importance of their researchers receiving these awards and thereby contributing to the university's academic research reputation. The first part of the research portrait of Professor Nelwa was used earlier in this chapter. The continuation of this research portrait is now included to highlight the value and role of scholarly recognition and prestige among peers that arises from the intellectual leadership of the research leaders.

As a young researcher, Professor Nelwa was the first African Engineer to be awarded the President Award (P-rating) by the National Research Foundation. He also received a number of other awards which include the National Science and Technology Forum (NSTF) awards for contributions to science. The most recent (May 2011) was that of Research Capacity Developer Award. This prestigious award is made to researchers who have made outstanding contributions in scientific research in developing countries in the previous five to ten years. He was also awarded the Outstanding Project Leader award for the Technology and Human Resources Industrial Programme (THRIP). He has been a significant driver of research in his field in Africa and for that he was awarded the TWAS-AAS-Microsoft 2009 Award for Young Scientists. He was the youngest recipient of the Order of Mapungubwe in Bronze for outstanding contributions to, and inspirational achievements in the field of engineering science (other recipients include

Nobel Prize Winners Sydney Brenner, Allan Cormack, JM Coetzee, FW de Klerk and Nelson Mandela). He has served on many boards of directors especially for information technology companies. He is a Fellow of the following institutes: African Scientific Institute, Royal Statistical Society, Academy of Science of South Africa, South African Academy of Engineering, Royal Society for the Encouragement of Arts, Manufactures and Commerce, Council for Scientific and Industrial Research and is a Registered Professional Engineer. He has been an associate editor of 6 journals including the International Journal of Systems Science and has acted as a reviewer for more than 26 international journals.

NRF Rating History

P(2003) – C(2008)

For a more nuanced understanding of the national context in terms of research rewards and recognition it becomes necessary to differentiate across national, continental and international boundaries. As it is to be expected, many of the awards presented to participants in this study are at the national level, although A- and B-rated scientists are regarded as international scholars according to their research performance. Most frequent national awards across the sample of professors are summarised in Table 11 below.

Table11: Summary of some South African recognition and award categories for research excellence**.**

NATIONAL AWARDS	**NAMES**	
Awards by State (political)	**Order of Mapungubwe Awards** • Platinum (OMP), for exceptional and unique achievements, • Gold (OMG), for exceptional achievements, • Silver (OMS), for excellent achievements, • Bronze (OMB), for outstanding achievements	Granted by the President of South Africa, for achievements in the international arena that have served South Africa's interests. **(X2 researches: one silver, one bronze)**

Awards by National Department (Science and Technology)	**Women in Science Awards**	Annual awards recognising achievements of academic women at various career stages.
Ratings by Science Agency (National Research Foundation)	**NRF Ratings** according to established researchers with solid track records (A, B, C) or younger researchers who show potential of becoming established in 5 years (Y) or becoming future leaders in their field (P)	Based primarily on the quality of research outputs in previous eight years and assessed through international and national peer review (**All researchers in this sample are rated)**
Awards by Sector Body (representative science sectors)	**National Science and Technology Forum (NSTF). Awards** for: a) Individual contributions to Science, Engineering and Technology. b) Research leading to an innovation. c) Research Capacity Development d) Science Communication, Outreach and Awareness	Annual awards recognising the outstanding contributions of individuals and groups to SETI. They afford opportunities for recognition and celebration to all practising scientists, engineers and technologists across the system of innovation. **(x4 researchers, more than once, across different categories)**
Academies	**Academy of Science of South Africa:** **Science for Society Gold Medals**	ASSAf Science-for-Society Gold Medals for outstanding achievement in scientific thinking for the benefit of society. **(X6 Academy members and x2 Gold Medal awardees)**
Learned Societies	**Royal Society of South Africa:** **Meiring Naude Medal** The normal criterion for election is significant achievement in the advancement or application of science **South African Society for Plant Pathology: HCP medal** **South African Institute of Chemical Engineers: Bill NEIL-May Gold Medal**	Medals awarded to outstanding young scientists who have already made their mark in their chosen field and who are poised to become scientific leaders. **(x 3 researchers)**

Institutional awards (individual awards per university)	**Exceptional academic achievers awards** e.g. Vice-Chancellors Award, Outstanding Achiever Award, Laureate Awards	The Exceptional Achievers Awards is hosted annually to honour academics who are leaders in their field and serve as role models to the university community. (**all researchers have received various institutional awards)**

From Professor Nelwa's portrait, one recognises that the awards are made at various levels throughout the national system. The highest national award in South Africa is presented by the president himself for scientific achievements in the international arena. This Mapungubwe prize has been won by only two researchers in the sample (one male and one female).

Scientific excellence at an early stage of a career is recognised through the NRF P-rating. This rating recognises scientific performance that builds from doctoral studies and at a level that shows potential for groundbreaking work and leadership into the future. Three researchers in this sample obtained P-ratings early in their careers. Of the participants, Professor Nelwa was the first NRF P-rated African engineer and Professor Liu the first NRF A-rated female engineer. The excellent research records illustrate that 60% of the researchers in the sample were nominated to the South African Academy of Science and at least two of these have been recognised by the academies for individual recognition and reward. These awards are related most strongly to individual scientific outputs. This group also includes research awards at institutional level. With regard to the NRF awards, one participant stated:

I think that the only way you can judge real international recognition is in the awards. Nobody wins those awards if they have not satisfied their peers. I have an A1 rating and this is part of the reason I have that rating, since it has to do with international recognition.

However, an alternative view or experience of the rating is also expressed by another of the research leaders. This view about the NRF rating system has been found to be prevalent among a number of researchers in the national system and dissatisfaction of this type contributed to the call for a review of the rating system in 2008/9 (reported in Chapter 5).

Don't talk to me about the rating system. I am furious. I was demoted from an A to a B1 just recently. The reason given is that I haven't enough single authored publications and my work is not theoretical enough, and yet I am told by my institution and others that I must be developing capacity. So how single authored publications link to developing capacity in this country I do not know. I don't want my A rating back, but I do want what I do well to be recognised.

The NSTF Awards are considered unique in the South African system. They recognise scientific contributions at individual and team level with specific categories for research performance based on race and gender, i.e. black researchers and separate male and female awards. The issue of special race and gender categories is a feature of the South African historical legacy, but is not always enthusiastically embraced by all sectors of the scientific community. Many researchers outside this sample also feel that it is more prestigious to win in an open category, rather than in one that is for a specific race or gender. Anecdotal evidence suggests that there are also strong feelings among the research community at large that having special categories perpetuates a myth of a changing scientific workforce. However, an alternate view is that as a country, we have not yet developed a representative science workforce and hence this type of segregated award system may need to remain in place for a while yet. According to Professor Bloom:

Awards like the NSTF awards belong to the group, to a lot of people, and I think they are less about my accomplishments directly. So you actually stand in a corner holding a little bit of this great achievement, but your name is on it.

At national level one also finds a number of gender specific awards recognising and rewarding the excellence of female scientists. The female researchers in this study have won the Women Scientist of the Year Award

(sponsored by Department of Science and Technology), Women Empowerment Award for Achievement (University Award) and an award sponsored by a national corporate food chain, The Shoprite Women of the Year (Science and Technology Category). These are prestigious awards based on international scientific excellence. However, comments from a female participant indicate that, although the national awards are not weighted, certain awards receive less recognition from peers than others:

As an example, I won a major public award (Science and Technology section) and my dean did not even have any clue of this. The award was a wonderful external validation and affirmation which I needed exactly at that time. It was an affirmation that what I was doing was valuable to the community at large. So these kinds of things, outside of the narrow institutional framework, people are oblivious of.

At a continental level, the higher education system of South Africa has emerged as one of the strongest research systems. There is an urgent need for Africa to mobilise its scientific resources quickly, to develop competencies and comparative advantages to champion programmes that promote access to science and technology by all, and to strengthen research capacity. The African Union Scientific Awards are awarded to African scientists who have remarkable achievements. This is demonstrated by the number of publications, the number of graduate research students, the applicability of the scientific work to Africa's challenges, and its patentability. Only nationals of the African Union (AU) Member States are eligible to participate in these Awards. One of the researchers in this sample won the inaugural African Union Award in the category Basic Science, Technology and Innovation. She was singled out for this prestigious honour from 48 entries submitted from all over Africa. South African President Jacob Zuma attended the awards ceremony that took place in Addis Ababa during the 14th African Union Summit. He had this to say:

I say with pride that South Africans continue to display excellence in various fields in the international arena. On behalf of the South African people I wish to congratulate Professors (names) and wish them well in their endeavours to make Africa and the world a better place to live in.

Professor Nelwa was also a recipient of a continental award to recognise young scientists working and living in Africa whose research in computer science has had, or could have, a positive impact on the developing world. These prestigious continental awards are directly linked to the possible impact on research and innovation in Africa. This links to the earlier words of Prof Agri when he said that South African researchers have a commitment to research leadership responsibilities in Africa (see Paragraph 3.1.3 above). International recognition of research expertise also seems to be through the appointment of researchers as fellows of international societies, international chairs at partner institutions, editors of international journals and appointment to international committees and boards. It is evident from the curriculums vitae that at least 80% of the participants in this study have been widely recognised internationally through being appointed to positions listed above.

It is important to note that the most effective combination of these rewards and recognition varies for each individual and for an individual over a life time. Discussions with the research leaders presented thus far reveal that the early findings of Bland and Ruffin (1992) who studied productive research environments, still apply, namely “although salary awards, promotions and the like are important rewards, what motivates researchers are the intrinsic pleasures of challenging work, intellectual accomplishment, stimulating colleagues and being valued by one’s colleagues, both local and abroad” (p.392).

In keeping with efforts to provide the mentees’ perspective on all issues discussed, one item on the questionnaire asked:

<u>What do you consider the essential characteristics of a credible researcher?</u>

The most common responses from Professor Frankie’s mentees are as follows:

- Expertise (deep and critical knowledge);
- Respected in the research world;

- Global networks to which juniors are introduced;
- Should do research in your field;
- Provides space and support;
- Is able to work with a team of junior researchers;
- Concern for others.

The results of the exploration of the intellectual leadership provided earlier are reflected in the first four demands of credible research leadership made by mentees. The next part of this chapter will discuss whether the research leaders live up to the expectations of the last three characteristics.

7.3. Leadership of the People

The intellectual leadership roles played and positions enjoyed in scientific domains have been outlined above. It is clear from this discussion that the research environments of the centres and institutes represented by the participants are led by highly skilled scientists. However, leadership in the research context is not just about the leader's technical competence or knowledge of the field, nor is it about driving technical reforms of the changing system like new accountability measures. Leadership of the research enterprise must place people and their context at its centre. Transformative leadership in education requires careful and consistent attention to the needs of the community in which one serves and understanding both the conditions in which we live and how to change them (Shields, 2009).

One of the questions in the interview with research leaders asked for comment about their research leadership approach and the mentee questionnaires provided a mirror image of this information through a similar question viz. How you would describe her/his leadership style/techniques?

This was to avoid the general criticism of leadership studies as being self-reporting. The most common descriptors of their own leadership style provided by the participants were empowering, enabling, capacitating and

consultative. The leadership attribute with the highest scoring frequency was people/team/collective, with shared vision and motivation in the top three leadership attributes identified. There was a strong emphasis on the team approach to management and leadership and the responsibility of creating environments that were conducive to research success.

My work with juniors or early career researchers includes finding out what they want to do, clarifying with them their area of focus, their passion, encouraging, brainstorming, introductions to other networks, co-authorship where this is possible, and proposal development. I feel that is important for the early stage researchers to be surrounded by a community of scholars who are doing similar research. They can be stretched through research conversations, through other community conversations. (*Professor Bright*).

Mentees described the leaders variously as passionate, confident, charismatic, dynamic, motivating, supportive, providing opportunities, compassionate and energetic but also as demanding, having high standards and sometimes as non-compromising.

Prof was encouraging, enthusiastic and interested (at times even fascinated) with how I was approaching my research. Her expansive body of knowledge prodded me into ways of thinking and bodies of knowledge I had not previously explored. She was an astounding resource of knowledge and expertise. Our relationship was one of deep mutual respect, open communication, and I always felt that she was 'championing' me and was my advocate for success. (Professor Brights mentee)

However a cautionary warning is that naming an effective leadership style or behaviour is often easier than using one. In a study by Argyris of more than 250 research and development supervisors, 85% of the supervisors described their leadership styles as facilitating autonomy, openness, risk taking innovation and self-responsibility (quoted in Bland and Ruffin1992). Yet the review of the audio recordings of technical problem-solving meetings with these supervisors found the opposite to be true. Some of the findings that relate to the general leadership style are tabulated below to illustrate both the researchers' different self-images tabulated alongside the mentee's experience of his/her leadership style.

These findings show that in this study most of the self reports of the researchers are independently confirmed by the mentees' experiences.

Table 12: Leader and mentee views of leadership approaches used and experienced.

Leadership approach as stated by most research leaders in the sample	*Empowering. Enabling. Capacitating. Consultative. Decentralised.*	
	Researcher's view of own leadership approach	**Mentees' view of researcher's leadership approach**
Professsor Liu	As a leader you have to be flexible to work with different people even though it sometimes drives you nuts. I see it more as enabling (rather than leadership) - enabling people to do what they can do.	She is an open-minded and intuitive researcher, willing to allow her students to step up and take initiative in pursuing their own ideas, but providing the guidance and support to ensure that the research stays on track.
Professor Agri	I generally don't have enough support at senior level, so my philosophy is basically to decentralise and empower people to take more responsibility for many of the activities and so get more work done	He was a very difficult supervisor to satisfy as he always strove for excellence. It was only when I got to the field that I admired his leadership style because he had made me a very sharp researcher.
Professor Bloom	My personality is a people person. My strength is in the strategic space and I think I am good at bringing people into sharing my vision. I couldn't do my work without my team	He is an extremely good motivator and his passion and drive for what he does is very infectious. He is the type of person who is always optimistic, looking for the best in everyone, and has the ability to make you believe you can do anything. In this way he is very inspirational and supportive to both students and staff alike
Professor Sandy	I am demanding of very high standards: action oriented with a great deal of critical reflection.	She expects a lot from students and wants independent thinking. She is supportive but tough when she needs to be. She is extremely good at providing constructive criticism without demeaning ones' attempts and she is diligent in her encouragement.

It is noted that one mentee (of a total of 30 questionnaire responses) described the relationship with the research leader as 'complex'. The mentee recognised the expertise of the leader, expressed respect for the breadth of knowledge and commitment to research and found the researcher to be generous with resources. However, the challenging aspect of the mentee - research leadership relationship was expressed as follows:

(Name of research leader) is a difficult person to say no to and can be vengeful if crossed. I felt blackmailed a lot of the time – I could not express opinions freely, or refuse requests as I was afraid of how that would impact on the final outcome of my PhD submission. (Mentee)

The same mentee also found that the doctoral experience **"**was a difficult, largely unrewarding, exhausting and emotionally draining process which for the most part I did not enjoy". Mentee responses were collected via a questionnaire and hence no further interrogation of this mentee experience was undertaken. This feedback is recorded as a reminder that any research leadership cannot be exercised or experienced as a one-size-fits-all commodity and whether formal or informal, mentoring relationships involve a complex and evolving process of interpersonal interactions (Ackerman Ventimiglia,and Juchniewicz, 2002).

