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.