At a general level, on a day-to-day basis these leaders seem to function in the distributed leadership framework that was described in the Literature review above. As Professor Agri explains, for his centre, this distribution is largely related to the lack of capacity and hence it becomes necessary to empower people at various levels in order to achieve the productivity targets that need to be met. However, this distributed leadership framework is also visible in how leaders and students function in some of the centres, where the role of leadership moves between the various players in the research teams.

When you think in the smaller context of the group, when we have a new student coming in, he/she is placed in different groups of research specialisation. His initial peers are his leaders. Research meetings take place in a team of students, so the more experienced students take on a leadership

and mentoring role among each other and to younger students. (Professor Liu)

This seems to be more visible in centres that are using the committee or large team approach to doctoral supervision. More traditional one-on-one supervisory approaches still align closer to the expert-apprenticeship relationship, although the professional and personal relationships in almost all cases were reported as positive. Distributed leadership dynamics are also at play when research leaders supervise students in areas slightly outside their own area of expertise and the student and leader acknowledge that the limitations. This was recognised by the leaders and mentees in this study and illustrated as follows:

She (Professor Liu) is not afraid to learn and not be the expert in all the fields. That allows her to integrate and optimise systems rather the unit operation processes. I also believe that this is very important in today's energy research environment, as there is no one technology or plant or one resource type that helps us out of the energy crisis.

He (Professor Nelwa) allowed me to do research in a field that he was not too familiar with but he tried as much as he can to find out about it and also the ways in which I could get better understanding.

This open, flexible, team oriented leadership style used by the research leaders can present challenges if not well-balanced by firm decision-making as and when required. The challenge lies mainly in the fact that highly productive research teams working at the cutting edge of their field are likely to comprise a number of independent, creatively thinking, questioning, intelligent team members. However, the findings indicate that research leaders at this level are aware of such challenges:

Sometimes I think I have 30 individual bosses - but that is how I think it should be when you work with the best of the best. My job is to make sure that it all works, that they will get their PhD's. I just have to make sure the environment is right. (Research leader)

It is also difficult to manage on a personal level as all of the researchers in our group are academically strong with strong personalities, and to still manage such people that would have been able to develop their own, different academic programs elsewhere, to serve a common goal yet each with his/her

own personal stamp, is an achievement. This is being achieved by creating an excellent team spirit by Prof, and by acknowledging the contributions of the team continuously and when awards are given. (Mentee)

At a deeper level of interrogation of the interview data it became clear that some of the participants expressed views that showed a leadership emphasis that went beyond the day-to-day dynamics of distributed leadership of the research enterprise. For some participants the leadership was about both the technical aspects of a productive research environment and the issues to do with people that influenced the environment and beyond. They emphasised their feelings of responsibility to make a difference to the total quality of the broader research experience; this included making sure that mentees were emotionally and socially cared for. In many cases they held strong views and performed activist functions in their institutions and in government forums with regards to issues such as student access and funding, curriculum and quality and availability of research facilities. Broader societal upheavals also impact on the people in research and leaders must be able to respond in ways that are morally justifiable. Research leaders describe various experiences as follows:

In our research team we have South African students, non South African students, religious differences etc- we have got to keep trying to balance it all. During the xenophobic attacks in South Africa (2009), many of our postgraduate students were working on a project in China. However, all their families were left behind in South Africa. They (students in China and families in South Africa) were panic stricken and so we had to organise around that situation, camping in the offices or bringing others to my home in some instances. It is real and respect is essential. (White Research Leader)

My career as a researcher/academic started in 1991, as apartheid was slowly coming to an end (legislatively)... I suppose the Centre for Human Rights and my academic work was a response to…a confrontation with apartheid, especially at a previously whites only institution. ….human rights as a culture of justification of authority rather than blank authority; and a culture of inclusion as opposed to the exclusion of the past. (White research leader)

There is also a strong involvement of research leaders in community work, especially at schools and in local communities, and some emphasis on community health issues. The emphasis and involvement in schools is

located in the understanding that the youth needs to be motivated to think beyond the confines and constraints of many of the impoverished communities. There is also the view that science and technology has to be taken out of the laboratory and made more accessible to the broader community. The other area in which researchers seem to have used their influence beyond the institution is that of health care. It is not surprising that the focus mentioned is on HIV/AIDS, since South African is a country with one of the highest infection rates in the world.

I have many diverse interests which are not normally known in the science community. I always encourage students to participate, to have a view. I am an activist, a community activist and I have firm beliefs. I do community work, especially organising donations to schools in my local home province. I take these community issues very seriously. I believe a person should be engaged in all sorts of things, not only research.

I feel that scientists have a responsibility to their community. I am sure that I do more than 10% of university requirements for community engagement. It makes sense for us to contribute, for people to understand a little bit of what we know, especially in the case of HIV Aids. I applaud scientists who work with non-governmental organisations and ensure that the people have more information. I try to instil the same kind of thinking in my PhD students as well, to tell them to share scientifically correct information with their communities and the general public.

I do lots of community oriented work. I believe that ideas about causation influence treatment seeking and affects adherence (e.g. to Anti-retrovirals/ ARV's). You have to ask the why questions and what are the barriers. I train my students to be activists and advocates. It is not just about doing their job. Research should always have meaning and relevance.

A discussion about the leadership approaches of the researchers and the mentees' reflected experiences of their leadership will be continued in Chapter 8 where the main focus is on mentoring, supervision and preparation of the next generation of researchers.

7.4. Synthesis of Chapter

Under the heading of "Fully Engaged Leadership" this chapter discusses salient features of the researcher's intellectual leadership and the capacity for the management of people. Many leaders in the sample were shown to have

contributed towards significant research developments in their disciplines, especially in their early careers. The decisions to drive these developments were associated with some level of risk-taking and personal drive and resulted in pushing the boundaries of their fields at the time. The leaders have made extensive inroads into the global community and this has benefited both individual research performances and institutional reputations. The internationalisation at this level has been significant since many of the participants have been able to influence how the international community views and collaborates with the developing world. The prestige among peers is valued by individual researchers. The South African reward and recognition system acknowledges both research excellence and contributions to building research capacity.

Most research leaders felt that their leadership style was people-centred and empowering or capacitating. The leaders self views were corroborated by the mentee responses. In general, mentees experienced a positive, professional relationship with their mentors. A distributed leadership framework seemed most common, with some leaders expressing views on leadership that showed a move towards transformative leadership, i.e. leadership that is concerned with addressing issues of inequality and social justice.

CHAPTER EIGHT

Preparation of the next generation of research leaders

In the transformation of the higher education system in South Africa it has become clear that the full mobilisation of the talent pool of the nation is both the biggest challenge of and the biggest opportunity for taking the country to new heights of national development and competitiveness (ASSAF, 2009:67). In the context of this study, part of that talent pool is the cohort of new young scientists and scholars. Mentoring in doctoral education is crucial to students' development as professional researchers. As with the term leadership, there is no single definition of mentoring in scholarship of graduate education, but there is some agreement that mentorship must contribute to a student's professional socialisation (Hall and Burns, 2009). The concept of research capacity has been widely used in the South African higher education research context and "there has been recognition of the need for 'research capacity building'" (Dison, 2004:84). The merger of higher education institutions has posed challenges for research capacity development. Within the South African context, "research capacity building' has most commonly been framed by discussions of research development of black and female students (individual level) or historically black universities (institutional level). It has been less commonly associated with development of novice white staff and students. This research sees research capacity development as an issue concerning all researchers. "The complex and wide ranging nature of research capacity means that development of capacity is a long- term, multifaceted ad multilayered process" (Dison, 2004:85).

In the context of mentorship as a potential strategy for the development of leadership, this chapter focuses on the different influences of research leadership in developing and driving the high-quality research performance of emerging researchers. This includes the participants' own views as well as the personal experiences of students of their research leadership. Mentoring occurs in the conceptual framework of a relationship and as such is

multidimensional; at its best it is also caring and transformational (Ackerman et al., 2002).

The mentees who responded to the questionnaire represent different disciplines, including the humanities, engineering and biological sciences. Tables 13 to 15 below provides a summary of the disciplines represented in order to illustrate their diversity and relate this to some of the more salient features of post-graduate education in South Africa. The participant leaders have supervised many postgraduate students (over 40 in the case of some). Thus the sample is not representative of all the students they have mentored in their careers. Nevertheless, the subsets of each group of mentees provide sufficient information to establish a mentee/student profile in relation to the findings.

Table 13: Summary profile of mentee respondents of one research leader in the Humanities

Research Discipline	HUMANITIES			
Mentee Respondents	A	B	C	D
Race/gender/citizenship	Black Female(1) Malawi	Black Female(1) South Africa	White Female(1) South Africa	Black Male (1) Lesotho
Current position	Dean of Faculty in Malawi	Full Professor and Executive Dean (another university)	Associate Professor	Senior Lecturer and Director of Institute in Lesotho

This information shows a diversity of students supervised, with more female than male students and more black than white students. Half of the students were from African countries outside South Africa, and all foreign students had returned to positions in their home countries. All had completed their Master's degrees under the supervision of the research leader, and, they all occupied academic positions in higher education institutions at the time of the research. Generally speaking, these details support the findings of a study on the profiles of PhD students conducted by ASSAF (2010), viz. that women are particularly well-represented among doctoral graduates in the social sciences

and that there has been an increase in the number of non-South African doctoral graduates from South African institutions (p47). South Africa is an important regional player and the leading host country for international students in Africa. The international students are mainly from countries in the Southern African Development Community (SADC) and the rest of Africa (more than 60%), with relatively smaller numbers from Europe (15%) and North America (Rouhani, 2007).

The next summaries represents mentees from the fields of engineering and natural sciences.

Table 14.1: Summary profile of mentee respondents of one research leader in Engineering

Research Discipline	ENGINEERING			
Mentee Respondents	A	B	C	D
Race/gender/ Citizenship	White Female **(1)** German	Black Female **(1)** South African	Black Male **(2)** South African Zambian	White Male **(1)** South African
Current position	Research and Developme nt Manager (HEI)	Senior Lecturer (HEI)	Senior Process Engineers (Corporate)	Co-director – Centre of Excellence (HEI)

This table illustrates that there is a diversity of students in this field as well, but that there are more males than females, as well as more black students. The researchers in this field reported that many of the black students come from other African countries to study at this particular historically white university. Internationalisation that promotes maximum institutional impact as part of an integrated experience, should be part of the critical transformation

agenda of the South African higher education system, curriculum and services. Students in engineering usually find employment both in and out of the higher education sector, as illustrated by corporate profiles. The majority of the students in this group studied under the research leader at Master's level, although one student had joined the doctoral team from another South African institution.

Table 14.2: Summary profile of mentee respondents of one research leader in the Biological Science

Research Discipline	BIOLOGICAL SCIENCES	
Mentee Respondents	A	B
Race/gender/ Citizenship	White Female **(3)** All South African	White Male **(1)** South African
Current position	1.Phd Student 2. Postdoctoral Research Fellow 3.Senior Lecturer (HEI)	Senior Lecturer Centre of Excellence (HEI)

This group of mentee respondents appears to be more homogenous than those discussed above, although the overall postgraduate student population at the institution consists of a large multinational group in which over 30 languages are spoken. A small percentage of this overall student group are black South Africans. All the mentee respondents have worked with the research leader in their undergraduate studies and have stayed in higher education and in the research institute through doctoral studies and to follow post-doctoral programmes or to take on senior staff positions in the research team. This finding corresponds with the results of the study on PhD profiles mentioned above which showed that about three in five students plan to take up academic and/or research positions after the completion of their doctoral studies, mostly in higher education institutions or as postdoctoral fellows (ASSAF, 2010 p.87).

However, it is also noticeable that a number of the respondent mentees have been employed after graduation, by their departments or centres. Cross Mhlanga and Ojo (2009) describe this as a problem of incestuous academic production and reproduction in South African universities. These have operated largely as closed systems where graduates of the same institution replace their own professors with very little space left for the recruitment of outsiders. It is felt that this practice tends to curtail intellectual cross-fertilisation and sound academic practice. In the Cross et al. research study on internationalisation at a South Africa university, a head of school speaks out on this topic saying:

. . . We tend to be intellectually incestuous. And there are obvious conditions and reasons for that. It has certain advantages but the disadvantages are quite large. What we do is we reproduce all forms of conceptions of the intellectual . . . The idea of being able to get into another institution to see how people are doing it elsewhere is very important for us.

The summaries of mentee profiles above from different disciplines provide an overview of student populations with regard to race and gender, as well as current positions. An outline of the research context in Chapter 2 discusses the transformative agenda of the post 1994 university system with race and gender imbalances in student and staff profiles a key area of attention. None of the research questions asked during the first interviews specifically interrogated this aspect of the research leadership domain, but the challenges of driving transformation became more apparent in discussions about students, through-put rates and the ongoing tensions between equity and excellence. Within the broader research system, research leaders identified challenges that have been grouped as:

a) Quality of basic school education

Given the standard of the schooling system, even the training background at undergraduate level, standards have gone down, especially the ability to write scientific research papers and reports continues to deteriorate. Their English writing and scientific writing skills are very poor. We are trying to get them to build the research mind. (Black research leader)

The policies that either directly request or allude to increasing the numbers of black (SA government definition applies) students in post-graduate research positions are problematic. Few of the students that meet these criteria choose science careers and those who do are ill prepared at high school. It's unfair to expect universities to rectify secondary school shortcomings. (Black research leader)

The comments of these research leaders are supported by recent benchmark studies that show that among South African first-year university students, only 47% were proficient in English and only 7% proficient in the mathematical skills required for first–year mathematics. According to the ASSAF study (2010), "the poor quality of university entrants will continue to contribute towards high dropout rates (40-50% for first year students) and low graduation rates, especially among black students" (p.96).

A participant felt particularly strongly about these impacts on his/her home institution that is one of the traditional research universities in the sample. The comments appear to indicate a level of dissatisfaction with the changes taking place especially with regard to increasing (poor) student admissions.

We want to be in the top 100, but you have to take in more students, work with less money, change your admission criteria etc. The mission of the university becomes incompatible with the policies of the university and it feels like a road to nowhere. Then they express bewilderment and ask why has (name of institution) gone down in the international ratings.(White research leader)

b) Ensuring diverse research student populations

The quantitative data of Chapter 2 reveal that the transformation of race and gender numbers has been slow at PhD level, a fact acknowledged by the research leaders interviewed. Diversity challenges are acknowledged by statements such as 'we are doing very poorly in that area' and 'black postgraduate numbers are not what they should be'. However, there seems to be little consensus about the solution. Black South African students are seen as a 'prized possession' in the research context, as highlighted by the statement that… *"*At our university the competition for the few black students at honours level in the sciences is intense across the different departments*".*

The ability of South African universities to attract increasing numbers of research students from other African countries has also posed dilemmas from a funding perspective (some bursaries are for South African students only) and from a research leadership perspective in some disciplines.

In South Africa, for example, we are finding it almost impossible to get South African students interested in the PhD programme of our field. However, we get lots of applications from candidates from other African countries and from Europe. This is a problem that is going to catch up with South Africa eventually where there will be a problem of replacement and continuity in local universities. (Black research leader)

One solution seems to be to draw students from outside the immediate campus. And yet the student selection process used for Master's and doctoral students is one that seems to discourage entry of 'outside candidates'. In most cases research leaders express a preference for PhD students who have studied at least a Master's degree with them. One professor said that most of her students have been with her from undergraduate years and she prefers this approach. Professors in the Engineering field start most of their PhD students at Master's level and prefer them to continue from there - "it is a waste for us and the student if they stop at that stage (Master's), although some (many females) do*".* A professor from the life sciences explained that he had made an explicit, although unpopular rule for student selection in his institution:

I want no Master's students from outside (name of his institution). I prefer to see them through a Master's programme, see their theses and get a better sense of their PhD potential. We do make exceptions to this rule in some cases where we are able to provide opportunities.

These internal 'grow your own timber' practices are said to increase chances of student success at doctoral level since the continuous track in one institution ensures the robustness of the undergraduate knowledge base. However, internal selection also limits the pool and diversity of potential students, and, in addition to stringent selection criteria, means that students from lesser research-intensive universities will find it difficult to be admitted to the more prestigious research universities. In the South African context this

still remains a particular challenge for achieving race and gender diversity across institutions.

c) Competitiveness and transformation

The tensions between the institutional practices of student selection and increasing diversity of student populations seems to be carried through to the ongoing equity/excellence debate in the South African research context. This is expressed by researchers quoted below and links to many of the preceding factors raised, such as the quality of pre-tertiary education.

There is a single standard concerning excellence in research. This is a global standard. Quality is still a key factor. The disparity of the educational background of students coming into Master's and doctoral programmes is enormous. And some people need more time, they really need more time. And if you do not give them more time they will come out with less and this affects the reputation of the academic programme and/or institutions.

Nurturing and mentorship is imperative. But this takes time and it is time that our competitors internationally do not have to spend. With an uneven playing field internationally, it is, and will continue to be, difficult to compete at the forefront.

Given these contextual transformation challenges for students and early researchers, it is no wonder that the mobilisation of the talent pool is considered both as the biggest challenge and the biggest opportunity. Increasing the diversity and number of doctoral students is imperative if South Africa is to become globally competitive. Individual research leaders, institutions and funding agencies have to remain committed to working together on a range of specific interventions to provide the necessary nurturing and mentoring still required in the system.

This generalised portrait of the mentee population and some of the salient transformation challenges to the context of doctoral education provides a background for the rest of the chapter that addresses the role of research leadership in:

- Attracting new researchers and scholars;
- Mentoring and supervision;
- Driving enhanced research productivity;
- Cutting the umbilical cord – creating new research identities.

8.1. Attracting new researchers and scholars

In order to mobilise the existing talent pool in higher education and improve the number of doctoral graduates in the country, there must be ongoing efforts to attract students to the research profession. At a national level, the recommendations of the study on PhD profiles recognise this fact and suggest building on early research awareness before students enter university, and then offering stronger incentives in early post-graduate programmes for students to continue studies towards Master's and doctoral qualifications (ASSAF, 2010:17). In trying to understand what motivated mentees in this study to enter doctoral studies for the question asked was:

Why did you choose to follow a research career through PhD studies?

The most frequent response to this question was that the PhD was viewed as a requirement in academia. There seems to be a very clear understanding among the mentee group that if you are to enter academia, then the PhD is the initial licence to practice. The goal is more than just the PhD for the qualification. As stated by one of the professors: "It is not so much the research itself: it's more like an apprenticeship, learning how to take an open-ended problem and mould it and grow it and work with it with a level of continuity". The mentee responses illustrate a level of curiosity in research and scholarly activities that is often stoked and intellectually challenged by a positive Master's experience. The large majority of mentees in this sample see the PhD as the foundation for a career path towards becoming a well-established and competent scientist. This relates to the early analysis that showed that the greatest proportion of the mentee sample was made up of those who had chosen to remain in the higher education sector. This is a positive perspective, especially considering that only about 40% to 50% of the

academic staff at South Africa's research-intensive universities have doctorate qualifications.

In some cases mentees were also staff members at the universities and the PhD as a requirement translated into pressure to graduate "….there is great pressure at my University (where I have worked for the past twenty years) to get a PhD and to do research". In some cases the PhD requirement was positive motivation as illustrated by one of the mentees who was a staff member at the time:

I was also motivated and needed to get the PhD as soon as possible since I was already employed by a university and knew that without a PhD I would not be promoted. I was also on three years' probation, which increased the pressure! Of course attending my students' graduation ceremonies and joining the procession in a black gown with many people wearing red gowns was also something I dreaded!

In other cases there seems to be a warning to be careful where some young members of staff are 'pushed' to do a PhD for promotion purposes rather than because of passion, interest or intrinsic motivation. It seems as if the doctoral experience in this case was one of frustration because of a possible lack of support at the institutional level.

The approach taken by my then Head of School to 'encourage' me to embark on a PhD I felt was entirely unsupportive and counter-productive. I was told that I would lose my job if I did not do a PhD. My lecturing load and clinical supervision load were excessive, with the result that it was difficult to find any time to focus on research. I believe that I would have been able to publish more successfully if my university had given me more time and space to work on writing. When it was pointed out by my HOD that I had an excessive workload and really had no time to fit in a PhD, she did not provide any support. As a result, I spent most of my research period feeling resentful towards the university structures, and did not feel particularly motivated to complete the PhD - other than to prove to myself that I could do it.

In this diverse disciplinary sample of mentees, there are also those whose PhD aspirations were also located in more practical applications for seeking solutions for problems that impact on life. These were sometimes technological (industry related) clinical or community oriented in nature. This was illustrated by the mentees as follows:

My research had reached a point of showing real promise for developing some of the tools we had worked on in the Master's, and with the encouragement of my supervisors, I saw a potential to be part of creating something innovative that could be a real contribution to the area of science.

Most of it I would say was personal motivation and the need to strive for excellence as an individual. More importantly was the drive to provide solutions (in this case anticancer and anti-HIV drugs) to help our society curb the scourges. This is underscored by the need to find ways of research paying back to the society

The findings discussed above are in line with the ASSAF study on PhD profiles (2010) where it was found that in South Africa there appears to be three prevalent understandings of the purpose of the PhD (p.41):

1. as training for an academic career;
2. as training for industry;
3. as training for a profession.

From the range of responses to the question of why it is necessary to have a PhD, it seems that when the starting point is an academic and intellectual interest in the subject matter, then the PhD is also connected to self advancement and enrichment, to a sense of achievement, and to being committed to extending oneself optimally in a chosen profession and scope of practice. This then impacts positively on early career research orientation and research performance.

A second question in the questionnaire sought to investigate whether the attraction to the field or the PhD studies was in any way linked to the particular research leadership or mentor. In this case the question was:

<u>How did you come to study under/work with Professor (name of mentor/supervisor inserted) during your PhD studies?</u>

The preference for internal student selection as discussed earlier in this chapter means that many of the mentees had encountered the professors at various course levels before embarking on PhD studies. Based on these

earlier encounters, the decision to move on to doctoral studies with the identified professors seems to have been a natural progression in most cases as illustrated below:

Prof taught certain courses to me in my Masters degree. I trusted and respected her and so asked her to supervise my Masters' research report. After that I asked her to supervise my PhD. (Frankie's mentee).

In some cases, the choice of supervisor was influenced by the limited availability of appropriately qualified supervisors in the field of choice. This illustrates the point raised earlier where the output of skilled doctoral students in higher education in South Africa is seriously hampered by the lack of enough suitably qualified senior experts in the various fields. This point was made numerous times in interviews with the research leaders and exemplified by the words of Professor Wayne.

We are very few on the ground, two supervisors essentially. Each of us has about 15 (Master's and PhD) students to supervise, with students at times off campus in their home countries.

The supervision then falls on the small cohort of researchers who have PhDs and productive research records. The student's comments illustrate this point.

Prof was the only person qualified to supervise PhD students in our department (Sandy's student). At the time he was the only member of staff in the department with expertise in natural resources and environmental economics, an area I specialised in at PhD level (Agri's student).

A large number of the mentees indicated their choice of supervisor had been based on the research reputation and track record of the professor. Since this is a study of research leadership, a number of quotations will be used to illustrate how important this factor was to the mentor–mentee relationship and to a successful doctoral experience. The students recognise the expert nature of the supervisor/mentor through research records and are aware of the NRF ratings of the researchers. There is recognition that the beginning of the mentee-mentor relationship is often one of "awe in the presence of greatness"

(researcher's own italics) and students often express feelings of honour to be selected or invited to these prestigious programmes. Over time, when successful, this awe-inspired relationship seems to mature into one of mutual respect between mentee and mentor.

As she is one of the foremost experts in the world, on the area I was studying, let alone in Johannesburg, she was really a natural choice for supervisor. (Sandy's mentee)

I completed my fourth year laboratory project under her mentorship, and this was a positive experience for me. When I was invited to join the research group to continue the work begun in my undergraduate lab project as a Master's student I was excited, and to be honest, quite honoured to be chosen to receive such an invitation. (Liu's mentee)

Prof was a researcher with a demonstrated track record and what started as a very respectful and (to be honest) awe inspired interaction grew to be a friendship and trusting relationship that allowed us to explore radical research concepts knowing that no idea was ever scoffed at and that we genuinely respected each others occasionally very different approaches to solving research challenges. (Liu's mentee)

I responded to an advert for a post-doctoral fellowship to work with her. I applied because she is well known and has a good reputation in her field and a chance to work with her is an honour. (Frankie's mentee)

When I returned to begin postgraduate work, she was the first and only person I approached to act as my supervisor. She and I had worked well together on the previous project and I knew she was someone with an extremely good reputation in research and academia. I also felt confident that I would be in good hands.(Sandy's mentee)

With some students, consideration of this expertise base extended beyond the individual research leader, and took into account the reputation of the research facility and the available research infrastructure. In at least two cases students mentioned that the NRF-rating (especially A-rating) was an important factor.

This decision was also based on the fact that the research done at the institute, under the directorship of Professor Bloom, is of the highest quality and recognised on an international level. The institute has excellent research facilities and also houses the largest number of experts who have skills and knowledge that would be valuable in my own research. (Bloom's mentee)

A good NRF rating is important. A good H-factor indicating that the research leader is publishing regularly and consistently and is thus up-to-date with the latest research trends. The research leader must be internationally renowned and respected. (Bloom's mentee)

The mentees' comments about expertise and reputation are often linked to feelings of respect and positive aspects of the broader mentee-mentor relationships. The combination of the academic expertise and the interpersonal relationship skills of the research leaders seem to enable a productive research environment. This importance of the personal dimension of leadership is supported by the work of Bolden et..al (2008) who found that two key personal leadership components included :

- The need for academic or professional credibility; and
- Consultation and openness.

I regarded her as an expert in the area of study I wanted to pursue. I had worked with her in my Master's and liked her style. Of course I also liked the fact that we get along - this is important because if the relationship disintegrates then it can be difficult to complete. (Frankie's student)

I think it is very difficult to be mentored by someone who you do not respect. I also believe that if you respect someone's work and the fact that they are an expert in that specific field of study it inspires you to work hard in order not to disappoint them. (Wayne's student)

Image of a scholar

The relationship between a student and supervisor or mentor is likely to be one of the most formative contexts in which the student's development of research capacity takes place (Dison, 2004). On examining the responses of the mentees to the question of choice of supervisor as well as to questions of experience of mentoring relationships with the supervisor, the findings indicate that these research leaders fulfil an important role in providing the much needed 'image of a scholar'. This image of the scholar also serves to attract and retain younger vibrant researchers in the system. It would seem that having role models who, at the time of mentoring and supervision, are recognised experts in their disciplines is a real advantage to the mentees. This is because they provide an image of what being a scholar is like, demonstrate what they have done, and because they take the time to show

mentees the way. These aspects seem to be significant in their subsequent development path as researchers.

Also the demeanour of Prof in leading by example, and the manner in which he provided guidance throughout my PhD studies, is an inspirational form of leadership to strive towards in my own engagement with individuals who turn to me for mentorship. Prof had (and continues to be) a huge inspiration for me. His supervision of my PhD was a turning point in my research development (Wayne's mentee)

I learned on the job and of course Prof was a good role model and mentor. Through her own work she motivated me to work towards excellence. She never demanded to have her name on all the papers I wrote. All the papers that have both our names were really co-authored (Frankie's mentee)

She is a multidisciplinary researcher who is able to introduce students to new theories and concepts in the field or to theory from other fields. She is an excellent networker who makes the most of every opportunity to network and interact with researchers in and out of her field. Ultimately, I think she is someone who believes in the power of research, is passionate about research and strives to conduct novel and excellent research. (Sandy's mentee

In summary, attracting and retaining a young, productive research cadre seems to be influenced by the students' own early interest in research and the quality of the research experience before embarking on doctoral studies. Those seeking to undertake a doctoral degree value a recognised expert and world leader as their supervisor and mentor. These research leaders provide the cutting edge research experience, but also act as positive research role models by providing an image of a productive scholar. This experience of working with researchers at the top of their profession seems to stimulate a long-term impact on research development and productivity as seen from the developing research trajectories of the mentees in the study.

8.2. Mentoring and supervision

Among most research leaders interviewed, the feeling was that staying connected to teaching is important to them as professionals. However, it is also clear that the teaching/research balance is still a challenge and, as

discussed previously, some career moves have happened because of what were considered unreasonable workloads (read teaching loads). Having fewer hours in teaching reflects the reality of highly productive researchers committing more time to research compared with others. Once again, even in teaching, emphasis is on the established researcher as the role model, providing the image of the scholar in efforts to attract undergraduate students to postgraduate studies. This is a role that should assume more importance, given the lack of adequate research training at the undergraduate, honours and Master's levels in the South African context.

I also believe that the best researchers should be teaching 1st years - this draws people into the field and inspires them and actually has a long term gain. (Professor Sandy)

So I try to talk to them already from undergraduate level - tell them what it means to do research, how amazing it is. But also that being a researcher is not an easy job and sometimes the rewards of the job take very long to arrive. It is not an instant gratification type of career. (Professor Marie).

8.2.1. Mentoring Models

It is evident that the research leaders in the sample use different approaches to training and development for research. At least 50% of the research leaders in the sample use the traditional apprenticeship model with a limited number of students per research leader. This is characterised by the one-on-one mentoring relationship between student and supervisor. This traditional model of supervision is still the most prevalent approach to doctoral education in South Africa. In this sample of researchers the model can be found to exist across disciplinary boundaries.

*I feel one must keep a reasonable size of people. I prefer 6-8 students which I can then manage effectively with my teaching load. Here I disagree with (name of institution). They want you to have as many students as possible, mainly because of financial benefits. More people may sometimes mean increased output, but the question of how to manage these effectively and the benefit of the growth of each remains a challenge. (*Professor Marie*)*

A smaller group of research leaders (about 20%) used a cohort or course-based model that brings together groups of students for specified cycles. The move towards cohort-based programmes satisfies the need to achieve a critical mass of students and to create an academic environment (ASSAF, 2010:93). An example of this type of programme is that in which Professor Agri is involved:

So we designed a regional Master's programme where people get placed at their own universities (about 18 participating universities from Africa) for the Master degree and then come here to our Centre for 4 months to be taught specialisation courses we have designed. They then go back to their home countries and complete programmes at and get degrees from their home universities.

An even smaller number of research leaders used the large-team or committee approach to student mentoring and supervision, with a professor admitting that his own positive experience of doctoral studies in the USA had influenced his decision not to use the single advisor-student type of relationship. The committee approach is thought to provide a strong mentorship chain and seems to work well for those few faculties that have adopted this method. The views of researchers using this approach are outlined below:

Pretty much all students working in the group have a committee of two or three and even occasionally, four, advisors. The committees are diversely structured and give the student access to more than one brain, more than one way of thinking and thus the security of a group of people. It also gives early career researchers an opportunity to learn to supervise in conjunction with the more experienced researchers in the team. (Professor Bloom)

Professor Liu believes that her team approach certainly works for scholarly development. She explains it as follows:

Students are put into research groups and then we meet with every research group every week to talk about their research. I think students sitting in and listening to other students is helpful since all the research projects are somewhat related. The other thing is the results they are getting, especially that the more senior members of the team who are near to PhD are listening to the younger ones – getting feedback every week. When one of the students is stuck, the others in the group can ask questions, encourage,

motivate etc. You are not on your own. So I think they learn quite quickly in the group and realise that some weeks or months will be tough with results not coming, things going wrong and a few dead ends. But you see other people in the group pull through that phase and the whole group can get excited on behalf of another student who they know has battled through. This is confidence building towards publication.

The outline above shows that this sample of established research leaders used different approaches to doctoral supervision. This ranged from the traditional apprenticeship model, more evident in the social sciences and humanities and with researchers doing fundamental research, to larger cohort-based programmes in inter-institutional collaborations across a number of countries. A limited number of research leaders in this sample worked with large research teams and used the research group or committee approach for doctoral supervision. However, regardless of the model of supervision used, there was a strong emphasis on providing a rigorous, quality academic experience as a solid base for the next generation of researchers.

8.2.2. Mentorship as leadership development

Part of the doctoral mentorship process is to provide opportunities for mentees to gain experience in the leadership role while still being part of a supportive environment. According to mentee responses, none of them were provided with formal leadership training through institutional human resources or management courses. However, they did acknowledge that they were initiated into supervisory or leadership roles through their graduate experiences and were given a fundamental perspective of the professoriate. This practice would be in line with holistic capacity development where ”learning to be a researcher involves more than acquiring the necessary knowledge to do research, the competence to perform procedures, and an understanding of the disciplinary material. A novice would need to become competent in all these abilities in an integrated way through acquiring the identity of a competent researcher in the communities of practice in which she/he is working” (Dison, 2004: 88). It is acknowledged that there is no such

thing as an ideal mentor or mentee – or even an ideal mentoring programme. However, the experiences listed below from responses of mentees to the question "What kind of training and preparation did you receive for any future leadership roles?" provide insight into what should be included in mentor programmes

8.2.3.1. International experiences

Postgraduate education increasingly includes preparation to be able to function in international contexts. The supervisor can provide a link to research communities by virtue of being an established member of a disciplinary community or communities. Some of the research leaders included international exchanges and study visits as part of the doctoral experience. This was an expensive undertaking for the research groups, but the research leaders who supported this as part of the doctoral training considered it to be an essential part of the research experience. Mentee feedback indicated that such opportunities were seen as highly-prized rewards that encouraged mentees to work very hard and enhanced the research experience and morale.

One of the things we try to do with all our PhD students is send them overseas for 3-6 months to work with one of the top research groups in their area. It is a great experience when they go overseas and work with these top teams and discover that they are as good as the best in the world. They come back and they are actually quite different people. (Professor Liu).

8.2.3.2. Committee Work

As part of large research institutions or research teams, mentees reported having served a number of roles that contributed to overall management experiences. These early responsibilities seem to have provided experience in the development of administration and people skills, all essential for the complex role of academic leadership.

Being head of the Post-graduate Student Association and student representative on the MANCOM committee was helpful. I have also been

involved in setting up and running our own mentoring program at our institute for the last several years. This would include interviewing appropriate students for the positions and training mentors. (Bloom's mentee)

8.2.3.3. Working with undergraduate students

In academia, the opportunity to tutor or mentor undergraduate students is one of the preparatory forms of leadership training. Most mentees reported this type of early research development.

I have also been involved for the past 2 years in clinical supervision of undergraduate student practical's, which has given me valuable skills in terms of evaluating and critiquing students work, as well as in dealing with tricky student issues such as unprofessional behaviour. (Sandy's mentee)

8.2.3.4. Joint research responsibilities

From mentee responses it seems that all the research leaders had been careful to give mentees opportunities that strengthened their development both as a researchers and as supervisors - e.g. joint writing of papers, joint supervision of both undergraduate and postgraduate students (with seniors taking a stronger supervision role and mentees watching and learning), observing research meetings between supervisors and other students, travelling with leaders to local and international conferences and presenting papers. In many cases mentees were also involved in the preparation of funding proposals.

8.2.3.5. Building networks

From Chapter 7 it is clear that extensive national and international networks are one of the hallmarks of research leadership. Research does not do well in isolation. Consequently, part of the role of the leader is to promote the development of the mentee network as early as possible in the research career. Conference attendance does promote network building, but it is interesting to note additional means of forging confidence in the network.

*During visits of international guests we are asked to chaperone them - show them around and help with anything they need help with. In doing so we get to know people from all over the world and start building networks. (*Bloom's mentee*)*

This type of experiences builds the social dimension of leadership which includes both formal and informal networks and relationships within and beyond the institution (Bolden et al, 2008)

8.2.3.6. Leadership by example

Mentee responses indicated that leadership training is also possible through the personal example of a credible research leader. Here the mentoring is less overt and formal, but seemingly equally powerful in impact on future leadership behaviour.

*Prof's mentoring was not about helping me in the lab. This I was capable of doing myself and teaching myself. The mentoring came in the subtle ways of how he treated people, the way he communicated, what he communicated and the general way he managed the institute. In this regard I have thus learnt a lot about how to motivate people to help them achieve the best of their potential. I have also learnt how to conduct myself professionally and how important it is to make and maintain international collaborations. (*Bloom's mentee*)*

From the discussions above it is evident that the mentees in this study emphasised the advantages of having opportunities for "learning on the job". For this reason it is essential that mentees are introduced into these early research leadership roles as part of their professional socialisation into academia.

8.3. Driving enhanced research performance

As recorded earlier, this group of research leaders form part of what would be considered the established research community. Most government support programmes for this community (e.g. The South African Research Chairs Initiative and Centres of Excellence) have been intentionally designed to

support researchers in their endeavours to increase research and innovation outputs as well as strengthen human capital development in the form of new generations of researchers. According to the research records discussed for the research chair professors (many of them from this sample of leaders) supervise, on average, more students and publish more papers than other research scientists. Based on the research output of the rated researchers (taken by NRF rating) in this sample, it became important to understand what they were doing to drive this level of research performance in their units.

Firstly, what stood out during discussions with the researchers and from the feedback of the mentees was that the research leaders were *research-centred*. This central focus on research can be seen by the high level of commitment to the research goals and a research vision that was clearly articulated by leaders and mentees alike. The leaders were passionate about research and as quoted earlier, in some cases the research had become the focus of their lives. Love of their work was mentioned in almost all discussions.

Research is the main focus, then other things. We work on a very strong team approach. My job is make sure it all works – that the research environment is right – that they will get their PhD's.

The love of my work is a key factor. It is also the relevance of what I am doing and the fact that I am developing people, meeting wonderful people and engaging others. I have a superb research team this year, two post docs, collaborations and work that is internationally recognised. This has been my best year productivity wise.

The research-centeredness was carried through to the creation of enabling research environments and research cultures, as illustrated by mentee feedback about the impact the mentoring of their research leaders had had on their research capacity and professional growth. Comments included the following:

Encouraged independent thinking and a questioning attitude….
Provided space to be creative, to test ideas without feeling judged….
Encouraged wider reading and writing beyond the narrow focus of the PhD topic….

Encouraged weekly meetings where she provided a platform for free discussions and criticism…..

Secondly, there is an overwhelming emphasis on developing the quality of scientific writing and on getting mentees to *publish* their research. Research leaders seem to use various means to improve levels of publication. Some research leaders only support conference attendance based on demonstrated progress toward publication. The emphasis is on increasing the quality of research output. One research unit has developed an incentive programme to encourage research performance and is giving special recognition for student publications in high prestigious journals. Mentees in this programme reported that the financial incentive had worked very well and that this had made students more critical of their own work and had encouraged them to think about where they would like to publish. According to the research leader of this unit… "We are saying we are doing great, but let see if we can do better. So it is about pushing the bar, but you have to work hard at it all the time". Mentees seemed to understand this emphasis and were guided by this philosophy. Evidence of this attitude is to be found in the feedback below:

Prof has very high academic standards and expectations, and chapters are usually ready to be published at the end of the thesis, if not already published. His criteria for reviewing and developing a thesis are thus the same as would be for a peer reviewed journal.

Thirdly, there is a strong focus on *excellenc***e**, on producing the highest quality science. This was discussed in detail in Chapter 7, but is worth repeating here since it is repeated in the mentoring relationships. One of the mentees described her professor in the following way:

She demands high-quality work. She is driven by outputs and expects her students to be reasonably intellectually independent.

Fourthly, mentees reported that adequate *financial assistance* was an important contributor to research performance. This factor is supported by the finding that "the most salient feature of a productive doctoral programme in South Africa is the level and diversity of funding" (ASSAF, 2010:92). In many

disciplines in South Africa, people coming in to doctoral programmes are older and have families to support. This creates enormous social pressures, and as Professor Liu, who has a team of up to 40 research students explains:

We do a lot of budgeting with students, since we believe that if they cannot cope financially, if they cannot feed themselves, then they cannot do research. So we have to attend to that type of support as well.

Where high-performance research leaders of the stature of this group are able to draw in substantial government, industry or donor funding for projects, then the students' circumstances are improved considerably:

We receive good bursaries – this means that we can concentrate on our studies and do not have to worry about generating extra income to survive.

Lastly, some research leaders have been shown to put together *innovative doctoral programmes* that are sometimes reproduced by colleagues in other parts of the university. Types of innovative schemes discussed in this study include specific ways of supervising students through multi-level committees, international research experiences during doctoral studies, students working on consulting assignments in foreign countries and financial incentives for quality publishing.

The findings suggest that the established research leaders are able to provide an environment that is conducive to enhanced research performance. This influence is based on their own intellectual research leadership and scholarship that ensures that they lead by example and hence can make demands for research excellence from their research teams. They are also able to provide adequate resources to facilitate research development and performance.

8.4. Cutting the umbilical cord: creating new research identities

The separation phase is a recognised phase in the mentoring relationship. It is described as "a phase in which the protégé begins to experience a new

sense of independence and autonomy. Furthermore, the mentor must be able to let go, to encourage power and independence" (Ackerman et al. 2002:1144). Dison's study of research capacity development of individuals within three research units in South African higher education institutions argued that "there is a reciprocal relationship between the growth of the mentee's internal strength, confidence and ownership of the meaning-making and the processes of exposure to and feedback from the disciplinary community "(p.95). Professor Marie offered the view that … "South Africa still puts a lot of value on the PhD. As one who has a PhD, you are given so much respect, are already viewed as a leader just because you have a PhD. However, this is dangerous, since lots of time people who have a PhD have not proved themselves as yet apart from their supervisor". This comment agrees with a commonly-held criticism that usually arises with large, successful research teams headed by publicly acclaimed research leaders. Given the dynamics of the research leaders and their sometimes equally-productive research mentees in this sample, this is a criticism that did not escape some of the research groups as evidenced by the comments below:

The other level is that it is often perceived from the outside that academics in our particular research group are not doing independent research but merely following the research vision of our leader. This is, however, not true as all of us also have our own research interests and we try to develop these more strongly. (Blooms' student)

This comment ties in with what Professor Marie, and others, say about the challenges of some doctoral students to develop an identity that is separate from that of their supervisors. In some cases, mentees reported that continued research collaboration with the supervisor had affected their rating applications with the NRF. As a mentee explained….

If one was to read the reviews I received for my rating application, it could be said that I have not succeeded in making the separation from my supervisor. (Lius' student)

In larger research teams, efforts to develop new research identities are sometimes not easy and may, in the short term, be rather stressful and have to be carefully managed. A mentee's experience follows:

My separation from the group was an unpleasant experience - there was some politics involved with the then head of school which led to some misunderstandings between all of us. However, in hindsight this has been the best thing that could have happened as it allowed me to create my own research area and I have not once regretted this. (Liu's student).

I think it was something about the students themselves - that they were able to grow and make their way, establish themselves separately. And it was not easy here. They were seen as my 'students' even post PhD. They also had their struggles. (Name of mentee) dealt with all kinds of things. For some she was too black and too angry. For others she was in my pocket and that was the only reason she was making progress. So they had to get pass all that stuff. Now they are making their own difference as independent, very senior academics (Research leader)

However, 'cutting of the umbilical cord' as part of establishing a new and separate identity seems to have been experienced by most mentees as a positive phase. There is recognition that it can be a gradual process of letting go but that it was a necessary process that was generally encouraged by the mentors, as illustrated by the mentee comments collected below:

My mentor always encouraged me to develop new skills, take up new initiatives, and be creative.

Prof agreed that it was important for me to do move on…

Prof often emphasised that I need to focus on my new career and was highly supportive.

These comments align with the concept of 'positioning voices' found in Dison's study where researchers mentioned the profound effect of affirming, constructive voices in building their confidence as academics and as researchers. The post PhD careers of the sample followed divergent pathways and mentees felt that they had achieved their individual and, in some cases, still emerging identities via various channels. In general, mentee responses indicate that this separation was initiated and/or achieved by:

Joining a new research group

This was a gradual process and at first the relationship was maintained. We still communicate and maintain a collaborative project together but having my own research and research group has enabled me to develop along my own path. (Maries' mentee)

By the end of my PhD I realised that I would like to take the research into a different direction, namely trying to commercialise some of the ideas that led to a cutting of the umbilical cord I guess. However she supported me all the way by using her networks and her status to realise meetings and funds (Liu's mentee)

Access to funding

Getting an NRF Thuthuka grant immediately after my PhD graduation was the greatest freedom from my mentor as supervisor. Suddenly I had an opportunity to make my own decisions about what goes on in my research, who to collaborate with etc. While I still continued to interact with Prof as my mentor, I made the decisions, owned the project and included her only when I felt necessary. I made contacts with other researchers in my field and developed relationships with them that were separate from Prof. In about two years of graduating I was beginning to introduce Prof to other researchers in our field that she did not even know. She allowed me to be the expert (Franki's mentee)

Independent publishing

I was provided with leeway to publish aspects of my research independently without my supervisor insisting on being a co-author. This has presented me as an expert on my own right. My research leader also created opportunities for me to make public presentations without insisting on sitting-in or taking credit for my work.

This letting go phase is critical to the professional development of the protégé. The doctoral experience is not distinctly separate from the eventual community of practice. The emergence of healthy, independent research identities in the new young cadre of researchers is a reminder that successful mentoring structures and relationships must allow all participants to grow and thrive both professionally and personally. If the process of mentoring and then cutting the cord is successful, then, in the words of Professor Franki,….. "We have created another chair".

I remember a conversation with one of my students in the very early days in the department and I said to her "where do you want to be in the future?" And

she said "I want to sit in your chair". Maybe somebody else would have thought that she wanted to usurp me. I didn't feel that way. That's where she was going and that was fantastic. Now I don't have to get out of the chair in order for her to be there - there is another chair.

8.5. Concluding remarks

In summary, the findings suggest that confident, intellectually strong, internationally renowned research leaders who lead with passion and compassion are able to motivate and mentor emerging researchers using a variety of supervision programmes. They encourage enhanced research performance through an emphasis on and demand for excellence and then let the mentees move on to take their own place as peers in the established research community. The research leaders in this study favoured a consultative, empowering leadership approach, and in general this view was confirmed by the mentee reports. Mentees seriously considered the research reputation when choosing supervisors and mentors and the actively performing mentors acted as role models by providing close-up images of the scholar. The research shows that mentors provided mentees with early professional socialisation experiences and provided them with management and leadership responsibilities throughout their studies. Most mentees reported that space was created in their mentee-mentor relationship for them to finally move out of the shadow of their research leaders and into a new identity as independent researchers.

Transformation imperatives for student diversity and a new generation of truly diverse South African researchers still however remain a challenge in the context of the overall skills requirements of South Africa.

CHAPTER NINE

Analysis, Summation and Recommendations

Academic leadership in higher education in the 21st century is very different and more multifaceted than it was just a decade ago. Thus, given the multi-layered, dynamic nature of higher education leadership at individual, group and organisational levels, a more nuanced understanding of its role in driving excellent research performance remains paramount. Hence, this study made an exploratory investigation of academic leadership through the lens of research performance. It sought to explore the professional and personal nature of research leadership that enables and stimulates high quality research performance. It explored the research trajectories of research leaders and the experiences and views of their mentees in a South African socio-historical-political context, in an effort to offer an interpretation of the research experiences and academic career pathways traversed by these leaders, and how they lead in order to influence research performance. The study assumed that their research trajectories developed as a result of the interplay of political, social, economic, institutional and individual dynamics across both pre- and post-apartheid phases of the history of South Africa's higher education. Hence, the research leadership experiences are viewed as contextualised and particular.

This final chapter will draw together the findings and early analyses as presented in the previous three chapters in answering the research questions posed for this study. It will also reflect on the research process used as well as the conceptual framework model described in Chapter 3 and the extent to which the findings support this model and suggest new ideas. In addition, the chapter will critically reflect on the ongoing system tensions that emerged for research leadership, as well as recommendations for further study.

9.1. Revisiting the Research Process – case selection

The literature review in Chapter 3 pointed out that leadership is hard to define and effective leadership even harder. In addition, Bolden et al. (2008) suggest that there is still little evidence of the impact of leadership or leadership development on performance and productivity. Given these sobering 'caveats' in relation to leadership, this study's focus on research leadership and its possible influences on research performance certainly position it within a contested space. And as the research methodology shows, the case selection for this study can be viewed as part of an ongoing South African debate about the NRF rating system. In the light of the centrality of the case selection to the study, it is important to revisit this aspect of the research process before arriving at any conclusions about research leadership and its influence on research performance.

As discussed in Chapters 2 and 5, the South African research personnel are relatively small, comprising about 16000 full-time equivalent research staff. Only between 6000-7000 of these are considered as publishing scientists and scholars. The definition of research leadership used in this study consists of a number of variables all associated with successful research staff. The main criterion was scholarly research performance. Thus in the first instance, the sample had to be based on research leaders with demonstrable research performance as a major criterion. An initial method proposed was that of reputation sampling, that is, which individuals in the national research community had the reputation of being research leaders? Reputation in that case cannot be presumed to be based strongly or solely on research performance, but may be influenced by public visibility (through media opinion pieces for example), institutional alliances, or heroic trait leadership characteristics of some larger-than-life individuals. In addition, in a small research community dispersed throughout competitive higher education institutions, this method of sampling was not considered rigorous enough for determining the sample for this study.

The NRF-rating system, as outlined in Chapter 5, was considered to provide a more objective benchmark of research performance through an international peer review process. Hence, the choice was to use only NRF-rated researchers since their ratings provided a standardised, transparent assessment of their research output, independent of this researcher or institutional communities. From that initial criterion for selection, the institutions were then asked to suggest rated researchers whom they considered to be research leaders in their institutions. They were not restricted, in their choice, to certain rating categories. However, the final sample shows that 80% of the researchers suggested by institutions had either A or B NRF–ratings. The final sample of researchers used in this study were thus all NRF-rated researchers who, in addition, were considered as research leaders by their nominating institutions.

This sampling strategy does not in any way imply that unrated researchers are not research leaders who are able to influence research performance in their research contexts. It is not mandatory for scientists and scholars employed in South African public higher education institutions to become NRF-rated. Currently, only about 2144 researchers (out of approximately 16 000) have chosen to become rated by the NRF. There are many researchers of international standing who are not rated by the NRF. In addition, researchers from the social sciences and humanities have been in the rating system for fewer than 10 years. Hence it is recognised that more researchers in the national system are unrated rather than rated. Thus, this study acknowledges that among that group of unrated researchers are research leaders who could also have met the criteria of research leadership used for this study i.e. scholarly publication at the cutting edge of the discipline, extensive quality national and international research networks, personal scholarly recognition and prestige among peers, leadership of quality Master's and doctoral programmes, early researcher mentorship and the ability to garner research funding. However, in the interests of a rigorous sample selection in a doctoral thesis, the unbiased assessment of research output by an independent panel, provided through the rating system, was used as a first criterion for sample selection.

Chapters 6, 7 and 8 provide the details of the career pathways of the research leaders, as well as their roles in intellectual leadership and management of the people in their research contexts, with a focused discussion on mentoring and supervision as a leadership development strategy. This information is helpful in answering the research questions that explore the research career pathways traversed by the research leaders (Question 1) and the attributes and leadership experiences of effective research leaders in the context of the research enterprise (Question 2)

9.2. Exploring research career pathways

The participants in this study were all NRF-rated researchers employed full time in higher education institutions at the time of this study. The selection process outlined ensured that they were all established researchers, with about 80% of them regarded as internationally recognised scientists and scholars (NRF-ratings). They are black and white South African citizens, with three research leaders being permanent residents from other countries. The majority of this sample (60%) obtained their doctoral qualification at overseas universities. Given disciplinary differences, some were late starters to academic life (PhD at approximately 40 years of age). They have held formal leadership positions in higher education for a number of years (all except one) and the data in Chapter 6 shows that the average age of the sample is 52.4 years. Those in their 50s (more than 50%) have almost reached the pinnacle of their research careers and are thinking of exit strategies from current research posts in their institutions. Given this outline of the more general features of the sample of research leaders, the discussion will now highlight the core features found to be common across the research careers and pathways outlined in the preceding chapters.

9.2.1. Research-centeredness

The career trajectories of the research leaders have shown a strong sense of research-centeredness that permeates all stages and phases of career development.

9.2.1.1. Early research orientation

Across the sample all researchers were immersed in research from an early career stage. For this discussion, the entry point to the research career is taken as the doctoral degree, although it is acknowledged that positive master's experiences can motivate towards further postgraduate education. Research leaders in this sample obtained doctoral degrees both in South Africa and from overseas universities. The South African universities where the research leaders obtained their doctoral degrees were (at the time of PhD graduation) and are still all at recognised research intensive universities. None of the research leaders in this sample studied at or were employed at a historically black South African university or technikon, even post 1994. This is in line with the original apartheid conceptualisation of these organisations as teaching and training organisations, as opposed to research institutions. Research leaders who obtained doctoral degrees from international institutions did so at institutions already known for their research strengths.

Although undertaking doctoral studies at an English medium, historically white South African research university, Professor Frankie, acknowledged that supervisory capacity at doctoral level was minimal in her emerging field at the time. However, she was able to obtain discipline based expertise from the international community. It is evident that for researchers in this sample the doctoral experience as the first immersion into research took place in institutions that had research as one of their missions and that gave priority to research. Some who attended international programmes studied under the committee approach as described earlier, and found this exposure to more senior students and established researchers a motivating, but challenging

experience. It is generally recognised that universities with strong research cultures have high research performance, and quality doctoral education forms an important part of that research performance. The emphasis is on research and the entire doctoral experience is preparation for research and scholarship. All the research leaders in the sample had completed their doctoral studies in quality research intensive environments. Given the desire to grow the South African research expertise base, a quality doctoral programme in a research focused environment seems to be a minimum entry requisite.

9.2.1.2. Research role models

It was shown in Chapter 6 that some research leaders (mostly female, both black and white) had not started out with a decision to enter research, and for many of these researchers, the decision to undertake the PhD came after motivation from supervisors or mentors from earlier studies. Resource-intensive research universities generally employ the most talented professors – scientists and scholars who are attracted by the research orientation, by the facilities and often by the favourable working conditions at these institutions (Altbach, 2007). It would appear that early exposure to these research environments increased the chances of being in close proximity to leading researchers. Significant role models in their career trajectories seem to have been influential in shaping the emerging research possibilities. As Professor Nelwa says, “I saw lots of people doing PhDs and it seemed like a logical step to me. I had people who mentored me and I was always looking at people slightly older than me – my professors – here I was being guided by them”. This type of mentoring experience is described by almost all research leaders and the feeling is that the focus of the mentors was never just on the immediate project (doctoral research question to be solved), but on the overall development as a researcher. This early experience of the research leaders is reflected by the discussion of their own roles in Chapter 8 where it was found that they too, in return, are now able to provide the image of the scholar for their mentees. This resonates with the work of McCarthy and Frederick (2008) who found that research development of staff required a

focus on strong and visible leadership. Hence positive role models, who are themselves leading scientists and scholars, are essential in shaping the intellectual development and identity of mentees while becoming academics. In a country context where fewer than half of the full-time research staff in the research universities has doctoral qualifications, the image and experience of the research-performing scholar may remain remote and easily idealised as unattainable unless the academic quality and experience of doctoral supervisors is improved in all postgraduate institutions.

9.2.1.3. Accountability for research productivity

Many of the researchers remembered, with pride and joy, seeing their own first research article in print. This emphasis on scientific writing, writing skills and writing for publication seems to have been a mantra throughout the discussions with research leaders and mentees. Hence a focus on publication remains pivotal to the research performance of these research leaders. This notion is discussed in detail in Chapter 8. However, as shown by mentee feedback, there is a keen awareness that the quality of the publication is of paramount importance in motivating excellence in research performance. This is driven through the mentoring process and research culture of the individual research units. According to an early study of research productivity by Ramsden outlined in the literature review, the strongest predictor of individual output is the membership of a highly productive team. The research cultures of the units became evident through the mentees' reports of the general leadership style; supportive but demanding, with a strong commitment to excellence. A perusal of Table 10 (Chapter 6) will show that all research leaders in the natural sciences and engineering became NRF-rated researchers in about five years of graduating with doctoral degrees. This rating is based on research publication records, and hence there is an early sense of accountability for driving research productivity after doctoral studies. They have all maintained their research ratings throughout the career trajectories, that is an indication of self-leadership to drive their own research performance at acceptably high levels of performance (mostly A- and B-rated scientists). The fact that they lead Research Centres of Excellence and

Research Chairs as well means that they are also accountable for ensuring the performance of these research institutions. This direct extrapolation from doctorate to rating cannot be done for the social sciences and humanities, because they have been included in the rating system only since 2002 and hence the longer lag periods in the table between PhD qualification and first NRF-rating.

Because productivity early in one's career usually predicts later success, efforts to secure and foster accomplishments early are important. The early NRF P-ratings for three research leaders in the sample provided early career recognition and reward for excellence in research outputs from the doctoral research. This early success has largely been realised (P-ratings to A-ratings) for those researchers who have remained close to research and not moved into more senior executive management positions. Tensions between maintaining high levels of research productivity while taking on senior leadership positions have been discussed, and generally it has been found that this affects research productivity to some extent. In Figure 10 (Chapter 6) this is shown where some researchers have moved from an A to a B-rating.

Student mentorship is an important part of research performance and, as discussed, many of these researchers have supervised large numbers of post-graduate students, especially in the natural sciences and engineering. Their commitment to creating cultures that are conducive to research through a continued focus on publishing, international conference presentations, quality research infrastructure, early leadership experiences, and so on (discussed throughout Chapter 8) is an indication that they, as leaders, are personally accountable for their own research productivity, that of their mentees, and that of the research centres overall. The reported leadership appears to contain a persistent theme of team –work and connectedness. Enhanced research performance does not happen overnight; it develops over time and with experience, and it helps if a credible leader takes accountability for making that happen at the forefront of the discipline. The complex and comprehensive nature of building intellectual capacity means that this is a

long term and multifaceted process to which institutions and individuals have to commit.

9.2.2. Leading by example

The findings discussed in chapter seven showed how the intellectual leadership provided by the researchers in the sample has been pivotal to both the developments in the disciplinary fields and to the personal scholarship of the individual research leaders. Many of the research groups led by the research leaders in this study were shown to be working at the cutting edge of their disciplines and usually form a core of expertise in and across various institutions. They have made extensive international networks that have been pivotal in the internationalisation of South African higher education. The emphasis has been on the key leadership roles that they have assumed in driving international relationships from the context of the developing world. Taken together, these contributions have led to many of these researchers becoming highly regarded scientists in international communities. This level of performance has also been recognised through numerous awards and international appointments to research bodies. This research performance allows the research leaders to lead from the front. This 'role model' role is supported by previous research on the academic department chair where deans interviewed felt that if chairs expect their academic staff to excel as teachers and researchers, then they think that they should lead by example (Benoit and Graham, 2005). Deans who make a conscious level to lead by example, do not neglect their duty as researchers, but are forced to reprioritise. Research leaders can then make research demands for improved performance, based on the fact that they themselves are performing at the cutting edge of the disciplinary field. Research development in South African institutions has tried to aspire to this principle, as can be seen by the stated personnel requirements of appointments of high level researchers "who can lead by example….the focus of such appointments should be fourfold including: i) establishing and managing a vibrant and productive faculty research group; ii) providing study leadership and mentoring; iii) the performance of one's own research and contribution of accredited research

outputs; and iv) production in knowledge application programmes in the occupation and the community" (Lues and Lategan, 2006:119). However, despite these aspirations, the cohort of high research performing South African researchers who can lead by example still remains limited when compared to the size of the academic population.

The feedback of the mentees illustrated that where they could, they chose research supervisors on the basis of their research reputation. Earlier findings illustrated that the mentees wanted to work in these high-performing teams and they appreciated the connections to these research leaders' networks. Hence, as illustrated by the various discussions, these research leaders are able to lead by the example of their own scholarship and prestige and drive research performance towards increasingly higher levels of achievement. The recommendations to increase the number of doctoral graduates in South Africa imply that we need a cadre of highly regarded scholars to lead these programmes. This research study has shown that quality research leadership by highly regarded scholars is able to influence research performance positively by providing the image of the scholar and a research-centeredness that is essential to attract new junior researchers to the field and to their long-term research career development.

9.2.3. Locally relevant and globally competitive research

Higher education institutions in South Africa have attempted to respond to the transformation agenda by creating environments in which researchers can become internationally recognised (and thus competitive), while also contributing to continental and national development. In the research arena, these efforts are generally seen to have an impact via knowledge production, technology transfer, training and capacity development.

Most of the research leaders in this study are working on problems in a variety of locally relevant areas such as engineering, education, health, energy, environmental and agricultural economics, human rights and forestry. In these research domains they are researching relevant aspects such as

reducing carbon emissions, teacher education, drug development and treatment protocols for HIV/AIDS. The importance and relevance of the research to local industry and policy is also illustrated through local university research units:

As such, the team bears the responsibility for all forest protection issues in South Africa, covering an area of about 1.5 million hectares of plantation (Prof Bloom's Research Group)

There are examples of cross-disciplinary research with applications in engineering becoming useful in local health and social sciences issues:

Image processing can also be used to diagnose diseases. An x-ray image of a patient's lung can be scanned and the image processing system can be used to determine if the patient is suffering from pulmonary embolism or a blockage of the lungs. Having taken the leap of turning an engineering application developed for the manufacturing environment to healthcare uses, the research expanded its functionality to diagnose other diseases and injuries, and can even be used to assist with the treatment of patients needing radiation therapy (Research of Professor Nelwa)

There are some researchers in the sample who have developed regional pre-eminence. This is illustrated by the work that is led through the extensive continental programmes which include mobility of students and research experts, as well as technological innovations. The larger doctoral programmes across the continent are in the areas of environmental and agricultural economics and international human rights, two issues with high relevance in the South African and African context. Two research leaders in engineering have won prestigious continental awards for research achievements that are deemed to have an impact on the quality of life for Africa and its people.

The international footprints of the research leaders discussed in Chapter 7 showed their competitive ability in the global knowledge markets. Two "special qualities" identified through the work of Hanson and Monsted (2007), and that are required in research leadership in the new knowledge economy, appear to be present in this group, viz: a) to be able to use the external contacts and dissemination of research for access to further research; and b) to create an environment of self management in a collective organised

research group to mobilize young researchers to take their own initiative. The latest work of Prof Liu and her team gives credence to the meaning of 'locally relevant and globally competitive':

Scientists and engineers at the (name of university), have developed a hybrid energy solution, based on the Fischer-Tropsch (FT) chemical process, which could be deployed at municipal rubbish dumps to produce both electricity and transport fuels from fresh garbage. Director Professor Liu tells us that the so-called 'Gate Project' (Garbage-to-Energy Project) has been proved on a laboratory scale, while the main electricity- and fuel-making components are already in commercial operation in Australia, China, Japan and South Africa. The proposed solution aims to combine these components into a modular facility capable of dealing with South Africa's triple challenge of municipal waste disposal, power shortages and unemployment.

The discussion above is intended to show that many of the research leaders are undertaking research that is of excellent quality, locally relevant and globally competitive. In terms of transformation, there has been a stress on the need for "the development of scholars interested in actively pursuing and developing new knowledge about the continent, scholars who realise that Africa desperately needs intellectuals that focus on Africa" (Nkomo et.al 2006: 9). In the South African context of the "brain drain" and/or institutional leeching created by academics on the move, a useful reminder is that the best local academics are employed at research universities which provide them with a home and with the possibility of contributing to science and scholarship without leaving the country (Altbach, 2007).

9.2.4. Personal Dynamics

The effective leadership and research productivity literature and models referred to in this study (Bolden et al., 2008; Bland et al., 2005; Bland and Ruffin, 1992) highlight the role of individual or personal characteristics. These usually relate to the personal qualities, experiences and preferences of individual leaders. This study comprised interviews with ten individual leaders from diverse disciplinary backgrounds, institutions and academic experiences as outlined in Chapters 6 and 7. Given their intellectual leadership roles and professional credibility, these are individuals with high academic capability

and an aspiration to succeed. This is seen through the self-leadership in driving continued research performance at the level of self, team and institute. They display a confidence in their ability to do research, raise funds and lead a team of researchers towards enhanced research performance. Overall, they all displayed a passion for learning and for research and knowledge production that can make a difference. Mentees described many of the leaders as energetic and very hard-working. For many of the research leaders, the roles of manager/administrator versus academic revealed identity tensions at the personal level and this is supported by the findings of the leadership model suggested by Bolden et al. (2008). People leadership is a central role of academic leadership and at the unit of analysis for this study (department/research unit), one of the strongest focuses was on the relationship with the post-graduate students. Naidoo's research study on deans in merged institutions pointed out that "people need to feel appreciated before deans can apply any form of transformational leadership" (2009:138). In general, the interviews with the leaders showed the centrality of the students to the research enterprise. This was confirmed by the mentee feedback on the interpersonal and professional relationships. As discussed in Chapters 7 and 8, the mentee feedback was overwhelmingly positive for this sample of leaders.

Hence the study draws attention to the fact that research leadership is also influenced by the personal characteristics of the leader. With the development of the new generation of research leaders as a core responsibility of research leadership (as discussed in Chapter 8), people centred leadership is an important attribute that arises out of a set of personal values and characteristics of individual leaders.

9.3. Notable differences

Having drawn attention to the more cross-cutting or common themes traversing the individual career trajectories, on further reflection, differences in research leadership across the sample can be traced mainly to differences in disciplines. Gibbs Knapper, and Picciin (2008) are of the opinion that much of

the research literature on leadership in higher education is discipline-blind, mainly because it focuses on senior and central management and not on departments. According to the authors, “disciplinary differences involve differences in activity systems and the way work is organised that have profound implications for the way leadership does, or could operate” (Gibbs et al., 2008:417). This research study focused on research leadership at the departmental and research centre level and hence permitted a level of detail that made visible the activity systems of the particular disciplines involved and the local organisation of the various forms of dispersed leadership. The research questions did not specifically address disciplinary differences, but the differences did emerge from the findings of the study.

Professors Liu and Bloom, coming from the engineering and biological sciences, showed research and leadership similarities in the sense that they were managing centres of excellence, working with large research teams in expensive laboratory environments, raising large budgets through industry partnerships and government funding, and using similar committee approaches to the mentorship of doctoral student. To this end, their research environments and leadership follow the new framework of “entrepreneurial action among researchers” referred to in the literature review. Their research activity systems align with the findings of Hansson and Monstead (2007), namely:

- Funding is tied to collaborative networks of researchers that cross both national borders and boundaries between universities and industry;
- Much stronger emphasis on applied research;
- Consultancy services for technology transfer and the legal and commercial aspects of innovative activities.

The ability to create these networks, play a brokerage role and create and use entrepreneurial opportunities is one of the most important leadership competencies of these research leaders. Personal qualities such as scientific capital and charisma are shown to foster these leadership competencies in

this complex environment. As showed earlier, both researchers used distributed leadership models in the large research teams, with accountability dispersed through various layers of expertise that included students.

This networking and industry collaboration was also found among other research leaders (Marie and Nelwa) but in different degrees. Professor Marie does not run a centre of excellence but has forged the industry relationships and focus through her drug-discovery programme in a move to a new research-intensive university. Professor Nelwa, who has three patents and technological innovations outlined in this and previous chapters, has moved out of the laboratory environment into executive management where he now overseas research development across seven different schools in the faculty. Hence, organisational factors influence research beyond the discipline. This agrees with Shattock (2003) who felt that discussions of leadership style in universities must be qualified by disciplinary cultures as well as by the nature of university organisations.

At least two of the professors from the biological sciences were undertaking fundamental research and hence were working with small student numbers. They relied on government funding through research support agencies.

Research activity systems and leadership differed in the cluster of social sciences and humanities. In this sample, the research leaders in law and economics worked in large teams across national and continental borders, with large injections of funding from international foundations and donor communities. This required leadership of diverse student populations who spent only periods in the home institutions. Education, business management and health leadership in this sample followed the solitary research model more closely, with one on one mentor-mentee relationships most prevalent in the respective departments. The leadership role was confined mostly in the higher education system with health professionals sometimes opting to move into private practice. Given that all study participants, regardless of discipline, are highly regarded research leaders, it is then clear that excellent research

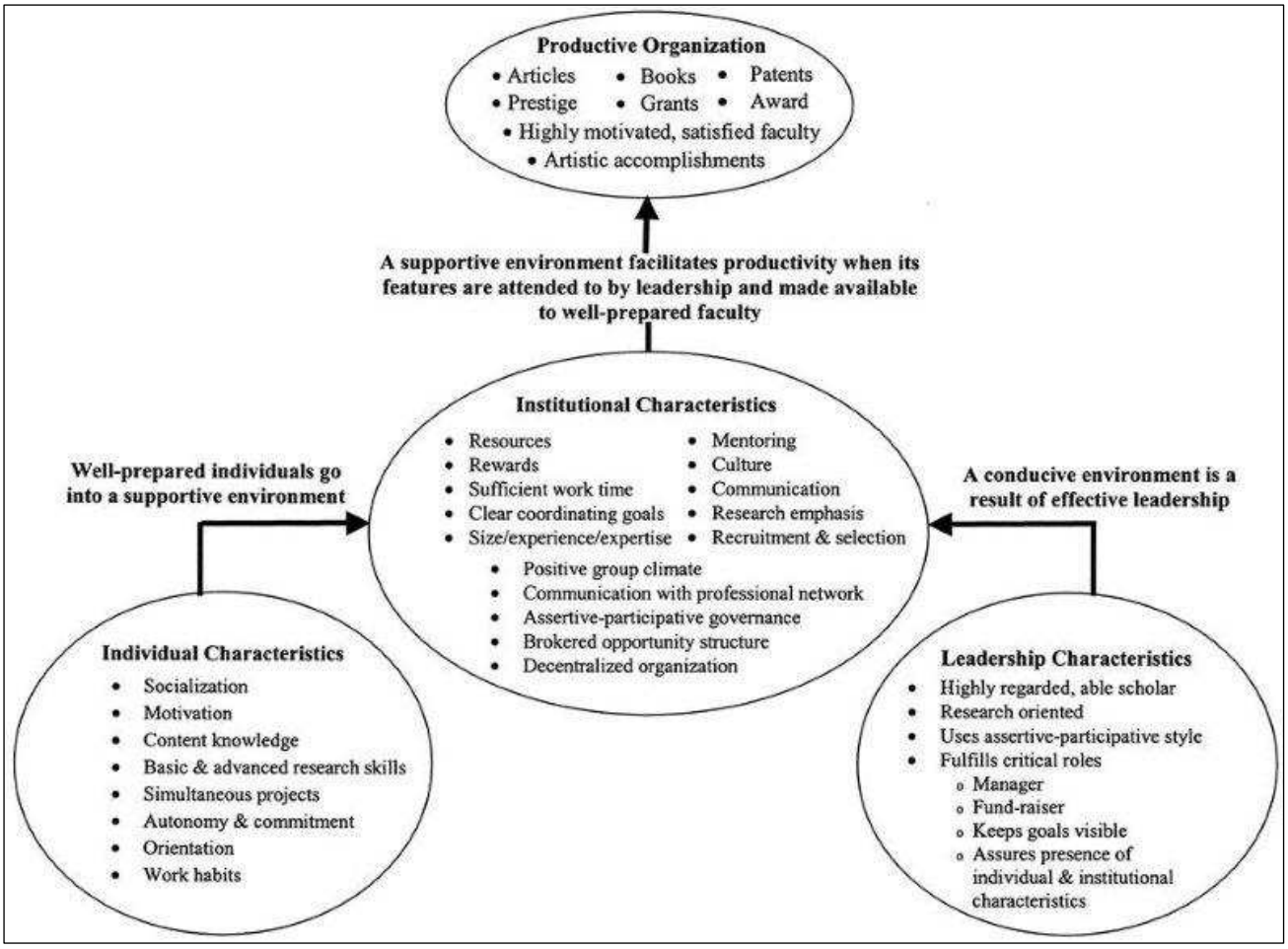
can be fostered through a variety of forms of leadership across-disciplinary boundaries.

9.4. Reflections on the Conceptual Framework

In exploring the professional and personal nature of research leadership and its influence on research productivity, the Bland et al. model was used as a conceptual framework. This model of faculty and departmental research productivity was tested in the environment of a large medical school in the USA, but was found by the authors to be internationally applicable beyond disciplinary borders.

In summary, the research productivity model confirmed that an individual's research productivity is influenced by a combination of individual characteristics and institutional characteristics. The impact of the institution is mediated by the qualities and style of the leader. Thus, given its emphasis on leadership as one of three important factors contributing to research performance, the model was found to be appropriate as a starting framework for this research study. However, it is recognised that a study of leadership characteristics will indirectly include features that are both individual and institutional in nature. The findings of this study are discussed here, using the Bland et al. model framework. Since this research study aimed to explore the leadership elements, characteristics and modes of practice that drive excellence in research performance, the main findings will focus mainly on the four leadership characteristics of the model, namely, highly regarded scholar, research orientation, leadership style and leadership roles.

Figure 10: Components of a productive research environment: the individual, environmental and leadership characteristics.



Source: (Bland etal.2005:227)

Highly Regarded Scholar:

The model suggests that the leader should be highly regarded as a scholar. In this research study, this important criterion formed the basis for selection of the participants in the study. Firstly, the original selection was based on the assessment of their research performance records (NRF-rating system). Their NRF-ratings gave assurance that they were all established, productive scientists, with at least 80% of the sample having been identified as leading international scholars or international scholars of note in their field. In addition to their NRF-ratings, each participant was recommended by their research institutions as a person who was considered to be a research leader.

Secondly, Chapter 7 illustrated how, because of their excellent research work, their personal intellectual scholarship was, in many cases, moving boundaries in their discipline fields. Thirdly, their curriculums vitae indicated that their peers had recognised them as leaders through national and international awards, appointment to international committees, professional associations, academies and panels and invitations to world congresses, joint collaborations or visiting fellowships. The internationalisation at this level has been significant since many of the roles have been able to influence how the international community views and collaborates with the developing world. All these areas ensured that the research leaders in the study are highly regarded scholars in their fields of specialisation.

Another important emphasis of the model is that the highly regarded scholar serves as a peer model and mentor for other group members. The qualitative data of Chapter 8 showed that a large portion of the mentees indicated that their choice of supervisor had been based on the research reputation and track record of the professor. It was also shown how having a highly regarded scholar as a supervisor provided the mentees with a close-up 'image of a productive scholar' that is so necessary to early socialisation into an academic research culture. Various mentee responses described how they valued this opportunity to work with good role models and mentors who lead by example. Hence, the findings of this research study support the Bland et al. emphasis on the need for the leader to be a highly regarded scholar who serves as a peer model and mentor.

Research-oriented:

The second leadership characteristic of the Bland et al. model is that the leader should be research-oriented. This characteristic has been identified as being common to the research career trajectories of all research leaders and is discussed fully earlier in this chapter. Given the detailed discussion of this factor in this chapter, there will be no further elaboration except a comment that the findings of this study illustrate the importance of research-centeredness to effective research leadership.

Leadership style:

The model found that leaders who facilitate research performance use an assertive, participative style. As discussed in Chapters 7 and 8, research leaders and mentees in this study emphasised a collective team approach, with a shared responsibility for maintaining excellent research performance and the reputation of the research unit. Leadership was found to be dispersed in a collegiate way among the members of the research teams. Communication was found to be a key feature of the professional and inter-personal relationships between leaders and mentees. Large teams were seen to be working in a distributed leadership mode, where junior and senior researchers worked together in committee style. The cultures supported excellence in all areas. This created supportive work environments and set expectations for all research team members. Mentee responses reported in earlier chapters illustrate mostly positive experiences of research leadership in doctoral programme. Hence this research supports the characteristic of participative leadership for effective research performance.

Leadership roles:

The Bland et al. model highlights the necessity of leaders to engage in the critical roles of manager, fund raiser and facilitator of research cultures and productivity. The findings discussed in Chapters 6 through 8 illustrate that all the identified leadership roles were performed by the research leaders in this sample. Their leadership style was generally described in mentee feedback as empowering and consultative. They played strong mentorship roles in a distributed leadership framework by preparing young researchers for academia. Many leaders were found to be transformative in their leadership roles, working at supporting mentees in areas that required social and emotional support outside of academia.

Their roles in obtaining funding was found to be instrumental to the research success of the team, with the research experience and reputation of the individual and the centre/institute playing a significant role in the ability to raise funds from a variety of sources. The research leaders were group advocates for the research team and individual mentees, taking on the

institutions on matters of student funding, laboratory safety standards, parking and safety and security. They appeared to be generally comfortable with the role of academic as fundraiser and entrepreneur. The emphasis on publication in quality journals and completing doctoral studies in allocated time frames meant that the mentees were oriented towards a group mission with a focus on excellence. This was emphasised in Chapters 7 and 8 that describe how the research leaders were instrumental in facilitating the overall research productivity of research teams.

The four main leadership features of the Bland et al. model are found to be present in the research leaders in this research study. It is thus concluded that the sample of research leaders chosen for this research study have leadership characteristics that are in common with effective research leadership in the international research community. As 80% of the participants are research leaders in research-intensive universities, the expectation is that these leadership features correlate highly with the institutional factors as well. It must be noted, however, that this study did not investigate the institutional characteristics in great depth, except through the contextualisation of the South African research environment and the participants' own narratives of their career trajectories. The research did not explore all the individual characteristics of the mentee's, except as they were exposed through their experience of the research process and research leadership provided.

9.4.1. Challenges in the use of the conceptual framework

Research is also about adding value to the individual, the community and broader society. The South African context has been uniquely characterised by a strong drive to redress deeply inherited systemic inequalities which have their roots in the pathologies and social relations of race, class and gender. In this context then, research leadership can be viewed as an agent of and for higher education transformation. Hence, effective research leadership in the South African context must, of necessity, include a responsibility to address the transformation imperatives of the system.). The policy framework of the

South African Government's 1997 White Paper placed key conditions on the transformation of the system including:

- Increased and broadened participation;
- Responsiveness to societal interests and needs;
- Co-operation and partnership in governance.

Transformational leadership shows itself through concern for the "development and well-being of others, in the ability to unite different groups of stakeholders in articulating a joint vision, and in a delegation of a kind that empowers and develops potential, coupled with the encouragement of questioning and of thinking which is critical as well as strategic" (Metcalfe and Metcalfe, 2005: 32).

The Bland et al. model allowed this research study to clearly illuminate the intellectual leadership role of the ten research leaders in driving research excellence. However, it does not allow as equal an elucidation of the transformational leadership required to change the research system. It does not seem to locate the research production in a framework that accounts for socio-political contexts and hence transformation imperatives. A research leader who has satisfied all the criteria for effective leadership according to the Bland et al. model i.e. highly regarded able scholar who is research oriented, uses a participative leadership style and fulfils a range of critical functional and management roles but failed to use this leadership to drive the research transformation needs of higher education in South Africa, could hardly be termed fully effective in making the country globally competitive. Anecdotal evidence suggests that a major argument against the late apartheid era and early post-apartheid system was that while senior rated researchers were internationally renowned scientists, they were not necessarily training South African black post-graduate students (in any significant numbers) in the national higher education system. Highly regarded researchers were supported to focus on research, with limited imperatives to train quality post-graduate students in quantities that would impact on the

research performance of the system. National funding systems like the NRF then introduced funding criteria that were more directly linked to transformation imperatives in order to drive systemic change. These were not always successful in accomplishing change at the levels required, especially when the grant size and rating categories were no longer linked. Highly-regarded researchers who obtained money external to the national system (e.g. from foundations or industry) were not compelled to meet the transformation imperatives of the country.

When these contextual influences are considered, it seems as if the Bland et. al. model could be strengthened for broader application to transforming education systems in certain ways. These include the following:

a) Foregrounding the entire model in a contextual milieu that recognises that research productivity is affected by the social, political and cultural context in which institutions, individuals and leaders find themselves. This then links more directly to some features of the Bolden et al. (2008) model of academic leadership discussed in Chapter 3. In that model the contextual dimension refers to the external social, political and cultural environment, as well as to the internal organisational culture, history and priorities. The research context outlined in Chapter 2 shows how the apartheid system differentiated the system along deep race and narrowly conceived knowledge production lines. The findings of this study reveal that the research trajectories and hence pathways to research leadership were affected by cultural, institutional, political and social factors. “Establishing the existence of research excellence cannot be reduced to numbers without losing contextual information that is essential for interpretation of findings” (Tjissen, 2005:100). Chapters 2 and 3 have shown that in South Africa, the historical higher education institutional legacy, its effects on research development and research careers of individuals and the slow development of strong intellectual leadership are all embedded within a social context. The absence of the contextual dimension in the current Bland et al model gives the impression that the three groupings that

influence research i.e. institution, individual and leadership are independent of social context

b) Adding a fifth characteristic to the leadership characteristics listed in the model, i.e. *Advocate/Agent for social change*. This characteristic would link research leadership and research performance to the transformation and societal needs of the higher education context in a more visible way. It would draw attention to the need for highly regarded scholars to be instrumental in leading for broader social justice (research leadership as an agent of transformation and for transformation). In a study of deans of academic departments referred to previously (Benoit and Graham, 2005) being a *Visionary* is described as a necessary leadership characteristic/role. This is recognised with the understanding that a visionary is a transformational leader, a change agent capable of creating a space for change and generating consensus among staff. Leaders accepted the role with the understanding that making changes would be an exciting challenge. A visionary moves out in front of the pack. Although the term might be applicable to research leaders who achieve broader roles, further reading of that study found that the term 'visionary' seemed to be more closely related to the research itself rather than to leadership roles that are truly transformative. If the term is eventually chosen to capture this broad role of research leadership, it should be used to encourage greater accountability and make 'leading by example' a truly lived value at this level.

9.5. Answering the research question

Chapters 6, 7 and 8 outline detailed findings that provide answers to research question 1 *What are the career experiences and pathways traversed?* and question 2 *What are the characteristics and leadership experiences?* These main findings are summarised, with common themes and differences highlighted in this final chapter. However, at this stage research question 3, *Why are some research leaders more effective than others in influencing and stimulating research performance?* remains unanswered.

This question opens up further questions about measurement and baselines for comparison in order to decide 'what is effective', and then 'what is more effective'. Research leadership in this qualitative study was broadly defined by the research hallmarks of excellence in scholarly publication at the cutting edge of the discipline, extensive quality national and international research networks, personal scholarly recognition and prestige among peers, leadership of quality master's and doctoral programmes, early researcher mentorship and the ability to garner research funding. In the sample used in this study, all researchers were rated and hence considered to be established researchers. Although they were all effective researchers, it became clear that not all research leaders in the sample were able to influence and stimulate research performance to the same level in their research contexts. Based on the qualitative data collected through this study, it is suggested that those research leaders in the sample who were able to influence and stimulate research performance, had the following sets of personal and environmental features in common:

- **Academic experience**

Firstly, they had been in the research environment for an extensive period of time (more than ten years). They had also held varying senior research leadership positions for a number of years. They had built an academic reputation over an extended period of time, based mainly on demonstrated intellectual capacity through personal scholarship. This has implications for the local academic sector which has, at times, been characterised by the appointment or promotion of individuals to positions of leadership without the necessary academic experience; "privileging race in these senior positions is extremely dangerous unless it is backed by broad consensus that the eligible candidate is in fact a leading scholar and a competent manager" (Jansen 2004:12).

- **Personal characteristics**

Secondly, they loved what they were doing. They loved their jobs. They had a passion for research, worked long hours, and showed maternal and paternal

attachments to the research students and their research units. Their leadership style was people centred. They were generally described as charismatic and dynamic by mentees. In at least one case the research leader was seemingly regarded by mentees almost as heroic, mostly in terms of what had been achieved in the research world. A case study of research development at a South African university of technology found that "the establishment of intellectual capacity amongst the existing population of researchers appears to demand more personal strategies" (Lues and Lategan, 2006:119).

- **Institutional support**

Thirdly, these research leaders generally had a positive relationship with their institutions. They were still very vocal in their institutions about things they did not like or were dissatisfied with, but they seemed to get the support from their institutional leadership to move beyond the everyday administrative annoyances. As illustrated in an earlier chapter, these leaders were left to do their own research thing. Their research performance, through rewards and accolades, added to the research reputation of the institution, and hence they were supported to continue to perform.

- **Leadership roles**

Fourthly, they embraced the leadership role with confidence, whether at the administrative/management or the strategic level. They managed to face the ongoing tensions in such a way as to ensure that daily operations continued while strategic and intellectual leadership were simultaneously achieved. They were able to assert both personal and professional authority which appeared to emanate from the self confidence in their intellectual scholarship and the drive to enhance research. They stayed close to the research field and the latest, cutting edge developments. Part of embracing that leadership role was seen as bringing in the right people to get the work done.

- **Culture of learning**

Lastly, but not of least importance, is the fact that mentees of the effective leaders reported research programmes as exciting and innovative, with the encouragement of some risk taking, especially in the conceptualisation of ideas. Open enquiry environments were described, where any question was allowed to be put forward without fear of discrimination or rebuke. Ambitious research targets were set and mentees were competitive in realising these targets for personal and departmental recognition. Hence it seems that the research leadership at this level is able to create a stimulating research culture of mentoring and learning.

These five features seem to be common to those leaders in this sample who were able to occupy senior leadership positions, train large teams of students, raise considerable amounts of funding and play leading national and international roles in research contexts and networks and hence effectively drive enhanced research performance. In the higher education context as outlined in Chapter 2, there has been a critical need for "the production of intellectuals who can make a contribution to the transformation project in South Africa" (Nkomo et.al. 2006). However, the findings discussed illustrate that research leadership characterised by intellectual scholarship and academic excellence is still struggling to drive an equally successful transformation agenda within the South African higher education context. The challenges that exist are outlined below.

9.6. Challenges for research leadership

This research has shown that leadership does matter and that research leadership that has professional credibility through personal scholarship and prestige is able to influence research performance positively. The research indicators discussed in Chapter 2 show that the South African higher education system is characterised by pockets of scientific excellence in certain disciplinary fields. A transformed system that supports the economy in being truly competitive and that improves the quality of life of all its citizens will require a focused effort to increase the quality of personal scholarship and

intellectual leadership of the majority of academics in higher education. In addressing this systemic gap in academic leadership, the research reveals a number of challenges that remain for research leadership in the South African context. These include:

- **Individualism and competition**

The South African system is relatively small when it is defined by the number of FTE researchers (approximately 16 0000). Most higher education institutions in South Africa aspire to be world-class research institutions, despite efforts to work towards a differentiated system of establishing some teaching and some research universities. Highly regarded scholars are still in the minority across disciplines and hence there is a 'market' culture that exists, where universities with resources can attract the best-qualified researchers. This is illustrated in the discussion on career moves (Chapter 6). As well qualified individuals seek out more and better paying job opportunities it becomes increasingly commonplace for better resourced departments to "raid" skills to meet their own research skill shortages or meet their staff equity targets. The practice lends itself to situations where the focus is on a few individual researchers as they reach iconic status in the system and where competition between departments and institutions is increased.

- **Equity and excellence**

Excellence is the 'gold standard' in research performance and a culture of excellence is part of the research cultures in the research environments created by these research leaders. However, the basic education system of South Africa is still not providing education that is of a high enough quality to ensure entry to university level courses. There is still limited university access for students from working class, rural, and poor social origins. Many schools attended by black students, especially from rural areas, do not meet minimum standards for quality education. Thus universities are increasingly required to fill the proficiency gaps (ASSAF, 2010). Research leaders should be mindful of the imperatives to fill these gaps and drive active research cultures and programmes that will address this ongoing system tension. To date, as

revealed in discussions with research leaders, there is competition for a limited number of black students who may meet the required standard of excellence.

- **Race and gender**

Despite the changes in higher education outlined earlier in this thesis, there has been very limited change "with respect to the challenges of decolonising, de-racialising and de-gendering of inherited intellectual spaces. The social composition of academic staff remains largely white." (Badat, 2009:465). Research leaders and mentees in this study discussed how the complexities of gender affected their research pathways. In Chapter 5 it was pointed out that the initial list of recommended research leaders supplied by institutions in the sample did not include a single black woman. Upon request, universities were able to offer at least one or two "possibilities". Hall and Burns (2009:56) point out that "while acquiring research skills may appear to be a neutral process, skills associated with being a researcher reflect what a research community values, and those values can be used in powerful ways to promote, marginalise or exclude". Research leadership has to be committed to the transformation needs and should be at the forefront of drives to change institutional cultures dominated by historical traditions that make it difficult for women and people of colour to become highly regarded scholars.

- **Research career exit and entry**

More than 50% of research leaders in this sample are thinking about possible retirement from their current research posts in the next five to eight years or less. Two researchers in this sample in the 40-year age category were adamant that they were working towards more senior research management posts in higher education. As a result, besides natural attrition, the system has to cater for the attrition of younger researchers into more executive academic or corporate posts. If effective leaders develop over time through academic experience, responsibility through a variety of leadership roles, personal characteristics and institutional support, then the system should already have a cohort of emergent leaders-in-waiting. Where will these new

research scholars emerge from? One concern noted earlier is that the mentee 'super stars' have been identified by research leaders and are the next leaders-in-waiting (Cross, et al. 2011). This makes addressing all of the challenges mentioned above more difficult. The imperative of building a new, more democratic process of knowledge production and a new, diverse, high-calibre research cohort is a pivotal role of research leaders. It is in this light that the changes have been suggested to the Bland et al. model.

At this point, reflections on the research model and the summary of the answers to the main research questions helps to clarify what contributions to knowledge have been achieved through this research study.

Firstly, there is a dearth of studies on higher education leadership in South Africa, so this exploratory investigation of research leadership and its influence on research productivity will add to the limited literature in this field. This research differs in that it has used the 'positive sample' i.e. research leaders who are already known to be high research performers and explored their pathways to this position of leadership. The focus of the leadership study has moved away from the role of the vice chancellor or other senior university leaders more commonly identified in leadership research. Instead the unit of analysis for this study has been at the departmental or research centre/centre of excellence level. At this level the leadership is still close enough to the disciplinary research context while also including management and administration roles. In exploring the contribution through the personal scholarship of individual leaders, the research has been able to provide a view of the developmental roles played by individual researchers in different research domains. Gibbs et al. (2008) point out that there is a limited number of studies that address leadership at the discipline level, so this exploration of research leadership at the disciplinary level will add to research in this area.

The findings from the study suggest that the Bland et al. model may be more reflective of transitioning higher education systems like South Africa if it positions the social-environmental context more visibly. The research findings show how research trajectories and hence research leadership pathways

have been affected by both race and gender and international politics, for example, the ban on international research collaborations or conference attendance with South African researchers during the apartheid era. Hence, in addition to the existing leadership characteristics that were all found to be important and positive in the research leaders of the study, the Bland et al. model of faculty and department research productivity should highlight their role as transformative leaders, as agents of change. This role has been found to be a central requirement of all research leaders in the transforming research context, although, admittedly, a role executed with seemingly less success than intellectual leadership. Although they have been identified in this research, future explorations of research leadership should perhaps look more closely at the role of research leaders in driving transformation agendas at varying levels of curriculum, new knowledge production and research culture and mentorship. This would test the feasibility and viability of suggested changes for the developing, transitional context.

9.7. Directions for Future Research

Given the limited research on leadership in higher education, especially in the context of South Africa and the developing world, this study could provide the basis of further developments in this field. This study used the NRF rating as a mandatory criterion for sample selection and the reasons for this choice have been explained. However, future research should explore the research trajectories of a sample of unrated research leaders across-disciplinary fields. This could provide a basis for comparison where the issue of rating scientists in a small science system is continually under discussion.

This sample of research leaders for this study had all been trained (doctoral degrees) at research-intensive universities and most occupied research leadership positions at research-intensive universities. This is not reflective of the entire higher education history of South Africa, where there is a legacy of researchers who attended and were trained through doctoral programmes in less research-intensive institutions. Many of these graduates possibly lead research capacity development in universities of technology or

comprehensive universities. An exploration of their research pathways may reveal a different path to the position of a highly regarded scholar and it would be important that their research story be told alongside the research pathways of this sample.

A common criticism of leadership research is that it is a tale of self-report by the leaders themselves. Hence this research study included the views of mentees who had worked with or were supervised by the research leader, generally at the post-graduate level. This has extended the research in the leadership domain. Most of the feedback from mentees on their experience of research leadership was positive. A criticism of that additional source of data may be that research leaders and mentees/students exist in power relationships that might have provoked the positive feedback. Future leadership research should continue to include mentees, but could also include the feedback of fellow established researchers in the research teams. These would provide the additional voice of the research peers.

Finally, a longitudinal study is suggested that might provide useful information for the South African scholar/leader debate raised in the rationale of this thesis. A number of the research leaders in this sample indicated that they would consider a move into executive research management if this was a possibility. If they did, a research study could explore what role their intellectual leadership plays in considerations of their appointment as well as how they lead from the position of a highly regarded scholar. This would be along the lines of the work by Goodall (2006; 2007) who suggested that leading universities are led by leading researchers.

A response from a mentee in this study seems an appropriate way to conclude this exploratory study on research leadership. . This is chosen for two reasons, namely to avoid the criticism of self report in general leadership studies, and because the response encapsulates the essential features of effective research leadership that have been highlighted in this study. The mentee described the impact of a research leader's mentorship on his/her research career in the following way:

The impact is immeasurable…

(Prof) helped me to develop with regard to fundamental research skills (thinking, research design, writing, etc.)…

(Prof) guided me into a network of wonderful and successful diversity scholars…

Perhaps as importantly (Prof) has been a role model with regard to being an overall scholar of the first rate.

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APPENDIX A

Student: B.Damonse (21231614)

PhD Study: Leadership through the through the lens of research productivity

Sample Selection-Research Leaders

Research leadership in this study is identified by the hallmarks of excellence in scholarly publication at the cutting edge of the discipline, extensive quality national and international research networks, personal scholarly recognition and prestige amongst peers, leadership of quality masters and doctoral programmes, early researcher mentorship and the ability to garner research funding.

Successful research faculty are generally those who publish in the leading journals, develop quality postgraduate students, garner large external grants, create intellectual property, garner publicity for their institutions and are selected for the nation's elite academies. It is also usually that same faculty who are able to command large teams of research associates, post-doctoral researchers and graduate students, and professorships and chairs (Pourciau, 2006 p3).

Target Level: Dean/assistant dean/head of department/head of research unit/centre of excellence etc

Discipline: Any

Indicators used in this study to verify that participants indeed exhibit signs of <u>excellent research leadership</u>

INDICATOR	SUPPORTING DATA/COMMENT
NRF Rating (A,B,C) (compulsory)	
Excellence in scholarly publication at cutting edge of field	
Personal scholarly recognition and prestige amongst peers	
Leadership and/or teaching of quality post graduate research programmes	
Early researcher mentorship	
Extensive quality national and international networks	
Research/scholarly awards	
Ability to garner research funding	
Contribution to management and administration in support of research excellence	
Innovations in research performance or capacity	
Appointment to position of research chair or leader of centre of excellence	
Selection to academy of sciences	
Other relevant indicator(s)	

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

APPENDIX B

Pretoria 0002 Republic of South Africa
Tel (012) 420-5721 Fax (012) 420-4215
http://www.up.ac.za

Faculty of Education

Prof
Deputy Vice Chancellor; Research, Innovation &Advancement
….

……

Dear Professor,

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH UNIVERSITY OF JOHANNESBURG

I am registered for a PhD degree with the Department of Educational Management and Policy Studies, Faculty of Education at the University of Pretoria. The topic of my dissertation is ***Leadership as viewed through the lens of research productivity.*** This study seeks to explore the professional and personal nature of academic leadership that enables and stimulates high quality research performance within the context of the research enterprise.

The participants of the study will be selected research leaders and at least two of their direct mentees from South African research institutions. The research leaders should satisfy the following criteria viz a) NRF rated researchers b) at level of dean or deputy dean or equivalent c) and selected by the DVC as a recognised effective research leader. The mentees will be individuals who where developed under the research leadership of the participant selected as above and who now occupy academic or research positions or senior positions in other related sectors. They may or may not still reside within your institution.

The research activities will include semi- structured interviews and focus group discussions. Data collection will also include research records of individual research leaders.

I request your permission to undertake the aforementioned study with selected research leaders from your institution who may be included as part of the final sample.

Yours sincerely

Beverley Damonse

APPENDIX C

University of Pretoria

Pretoria 0002 Republic of South Africa
Tel (012) 420-5721 Fax (012) 420-4215
http://www.up.ac.za

Faculty of Education

Professor ……

……

10 July 2009

Dear Professor ,

RE: Request for participation in research study

I am registered for a PhD degree with the Department of Education Management and Policy Studies, Faculty of Education at the University of Pretoria. The topic of my dissertation is ***Leadership as viewed through the lens of research productivity.*** This study seeks to explore the professional and personal nature of academic leadership that enables and stimulates high quality research performance within the context of the research enterprise.

Through a process that included, amongst others, the criteria of NRF rating and recommendation by your institution, you have been selected as a suitable participant for my study. As a participant you will be required to take part in a face–face-interview (possibly a minimum of 1x 3hrs or 2x2 hrs each) where I would like to discuss your personal and professional research leadership and research productivity experiences within the academic context.

My data collection would also include your curriculum vitae and records of scholarly production, although as a rated researcher, much of this research information may already be available on the NRF database. Your responses

will be held in confidence and I will be pleased to share the transcripts of interviews with you for comment.

Research studies show that there is a dearth of literature on leadership within higher education. Feedback received on the research proposal to date suggests that this study could contribute to an informed understanding of the nature of academic research leadership that promotes scholarly excellence.

I do look forward to your positive response to my request.

Yours sincerely

Beverley Damonse

APPENDIX D

University of Pretoria

Pretoria 0002 Republic of South Africa
Tel (012) 420-5721 Fax (012) 420-4215
http://www.up.ac.za

Faculty of Education

Dr A Van Jaarsveld
Acting President and CEO,
National Research Foundation
PO Box 2600
Pretoria 0001
Tel;012 418 4109
Email: albert@nrf.ac.za

Dear Albert,

RE: Request for access to data records

As you know, I am an employee of the NRF and currently the Executive Director of SAASTA. I am also registered for a PhD degree with the Department of Educational Management and Policy Studies, Faculty of Education at the University of Pretoria. The topic of my dissertation is ***Leadership through the lens of research productivity.*** This study seeks to explore the professional and personal nature of academic leadership that enables and stimulates high quality research performance within the context of the research enterprise.

The participants of the study will be selected research leaders and at least two of their direct mentees from South African higher education institutions. One of the criteria for the selection of the participants is that they must be NRF rated researchers. I will also use their research records as part of my data collection.

Hence, since the participants are rated, much of their research data may be stored on the NRF base. Any NRF grant funding and student support records

will also be information that contributes towards an analysis of research productivity of the participants.

I hereby request your permission for access to the NRF research records of the selected participants who will be part of my research study. The participants are unknown at the stage.

Yours sincerely

Beverley Damonse
Student No: 21231614

APPENDIX E

PhD research study
Leadership through the lens of research productivity

LETTER OF CONSENT

I ……have consented to participate as a research subject in the PhD research study of Beverley Damonse, a student of the University of Pretoria. I understand that the interview data will form part of the main body of the PhD dissertation and that her studies are to be used for educational purposes.

In addition, I have agreed that my professional curriculum vita, research records submitted for my NRF rating, and my grant funding history may be used as secondary data for the study.

I understand that responses will be held in confidence and transcripts of interviews will be shared for comment. Furthermore I have agreed that in the study the researcher will refer to me by: (tick the appropriate block)

A pseudonym ☐

My given name ☐

_____ _____
Signed Date

APPENDIX F

1A. INTERVIEW SCHEDULE

Schedule for face-to face interview with research leaders

Respondents background details, especially related to research.

1. Describe the nature of your qualifications and the institutional affiliations that make up your academic pathway.

2. What do you consider as 'key events/ hinge moments' that shaped your development as a researcher and academic scholar?

3. Describe your current job title and primary employment function? Did you apply for this position or were you promoted into it?

4. What are the tasks/responsibilities that make up your current portfolio? Are there any role demands and/or tensions that you experience within this portfolio?

Respondents' thoughts about research and research leadership

1. What are your views of the nature of research and research excellence?

2. What is your understanding of the nature of research leadership?

3. What do you consider as the determinants of credibility for a research leader?

4. Research leader and individual researcher. How does one fulfil these roles effectively?

5. How would you describe your own approaches to research leadership?

6. Can you describe any examples of good and bad research leadership experiences in your academic career.

Experience of leadership upon others – respondents thoughts about mentoring, building capacity and research productivity

1. How do/did you build research capacity and drive scholarly production within your faculty/research team?

2. To what extent is scholarly productivity influenced by the context of research environment? How would you describe your current research context?

3. What factors have you found to most hinder effective research and research development?

4. How do you evaluate the research productivity of your faculty members?

5. What rewards and motivations do you/ your institution use to drive research productivity? What are the 'symbols' (conscious and unconscious) of research success in your unit?

ADDITIONAL QUESTIONS PER EMAIL

1. How has your personal research development/career been impacted by the higher education context of apartheid South Africa?

2. What roles have you personally played (had to play!) as an academic leaders in driving the research transformation required in post apartheid South Africa?

APPENDIX G

Questionnaire: Research mentees

Thank you for taking the time to complete this questionnaire

SECTION A

Please provide the required personal information in the spaces below.

Name:	
Current Employing Institution:	
Current Position in the Institution:	
Year in which PhD was completed:	
Supervisor and/or co-supervisor:	

SECTION B

1. Why did you choose to follow research through PhD studies?

2. Where there any 'critical incidents' that motivated your research development and productivity?

3. What do you consider as essential characteristics of a credible a research leader?

4. How did you come to study under/ work with Prof XXXX during your PhD studies?

5. How would you describe her/his research leadership techniques/style? Explain as fully as possible

6. What do you think creates effective mentoring relationships in the research context?

7. Describe the nature of the mentor- mentee relationship you experienced with your research leader?

8. Looking back, what do you consider was the impact of mentoring on your individual research capacity and professional growth

9. What was the nature of the interpersonal relationships and communication that you experienced with your research leader?

10. What rewards and motivations were used to drive research excellence and productivity in your PhD years?

11. What kinds of training and preparation did you receive for any future leadership roles?

12. How did you, as a developing researcher, create your own research identity/niche i.e. separate from your mentor/research leader (cutting the umbilical cord).

    In what ways was this facilitated by your leader?

13. How would you describe your current research and/or professional profile?

APPENDIX H

All the interview and questionnaire data has been coded using Atlas Ti software. This information is available on CD.